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THE FIRST RELIABLY IDENTIFIED MACAQUE (CERCOPITHECIDAE, PRIMATES) FROM THE PLIOCENE OF THE UKRAINE

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ABSTRACT: The M^1 of a macaque from the Early Ruscinian of the Ukraine (Odessa region, Grebeniki-2 locality), the first reliably identified find of the genus *Macaca* from the Pliocene of the Ukraine is described. Some morphological aspects of this primate are clarified, and compared to the Recent representatives of the genus *Macaca* and extinct genera of Colobinae. A brief review of the genus *Macaca* in Europe is presented.

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Bones of monkeys of the genus *Macaca* from Eastern Europe are known from two Pliocene localities: Zhovten' [4] and Novopetrovka [1]. These finds, however, have no stratigraphic correlation, nor any description of the material itself, and even the place where they are kept is unknown. The accompanying fauna of large mammals is stated as Ruscinian (Moldavian). The indeterminate systematic position and lack of stratigraphic correlation of these finds are the reasons for the great importance of the first reliably identified find of a macaque tooth from the Ukraine. The M^1 (left) tooth of this primate was found by A. S. Tesakov at Grebeniki in the summer of 1990 (GIN No. 1074/93).

The Grebeniki-2 locality of Pliocene mammals is located 2 km southeast of the settlement of Grebeniki in the Velikomikhaylovskiy district of the Odessa administrative region in the Ukraine (the Grebeniki-1 Late Sarmatian-Early Meotian mammal locality lies on the northern outskirts of this village). Here, a quarry below the present soil level exposes a series of sandy-gravelly deposits (the Kuchurgan alluvium), which is assigned to the Middle Pliocene (Kimmerian) on the scale of the International Stratigraphic Commission (ISC). The visible thickness is 15 m; the bottom of the quarry is 135-140 m above sea level. The direct contact with the underlying deposits cannot be seen in the quarry. Considerably below the quarry bottom, on the slopes of a ravine gully, are outcrops of Upper Miocene fine-grained light-colored sands of the Balta Formation, and Upper Sarmatian marine deposits are exposed still farther down. The primate tooth was found in a lens of coarse sands some 2.0-2.5 m above the quarry floor, in its eastern part. The following mammals were collected here: Insectivora: Soricidae g. i., Talpidae g. i. Lagomorpha: *Trischizolagus dumitrescuae*, *Prolagus* cf. *michauxi*, *Ochotona antiqua*, *O.* cf. *eximia*.

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Rodentia: *Promimomys moldavicus*, *P.* sp., *Epimeriones* sp., *Kowalskia* cf. *polonica*, *Cricetus* sp., *Prospalax* sp., *Nannospalax macoveii*, *Apodemus* sp. (large form), *Apodemus* sp. (small form) *Pliopetaurista* sp., *Sciurotamias* sp., *Trogotherium* cf. *minus*. Carnivora: *Mustela* sp., Mustelidae g. i. Artiodactyla: Cervidae g. i.

The presence of brachydont Pliocene field mice of the genus *Promimomys* indicates the Ruscinian age of this locality. The other faunal elements are consistent with this dating. As at many other Ruscinian localities in the south of Eastern Europe, lagomorphs, chiefly archaic pikas, predominate at Grebeniki-2 [7].

In the P. Mein scale of Neogene mammals (MN zones) [15], the Ruscinian corresponds to the zones MN 14 and 15. The MN 14 zone is characterized by primitive field mice of the genus *Promimomys* with rooted teeth having low crowns. The MN 15 zone is characterized by more hypsodont species of *Promimomys*, which some non-Russian specialists assign to the genus *Mimomys*, and the first representatives of the genera *Pliomys* and *Dolomys* [3, 6, 16, 18] appear here.

The field mouse of the species *Promimomys moldavicus* Kormos from Grebeniki-2 is close in morphology of its rooted teeth and the degree of their hypsodonty to the type material from the Romanian Malusteni locality [18], and also to *P. antiquus* Zazhigin, from the Ruscinian of Western Siberia [2]. The field mice on this evolutionary level are dated by various investigators either to the end of the Early Ruscinian (end of the MN 14 zone) [3, 16] or to the beginning of the Late Ruscinian (the end of MN 15) [18].

