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Southern Scientific Centre, Russian Academy of Sciences
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QUATERNARY STRATIGRAPHY AND PALEONTOLOGY OF THE SOUTHERN RUSSIA: connections between Europe, Africa and Asia

Programme and guidebook of excursions

2010 annual meeting INQUA-SEQS
Rostov-on-Don, Russia
June 21–26, 2010

Rostov-on-Don
2010

Quaternary stratigraphy and paleontology of the Southern Russia: connections between Europe, Africa and Asia: Programme and guidebook of excursions of the International INQUA-SEQS Conference (Rostov-on-Don, June 21–26, 2010). – Rostov-on-Don, 2010. – 52 p.

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Четвертичная стратиграфия и палеонтология южной России: взаимосвязи между Европой, Африкой и Азией: Рабочая программа и путеводитель экскурсий международной конференции INQUA-SEQS 2010 (Ростов-на-Дону, 21–26 июня 2010 г.). – Ростов н/Д, 2010. – 52 с.

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ЧЕТВЕРТИЧНАЯ СТРАТИГРАФИЯ И ПАЛЕОНТОЛОГИЯ ЮЖНОЙ РОССИИ: взаимосвязи между Европой, Африкой и Азией

Рабочая программа и путеводитель экскурсий

Международная конференция INQUA-SEQS 2010
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Ростов-на-Дону
2010

PROGRAMME

June 22, Tuesday

ORAL SESSION

9^{00} – 10^{00} Registration
10^{00} – 11^{00} Opening ceremony
11^{00} – 12^{30}

Reports – 10 min
Questions – 5 min

1. *Velichko A., Pisareva V., Morozova T., Borisova O., Faustova M., Gribchenko Yu., Timireva S., Semenov V., and Nechaev V.* Correlation of the glacial and periglacial Pleistocene events in Eastern Europe: lines of attack.
2. *Iosifova Yu., Agadjanian A.* Quaternary climatic changes, stratigraphy, and sedimentology of the Don River basin.
3. *Borodin A., Zinoviev E., Strukova T., Fominykh M., Markova E., Zykov S.* Quaternary rodent and insect faunas of the south of the Urals and Western Siberia: connection between Europe and Asia.
4. *Sycheva S.* High-resolution stratigraphy and chronology of Late Pleistocene periglacial zone of the East-European plain.
5. *Palombo M.R.* Climate changes and large mammal dispersal during the Quaternary: a Mediterranean perspective.
6. *Kalnina L., Strautnieks I., Cerina A., Juskevics V.* The Zidini (Cromerian) Complex lake sediment sequence, South-Eastern Latvia.

Lunch 12^{30}–13^{50}

13^{50}–15^{50}

1. *Tesakov A., Simakova A., Inozemtsev S., Titov V.* Gorkaya Balka: a reference Quaternary section in the North Caucasus (Krasnodar Region, Russia).
2. *Baigusheva V., Titov V.* Pleistocene large mammal associations of the Sea of Azov and adjacent regions.
3. *Mayhew D.F.* West European arvicolid evidence of intercontinental connections during the Early Pleistocene.
4. *Abramson N.* Evolution and distribution history of arvicoline fauna: contribution from molecular data.
5. *Kolfschoten T. van, Tesakov A.* Biostratigraphy of arvicoline assemblages from the Zuurland (the Netherlands) drilling project.
6. *van der Made J., Torres T., Ortiz J.E., Moreno-Pérez L., Fernández Jalvo Y.* The fauna from Azokh: new fossils and new interpretations.
7. *Palombo M.R., Giovinazzo C., Rozzi R.* The early to Middle Pleistocene Italian bovidae: biochronology and palaeoecology.
8. *Suata Alpaslan F., Dinçarslan İ.* The paleoenvironmental implications of the Eastern Mediterranean: a construction based on rodents.

Coffee-break 15^{50}–16^{10}

16^{10}–18^{00}

1. *Coltorti Mauro, Pieruccini P.* Unconformity bounded stratigraphic units (UBSU) and their application to Central Italy and Sardinia.
2. *Danukalova G., Osipova E., Lefort J.-P., Monnier J.-L.* Recent advance in the stratigraphy of the Upper Pleistocene of Northern Brittany (France).
3. *Dikarev V.* Problem of Phanagorian regression – comparing archaeological and paleogeographical data.
4. *Kovaleva G.* The reconstruction of hydrological regime and the level of the Azov Sea in the Quaternary by using of diatom analysis.
5. *Yanina T., Svitoch A.* Biostratigraphy of the Caspian Neopleistocene.

6. *Schokker J., Greaves H.J., Bunnik F.P.M.* Early Weichselian palaeogeography and palaeoecology of the North-Western Netherlands and correlation to global events.
7. *Westerhoff W., Donders T*. The North Sea drilling project: Cenozoic climate and sea level changes on the NW European shelf – a major challenge for science (proposal outlines).

18^{00}–19^{00} Small welcome party in the Southern Scientific Centre RAS

June 23, Wednesday

ORAL SESSION

9^{30}–11^{00}

1. *Gerasimenko N*. The Late Pleistocene environmental changes from the Northern Ukraine to the Southern Crimea as evidenced by pollen.
2. *Novenko E., Krasnorutskaya K*. Vegetation dynamics of the Azov Sea Region in the Late Holocene.
3. *Rudenko O.* Vegetation and climate dynamics through late glacial to Middle Holocene derived from Pechora Sea pollen records.
4. *Chepalyga A*. High Resolution Stratigraphy of the Latest Pleistocene (16–11 ky) in Caspian Sea (Khvalynean basin).
5. *Lefort J.-P., Danukalova G.* Stratigraphic evidence for an Aktchagylian to Quaternary deformation developed at a right angle with the Main Southern Urals Chain.
6. *Agadjanian A*. Development of small mammal communities in the Don River basin during the Pliocene and Pleistocene.
7. *Frolov P.* Neopleistocene molluscs from Siniy Yar locality (Severskii Donets River Rostov Region, Russia).

Coffee-break 11^{00}–11^{20}

11^{20}–13^{00}

1. *Deng T.* Dispersals of Early Pleistocene large mammals between East Asia and Europe.
2. *Sharapov S.* The Late Cenozoic Hyaenidae (Mammalia, Carnivora) of South-East Middle Asia and their stratigraphical distribution.
3. *Sato T., Khenzykhenova F.* Mammoth fauna of Baikal Siberia: results of contemporary archaeological studies.
4. *Popova L*. History of *Spermophilus* species, as it has been read through the teeth.
5. *Pogodina N., Strukova T.* New data on Pliocene vole fauna from Zverinogolovskoye locality (Southern Trans-Urals region).
6. *Petrova E*. New data about the skull of the *Elasmotherium sibiricum*.

Lunch – 13^{00}–14^{30}

14^{30}–16^{30}

1. *Kirillova I., Shidlovskiy F., Chernova O*. New data on woolly rhinoceros (*Coelodonta antiquitatis* Blumenbach) horns.
2. *Tong H*. Studies on the early steppe mammoth from North China, compared with those from Russia.
3. *Chlachula J., Serikov Y.* Human adaptation to the last glacial environments in the Central Trans-Urals.
4. *Van der Made J.* Biogeography and human dispersal into Europe.
5. *Kashibadze V*. Evidence from dental anthropology to the history of Eurasian populations.
6. *Shchelinsky V., Tesakov A., Titov V*. Early Paleolithic sites in the Azov Sea Region: stratigraphic position, stone associations, and new discoveries.
7. *Zastrozhnov A*. Main features of geological Structure and stratigraphy of Rostov Region.

PROGRAMME

POSTERS SESSION

16^{40}–18^{00}

Report and questions – 5 min

1. *Agadjanian A., Iosifova Yu.* Dynamics of paleogeographical events in the Don River basin in Pleistocene.
2. *Agadjanian A., Shunkov M.* Locality of Upper Pliocene mammals and Early Paleolithic in Ciscaucasia.
3. *Akimova E., Stasyuk I., Harevich V., Motuzko A., Laukhin S., Orlova L.* The Late Paleolithic study of the Derbina Bay (Krasnoyarsk reservoir, Siberia).
4. *Alexeeva N., Erbajeva M.* Development of the aridity in the Transbaikal area in context of global and regional events based on the study of small mammal faunas.
5. *Andreescu I, Codrea V., Lubenescu V., Petculescu A., Stiuca E.* New developments in the Upper Pliocene-Pleistocene stratigraphic units of the Dacian Basin (Eastern Paratethys), Romania.
6. *Berto C., Rubinato G.* The Upper Pleistocene mammal record from Caverna Degli Orsi (San Dorligo della Valle – Dolina, Trieste, Italy): a faunal complex between Eastern and Western Europe.
7. *Bezusko L., Mosyakin S., Bezusko A., Boguckyj A.* Palynostratigraphy of the Upper Pleistocene deposits (Riss–Würm interglacial and Early Würm interstadials) in the unique section Kolodiiv–5 (Galych Dnister area, Western Ukraine).
8. *Danukalova G., Osipova E., Yakovlev A., Kosintcev P.* Palaeoenvironment of the Bronze Age settlement Tanalyk located in the Trans-Urals Region (Russia).
9. *Demina O.* Paleoecological patterns forming of the Lower Don vegetation.
10. *Dobrovolskaya M., Kirillova I., Shidlovskiy F.* Stress markers of large mammals and humans. Enviromental influences reconstruction.
11. *Farboodi M., Khaksar K., Haghighi S.* Study of erosion in the Quaternary units of Shiraz Area, Maharlu basin – Zagros mountains (SW Iran).
12. *Field M.H.* Preliminary results from an investigation of Pleistocene deposits at Happisburgh, Norfolk, UK – evidence of early hominin activity.
13. *Frolov P.* Neopleistocene molluscs from Sinyi Yar locality (Severskii Donets River, Rostov Region, Russia).
14. *Golovina L.* Coccoliths and associated nannoliths from Maeotian (Taman peninsula).
15. *Haghighi S., Khaksar K., Rahmati M.* The Quaternary stratigraphy of Iran.
16. *Inozemtsev S., Tesakov A., Targulian V., Sedov S., Shorkunov I.* Development of paleopedogenesis in Early Pleistocene in territory of the Ciscaucasia (Temizhbeksky section, Middle course of the Kuban River).
17. *Kachevsky P., Litvinenko V.* Some results on Early Paleolithic sites and paleontological locatlities in the North-Eastern Sea of Azov Region.
18. *Khaksar K., Farboodi M.* Land subsidence problem in the Quaternary strata of Tehran Region-Iran.
19. *Khaksar K., Haghighi S., Rahmati M.* The Quaternary stratigraphy and sedimentology of Tehran, Iran.
20. *Kleschenkov A.* The use of digital elevation model for study of the paleogeography of the Azov Sea Region.
21. *Komar M.* About location of possible last glaciation European trees refugium.
22. *Komar M., Łanczont M.* Late Magdalenian and Świdry culture archeological objects from Poland in the light of palynological investigation.
23. *Kosintsev P.* Relict mammal species of the Middle Pleistocene in Late Pleistocene fauna of the south of Western Siberia.
24. *Kosintsev P., Bachura O.* Mammal faunas during the Late Pleistocene and Holocene in the Southern Urals.
25. *Krokhmal' A.* Morphogenesis of Allophaiomys teeth – the basis of European Early Pleistocene biostratigraphy.
26. *Kuznetsov D., Subetto D., Neustrueva I., Sapelko T., Ludikova A., Gerasimenko N., Bakhmutov V., Stolba V., Derevyanko G.* Lakes sediments of the Crimean Peninsula and their use in reconstructions of the Black Sea level changes.
27. *Leonova N., Nesmeyanov S., Vinogradova E., Voeykova O.* The reconstruction of hilly paleolandscapes and Upper Paleolithic subsistence practices and settlement system on the South of the Russian Plane.
28. *Markova A., Tchepalyga A.* The first locality of fossil rodents in the Manych basin (Rostov province).
29. *Matishov G., Polshin V., Kovaleva G.* The specific features of sedimentation on the shelf of the southern seas (the Sea of Azov being exemplified).

30. *Motuzko A.* Discovery of the herd of Late Pleistocene mammoths in Belarus.
31. *Naidina O., Bauch H.* Holocene paleogeographical changes in the Laptev sea as evidenced by sedimentary and pollen records.
32. *Nevidomskaya D., Iljina L., Dvadnenko K.* Influence of the Bronze age burials on properties of soils of the Lower Don Region.
33. *Orlov N., Cooklin A.* Cave bears with pathological bone changes from the Nerubajskoe (Odessa Region, Ukraine).
34. *Ovechkina M., Green A., Garlick G.* Calcareous nannoplankton from the Holocene of the Eastern Coast of South Africa.
35. *Rekovets L., Dema L.* The faunistic association and evolution of biocoenosis of the periglacial zone of Eurasia in the Late Pleistocene.
36. *Sanko A., Kovaleva A., Tsygankova M.* Dubman A. Migration of Ponto-Caspian Dreissena polymorpha (Pallas) into Upper Dnieper basin in Pleistocene and Holocene.
37. *Schlöffel M., van Hoof L.* Geoarchaeological investigations on the landscape history of the Preazovian Plain (Southern Russia) during the Late Holocene.
38. *Schvyreva A., Maschenko E.* Geological age and morphology of Archidiskodon meridionalis from Stavropol Region (Russia).
39 *Sedov S., Rusakov A.* MIS3 paleosols in Mexico and Northern Central Russia: paleoenvironmental implications from two geographical extremes of interstadial pedogenesis.
40. *Socha P., Nadachowski A., Proskurnyak Y., Ridush B., Stefaniak K., Vremir M.M.* New data on stratigraphy and fauna of Emine-Bair-Khosar cave, Crimea, Ukraine.
41. *Sotnikova M.* Major biotic events related to the dispersal and evolution of Canidae during the Pliocene and Pleistocene in Eurasia.
42. *Sotnikova M., Foronova I.* Late–Early–Middle Pleistocene records of Homotherium Fabrini (Felidae, Machairodontinae) from the Asian territory of Russia.
43. *Svitoch A.* Late Pleistocene history of the Russian shelf of the Caspian Sea.
44. *Syromyatnikova E., Danilov I.* The review of turtle record from the Quaternary sediments of European Russia and adjacent territories.
45 *Tesakov A.* New small mammal faunas of Late Pliocene – Early Pleistocene from Northern Caucasus and Lower Don area.
46. *Tleuberdina P., Nazymbetova G.* Distribution of Elasmotherium in Kazakhstan.
47. *Tymchenko Yu., Ogienko O.* Late Pleistocene – Holocene transformation of diatom assemblages in the Black Sea north-western shelf.
48. *Tyutkova L.* Meizhartyk – Late Pliocene locality of small mammals (North Kazakhstan).
49. *Veklych Yu.* Quaternary stratigraphical framework of the Zakarpattia Reion of Ukraine.
50. *Velichko A., Catto N., Tesakov A., Titov V., Morozova T., Semenov V., Timireva S.* The structure of Pleistocene loess-paleosol formation in southern Russian Plain based on data from Eastern Azov Sea Region.
51. *Voskresenskaya E.* Late Pleistocene stratigraphy and stratigraphic setting of the Khotylevo Paleolithic sites (Central East European plain, Desna drainage basin).
52. *Yelovicheva Y.* Pleistocene nature events of the Central and Middle-East Europe for the comprehension of their development in the future (by palynological data).

17^{00}–18^{00} General discussion
18^{10}–18^{40} The excursion to the Rostov Regional Museum

Conference friendly party 19^{00} (restaurant in city)

June 24, Thursday

9^{00}–20^{00}

Fieldtrip 1: The excursion to the northern coast of the Taganrog Gulf of the Sea of Azov:
Archaeological museum-reserve "Antique city Tanais".
Upper Paleolithic site "Kamennaya Balka".
Locality Merzhanovo, Lower Pleistocene Khapry alluvial layers.
Locality Beglitsa, Middle – Upper Pleistocene fluviatile, lacustrine, and loess-paleosol sediments.

June 25, Friday

9^{00}–19^{00}

Fieldtrip 2: The excursion to the southern coast of the Taganrog Gulf of the Sea of Azov:
River boat excursion from Rostov-on-Don to Azov, passing by the Don River delta.
Early – Late Pleistocene localities Semibalki 1 and 2 (fluviatile, lacustrine, loess-paleosol sediments, fossil mammals and molluscs).

Biological station of Southern scientific centre RAS, Kagal'nik

June 26, Saturday

9^{00}–19^{00}

Fieldtrip 3: The excursion to the Azov archeological, historical and paleontological museum reserve.
Middle Pleistocene alluvial deposits in the Kagal'nik sand pit (Zelenyi; fossil molluscs and mammals).