Until the revision of the types of *P. moldavicus* in the CIS, this species was usually considered to include the later and more hypsodont than the types from localities dated as the end of the Ruscinian and even the Villafranchian [6, 8]. On the basis of the presence of the field mouse *Promimomys moldavicus*, the Grebeniki-2 locality can be dated at the end of the Early or beginning of the Late Ruscinian (the boundary between the MN 14 and MN 15 zones). The absolute age of this boundary is estimated as about 4 mln yrs [5]. The Ruscinian mammalian fauna from the European part of the CIS is traditionally assigned to the Moldavian faunal assemblage, although after the criteria for the fauna of the first half of the Ruscinian have been corrected, it will be appropriate to distinguish an independent Kuchurgan faunal assemblage [6, 7]. Also close to Grebeniki-2 in age is the Novopetrovka locality. The discovery of a macaque tooth here, even if not verified, perhaps indicates that this genus was not just accidentally present in the composition of the Ruscinian mammalian fauna of this district. Unfortunately, the absence of comparative material on the fossil macaques of Western Europe does not permit identification to the specific level (which, moreover, could hardly be done on the basis of one isolated tooth). The macaque from Grebeniki-2 may clearly be assigned to one of the two species of Ruscinian and Villafranchian macaques of Europe.

The earliest finds of cercopithecids initially identified as *Macaca* are known from the Late Miocene of Zaire [17] and from the Late Turolian of Algeria [9]. But the American paleontologist E. Delson considers these identifications to be not fully accurate and regards these Late Miocene Cercopithecinae as possible polytypic species of the tribe Papionini [13]. In his opinion, further differentiation within this group led to the appearance in Africa of the genera *Papio*, *Cercopithecus* and *Theropithecus*, and in Europe and evidently also North Africa of the genus *Macaca*. In fact, the main paleontological evidence for the genus *Macaca* has actually been found in the Pliocene and Early Pleistocene of Europe.

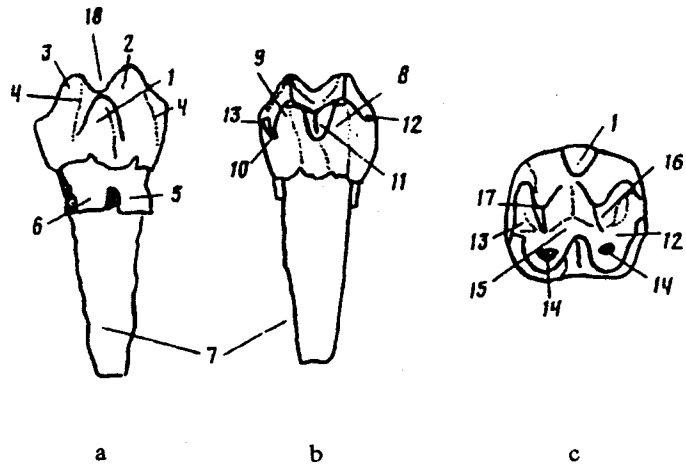

Fig. 1. Left M^1 macaque from Grebeniki-2 locality, Ukraine (GIN No. 1074/93): *a* - buccal side, *b* - lingual side, *c* - masticatory surface. Designations: *1* - styloid cusp, *2* - paracone, *3* - metacone, *4* - cracks in enamel surface, *5*, *6* - buccal roots, *7* - lingual root, *8* - hypocone, *9* - protocone, *10* - mesial-lingual groove, *11* - median-lingual groove, *12* - distal flank, *13* - mesial flank, *14* - worn apices of hypocone and paracone, *15* - depression of trigonid, *16* - distal transverse ridge, *17* - mesial transverse ridge, *18* - median-buccal notch.

The oldest fully and precisely identified macaque find is from the Late Miocene of Egypt [19]: *Macaca libica*. The oldest macaques in the south of Europe, *Macaca silvanus priscus*, is from the Ruscinian or perhaps the Early Villafranchian [13]. This species coexisted in Europe with two colobus species: *Dolichopithecus ruscinensis* Depéret and *Mesopithecus pentelici* Gaudry. The Middle and Late Villafranchian have yielded another subspecies—*M. silvanus florentina* from localities in Spain, France and the Netherlands.