June 27, Sunday

10^{00}–11^{00} The excursion to the Rostov Regional Museum.

FIELD EXCURSIONS

PHYSIOGRAPHY
OF THE ROSTOV REGION

The Rostov Region is located in the south of European Russia, at the southern margin of the East European or Russian Platform. The characteristic steppe landscapes of lowlands in the south are combined with the Kalach and Donets-Don uplands in the north. They represent elevated plateau-like plains, gently lowering to the south, towards the low left bank areas of Don River. Interfluves have absolute elevations from 120–160 to 200–220 m. River valleys are at elevations of 30–50 m. Watershed areas elevate above the local base level up to 190 m.

The most uplifted part of the area is the Donets Range. It is formed by naturally exposed Carboniferous coal-bearing terrigenous rocks. The relief of this area shows multiple parallel ridges towering up to 30–40 m. This is a characteristic terrain with watershed slopes strongly dissected by river valleys and gullies. Typical for the local relief are numerous 20–30 m high cone-shaped spoil heaps of coalmines of the Donets Coal Basin (Donbas).

Azovian plain gently slopes to the Don River valley and the Taganrog Gulf south of the Donets Range. The plain has absolute elevations from 140–160 m in the north to 107–109 m in the south. In southeast of the Rostov Region, Ergeni Upland is located. It is a flat interfluve between valleys of Don and Manych Rivers. The southern part of Ergeni area is elevated up to 220 m a.s.l. In the west and north, absolute elevations decrease to 100–120 m, and in river valleys, to 10–20 m a.s.l.

Lowlands include the most extensive Azovian-Kuban' plain and smaller lowlands in the lower and middle course of Don River, and the Manych lowland.

The drainage network of the Rostov Region is associated with the Sea of Azov basin. The system includes the lower course of the major Don River, its larger tributaries, Donets (right bank) and Manych (left bank) rivers, and numerous smaller rivers (Mius, Kagalnik, Mokryi Elanchik, and others).

In the region, Don River has a drainage area of 86 000 km^2. Its width averages 400 m in the lower course. Don has a nearly latitudinal direction flowing from the east to west towards the Azov Sea. The Don River represents a busy commercial navigation channel with the depths from 4–6 to 10 m. Due to an insignificant general slope, the water speed ranges from 0.1–0.4 m/s in winter and summer low level periods, and up to 1.5–2.0 m/s in high water period.

In the last century the Don River has been dammed by large Tsymla and Konstantinovsk hydroengineering complexes. The giant Tsymla reservoir (1952–1955) has an area of 2700 square km. The average annual discharge of Don below the Tsymla Dam is 874 m^3/s. The average annual drainage module in the basin is 1.8 l/s from km^2. On the annual average, the river is frozen in early December.

The main right bank tributaries of Don are Severskyi Donets, Tuzlov, and Chir. From the left bank inflow Sal and Zapadnyi Manych with second order tributaries Srednyi Egorlyk and Bolshoi Egorlyk.

Rivers of the southern and southwestern part of the region (Kagalnik, Eya, and others) drain the Azovian-Kuban' lowland running directly to the Sea of Azov. These are the typical steppe rivers with a variable water current and seasonal local drying up mode.

In the west, the largest Mius River runs into the Taganrog Gulf of the Sea of Azov. The river forms a large Mius Estuary. Mius has 60–100 m wide channel, and averagely 4 km wide valley, and a slow water current of 0.1 m/s.

The Rostov Region has a temperate continental climate. It is in influenced by the Aralian-Caspian arid province. Especially strongly continental is the climate of the eastern areas, Ergeni Upland and the Zapadnyi Manych River valley. These areas show rapid fluctuation of daily and seasonal temperatures, insignificant annual precipitation (320–350 mm), high evaporation, and relatively low air humidity.

Climatic conditions in the north- and southwest are quite different. The Don-Donets upland and the Azovian-Kuban' lowland have markedly higher annual precipitation (400–520 mm) and higher relative humidity.

The Rostov Region has a variety of natural areas. Steppe open spaces, islands of woods, floodplain of Don River, and maritime coastal zone sustain more than hundred species of vertebrates.

The region mostly belongs to the steppe zone, with the extreme southeast showing a transition from steppes to semideserts. Forest and bush cover 5.6 % of the region, while with the bulk of the area is occupied by farmland, mainly on highly fertile chernozems.

The largest towns of the region are Rostov-on-Don (1 050 000), Taganrog (260 000), Shakhty (245 000), Novocherkassk (176 000), Azov (83 000), and others.

Main industry fields include mechanical engineering, chemical industry, coal mining, and agriculture (cereals). In the east of the region, there is Rostov nuclear power plant.

Rostov is a major transportation hub in European Russia. It is situated on the high right bank of the Don River, near its mouth. The city is a port of the Volga-Don river-sea commercial route. The major north-south national railroad and Moscow-Baku Highway pass through Rostov. Rostov is informally called "the Gate of the Caucasus".

GEOLOGY

The geological structure of the region comprises the subsided parts of the **Precambrian** Ukrainian Shield and Voronezh Massif of the East European Craton divided by the Late Paleozoic Dnieper-Donets Depression, and the **Paleozoic-Cenozoic** cover represented by marginal facies of marine basins.

The regional geological section includes crystalline rocks of the Precambrian, sedimentary-metamorphic Paleozoic deposits (**Late Devonian, Carboniferous**, and **Permian**), sedimentary formations of Mesozoic (**Triassic** to **Cretaceous**) and **Cenozoic** (**Paleogene** and **Neogene**), and **Quaternary** continental and marine deposits.

Tectonic structure of the region includes three main zones:

1. The southern slope of the Voronezh Massif.
2. The Donets Foldbelt (Donets Depression).
3. The Rostov Dome (eastern subsided margin of the Ukrainian Shield).

The Rostov Region is known for deposits of anthracite coals, natural gas, flux limestones, sand, refractory clays, and various construction materials. The area is rich in ground and mineral water (Geology of the USSR, 1970).

The southwestern part of the Rostov Region includes the lower Don Valley and coastal area of the Taganrog Gulf of the Sea of Azov (Plate 1). Tectonically, this territory represents the submerged Azovian-Rostov segment of the eastern extension of the Ukrainian Shield, the so-called Rostov Dome of the platform cover. In this area, the crystalline basement occurs at depths of only 400–500 m. The sedimentary cover is formed by **Cretaceous** to **Quaternary** deposits. It is bordered from the south by the Azovian-Kuban' depression.

All geological outcrops intended for filed excursions are situated along the coastline of the Taganrog Gulf. In this area, the **Pliocene-Pleistocene** strata overlie **Middle-Upper Miocene** marine deposits of eastern Paratethys (**Sarmatian, Maeotian, Pontian**). According to the geological structure and genetic properties, the **Upper Pliocene** and **Quaternary** deposits are subdivided into four units. The **Upper Pliocene** and **Lower Pleistocene** marine sediments (**Kujalnikian** and **Apsheronian**) occupy the most tectonically depressed area in the southern part of studied territory in the Eisk Peninsula area and only known in boreholes at depths of few hundred meters (Popov, 1948; Rodzyanko, 1967).

Northern and southern coast of the Taganrog Gulf have dissimilar structure (Plate 2). The distinctions are determined by the general tectonic structure with more subsided southern zone (transition to the Azovian-Kuban' Depression) compared to the uplifted northern one. Natural outcrops at the southern coast show Lower Pleistocene to Holocene deposits, whereas at the northern coast the **Quaternary** sequence is underlain by naturally exposed **Upper Miocene** shallow marine limestones to fluviatile deposits of the paleo-Don fluvial system of lowest Pleistocene (equivalent of Gelasian).

Only the upper part of the Lower Pleistocene lagoon deposits outcrops along the cliff between the Port-Katon and Kagal'nik settlements. The lower Middle Pleistocene fluvial-deltaic series outcrops between Chumbur-Kosa and Kagal'nik. The **upper Middle Pleistocene** and **Upper Pleistocene** loess-palaeosol series is developed as a regionally continuous cover that interfingers with the subaqueous formations. The recent (Holocene) alluvial-deltaic sediments of the Don River are exposed between Kagal'nik settlement and the city of Rostov-on-Don (fig. 1).

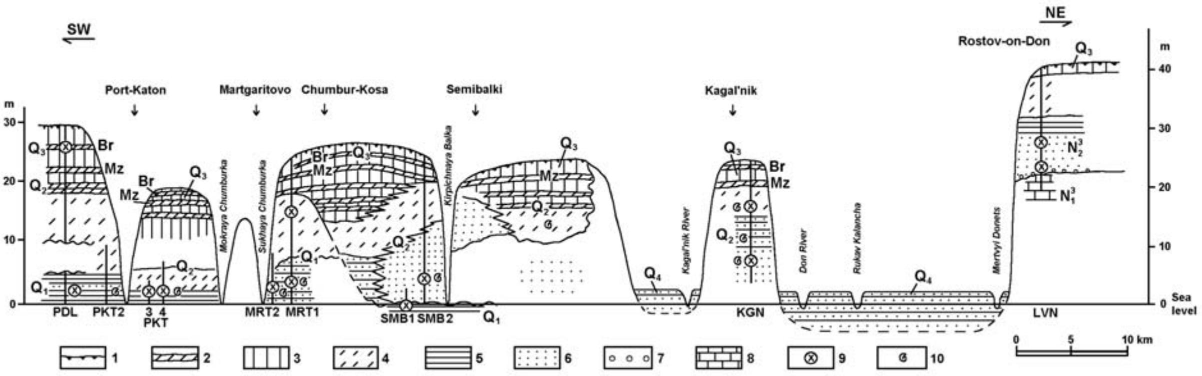

Fig. 1. Geological profile along the southeastern shoreline of the Taganrog Gulf and the mouth of the Don River (after Tesakov et al., 2007).
1. Recent soil; 2. Paleosol; 3. Loess; 4. Loam; 5. Clay; 6. Sand; 7. Gravel; 8. Limestone; 9. Mammal fauna; 10. Molluscan fauna. Sections: PDL: Podlyudki, PKT: Port-Katon, MRT: Margaritovo, SMB: Semibalki, KGN: Kagal'nik, LVN: Liventsovka. Paleosols: Br: Bryansk, Mz: Mezin

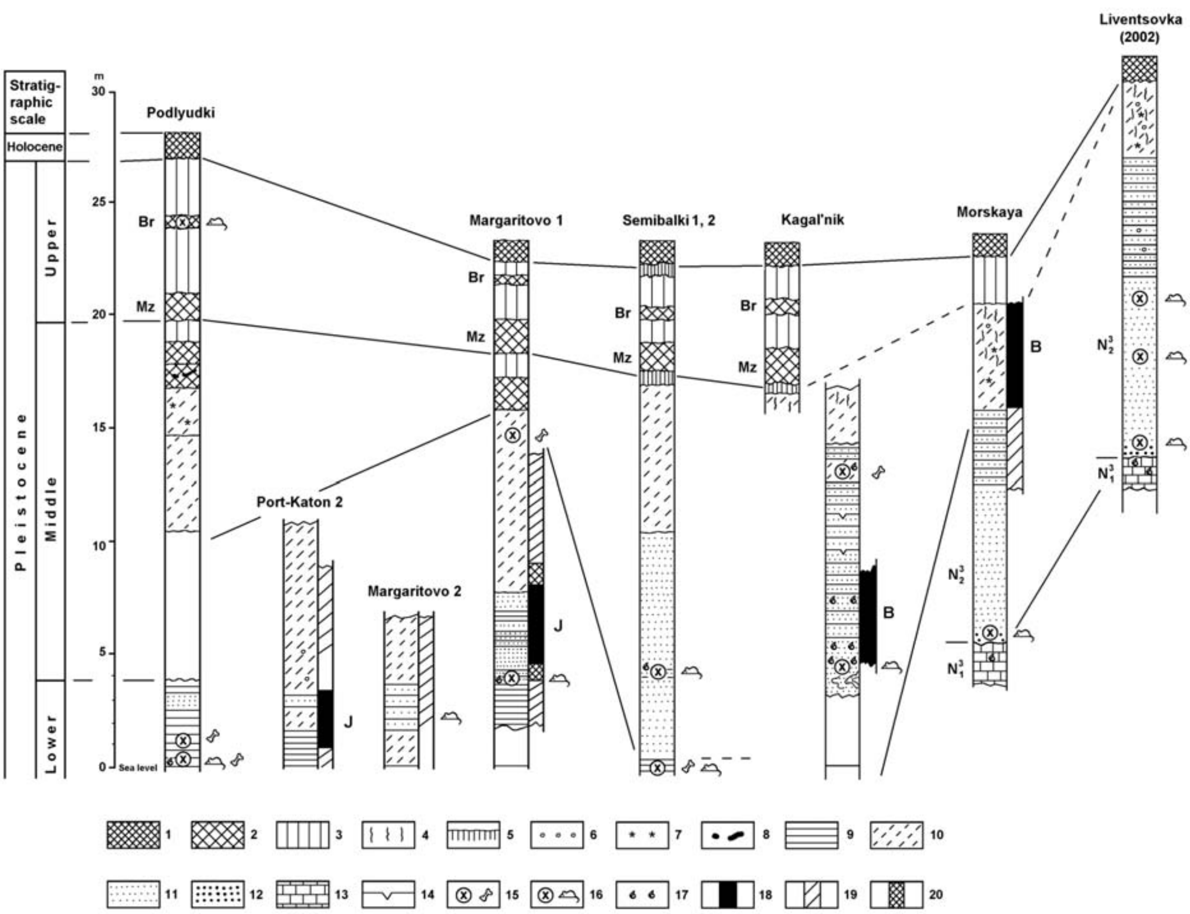

Fig. 2. Correlation of the Upper Pliocene-Quaternary sections in the northeast of the Azov Sea area (after Tesakov et al., 2007).
(1) modern soil; (2) fossil soil; (3) loess; (4) traces of palaeosol processes; (5) illuvial carbonate horizon; (6) carbonate concretions; (7) gypsum; (8) crotovinas; (9) clay; (10) loam; (11) sand; (12) gravel; (13) limestone; (14) traces of cryogenesis; (15) large mammal fauna; (16) small mammal fauna; (17) molluscan fauna; (18–20) palaeomagnetic polarity: (18) normal, (19) reversed, (20) anomalous; B: Brunhes Chron, J: Jaramillo Subchron

Three main terrace levels have been identified in the coastal area (Lebedeva, 1972; Velichko et al., 1973; Velichko, 1975). The highest, the Khaprovian terrace of 40–45 m a.s.l. is formed with **Upper Pliocene** to **earliest Pleistocene** sediments. It is developed on the right bank of the palaeo-Don River Valley. In the terminology of Velichko (1975), it corresponds to the Melekino level which consists of lagoonal-marine sediments at the base of sections exposed along the northern coast of the Azov Sea. Another terrace is arbitrary established at a height of 30 m. It is composed of upper **Lower Pleistocene** lagoon deposits. This Margaritovo terrace occurs along the southeastern coastal area of the Taganrog Gulf or the Nagaisk level of the northern coast of the Azov Sea. The next, topographically lower level is associated with the **Middle Pleistocene** fluvialdeltaic or lagoon sediments and is termed the Platovo or Semibalki terrace. The height of the latter is not more than 20–25 m a.s.l. The summary of the local stratigraphy and mammalian fauna is shown in the Fig. 3 (after Tesakov et al., 2007).