From the Middle Pleistocene (Late Biharian) of Western Europe, several forms of macaques have been described that can be combined into the subspecies *Macaca silvanus florentina*, despite the existence of a certain degree of polymorphism of this group [13]. A recent find from the Riss-Würm (cave deposits) of Austria [14] indicates that *Macaca* were evidently widespread in Western Europe during the Late Pleistocene as well.

In the identification of the monkey from Grebeniki-2, the comparative material used were the skulls of Recent macaques from the collections of the Paleontological Institute (PIN), Russian Academy of Sciences: *Macaca fascicularis* No. 4355-2, *M. mulatta* No. 4355-3 *M. nemestrina* No. 4355-4, *M. fuscata* No. 4355-8; casts of upper jaws of *Dolichopithecus ruscinensis* No. 4354-4 and a fragment of the upper jaw of *Mesopithecus ucrainicus* Gremiatskyi No. 1997-4.

Description of isolated left M^1 (GIN No. 1074/93) of macaque from Grebeniki-2 locality (fig. 1).

Buccal roots are broken off at base of crown. Only small part of end of lingual root is

Table

Comparison of Dimensions

Feature	*Macaca* sp. (GIN No. 1074/93)	*Macaca fascicularis* (male, PIN No. 4355-2)	*Macaca mulatta* (female, PIN No. 4353-3)
Mesial transverse diameter	6,5	6	5,5
Distal transverse diameter	6,5	5,5	5
Mesiodistal diameter	6,9	7,5	6
Length of lingual root	9,5	—	—
Width of lingual root	4	—	4
Height of crown on buccal side (unworn teeth)	4,8	5	4,5

broken off. Age of individual animal (judging by wear of enamel) was perhaps six to seven years. Hypocone and protocone are worn down to dentine. Metacone and paracone show almost no wear. Enamel is light cinnamon in color, but darker (almost cinnamon) at base of crown.

Crown is almost square, with rounded corners. Buccal cusps are less worn and markedly higher than lingual, whose distal surface is more bulging than mesial surface. Buccal surface is relatively more convex than in Recent macaques used for comparison, because of additional cusp (fig. 1*c*, 1). Principal cusps are slightly inclined toward center of masticatory surface of crown. Their bases are wide and somewhat inflated—that is, principal cusps of crown are bunodont, according to type of structure of main cusps of crown of rooted teeth in Cercopithecinae [12]. Base of crown is one-third wider than masticatory surface. Mesial and distal surfaces bear facets for contact with adjacent teeth. Mesial facet is smaller than distal, as in Recent *Macaca* representatives, since in this genus P^4 has rounded, relatively narrow distal margin and crown of P^4 adjoins mesial edge of M^1 usually closer to its buccal edge. In *Dolichopithecus ruscinensis* and *Mesopithecus ucrainicus* distal part of P^4 is relatively wider, so that facet on mesial surface on M^1 is larger and lies closer to center.

Additional styloid cusp is in middle of buccal surface of crown, somewhat closer to paracone. Base of styloid cusp is almost at same level as base of crown and its apex at level of floor of median-buccal notch (fig. 1*a*, 18). In Recent Cercopithecinae styloid cusps occur on apices of rooted teeth in *Papio* and *Theropithecus*, somewhat more often in males than in females. In macaques styloid cusps on rooted teeth are rare, and in Recent Colobinae styloid cusps usually do not occur on upper rooted teeth. In fossil Colobinae, presence of additional cusps was noted by Gaudry [10] in male *Mesopithecus pentelici* from Pikermi, east of Athens, Greece. Females of this species from same locality had no such cusps [11, pl. 1, figs. 6, 7; pl. 3, fig. 3]. Additional cusps on upper rooted teeth of male *M. pentelici* from Pikermi are present on M^1, M^2, and M^3. On M^1 and M^2 they lie on site of median-buccal groove, but on M^3 on site of median-lingual. On M^1 additional cusp is smaller and on M^2 larger than additional cusp on M^1 of macaque from Grebeniki-2. In *Mesopithecus ucrainicus* from Grebeniki-1 (PIN, No. 1997-4), additional cusps are not present on upper rooted teeth.

1

of M^1 Crown, mm

Macaca fuscata (male, PIN No. 4353-8)	*Macaca nemestrina* (male, PIN No. 4355-4)	*Mesopithecus ucrainicus* (PIN No. 1997-4)	*Dolichopithecus ruscinensis* (PIN No. 4354-4)
7,2	7,9	7,5	7,8
7	7,5	7	7
8,1	7,4	6,5	9
—	12	8	—
5	5	4,5	—
4,8	—	—	5,3

Judging by dimensions of crown (table 1), its size in macaque from Grebeniki-2 evidently corresponds to size class of Recent species *M. mulatta* or *M. fascicularis* and is somewhat larger than in *Mesopithecus pentelici* and *Mesopithecus ucrainicus*. Mesial flank is less strongly developed distally, as in other Cercopithecinae. In *Mesopithecus ucrainicus* and *Mesopithecus pentelici* mesial flank is more massive than distal. Mesial-buccal groove is lacking, as in Recent *Macaca* representatives used for comparison. It is present, as a rule, in Recent Colobinae (but may sometimes be absent in small species of *Presbytis*). Median-buccal notch is incised into half height of crown; in *Dolichopithecus* and *Mesopithecus* it is always deeper. In contrast to *Mesopithecus*, metacone is almost equal in size to paracone. Buccal surface of distal flank has no relief on lateral surface.

The broken remnants of buccal roots in macaque from Grebeniki-2 diverged laterally less than on M^1 in *Mesopithecus ucrainicus* and were less recurved rearward. In *Mesopithecus* from Pikermi, roots of rooted teeth have no significant distal inclination and were relatively massive. In Recent macaques, roots on M^1 and M^2 may be either straight and slender or massive and bent rearward (in *M. nemestrina*).

Depth of median-lingual notch is one-third total height of crown. In Recent *Macaca* and *Papio* representatives they are usually even smaller. Median-lingual groove is fairly small, descends from masticatory surface to base of crown, and does not reach middle of lingual surface. In Recent *M. fuscata* this groove is larger and reaches base of crown, but, in relatively small species *M. fascicularis*, median-lingual groove is shorter and is far from reaching base of crown. In *Mesopithecus* this groove is distinct.

Mesial-lingual groove is fairly small. Lingual root is relatively slender and straight. Mesial depression (which in Recent macques takes form of groove) is not discernible because crown is worn down. Depression of trigonid is fairly shallow and relatively small because of closeness of bases of buccal cusps bordering it. In Colobinae it is much larger, owing to great overall development of relief of tooth crown. Because of wear, distal depression is not distinguishable.

Thus, in such features as size of mesial and distal flanks, shape of facets for contact with adjacent crowns on them, depth of median-lingual and median-buccal notches, shape of principal

cusps and their position, monkey from Grebeniki-2 is closer to Recent Cercopithecinae, and is assigned by us to genus *Macaca.*

In such features as development of styloid cusp, small median-lingual groove and shape of depression between two lingual cusps (on lingual surface) (fig. 1*b*), macaque from Grebeniki-2 differs from four Recent macaque species with which it was compared.

Among features in which monkey from Grebeniki-2 resembles subfamily Colobinae are: short median-lingual groove (taxonomic significance of this feature may not be very great, in view of variability of structure of grooves in Cercopithecinae), presence of additional cusplike cusp in *Mesopithecus* from Pikermi, and, clearly, overall size close to that of *Mesopithecus* (somewhat larger than *Mesopithecus ucrainicus*) (table 1), and less bunodont crown in comparison to typical Cercopithecinae.

Among differences of new form from *Dolichopithecus* should be considered relatively large mesiodistal diameter in comparison to buccolingual, as in all Cercopithecinae, shape of principal cusps, absence of mesial-buccal groove, fairly small trigonid depression, and shape of median-lingual notch.

Main features in which macaque from Grebeniki-2 differs from *Mesopithecus* are almost equal size of paracone and metacone (in *Mesopithecus* paracone is markedly larger), weak development of mesial-lingual groove, square shape of crown (with rounded edges) instead of oval with markedly narrower lingual surface than buccal, shape of mesial facet and its position, and large and long (relative to crown height) roots, since in *Mesopithecus* their length is not much more than height of crown.

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