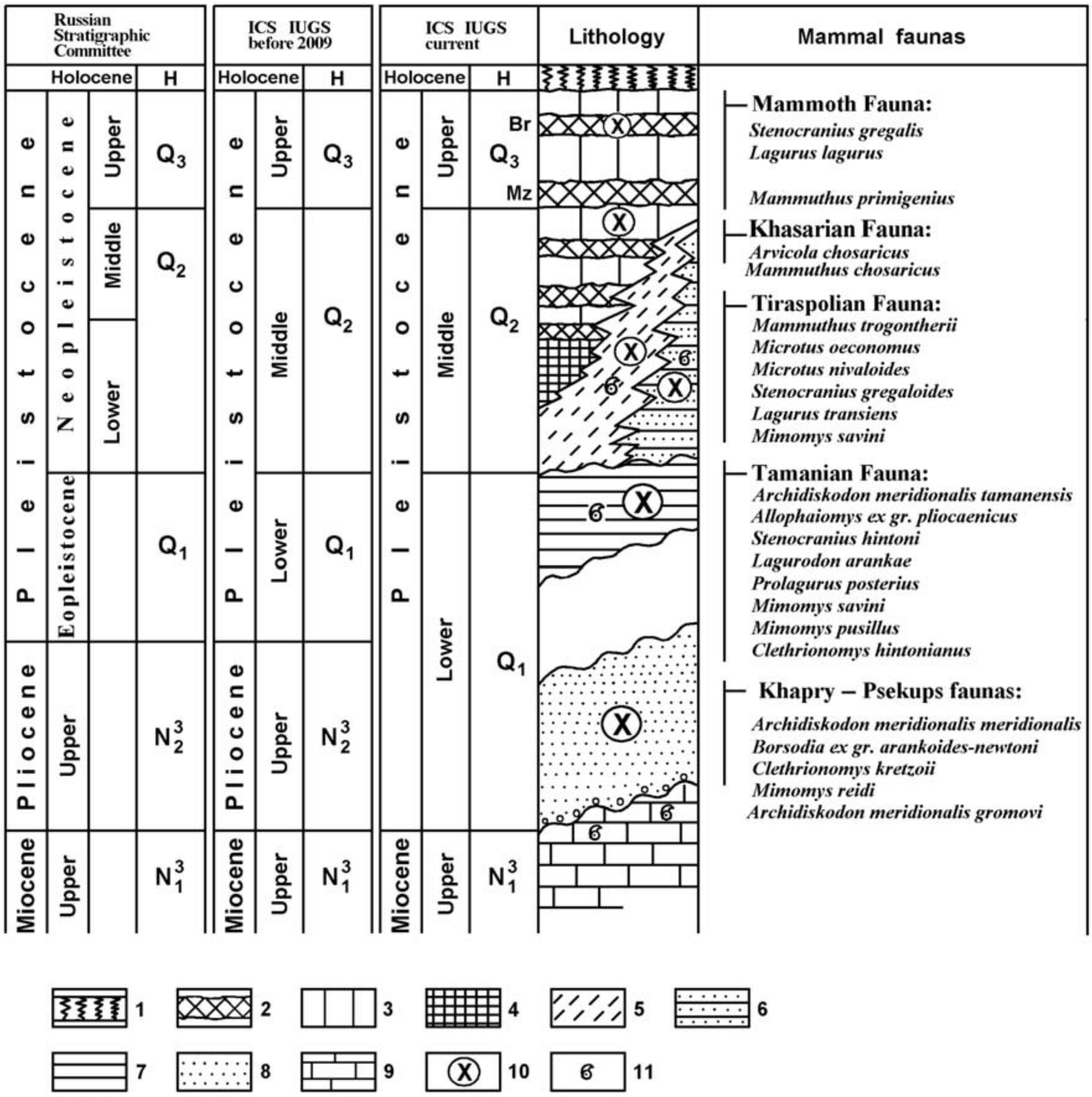

Fig. 3. Summary section of the Upper Pliocene and Pleistocene deposits outcropping in the northeast of the Azov Sea area (modified after Tesakov et al., 2007).
(1) modern soil; (2) palaeosol; (3) loess; (4) loam reworked by palaeosol processes;
(5) Middle Pleistocene lagoonal deposits (loam and clay);
(6) Middle Pleistocene alluvial and deltaic deposits (sands with clay interlayers);
(7) Lower Pleistocene lagoon deposits (clays); (8) Upper Pliocene alluvial deposits (sands);
(9) Upper Miocene limestone; (10) mammal fauna; (11) molluscan fauna

The **oldest Quaternary** deposits of the region are represented by extensive fluvial deposits mapped as the Khapry Formation (fig. 3). The Khapry Formation outcrops along the northern coast of the Taganrog Gulf and the right bank of the lower Don River. The deposits consist of light quartz sands with clayey and gravelly interbeds. They rest on eroded Upper Miocene Maeotian and Pontian limestones and are overlain by variegated and characteristically red-coloured 'Scythian clays', which are palaeomagnetically referred to the upper Matuyama and early Bruhnes Chron. In all the sections studied, the deposits of the Khapry Formation are reversely magnetised. In the parastratoptype, the now abandoned Liventsovka sandpit in the western suburbs of Rostov-on-Don, these deposits yielded a rich fauna of large and small mammals. Several natural exposures of the Khapry Formation occur in the cliff of the northern coast of the Azov Sea (see excursion details to the settlement of Merzhanovo below). Mammalian faunas suggest polycyclic formation of the Khapry deposits from the late **Late Pliocene** (equivalent of **Piacenzian**) to **earliest Pleistocene** (**Gelasian**). Extensive sand pits on the western outskirts of Rostov-on-Don (figs. 1, 2) have provided excellent exposures of the fluvial Khapry deposits since mid 20th century. Large mammals from these exposures have been studied by Gromov (1948), Bajgusheva (1971), Sotnikova et al. (2002), and others. The latest revision of the mammalian megafauna has been published by Titov (2008; tab. 2). The small mammals from this sequence were studied by Schevtschenko (1965), Agadjanian (1976), and Alexandrova (1976). Important small mammal collections have been also obtained by A. Krukover (in the 1980s), and recently by Titov and Tesakov. Tesakov (2004) revised the small mammals from the section. The Khaprovian mammalian fauna, correlated to Middle-Late Villafranchian and Late Villanyian, includes *Archidiskodon meridionalis gromovi*, *Equus livenzovensis*, *Paracamelus alutensis*, *Mimomys reidi*, *Mimomys pliocaenicus, Borsodia* spp., *Clethrionomys kretzoii,* etc.

The **late Early Pleistocene** (equivalents to '**Calabrian'**) deposits are naturally exposed at the coastal cliff base in several sites along the southern coast of the Taganrog Gulf. These sediments represent lagoonal and fluviatile deposits (bluish clays and variegated sands). Refer to field excursion to Semibalki below. The mammalian fauna of Early Pleistocene deposits is referred to the Tamanian faunal complex (Early Biharian). It includes *Archidiskodon meridionalis tamanensis*, *Allophaiomys pliocaenicus*, *Lagurodon arankae, Mimomys savini* and other forms. Two diachronous faunas are recognized based on small mammals. The older association with co-occurring *Allophaiomys*, *Lagurodon arankae*, and *Mimomys savini* is known from Port-Katon (Markova, 1990), Semibalki (Rekovets, 1994), and Martgaritovo 1 (Tesakov et al., 2007). At Margaritovo, this faunal level has been shown to occur at the base of the normal paleomagnetic episode interpreted as Jaramillo (Tesakov et al., 2005). The slightly younger association Margaritovo 2 includes *Microtus (Stenocranius) hintoni, Mimomys savini,* and *Prolagurus pannonicus transylvanicus.*

The **Middle Pleistocene** deposits outcrop at cliff sections along the northern (Platovo) and southern (Kagal'nik**,** Semibalki, Port-Katon) coasts of the Taganrog Gulf. These are predominantly sandy and gravelly fluviatile deposits of the paleo-Don River rich in shells of fresh-and brackish-water molluscs. The mammalian fauna is referred to the Tiraspol faunal complex (Late Biharian) and dated to **early Middle Pleistocene**. It includes *Mammuthus trogontherii, Microtus (Stenocranius) gregaloides, Microtus arvalidens*, *Mimomys savini, Lagurus transiens*, etc. Suabaerial deposits of Middle Pleistocene forms lower beds of loess-paleosol sequence (Velichko et al., 2009). The section of **Beglitsa** (see the excursion details below) yielded the late Middle Pleistocene fauna with *Arvicola chosaricus*, *Microtus* gr. *arvalis, Lagurus lagurus*, *Mammuthus* cf. *chosaricus, Megaloceros* sp., etc.

The **Upper Pleistocene** deposits are represented in the coastal sections of the Taganrog Gulf by upper beds of the loess-paleosol formation. In several sites near the settlement of Semibalki the **Upper Pleistocene** is represented by the Mesin pedocomplex (Velichko et al., 2009). The same pedocomplex correlated to the Eemian interglacial of **Late Pleistocene** is well represented in the Beglitsa section.

FIELDTRIP 1

June 24

KAMENNAYA BALKA

A series of Upper Paleolithic sites of Kamennaya Balka representing the eponymous archaeological culture is located on the high right bank of the Don River valley near its mouth (Plate 2). These are typical open type sites. Sites are mostly located on the right bank of the local gully, the Kamennaya Balka, at the eastern margin of the Nedvigovka village (Myasnikovsky district of the Rostov Region).

This complex site was discovered by M.D. Gvozdover in 1957 and since then it is under continuous study by expeditions of the Moscow State University headed by M.D. Gvozdover and N.B. Leonova. Since 1990, the field studies were complimented by the team of the State Historical Museum headed by N.A. Haykunova. Geological and geomorphological studies were carried out in the site over the years by V.I. Gromov, V.M. Muratov, G.N. Rodzianko, and, since 1986, by S.A. Nesmeyanov. Since 1995 pedological studies were conducted by S.A. Sycheva, and since 2004, by L.A. Gugalinskaya. Paleobotanical and paleozoological studies were conducted by E.A. Spiridonova, A.K. Agadjanian, V.S. Baigusheva, E.A. Vangengeim, A.L. Tchepalyga and others (Leonova et al., 2006).

The limited area of the Kamennaya Balka hosts several sites belonging to the same culture but slightly diachronous (Leonova, 2005). In the stone artifact typology, the Kamennaya Balka culture is similar to the Imeretian culture of the Caucasus and the Baradost culture of Near East. Economically, all sites represent basic sites. The studied group includes sites Kamennaya Balka I, II, III (Tritii Mys) (fig. 4).

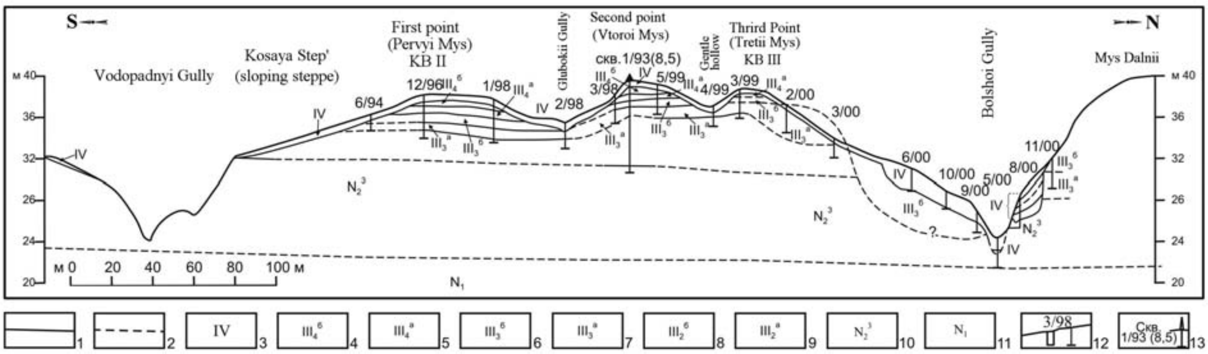

Fig. 4. Schematic geological profile of the right flattened bank of the lower part of the Kamennaya Balka gully near the Paleolithic site Kamennaya Balka.
1–2: Geological boundaries: 1. Reliable, 2. Assumed; 3–11: Stratigraphic units:
3–9: Members of Quaternary cover sequence: 3. Holocene soil, 4. Brownish-fawn mb.; 5. Fawn mb., 6. Brown mb., 7. Red-brown mb., 8. Dark green mb., 9. Grey-green mb.; 10. Khapry fluviatile deposits; 11. Late Miocene limestones;
12–13: pits: 12. Pits with numbers (nr/year), 13. Boreholes and numbers, nr/year (depth, m)

Kamennaya Balka I is completely exposed. The area of the site is about 600 m^2. The ^{14}C date is 14670 ± 105. This relatively short-term settlement has existed for 2–3 seasons.

Kamennaya Balka II is three-layered site. All cultural horizons are separated by sterile 30–50 cm thick layers (fig. 5).

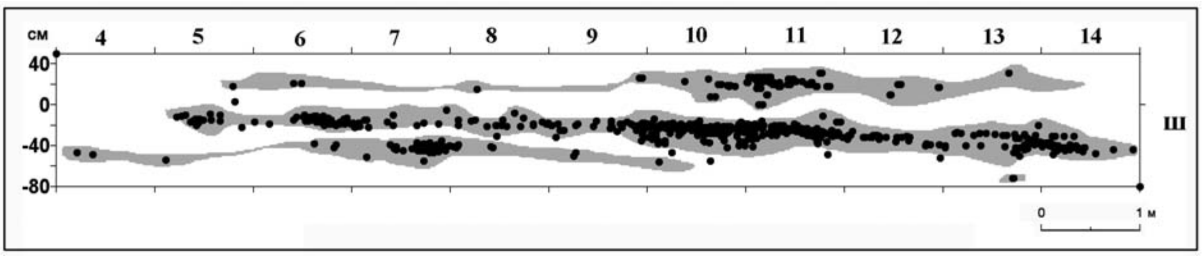

Fig. 5. Relative vertical location of the three cultural layers site Kamennaya Balka II

The lower (third) bed is dated by the archaeological material and geological data to 20–21 ka. It is the oldest settlement of the Kamennaya Balka culture. It has a limited area of 400–500 m^2. The cultural horizon has a moderate saturation.

The second (main) layer of the site covers much larger area of ca. 1700 m^2. This layer is characterized by more than 20 radiocarbon dates. A combination of archaeological and geochronological evidence permits to date it in the range of 15–16 ka. The cultural layer is very rich in flint artifacts and faunal remains. This settlement a complicated plan, which includes several residential complexes and a variety of industrial zones (fig. 6).

The upper (first) layer, judging from the natural science research, and archaeological material, formed around 13–13.5 ka. Its area exceeds 1500 m^2, but the cultural layer is not rich, and evidence of changed conditions of existence.

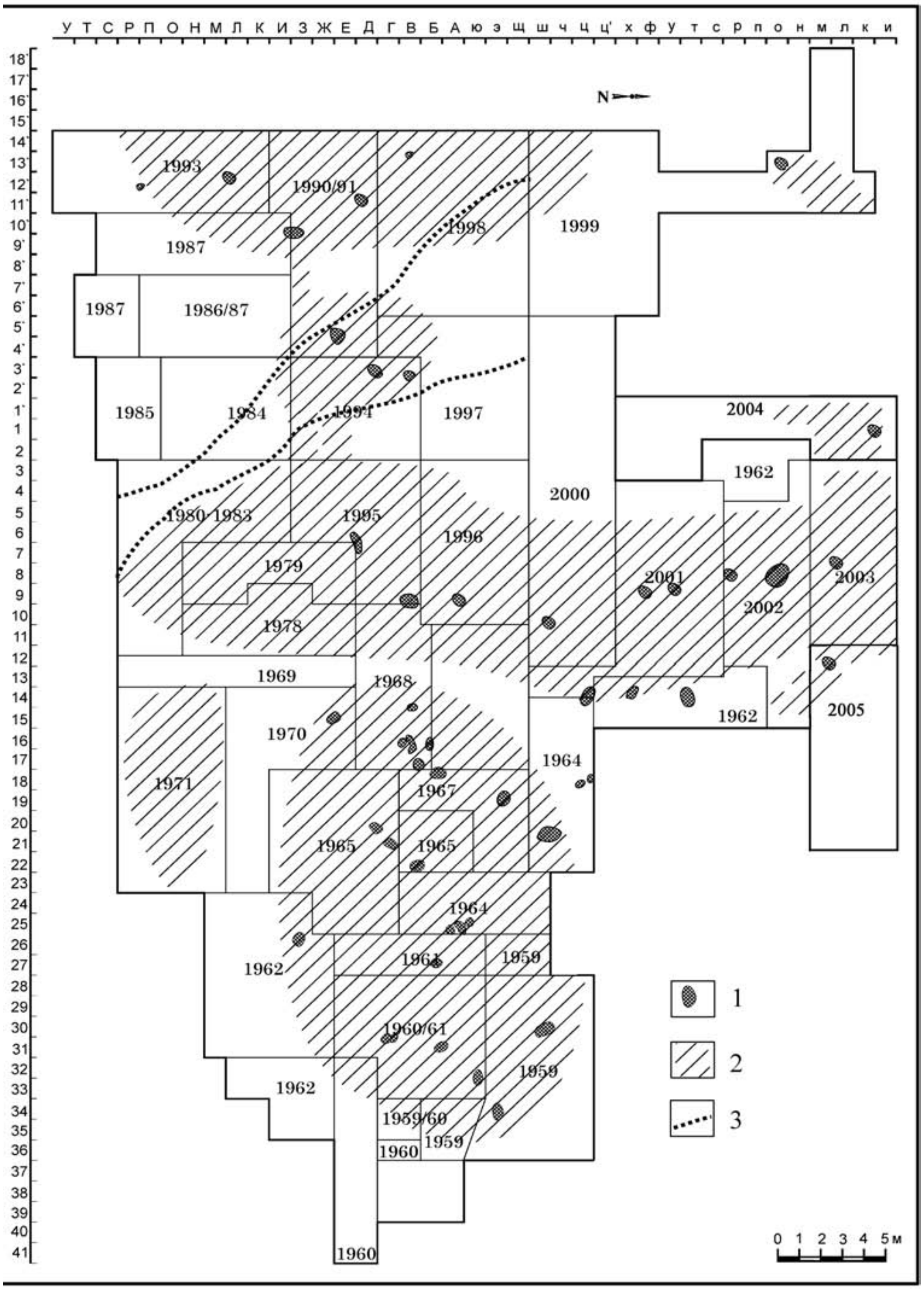

Fig. 6. Site Kamennaya Balka II. The plane of excavations and main culture remains assemblages' location

FIELDTRIP 1, JUNE 24

Table 1

Palynological zonation of the site Kamennaya Balka II

Absolute age, ka	Stratigraphic units	Glacial phases	Lithology	Palynozones	Palynozone index	Cultural layer
10	Holocene		"grey"	Predominant sagebrush, grasses	33	
				Predominant Chenopodiaceae, sagebrush	32	
				Predominant grasses, pine, birch, spruce and broadleaved forms	31	
				Dominant pine, spruce present	30	
22–23?	Late Valdai	Stadial	" brownish-fawn "	Predominant Chenopodiaceae and sagebrush	29	
		2nd half of interstadial		Predominant pine and birch with presence of grasses and Chenopodiacea	28	
		1st half of interstadial		Dominant pine with presence of birch, Chenopodiacea and полыней	27	
		Stadial		Abundant spores of green mosses. Also present grasses and Chenopodiacea	26	Cultural layer 1
				Predominant grasses	25	
		2nd half of interstadial	"fawn"	Predominant sagebrush, Chenopodiaceae present	24	
				Dominant birch, pine and herbage	23	Cultural layer 2
				Dominant pine with presence of herbs	22	
		1st half of interstadial		Increasing role of arboreal forms with predominance of grasses and herbs	21	
		Stadial		Predominance sagebrush with presence of Chenopodiacea	20	
				Predominant Chenopodiacea, abundant sagebrush	19	
60	Middle Valdai	Beginning of stadial	"brown"	Predominance of herbs	18	
		1st half of interstadial		Dominant pine, birch with presence of herbs	17	Cultural layer 3
				Dominant pine with presence of spruce, alder, birch, broadleaved forms	16	
				Dominant spruce with presence of pine, alder, and broadleaved forms	15	
		Cooling		Dominant herbage	14	
		Interstadial optimum		Dominant pine and alder, maximal role of broadleaved forms	13	
				Dominant pine, constant presence of alder, birch and broadleaved forms	12	
		Beginning of interstadial optimum	"red-brown"	Dominant birch, alder with high content of grasses and herbs	11	
		Ist half of interstadial		Predominance of pine, birch and broadleaved forms	10	
		Stadial		Dominant Chenopodiacea	9	
		2nd half of interstadial		Predominance of pine	8	
				Predominance of pine, birch, alder and broadleaved forms	7	
		Stadial		Dominant Chenopodiacea, abundant sagebrush	6	
		Transition to stadial		Increasing role of grasses, Chenopodiacea, herbs with presence of pine	5	
		Interstadial optimum		Dominant pine, alder, birch and broadleaved forms	4	
	Early Valdai?	Interstadial	"green-coloured"	Predominance of pine, sporadic broadleaved forms	3	
				Predominance of birch, pine	2	
		Stadial		Predominant Chenopodiacea, sagebrush, Asteracea	1	

Lime thickness indicates hiatuses in sedimentation:	thick — long, double – short.

Kamennaya Balka III (Tretii Mys) – triple-layer monument, the middle layer which has a date of 13400 ± 80 years. Lower and middle cultural strata are characterized by relatively high saturation anthropogenic residues, which form the expressive clusters.

Palynological spectra of the lower and second cultural layers of Kamennaya Balka II show the presence of green mosses, ferns, plants of riparian habitats and wet grasslands, and deciduous arboreal species (oak, linden, elm, and alder). This evidence indicate riparian and gully forests. The cultural layers of the Kamennaya Balka I do not yield pollen of lime or oak, but contain abundant pollen of willow and alder. The palynological spectra of the third layer in the site (Tretii Mys) indicate the presence of grassland steppe. In addition, they include relatively high percentage of pollen of arboreal, mainly coniferous forms.

The large mammal fauna of the sites is represented by the wolf *Canis lupus*, brown bear *Ursus arctos*, broad-toed horse *Equus latipes*, wild ass *Equus* cf. *hemionus*, aurochs *Bos primigenius*, steppe bison *Bison priscus*, reindeer *Rangifer tarandus*, elk *Alces alces*, sheep *Ovis* (?), and hare. In the material from Kamennaya Balka II, the largest number of bones belongs to bison (ca. 53 %) and horse (45 %).

Small mammals are represented by diverse rodents, including burrowing animals. The faunal composition correlates well with pollen spectra. It is worth noting interesting to note that residents of the site fed on marmots (*Marmota bobak*), which burnt bones were found in many hearths.

The general structure the section on the right bank of the Kammenaya Balka gully (upsection):

The Late Miocene (Pontian) limestone (N_1^2) at the base of the section are covered by cross-bedded alluvial sands of the Khapry Formation (N_2^3). Above occur 6–7 m thick covering sequence divided into six members.

I. Green-coloured member (III2). Clay green, greenish grey, with manganese and carbonate concretions; usually less than 0.5 m thick.
Divided into two submembers:
   1. Grey-green submember that fills erosional pockets, represented by alternating cross-bedded sands and green clay; up to3 m.
   2. Submember of dark-green and greenish-grey clays with manganese nodules and carbonate concretions; up to 0.85 m.

This bed unconformably overlies sands of the Khapry Fm on interfluves, and deposits of the submember 1, in ancient ravines.

II. The red-brown member (III3a). Clay and loam, reddish-brown, brown, dark, often with calcareous concretions, the lower boundary is sharp, locally erosional; 0.7–1.7 m.

III. Brown member (III3b). Clay loam brown (the color intensity decreases upsection) with carbonate inclusions; 0.7–0.8 m
At the very top of the member occurs the lower cultural layer of the Kamennaya Balka II, about 10 cm thick.

IV. Fawn member (III4a). Loess-like loam, pale yellow; up to 0.6–0.7 m.
This member includes the main (second) cultural layer, 12–20 cm thick.

V. Brownish-fawn member (III4b). Loam loess-like brownish-yellow with numerous carbonate concretions; clotted structure; 0.6–0.7 m.
At the base of this member occurs the upper (first) cultural layer, ca.15 cm thick.

VI. Grey member. Holocene soil. The lower boundary is uneven with streaks of humus-containing loam in the underlying beds; up to 0.7 m.

The long-standing archaeological study of sites of the Kamennaya Balka culture showed that here we deal with a set of relatively long-term settlements on the higher side of the valley. The sites included dwellings or fenced living areas with complex structure and various functional zones. The broad range of functional activities included manufacturing of working and hunting tools, processing of skins, making of clothing and decorations, harvesting and storage of food, and performing of certain rituals apparently related to the hunting magic. The abundance of split and processed stones, transported from remote sources, indicates the prolonged habitation of people in the settlement. The same is evidenced by the age of animals and their death seasons: the hunting game was brought to the settlement almost round the year. All data taken together indicate a relatively low mobility of ancient people and a flexible system of cultural adaptations to changing environmental conditions.

In addition, at the mouth of the Kamennaya Balka gully S.A. Nesmeyanov and N.E. Kotelnikova found lagoonal deposits with molluscs indicative of the Karangatian (Eemaian) transgression of the Azov-Black Sea basin (molluscs determinations by A.L. Tchepalyga).

S.A. Sycheva (2005) identified in the covering deposits three diachronous paleosols, the Kamennaya Balka, Martynovka, and Nedvigovka ones. The formation of the two lower soils corresponds to the Middle Valdai (Weichselian) megainterstadial and the formation time of the Bryansk (Denenkamp) paleosol. The upper one was formed in the late Valdai.

The Nedvigovka paleosol occurs at the boundary of the red-brown and brown members, represented only by the *Btm* horizon and shows features of forest and meadow pedogenesis.

The Martynovskaya soil occurs in the upper part of brown member. It is represented by *Bm* horizon. It is a pioneer brown soil formed for not more than 100 years. Its hierarchical order is lower than interstadial.

The Kamennaya Balka soil is associated with the fawn member and the second cultural layer (CL-2). This is the youngest paleosol in this complex. It evolved over 20–50 years during activation of relief shaping processes. It is represented by a thin light gray humus (3–5 cm) or pale-brown (5–8 cm) horizons, which are separated by the cultural layer CL-2. The paleosol is characterized by high porosity, high content of dispersed mull type humus, spongy microstructure and complex microtexture.

A special feature of palynological research was the parallel palynological inspection of a group of sections characterizing the cover sequence. As a result, each member was characterized by several palynozones, frequently not identical in composition. Altogether 33 palynozones were defined in the cover deposits.

MERZHANOVO

The section is situated in the landslide block of the northern bank of the Taganrog Gulf near the Merzhanovo settlement (Plate 2). The block preserves undisturbed bedding. The Merzhanovo section illustrates characteristic geological structure of the northern bank, including Late Miocene limestones at the base, and the quartz sands of the fluviatile Khapry Formation in the middle, and subaerial "Scythian" clays on top.

The Khapry alluvial deposits yielded over many years of study an extensive collection of mammalian fossils referred to the Khapry Faunal complex by V.I. Gromov (1948), see Table 2, Plate 3. Most of large mammalian fossils come from the lower beds of the Khapry Formation.

The general structure of the section:

Bed	Lithology	Thickness, m
1	**Modern soil**	0.2
2	"**Scythian**" clays. Early Pleistocene. Alternating red-brown and greenis-grey interbeds, non-layered, compact, with dark small ferro-manganese concretions, with large carbonate concretions at the top of the bed (up to 1 m in diameter)	2.5
3	**Kahpry fluviatile formation.** Earliest Pleistocene ("Gelasian" equivalent)	
	Sands fine-grained, quartz, with high content of dark-coloured minerals, light grey with yellow interbeds, nearly horizontally-bedded. Two interlayers 0.05–0.15 m thick interlayers of dark-green clays occur here	4
	Sands grey-yellow fine- to medium-grained, cross-bedded, with gravely interbeds. Thin clay interlayers clay up to 0.01 m thick occur at the contact with underlying limestone. This bed is fossiliferous. It is know to yield bones of *Archidiskodon,* and *Equus (Allohippus)*	2
4	**Maeotian,** Late Miocene (correlated with Late Tortonian – Early Messinian). Limestone with abundant molds of *Congeria* sp.	2
5	**Middle Sarmatian (Bessarabian),** Late Miocene, early Tortonian. Limestone strongly crystallized. Contains imprints and molds of *Mactra* cf. *fabreana* and *Plicatiforma* cf. *fittoni*	> 2

Table 2

The summary list of vertebrates from Khapry alluvium from several sites of Rostov Region
(Khapry, Liventsovka, Morskaya 1, Volovaya Balka, and others; by Titov, 2008).

Khaprovian faunal complex (Middle Villafranchian, MN 17)

Pisces

1. *Acipenser gueldenstaedti* Brandt
2. *Acipenser ruthenus* L.
3. *Esox lucius* L.
4. *Rutilus frisii* (Nordmann)
5. *Rutilus rutilus* L.
6. *Silurus glanis* L.
7. *Stizostedion lucioperca* L.
8. *Zingel nogaicus* Tarasht.
9. *Cyprinus carpio carpio* L.
10. *Perca fluviatilis* L.
11. *Abramis brama* L.
12. *Mylopharyngodon piceus* (Richardson)

Amphibia

13. *Bufo albus* Ratnikov
14. *Bufo raddei* Strauch
15. *Liventsovkia jucunda* Ratnikov

Reptilia

16. Lacertidae gen.
17. *Melanochelys* sp.
18. *Emys* sp.
19. *Testudo* sp.

Aves

20. *Cygnus* sp.
21. *Branta* sp.
22. *Struthio* cf. *asiaticus* Milne-Edwards

Mammalia

Insectivora

23. Erinaceidae gen.
24. *Desmana* sp.
25. *Talpa* sp.
26. Soricidae gen.

Lagomorpha

27. Leporidae gen.

Rodentia

28. *Citellus* sp.
29. *Trogontherium cuvieri* Fischer
30. *Trogontherium* sp.
31. *Castor* sp.
32. *Sicista* sp.
33. *Allactaga* sp.
34. *Plioscirtopoda* cf. *novorossica* Tesakov
35. *Spalax* sp.
36. *Allocricetulus* sp.
37. *Cricetulus* sp.
38. *Cricetus* sp.
39. *Dolomys* cf. *milleri* Nehring
40. *Pliomys ucrainicus* Topachevski et Scorik
41. *Clethrionomys kretzoii* Kowalski
42. *Borsodia fejervaryi* (Kormos)
43. *B. arancoides* Alexandrova
44. *B. lagurodontoides* (Shevtschenko)
45. *Borsodia praehungaricus cotlovinensis* (Topachevsky et Scorik)
46. *Pitymimomys pitymyoides* (Jan. et van der Meulen)
47. *Mimomys praepliocenicus* Reabeder
48. *Mimomys* cf. *reidi* Hinton
49. *Mimomys* ex gr. *reidi – pusillus*
50. *Mimomys hintoni livenzovicus* (Alexandrova)
51. *Mimomys polonicus* Kowalski
52. *Ellobius* sp.

Carnivora

53. *Nyctereutes megamastoides* (Pomel)
54. *Canis* cf. *senezensis* Martin
55. *Ursus* cf. *etruscus* Cuvier
56. *Lutra* sp.
57. *Pannonictis nestii* (Martelli)
58. Mustelidae gen.
59. *Pliocrocuta perrieri* (Croizet et Jobert)
60. *Pachycrocuta brevirostris* (Aumard)
61. *Homotherium crenatidens* (Fabrini)
62. *Lynx issiodorensis* (Croizet et Jobert)
63. *Acinonyx pardinensis* (Croizet et Jobert)

Proboscidea

64. *Anancus arvernensis alexeevae* Bajguscheva
65. *Archidiskodon meridionalis gromovi* Garutt et Alexeeva

Perissodactyla

66. *Hipparion moriturum* Kretzoi
67. *Equus (Allohippus) livenzovensis* Baigusheva
68. *Equus* sp.
69. *Stephanorhinus* ex gr. *megarhinus – kirchbergensis*
70. *Elasmotherium chaprovicum* Shvyreva

Artiodactyla

71. *Sus strozzii* Major F.
72. *Paracamelus alutensis* (Stefanescu)
73. *Paracamelus* cf. *gigas* Schlosseer
74. *Cervus (Rusa) philisi* Schaub
75. *Eucladoceros* cf. *dicranios* Nesti
76. *Arvernoceros* sp.
77. Cervidae gen. indet.
78. *Libralces gallicus* Azzaroli
79. *Palaeotragus (Yuorlovia) priasovicus* Godina et Baiguscheva
80. *Leptobos* sp.
81. *Gazellospira gromovae* Dmitrieva
82. Tragelaphini gen indet. A
83. Tragelaphinae gen. indet. B
84. *Gazella* cf. *subgutturosa* Güldenstaedt
85. Gazellinae gen. indet

BEGLITSA SECTION

The Beglitsa section is located in 20 km W of Taganrog (Plate 2). The coastal cliff exposes up to 15 m thick sequence of lagoonal clays and silts crowned by reduced loess-paleosol deposits that include the Mezin paleosol complex (Eemian) and the Bryansk paleosol. The section is known by the discovery of a Mousterian core 1 m above the Mezin (Eemian/Mikulino) soil complex, and the presence of bone remains of *Mammuthus* below this complex (Ivanova and Praslov, 1963; Lebedeva, 1972). The modified profile published by Lebedeva is shown in the Fig. 7.

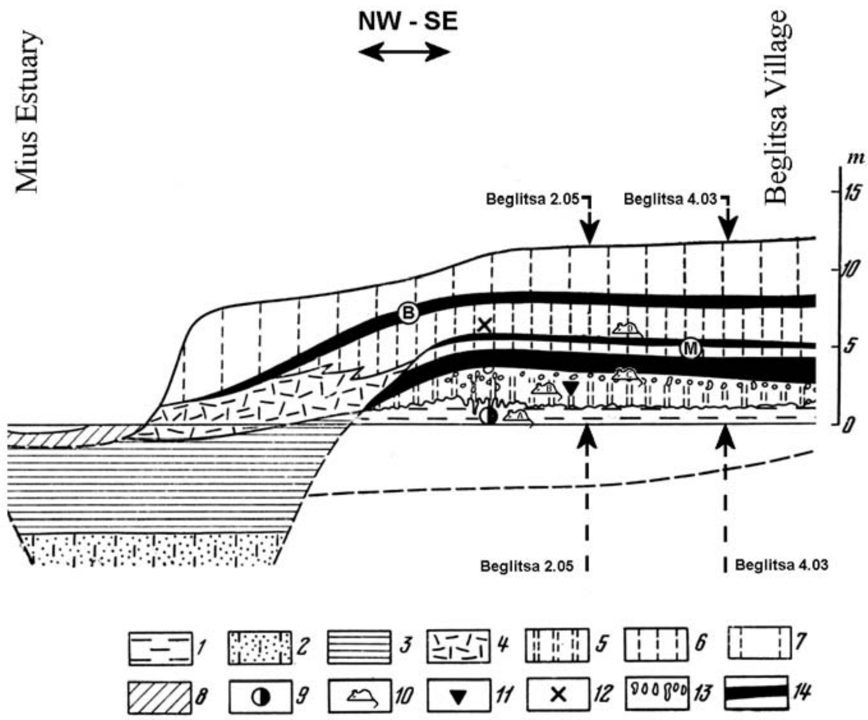

Fig. 7. Geological profile near Beglitsa village (modified after Lebedeva, 1972). Captions: 1. Lagoonal clays of the Beglitsa terrace; 2. Sands of incised valleys; 3. Lagoonal clays of incised valley of the Eemaian age; 4. Lagoonal-gully silts; 5–7. Loess-like loams; 8. Modern lagoonal deposits; 9. Large mammals; 10. small mammals, A-D: faunal levels (see the table); 11. Molluscs; 12. Mousterian core; 13. Carbonate concretions; 14. Paleosols

Recently, the characteristic late Middle Pleistocene fauna of small mammals has been discovered in 1.5 m below the Mezin soil complex. The fauna includes *Spermophilus* aff. *pygmaeus, Spalax* sp., *Lagurus lagurus, Eolagurus* cf. *luteus, Arvicola chosaricus*, *Microtus arvalis, Microtus gregalis, Microtus oeconomus* (Tesakov et al., 2005). The water vole has typical, almost undifferentiated enamel (SDQ: 97–98). The evolutionary level of *Arvicola* and faunal composition supports the late Middle Pleistocene age of the fauna (Tesakov et al., 2007). The fauna is referred to the regional zone MQR2. The same deposits yielded molluskan assemblage including *Monodacna* sp., Unionidae gen., *Dreissena polymorpha, Bithynia leachi, Valvata pulchella, Valvata piscinalis, Valvata naticina, Micromelania* sp., *Anisus strauchianus*, and *Vallonia pulchella*. This is mostly fresh-water assemblage with some indicators of brackish-water conditions.

Beglitsa 4.03, (47˚07'36'' N 38˚31'02'' E), field description of A. Dodonov		
Bed	***Lithology***	***depth, m***
1	Humic horizon of modern chernozem soil	0.0–0.4
2	Brownish-dark grey illuvial bed of modern soil, well developed structure	0.4–1.1
3	Carbonate bed of the modern soil, light brownish, carbonatized, clotted structure	1.1–1.5
4	Loess light brownish	1.5–2.0
5	Bryansk paleosol. Loess-like loams light-brown, weak clotted structure	2.0–3.2
6	Loess light brownish	3.2–4.5
7	Loess grey to light brownish	4.5–5.0
8	Loess, weakly humic, carbonate pseudomycelium	5.0–5.5
9	Mezin pedocomplex brownish paleosol. Loams grey-brown, clotted structure with desiccation veins and occasional hypsum crystals	5.5–6.2
10	Mezin pedocomplex chernozem-like paleosol. Loams dark grey, strongly humic, clotted structure, carbonate pseudomycelium	6.2–6.8
11	Loams brownish-grey carbonatized. Illuvial horizon of the Mezin paleosol	6.8–7.1
12	Loess-like loams grey-brown	7.1–9.0
13	Loams greenish-dark grey with lime concretions	9.0–9.7

The palynology of the upper part of the subaerial sequence in the Beglitsa section was studied by Simakova (2008) in two neighbouring sections, Beglitsa 4.03 and Beglitsa 2.05, which are 700 m apart. The location of the studied sections is shown in Fig. 7.

Beglitsa 2.05, (47˚07'48'' N 38˚30'29'' E), field description of A. Dodonov		
Bed	***Lithology***	***depth, m***
1	Modern chernozem soil	0.0–1.0
2	Loams loess-like, grey-light brown, fine porosity	1.0–2.6
3	Bryansk paleosol. Loess-like loams light-brown, weak clotted structure	2.6–3.8
4	Silt loess-like, grayish-light brownish, homogenous, fine porosity	3.8–6.2
5	Mezin pedocomplex brownish paleosol. Loams brownish to dark grey, weakly carbonatized, dessication veins	6.2–6.9
6	Mezin pedocomplex chernozem-like paleosol. Loams dark grey, strongly humic, clotted, carbonate pseudomycelium and desiccation veins	6.9–7.65
7	Loams grayish to light brownish, carbonatized, lime concretions	7.65–8.4
8	Loams loess-like, grayish to light brownish	8.4–9.85

Altogether 19 samples have been studied from Beglitsa-4.03 and 15 samples from Beglitsa-2.05 (Fig. 8). The most complete pollen data characterize the Beglitsa-4.03 section in its upper part (beds 1–5, depth range 0–3.5 m), and for the chernozem-like horizon of the Mezin pedocomplex (bed 10, depth 6.0–6.4 m). Loess-like loams underlying the Bryansk paleosol and the Mezin pedocomplex (beds 6–8 and 11–13) were found to be less informative, with only sporadic pollen grains of *Pinus*, *Betula*, Asteracea, and Brassicaceae identified. Six pollen zones (I–VI) were defined. Palynological characteristics of the Brynask and Mezin interval were amplified by the data from the section Beglitsa-2.03 (correspondingly, bed 3 and beds 5–6).

***Pollen assemblages (upsection)*:**

<u>Assemblage I</u> (bed 11, depth 7.1–6.8 m) characterizes the illuvial horizon of the Mezin paleosol. Dominant role has pollen of *Pinus* and Asteracea. Sporadic occurrence of *Betula*, Cichoriaceae, *Artemisia*, Brassicaceae. Reconstructed vegetation: herbage steppe in combination with small patches of pine forests and gully thickets.

Assemblage II (bed 10, 6.8–6.2 m; bed 6 of Beglitsa-2.05) comes from the chernozem-like paleosol of the Mezin complex. It is dominated by pollen of herbs (up to 80 %), including Asteraceae, Chichoriaceae, Chenopodiaceae, Polygonaceae, and Leguminoseae. The arboreal group is represented by pines. Maximal diversity (though sporadic occurrences) of broadleaved elements *Carpinus, Ulmus, Fraxinus, Quercus,* and *Corylus, Tilia* is associated with the lower part of this bed. Wide-spread herbage and meadow vegetation with a limited presence of conifer-broadleaved forests and birch-alder gully thickets.

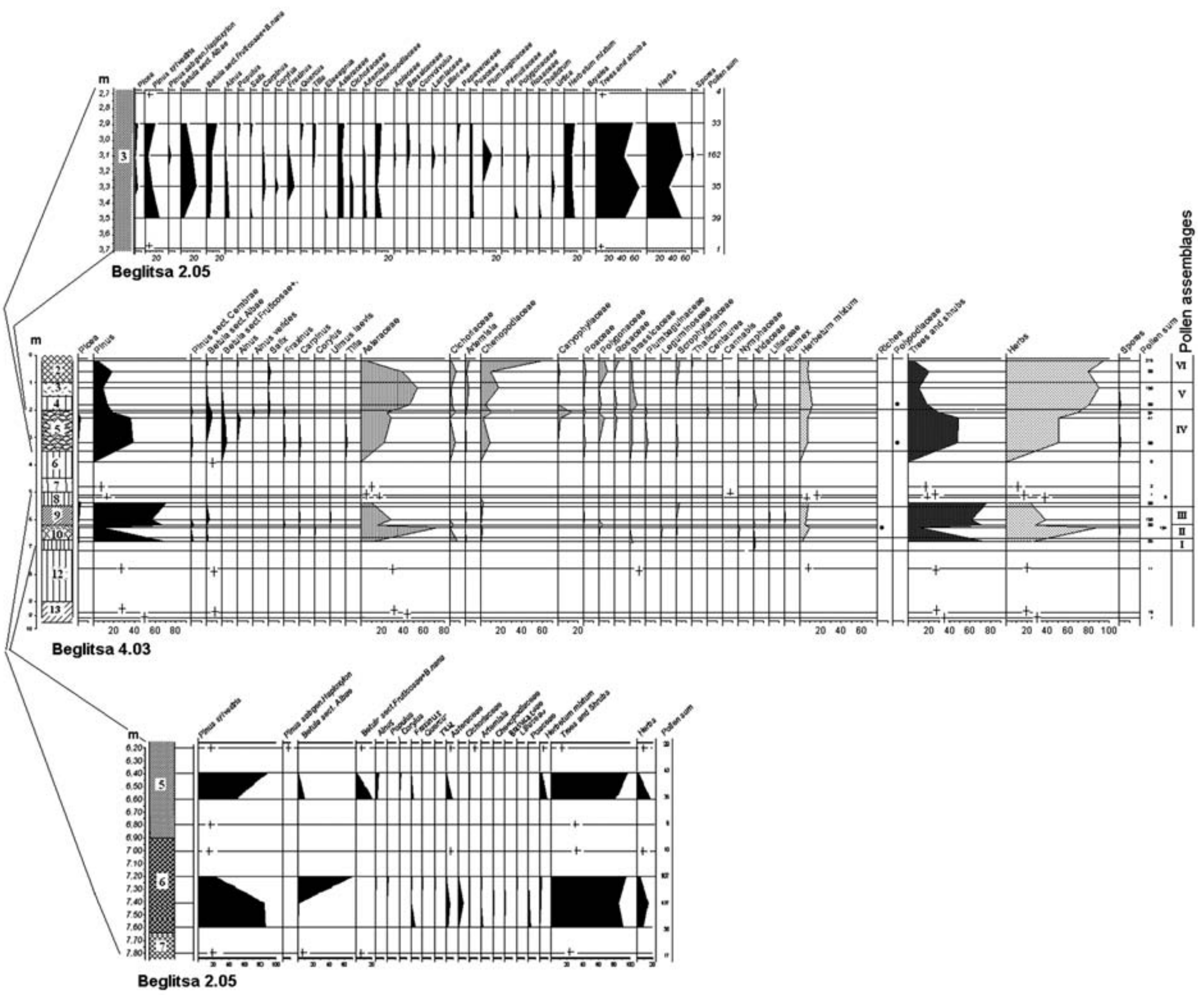

Fig. 8. Pollen diagrams of Beglitsa section

Assemblage III (bed 9, 6.2–5.5 m; bed 5 of Beglitsa-2.05) characterizes the brownish paleosol of the Mezin pedocomplex. The spectra are distinct in sharp reduction in pollen of broad-leaved forms and sporadic occurrence of *Picea* pollen. Also appears *Pinus* sect. *Haploxylon*. The spectra of this interval indicate colder climatic conditions compared to the preceding period. Forest-steppe landscapes combining meadow steppes with limited areas of conifer and small-leaved forests.

Assemblage IV (bed 5, 3.2–2.0; bed 3 of Beglitsa-2.05). The spectra of the Bryansk paleosol are dominated by pollen of herbs (up to 60 %). Most important shares have pollen of Asteraceae, Chenopodiaceae, Polygonaceae, Plumbaguinaeae, and *Pinus* and *Betula* among trees. Also present are *Picea, Pinus* subgen. *Haploxylon, Alnus,* and *Salix*. Sporadic pollen grains indicate presence of *Tilia, Carpinus, Corylus, Quercus,* and *Elaeagnus*. The palynological data indicate widespread herbage-Chenopodiacea steppes in combination with islands of forest vegetation (pine-spruce forests with insignificant role of broad-leaved forms and shrubs of birch, alder, asp, and willow) under conditions of cool and arid continental climate.

FIELDTRIP 1, JUNE 24

Assemblage V (beds 3–4, 2.0–1.1 m) characterizes the loess-like bed covering the Bryansk paleosol. The spectra show a drastic decrease in pollen of trees (20 %). The arboreal forms are represented by pine, birch, and willow. Pollen of Asteraceae and Chenopodiaceae dominate in the spectra. Meadow-steppe and steppe phytocoenoses can be reconstructed for this interval.

Assemblage VI (bed 1–2, 1.1–0 m) of the modern chernozem-like soil. The spectra show sporadic pollen of pine, birch, alder, and willow. The dominant role have pollen of Chenopodiaceae, Asteraceae, Polygonaceae, and Poaceae. The spectra indicate wide distribution of herbage-Chenopodiacea steppe vegetation during the formation of this soil.

Faunal data (A. Tesakov, V. Titov, V. Bajgusheva, P. Frolov; Fig. 10, Plate 4)

Member	***Litho-genetic levels***	***Mammalian fauna***	***Molluscan fauna***
1	Lagoonal greyish-blue clays and silts	***Beglitsa A*** *Mammuthus* cf. *chosaricus* *Megaloceros* sp., *Lagurus lagurus*	*Dreissena polymorpha*, *Viviparus* sp.
2	Loams and silts	***Beglitsa B*** *Spermophilus* aff. *pygmaeus, Spalax* sp., *Lagurus lagurus, Eolagurus* cf. *luteus, Arvicola chosaricus, Microtus arvalis, Microtus gregalis, Microtus oeconomus*	*Monodacna* sp., Unionidae gen., *Dreissena polymorpha, Bithynia leachi, Valvata pulchella, Valvata piscinalis, Valvata naticina, Micromelania* sp., *Anisus strauchianus*, and *Vallonia pulchella.*
3	Mezin pedocomplex	***Beglitsa C*** *Spermophilus* sp., *Ellobius* sp.	–
4	Loess-like loams	***Beglitsa D*** *Lagurus lagurus*	–
5	Bryansk paleosol	–	–
6	Loess-like loams	–	–
7	Modern soil	–	–

Archaeological evidence

In 1962, the Mousterian core was unearthed by Ivanova and Vasiliev (Geological Institute of the USSR Academy of Sciences) in approximately 1 m above the Mezin (Eemian/Mikulino) pedocomplex (Ivanova and Praslov, 1963; Praslov, 1968; Lebedeva, 1972). The core occurred in loess-like loam, at the level corresponding to the boundary between beds 6 and 7 of the Beglitsa 4.03 section (Fig. 9). In addition, N. Praslov (1968) described several Mousterian artifacts from Beglitsa found on the beach. According to Praslov (1968), the in situ core is made of transparent Createaceous chert. In industrial features this core is similar to the Levallois type, turtle-back cores. Due to geological position, this find can be dated in the range of ca. 90–25 ka, between the Mikulino/Eemian interglacial and Bryansk/Denekamp interstadial.

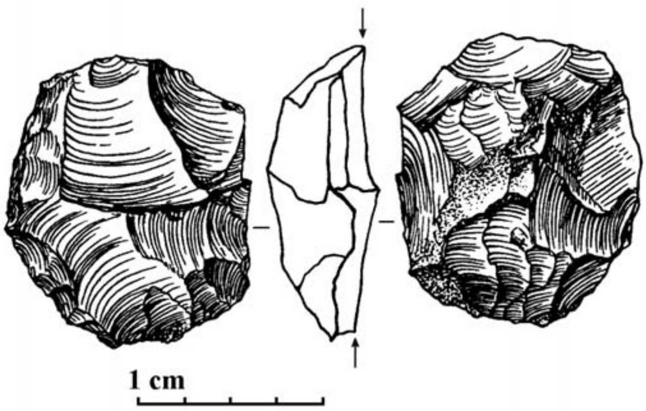

Fig. 9. Mousterian core from Beglitsa (after Praslov, 1968)

FIELDTRIP 2

June 25

SEMIBALKI

Semibalki is a large settlement of the Rostov Region on the southern coast of the Sea of Azov. The coastal cliffs near Semibalki provide excellent natural exposures of the Quaternary deposits, which have been and still are under active study by various research teams (Popov, 1948; Shchevtchenko, 1965; Lebedeva, 1972; Rekovets, 1994; Velichko et al., 2006, 2009; Tesakov et al., 2007, and many others). Natalia Lebedeva (1972, Fig. 11) following the terrace philosophy of that time defined two diachronous terraces, the Semibalki V terrace with the Tiraspol (Cromerian) mammalian fauna in the base, and an older the Margaritovo VI terrace with Tamanian (Galerian) mammals in the base. These formations can be seen near Semibalki settlement.

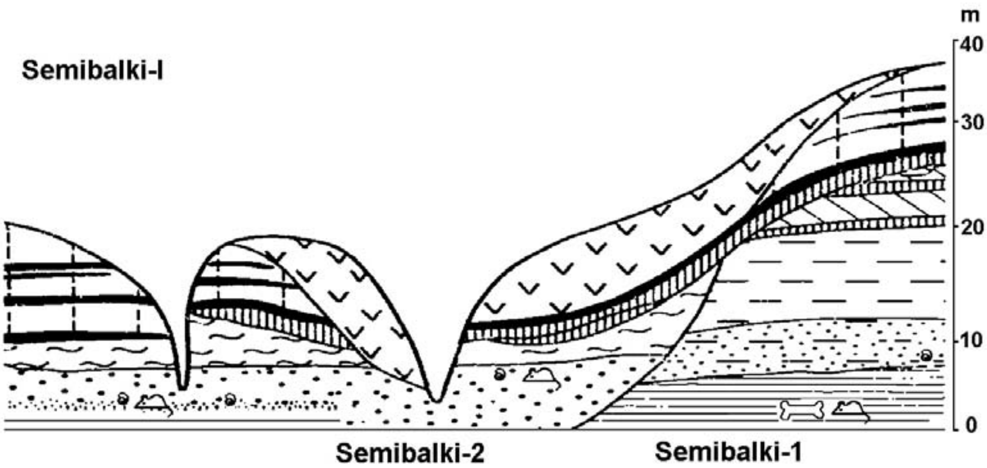

Fig. 10. Geological profile near Semibalki village (modified after Lebedeva, 1972)

The geological record of multiple Semibalki sections can be divided into three main parts. First, lagoonal-fluviatile deposits of late Early Pleistocene exposed at the very base of the cliff in 2 km SW of the settlement. This outcrop is only possible for the study during wind-blown low water level in the Azov Sea. Quartz sands, gravels, and compact bluish-gray clays yielded rich material of fresh-water molluscs, large, and small mammals (Popov, 1948; Rekovets, 1994, Bajgusheva et al., 2001; Tesakov et al., 2007). Molluscan association includes characteristic thick-walled unionids "*Unio kunugurensis*" and *Viviparus aethiops* (Popov, 1948), as well as *Dreissena polymorpha, Unio chosaricus, Viviparus turritus, Lithoglyphus* cf. *piramidatus, Fagotia* sp. (determination of P. Frolov).

Large mammals include *Pachycrocuta brevirostris, Homotherium latidens*, *Archidiskodon meridionalis tamanensis, Elasmotherium* sp., *Equus* aff. *major*, *Cervalces* cf. *latifrons*, *Eucladoceros orientalis pliotarandoides*, *Pontoceros* cf. *ambiguus*, *Bison* cf. *tamanensis* (Bajgusheva, 2000; Sotnikova, Titov, 2009; Plate 6). Insectivore and rodent association includes S*orex* sp., *Desmana nogaica, Marmota* sp., *Spermophilus nogaici, Trogontherium cuvieri*, *Allactaga* sp., *Lagurodon arankae, Clethrionomys* cf. *hintonianus, Prolagurus pannonicus transylvanicus, Eolagurus argyropuloi argyropuloi, Mimomys pusillus, Mimomys savini, Allophaiomys pliocaenicus, Microtus (Stenocranius) hintoni* (modified after Rekovets, 1994, and Tesakov et al., 2007). This locality is known in the literature as **Semibalki-1.** This is the type locality of *Eolagurus praeluteus* (Schevtschenko, 1965) (Fig. 12), later synonymised to *E. argyropuloi.*

Second, the overlying deposits forming the lower and middle part of the Semibalki coastal sections are represented by a sequence of light, medium-grained to coarse cross-bedded sands with abundant shells of fresh-water molluscs. These deposits were referred to the base of the Semibalki terrace of Lebedeva. The representative section of these deposits is situated at the southwestern margin of the Semibalki settlement. According to Popov (1948, 1983), the molluscan assemblage includes *Unio* ex gr. *batavus*, *Unio* aff. *emigrans*, *Viviparus tiraspolitanus*, and other fresh-water mollusks. Popov (1983) also reported brackish-water bivalve *Monodacna* *caspia* in this fauna. Fresh-water mollusks of this association also include *Dreissena polymorpha, Sphaerium rivicola, Pisidium amnicum, Lithoglyphus naticoides*, etc. (determinations of A. Tchepalyga in Lebedeva, 1972), and *Viviparus vivparus, V. diluvianus, Bithynia tentaculata, Parafossarulus* sp., *Valvata piscinalis, Valvata naticina, Planorbis planorbis, Anisus spirorbis, Gyraulus albus, Gyraulus acronius, Fagotia* sp., *Micromelania* sp., *Lithoglyphus piramidatus*, etc. (determinations of P. Frolov). Remarkable is the presence of black silicified shell fragments of Carboniferous spirifirid barachiopods. This is a clear indication that the source area for the alluvial sediments was situated close to the Donets Range in the north. Small mammal association (Rekovets, 1994; Tesakov et al., 2007) includes *Spalax* sp., *Microtus (Stenocranius) gregaloides, Microtus nivaloides, Mimomys savini, Lagurus transiens, Eolagurus argyropuloi*, etc. This site is called **Semibalki-2**. The representative section near Glubokaya gully in 2 km W from the settlement was described upsection by Lebedeva (1972), Fig. 11:

Fig. 11. Lower m1-m2 of *Eolagurus praelutreus* Shevchenko, 1965, type specimen from Semibalki

Bed	Lithology and fauna	Thickness, m
1	Cross-bedded coarse sands and gravels brownish with abundant shells of fresh-water molluscs (*Viviparus, Unio*) and bones of small mammals (*Lagurus transiens, Microtus gregaloides*, etc.). Mammalian site **Semibalki-2**	2.0–2.5
2	Sands fine- and medium grained, silty, greenish-greyish, horisontally bedded with interlayers of greenish-greyish silts. Horizontal members show cross-bedding.	3.0–4.0
3	Silts of tabacco-grey colour	1.5–1.5
4	Paleosol represented by dark grey clay	1.0
5	Paleosol represented by reddish and olive-brown clay with well developed illuvial horizon marked by carbonate concretions	1.0
6	Paleosol represented by compact, chokolat-brown loam with well developed illuvial bed at the base	1.5
7	Loam dark brownish grading into light brownish at the bed's top	2.0
8	Paleosol represented by brown loam with well-developed carbonate concretions of illuvial horizon.	0.5
9	Loam brownish, porous	1.0
10	Paleosol represented by dark brownish loam. Illuvial horizon at the base.	1.0
11	Loam greyish-brownish, porous	2.0
12	Modern soil	0.7

According to recent observations, gravels and sands of Bed 1 overly with erosional boundary bluish silts and clays of lagoonal origin, the member characterized by mammals of the Tamanian faunal complex in some 0.5 km to the west (Semibalki-1 mammalian site).

Third, the loess-paleosol sequence crowns the sections exposed in coastal cliffs near Semibalki. The first detailed study of paleosols in this area was published by Lebedeva (1972). In recent decade, this part of the section is under a close study by Prof. A. Velichko and his team (Velichko et al., 2006a, b; 2009; fig. 13). Important data on subaerial and lagoonal deposits of Semibalki sections were provided by Tesakov et al. (2007) and by Simakova (2008). The most important composite loess-paleosol section is situated in the center of the settlement. It is referred to as **Semibalki I** (N 47°00'59,8" E 39°02'38"). According to Velichko et al. (2006a, 2009) this section has the following structure (downsection):

FIELDTRIP 2, JUNE 25

Structure of loess-paleosol sequience in the section Semibalki-I

Bed	Paleosol and loess horizons, faunal remains	Depth, m	Thickness, m
	Modern Soil. *Lagurus* sp., *Valvata* sp.		
1	**A humic horizon of the modern Holocene chernozem soil**: Sandy loam; 0YR 3/1 (dark grey); granular structure; gradational lower contact	0.80	0.80
2	**Transitional A/B horizon:** Loam–to-sandy loam; 10YR 5/2 (pale yellow-grey); prismatic to fine blocky structure; gradational lower contact	1.50	0.70
3	**BCa horizon:** Loam to sandy loam; 10YR 4/3 (yellowish-brown); porous; prismatic structure; carbonate accumulations; indistinct lower contact	2.00	0.5
4	**BC horizon, pedogenically modified loess:** Sandy loam; 10YR 6/4 (pale yellow, with brownish hue); prismatic to medium angular blocky structure; almost completely devoid of carbonates; krotovinas 8–15 cm in diameter; gradational lower contact	2.65	0.65
5	**BC horizon, pedogenically modified loess:** Sandy loam; 10YR 6/4 (pale yellow, with brownish hue); prismatic to medium angular blocky structure; almost completely devoid of carbonates; krotovinas 8–15 cm in diameter; gradational lower contact	4.90	2.25
	Mezin Palaeosol complex (PC 1) (Mz), attributed to Mikulino/Eemain interglacial. *Spermophilus* sp., *Lagurus lagurus*, Lacertidae gen.		
6	**Upper humified horizon; Krutitsa interstadial phase of the Mezin soil complex:** Loam; 10 YR 5/4 (brown, with weak grey hue); well-developed fine columnar prismatic structure; compact, firm, and cohesive; isolated fine carbonate crystals (2–3mm) in pores	5.37	0.47
7	**Lower humic horizon; Salyn phase of the Mezin soil complex, corresponding to the Mikulino Interglacial:** Loam; 10 YR 4/4 (grey-brown); well-developed fine columnar prismatic structure; compact, firm, and cohesive; upper part abounds in fine-grained (powdery) carbonates concentrated in macropores (root channels) 2–4mm in diameter; decreasing carbonate concentrations below 0.30m thickness; gradational lower contact	6.00	0.63
8	**AB horizon: Loam**; 10 YR 4/4 (grey-brown); medium prismatic structure; isolated powdery carbonate crystals; krotovinas of burrowing animals (3–5 cm diameter); distinct lower contact	6.45	0.45
9	**BCa horizon: Loam**; 10 YR 4/3 (grayish-brown, with a weak yellowish hue; prismatic structure; abundant carbonate weakly lithified nodules and concentrations ("byeloglazka"), 0.5–0.8 cm diameter; krotovinas infilled with material from the overlying soil horizon (unit 8) to 5 cm diameter; distinct lower contact, but without evidence of erosion	7.22	0.77
	Kamenka Palaeosol complex (PC 2) (Km)		
10	**Am horizon: Loam**; 10 YR 4/3 (grayish-brown); fine prismatic structure; carbonate present only as vertical inclusions arranged as veinlets 4–8 mm wide, along fossil plant roots; krotovinas to 12–15cm^2, filled with material from layer 8; numerous vertical veins penetrate to the lower portion of the layer 10 and below; distinct lower contact	8.06	0.84
11	**Bm horizon: Loam**; 10 YR 3/3 (dark brown); granular structure; compact and firm; scattered carbonate concentrations ("byeloglazka") due to carbonate migration from the overlying layer; fine vertical veins extending from units 9 and 10; distinct lower contact	8.56	0.50
12	**BCa horizon: Loam**; 10 YR 4/4 (brown); weak prismatic to granular structure; compact; abundant carbonate inclusions ("byeloglazka" type) in upper 0.50 m, but reduced in lower 0.25 m; krotovinas 5–7 cm in diameter; vertical veinlets 2–4 cm wide filled with material from the overlying horizons, forming the continuation of structures extending downwards from unit 9; gradational lower contact	9.38	0.82
13	**Lower B horizon**: Clayey loam to clay; 10 YR 5/5 (light brown), grading downwards to 10 YR 4/4 (brown); granular-to-weak fine blocky; compact; manganese oxide staining on block surfaces; distinct lower contact	9.85	0.47

Ending of the Table

Bed	Paleosol and loess horizons, faunal remains	Depth, m	Thickness, m
	Inzhavino Palaeosol complex (PC 3) (In), attributed to the Likhvin Interglacial, split by vertical fractures into columns		
14	**A horizon: Sandy loam, humic;** 10 YR 4/4 (brown); strong medium to coarse blocky structure; fissures 4–5 cm wide separating blocks are infilled with material from unit 13; manganese oxide staining on block surfaces; gradational lower contact	10.35	0.50
15	**AB horizon: Loam, humic;** 10YR 3/3 (dark greybrown); fine blocky structure; compact; split by vertical fractures into columns, increasing in width from 10–15 cm in the upper part of the layer to 30–40 cm towards its base. The width of inter-block infilled fractures varies from 3–5 to 8–12 cm, and they are filled with grey-yellowish loam, resembling that of the overlying layer; coloring due to humus darkens downwards. Krotovinas 5–8 and 5–10 cm^2 in dimensions filled with mixed material (from blocks and fissures) occur within the lower 0.3 m of the layer; gradational lower contact	11.10	0.75
16	**AB horizon: Loam to clayey loam, humic;** 10 YR 3/3 (dark grey-brown); fine blocky to granular structure; distinct iron oxide films on ped facets; individual columns (between vertical fissures) widen to 60–65 cm; fissures are reduced in width to 5–7 cm; gradational lower contact	11.40	0.35
17	**B horizon: Loam to sandy loam;** 10 YR 4/4 to 10 YR 3/4 (brown to brownish grey); granular-to-weak fine blocky structure; fine silty carbonates in pores; isolated krotovinas (5–10 cm dimensions) filled with material from humus horizon; numerous thin (5–10 mm) subvertical veinlets penetrate into unit 17 from the overlying layer; distinct lower contact	11.85	0.30
	Vorona Palaeosol complex (PC 4) (Vr), attributed to the Muchkap Interglacial *Spermophilus* sp, *Lagurus* ex gr. *transiens-lagurus*, *Eolagurus* sp., *Microtus* cf. *arvalidens*, Anura, *Chondrula tridens*		
18	A horizon: Sandy loam; 7.5 YR 5/8 (red-brown); weak fine blocky to granular structure; friable, non-cohesive; fine porosity; carbonate inclusions ("byeloglazka"); krotovinas (5–10 cm) filled with humus material from the above-lying soil; trace structures of small burrowing animals (10–15 mm) filled with dark-grey organic matter; gradational contact	12.73	0.88
19	**AB horizon: Loam**; 7.5 YR 4/3 (reddish brown); weak fine blocky to granular structure; friable, non-cohesive; fine porosity; rare carbonate inclusions ("byeloglazka"); scattered krotovinas (5 cm) filled with materials presumably from the overlying layer; gradational lower contact	13.20	0.47
20	**BCa horizon: Sandy loam-to-loam;** 5YR 4/6 (light yellow-brown); very weak fine blocky to granular structure; friable, non-cohesive; rich in fine carbonates; some "byeloglazka" inclusions; carbonate content decreases with depth; gradational lower contact	13.85	0.65
21	**BC horizon: Sandy loam;** 7.5 YR 5/4 (grayish-yellow); very weak fine blocky to granular structure; friable, non-cohesive; carbonate "byeloglazka" inclusions; small manganese oxide crystals; krotovinas with 5–15 cm dimensions. In the lower part (within 25 cm above base) the layer becomes gradually lighter, with isolated lenses of light grey fine sand. The increase in sand content is noticeable from the cumulative thickness of 14–14.5 m, indicating that the soil developed on the underlying lagoonal sediments; gradational lower contact	14.90	1.05
22	**Tiraspolian (Cromerian) sand.** Fine sand: 10 YR 7/3 (light grey with a slight greenish hue); horizontally stratified, with fine cross-lamination within horizontal beds; subvertical root channels penetrate from the overlying unit; krotovinas with 5–15 cm dimensions	15.15	0.25

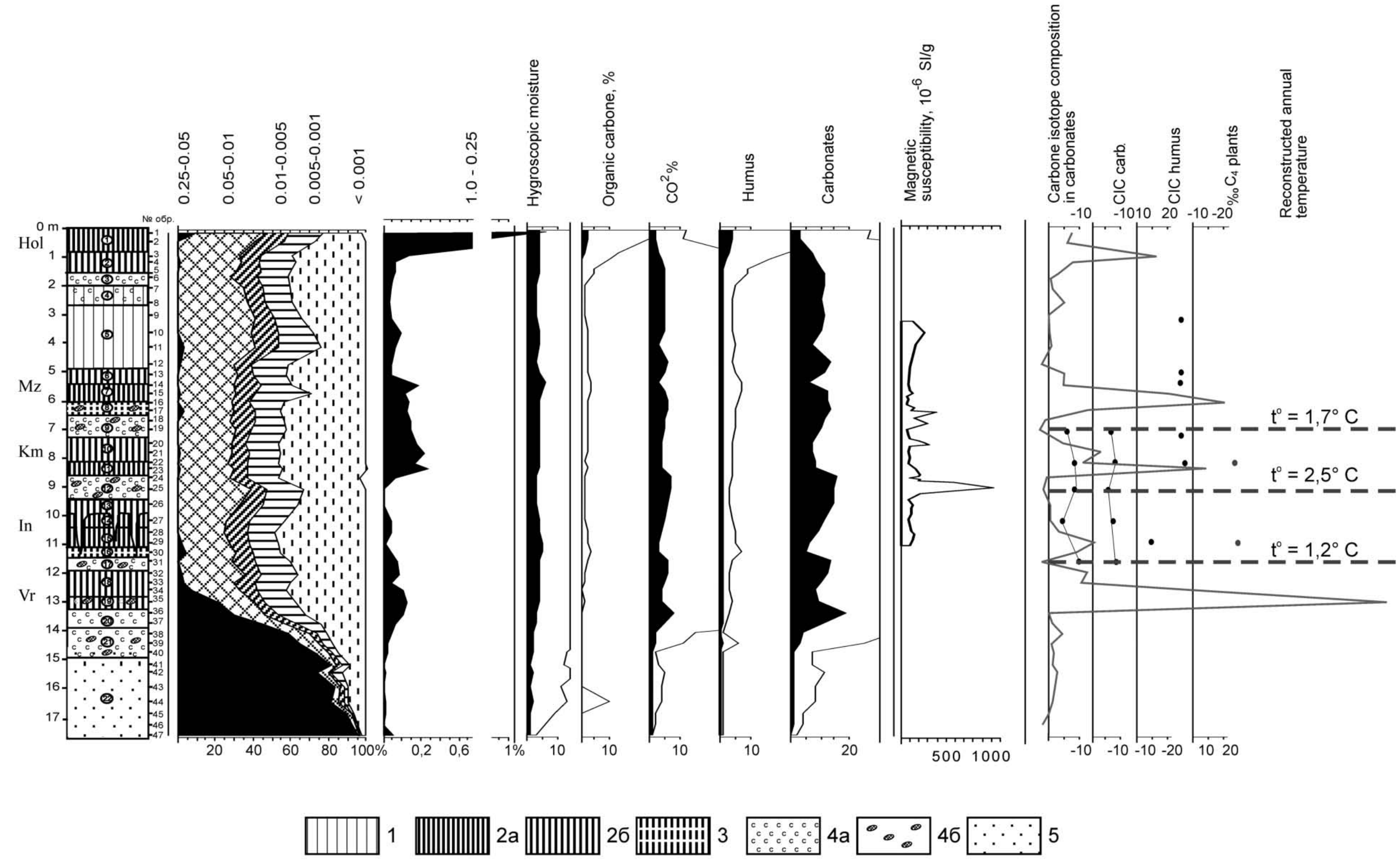

Fig. 12. Lithological, chemical, magnetic susceptibility, and oxygen-isotope data on subaerial sequence in Semibalki-I section. Designations: 1. loess; 2. humus horizon (A) of varible coloration degree; 2a. strong, 2b. Less strong; 3. transitional (A/*B*); 4. horizon *B,* containing: 4a. Carbonates, 4b. burrowings; 5. lagoonal-marine sands. Soil horizons: Hol, Holocene. Paleosol complexes: Mz, Mezin; Km, Kamenka; In, Inzhava; Vr, Vorona. ICC, isotope composition of carbon; IC, isotope composition (Velichko et al., 2006b)

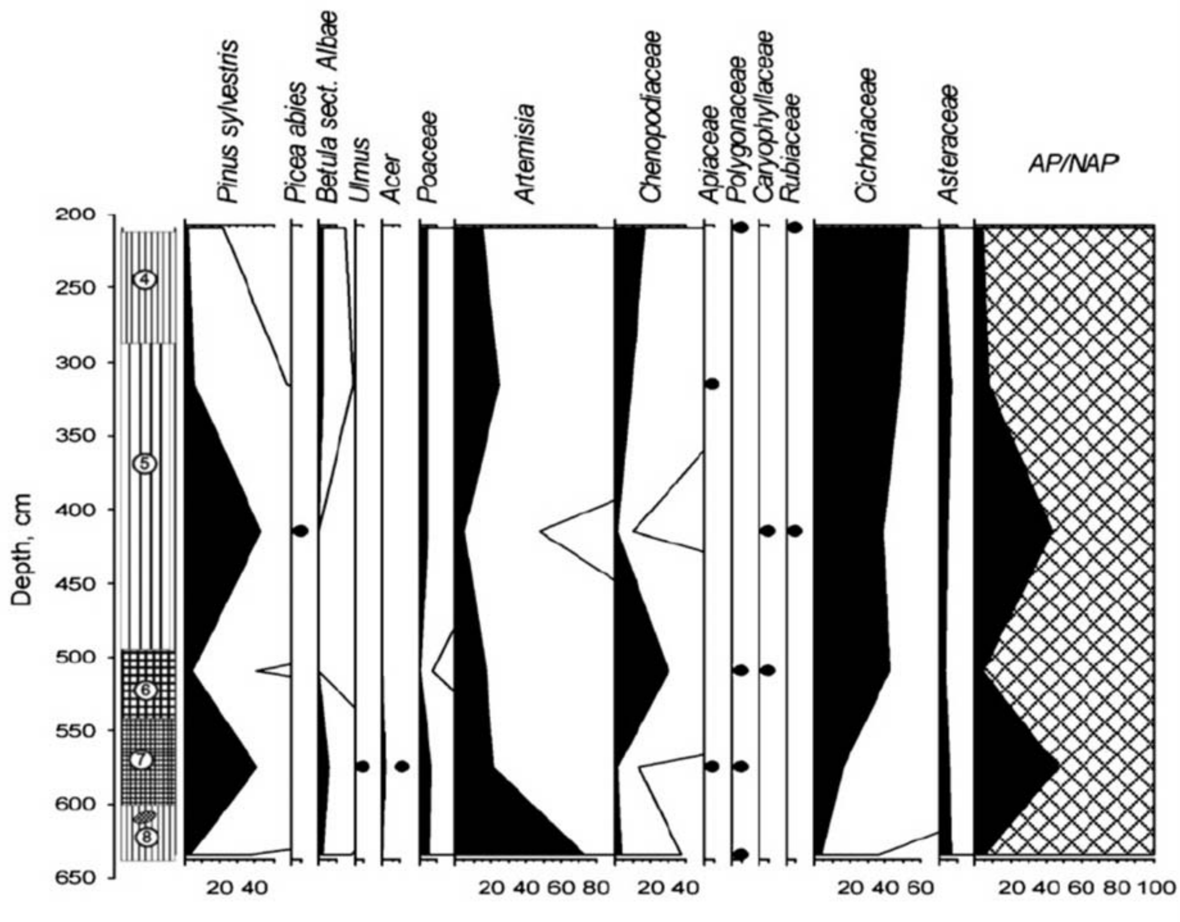

Fig. 13. Pollen diagram of upper part of the section Semibalki I

The upper part of the section was studied palynologically (Velichko et al., 2006a) (fig 14). The results permit only tentative conclusions on the quantitative relationship among the principal constituents of the spectra. Pollen assemblages determined in unit 4 and the uppermost part of unit 5 (Valdai loess) are dominated by nonarboreal constituents (NAP). Typically for steppe assemblages, they abound in Chenopodiaceae, Gramineae, and *Artemisia*, including *Artemisia* s.gen. *Seriphidium*. Cichoriaceae pollen constitutes a noticeable portion of the assemblages. These typical inhabitants of disturbed grounds grew presumably on the coastal scarp and could occur on the adjacent flat surface with scarce vegetation. In the lower part of unit 5, there is a noticeable rise (up to 40 %) in AP abundance, mostly *Pinus sylvestris*, with individual grains of *Picea* and *Betula*. The proportion of Cichoriaceae and *Artemisia* is high. It is not inconceivable that some open forest communities did exist in the region at that time, giving a forest-steppe appearance to the environment. This could be related to the Mid-Valdai mega-interstadial (MIS 3). However, the data at hand do not permit a definite conclusion on this point. *Pinus* pollen can be easily transported by wind for tens of kilometres, and no plants that could be confidently attributed to a forest floristic complex has been found among the NAP. The problem requires future investigations. The upper part of the Mezin palaeosol complex (unit 6) yielded pollen assemblages not unlike those of unit 4, except for a somewhat higher content of Chenopodiaceae. The assemblage is definitely representative of a steppe environment.

Pollen spectra recovered from the lower humic horizon of PC 1 (Salyn, unit 7) are distinguished by considerably higher percentages of AP (up to 65 %), with dominance of *Pinus* and *Betula* and small proportions of *Ulmus* and *Acer*. In the NAP group, *Artemisia* and Gramineae prevail, while Cichoriaceae participation is considerably reduced. The pollen assemblages are indicative of forest-steppe communities over the region at that time, and the presence of themophilic tree species (*Ulmus*, *Acer*) suggests interglacial environments.

Pollen assemblages of unit 8 are noticeably different from those of the overlying unit. The proportion of NAP rises to 93 %. The assemblages are dominated by *Artemisia*, with Gramineae, Chenopodiaceae, Asteraceae, and Cichoriaceae present in small amounts. The vegetation was similar to the modern southern steppe.

FIELDTRIP 3

June 26

ZELENYI (NEW KAGALNIK)

Kagalnik is a river and homonymous settlement to the west from Azov town. The Kagalnik River is flowing into the Sea of Azov. Elevated hills near the river's mouth are formed by ancient fluviatile sand of paleo-Don. These deposits are actively dug for construction purposes in a series of small and medium-size sandpits. The Kagal'nik section [47°10'50"N, 39°12'10"E] was studied in the sandpit 5 km to the WSW of the town of Azov (Tesakov et al., 2007; Plate 2). The sandpit exposes the Semibalki terrace deposits of the left bank of the Don Valley to the northeast from the mouth of the Kagal'nik River. The locality is famous for the finds of two skeletons of the throgontherine elephant, *Mammuthus trogontherii* in 1964 and 1998 (Bajgusheva, Timonina, 2001); the latest excavation campaign was carried out during the summer of 1999. Both skeletons are on display in the Azov Museum-reserve.

The Kagal'nik section consists of sandy and loamy members of deltaic-lagoon origin overlain by subaerial deposits. The following section was described during the excavations in 1999 (upsection):

Bed	*Lithology*	*Thickness, m*
1	Sands, light grey horizontally bedded with interbeds of dark grey silty clays. The lower part of the bed contains lenses of clayey sand with freshwater mollusc shells and bones of small mammals	2
2	Alternation of light grey, fine-grained, cross- and horizontally bedded sands and brown grey clays. Clay interlayers contain mollusc shells	3.5–3.7
3	Sands light grey, fine-grained, fine layered with thin interbeds of grey clays. The middle part of the bed is cryoturbated: an ice wedge pseudomorph penetrates the sand down to the depth of 0.6 m	2.5
4	Loamy sand light brown indistinctly bedded	0.7–0.8
5	Loams dark brown with sparse green reddish gleyed spots, carbonate concretions (+2 cm) and sparse shells of freshwater molluscs. The bed contained the skeleton of *Mammuthus trogontherii*	0.5–0.8
6	Loams, dark brown, layered, contain fine carbonate concretions (diameter 2 cm)	0.5
7	Loam, dark brown with carbonate concretions and fine iron and manganese grains (diameter 2–3 cm);	2–3

Higher parts of the section are not exposed.

The elephant remains were confined to the loamy layer in the upper part of the section. The sandy deposits at the base of the section (bed 1) have yielded a characteristic association of small mammals. The mammalian fauna is almost identical to that known from the Tiraspolian strata at Semibalki: *Microtus nivaloides,* primitive *Lagurus transiens* and *Microtus (Stenocranius)* ex. gr. *hintoni-gregaloides*. Only the lower (essentially clayey) layers in the Kagal'nik section, beds 1 and 2, could be measured palaeomagnetically and showed normal polarity. Of particular importance are the cryogenic structures seen in the clayey sands (bed 3) of the upper deltaic sequence at Kagal'nik. These structures are a good example of early periglacial processes in the Azov Sea region during the Middle Pleistocene. The association of the molluscs in bed 1 (Tchepalyga, pers. comm.) has a rheophilous appearance and contains shells of the extinct gastropod *Viviparus tiraspolitanus* (Pavlow) that was originally described from the so-called 'Tiraspol Gravel' fluvial deposits. These deposits forming the Kolkotov Terrace near the city of Tiraspol in Moldova, are the stratotype of the Tiraspolian mammal complex. The molluscan assemblages from beds 2 and 5 are of limnophilous and stagnophilous character and indicate a deltaic-lagoonal environment.

Currently the old sandpits are closed. An actively used sandpit Zelenyi (New Kagalnik) is selected for the field excursion. The quarry exposes about 15–20 m of the light quarts sands with abundant shells of *Viviparus*, *Dreissena* and other fresh-water mollusks. These deposits form a base of the so-called Semibalki terrace (Lebedeva, 1972). The mammalian fauna from the site includes *Microtus (Stenocranius) gregaloides*, *Microtus nivaloides,* and *Eolagurus argyropuloi* (Plate 5). This is the typical assemblage of the Tiraspolian faunal complex known in many early Middle Pleistocene sites in the area.

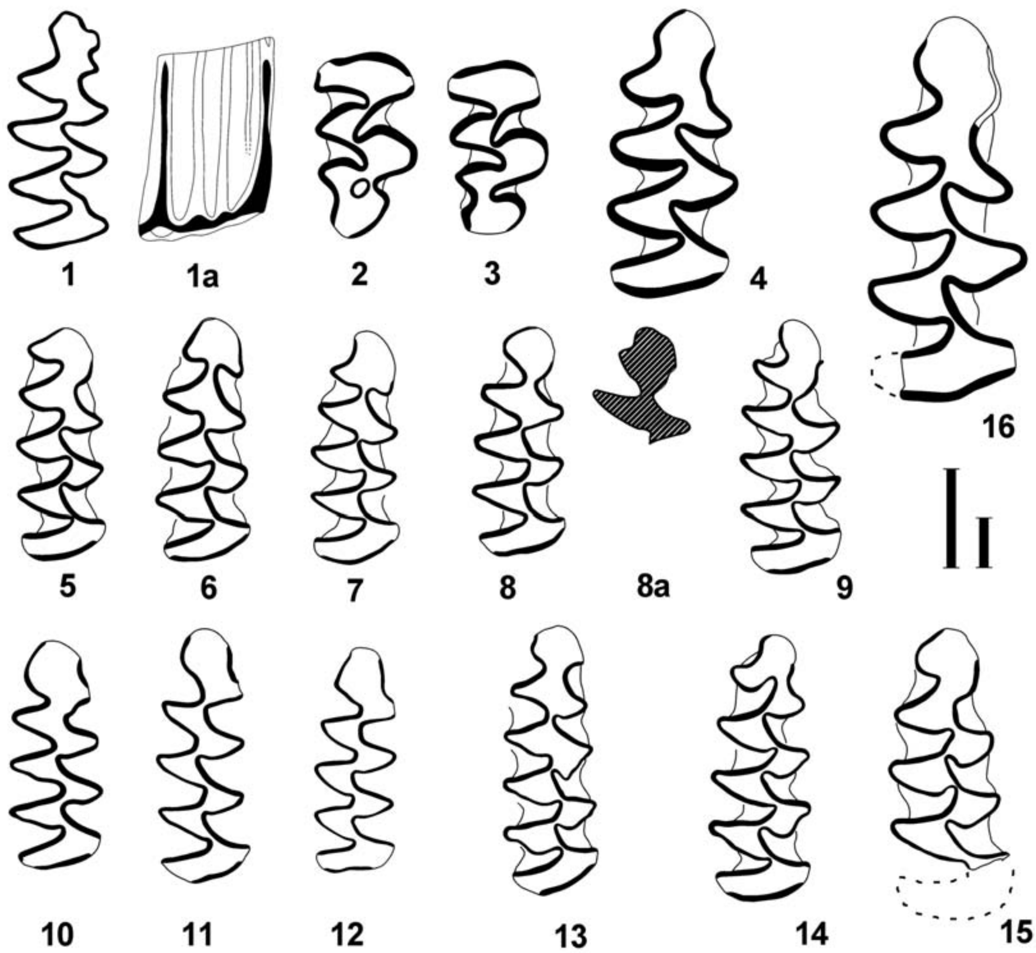

Fig. 14. Characteristic small mammals of the Plio-Pleistocene sequence of the Azov Sea region. (Tesakov et al., 2007). First lower (m1) and third upper (M3) molars, occlusial surfaces (1–16), labial side (1a), root view (8a). Scale bars equal 1 mm, the smaller bar refers to (1a). (1) *Borsodia* gr. *newtoni-arankoides*, m1, Liventzovka-west, early Early Pleistocene; (2–4) *Mimomys savini*: (2, 3) M3, (4) m1, Margaritovo 1, late Early Pleistocene; (5, 6) *Allophaiomys* gr. *pliocaenicus*, m1, Margaritovo 1, late Early Pleistocene; (7) *Microtus* sp., m1, Port-Katon 3, late Early Pleistocene; (8) *Stenocranius hintoni*, m1, Margaritovo 2, late Early Pleistocene; (9) *Stenocranius gregaloides*, m1, Platovo, early Middle Pleistocene; (10) *Lagurodon arankae*, m1, Margaritovo 1, late Early Pleistocene; (11) *Prolagurus panninicus transylvanicus*, m1, Margaritovo 2, late Early Pleistocene; (12) *Lagurus transiens*, m1, Platovo, early Middle Pleistocene; (13) *Microtus arvalidens*, m1, Port-Katon 4, early Middle Pleistocene; (14) *Microtus nivaloides*, m1, Platovo, early Middle Pleistocene; (15) *Microtus oeconomus*, m1, Platovo, early Middle Pleistocene; (16) *Arvicola chosaricus*, m1, Beglitsa B, late Middle Pleistocene

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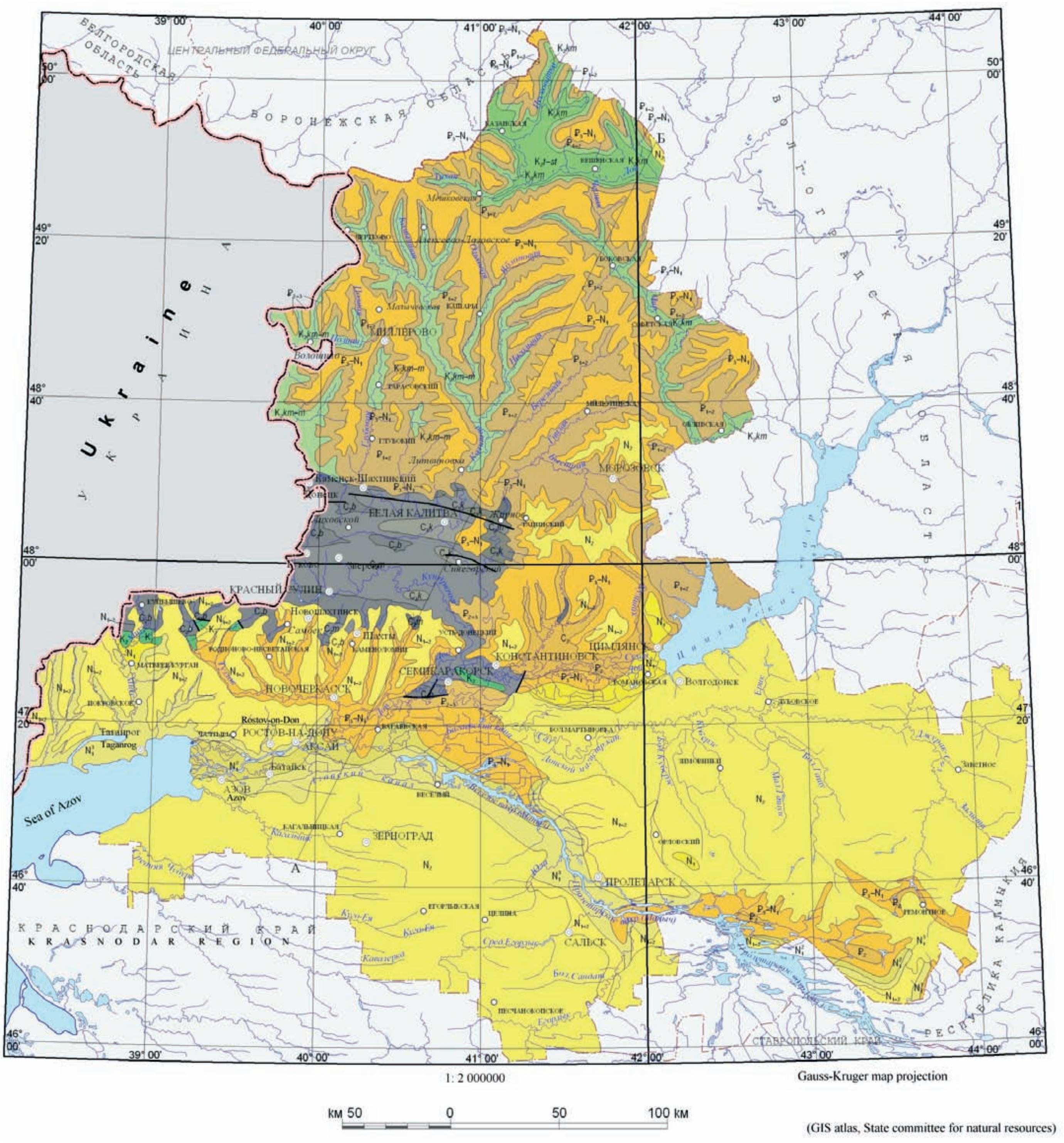
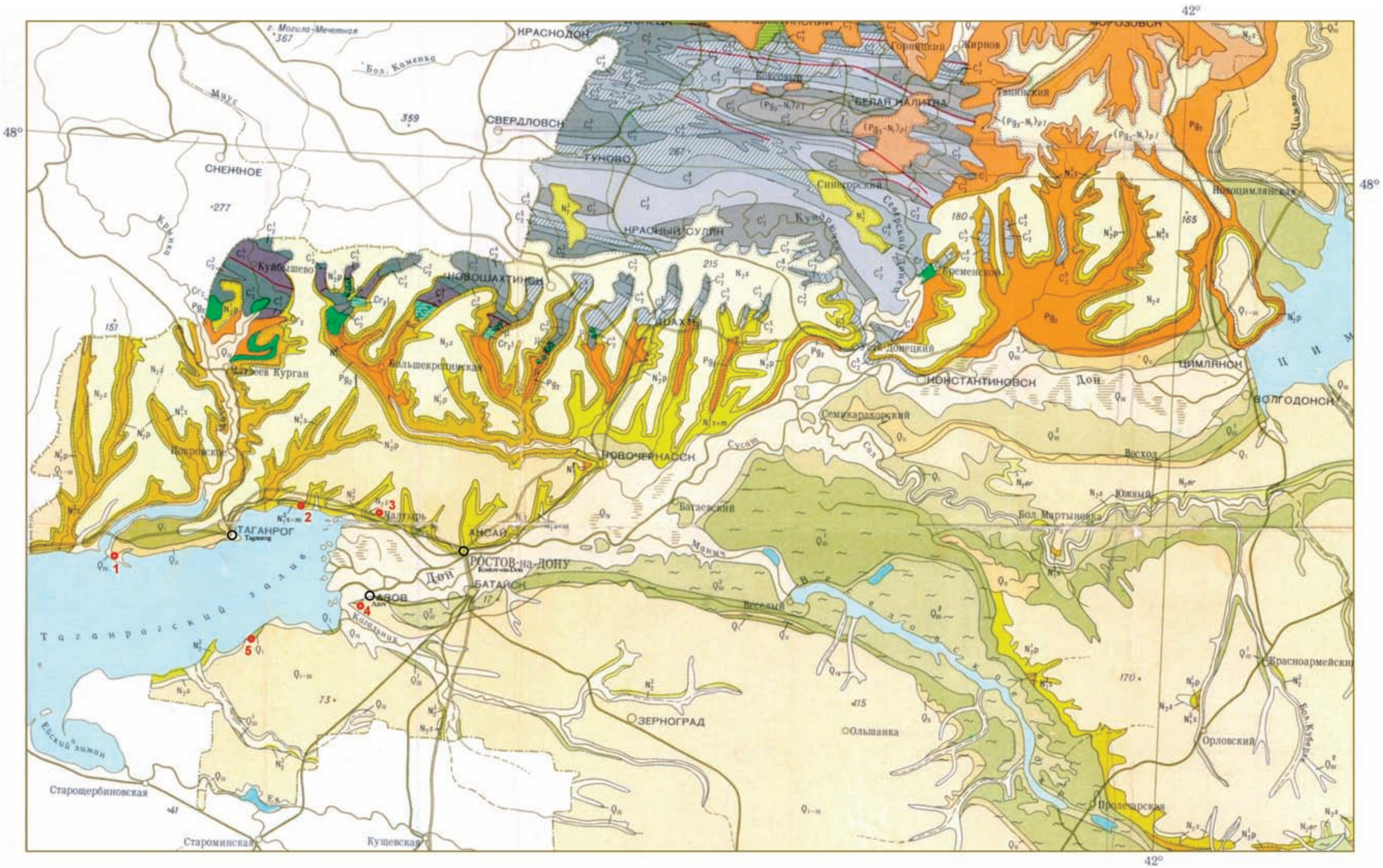
Plate 1



Overview geological map of Rostov Region, 1: 2000000
(modified after GIS atlas, State agency of mineral resources)

Plate 2



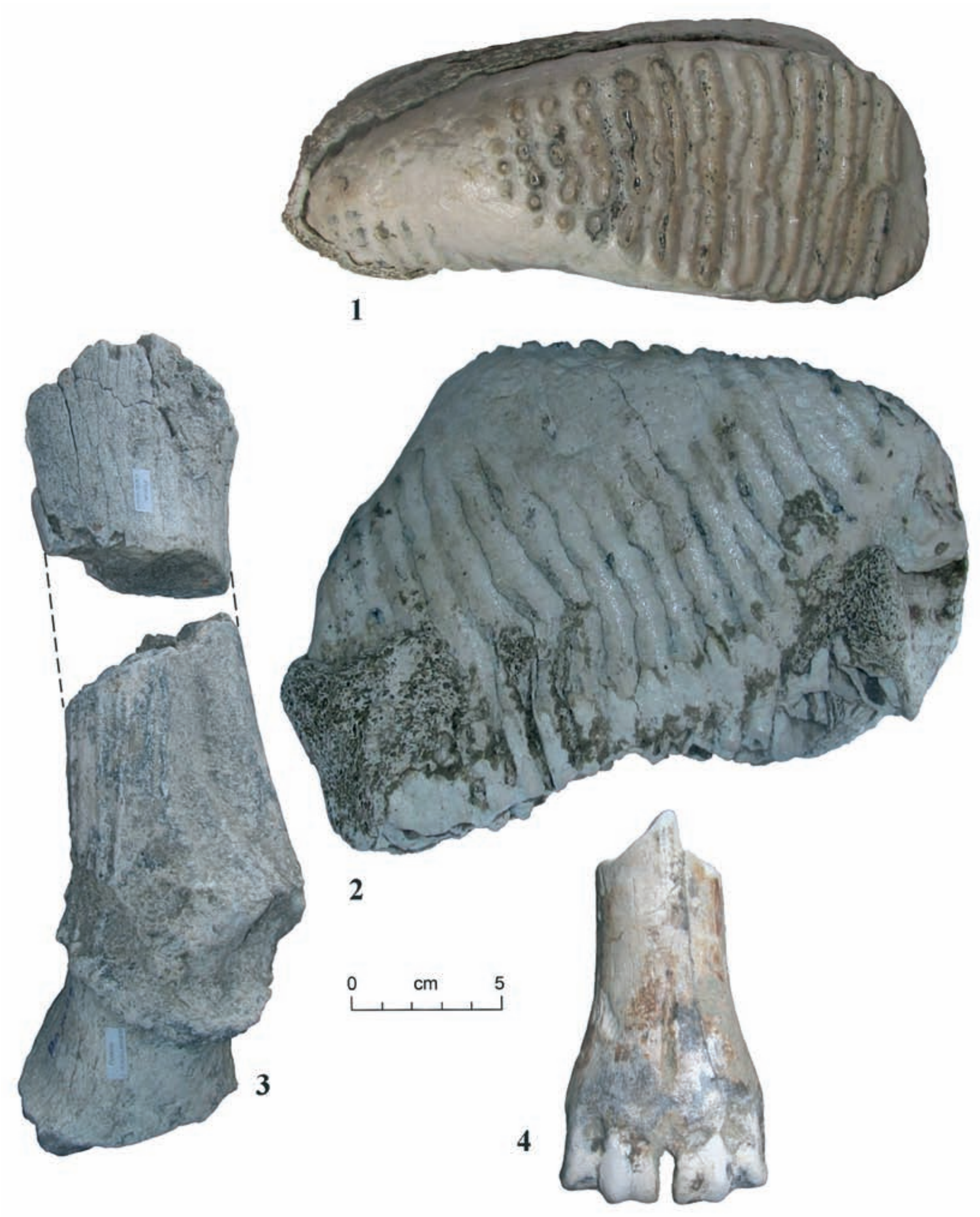
Geological map of the western part of Rostov Region (modified after Geology of the USSR, vol. XLVI, 1968, geological map 1:1000000).
Excursion sites (red points): 1. Beglitsa, 2. Merzhanovo, 3. Kamennaya Balka, 4. Kagalnik (Zelenyi), 5. Semibalki

Plate 3

Large mammals of Khaprovian faunal complex from Liventsovka locality.

1 – *Arvernoceros* cf. *verestchagini*: the part of the skull with the fragments of antlers, rostral view; 2 – *Eucladoceros dicranios tanaitensis:* the fragment of left antler, medial view; 3 – *Gazellospira gromovae*: the fragment of left horn, aboral view; 4 – *Anancus arvernensis alexeevae*: right upper jaw with M^2-M^3, occlusal view; 5 – *Archidiskodon meridionalis gromovi*: right ramus of lower jaw with M_3, occlusal view; 6 – *Palaeotragus (Yuorlovia) priasovicus* Godina et Baigusheva: the fragment of right lower jaw with M_1-M_3, labial view; 7-8 – *Paracamelus alutensis*: 7 – right metacarpal bone Mc III+IV, dorsal view, 8 – right metatarsal bone Mt III+IV, dorsal view; 9 – *Stephanorhinus* sp.: left lower jaw with P_2-M_3, labial view; 10 – *Elasmotherium chaprovicum*: right M^1, occlusal view; 11 – *Equus* sp.: the fragment of right upper jaw with P^4-M^1, occlusal view; 12 – *Equus (Allohippus) livenzovensis*: occlusal view of right P^3-M^3

Plate 4



Large mammals of Khasarian faunal complex from Beglitsa A locality

1 – *Mammuthus* cf. *chosaricus*: right M^3, occlusal view, 2 – right M^3, lingual view; 3-4 – *Megaloceros* sp.: 3 – fragments of right antler, 4 – distal part of right metacarpal bone MC III+IV

Plate 5

Large mammals of Tamanian faunal complex from Semibalki locality

1 – *Bison* cf. *tamanensis*: incomplete skull, lateral view; 2-4 – *Eucladoceros orientalis pliotarandoides: 2* – incomplete skull, rostral view, 3 – aboral view, 4 – fragment of antler; 5 – *Pachycrocuta brevirostris*, right upper P^3, 6 – *Homotherium latidens*: right lower jaw, lateral view; 7-8 – *Pontoceros* cf. *ambiguus*: 7 – the fragment of lower jaw with P_4-M_1, 8 – the fragment of right horn; 9 – *Equus* (*Allohippus*) cf. *major*: left metacarpal bone MC III, dorsal view.

Plate 6

Localities of Tiraspolian faunal complex – Kagalnik and Zelenyi (New Kagalnik).

1 – the excavations of *Mammuthus trogontherii* by researches of Azov museum-reserve in 1998; 2 – lower jaw *Mammuthus trogontherii* (1998 excavations' year); 3 – the skeleton of *Mammuthus trogontherii* of 1964 excavations' year in the exposition of Azov museum-reserve; 4-5 – cross-sections of Zelenyi sand pit; 6 – Arvicolids from the New Kagalnik (Zelenyi) locality. 1. *Lagurus transiens*, m1, fragment; 2. *Eolagurus argyropuloi*, m1; 3. *Microtus nivaloides*, m1.

CONTENTS

СОДЕРЖАНИЕ

FOR NOTES

FOR NOTES

FOR NOTES

FOR NOTES