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Late Pleistocene lynx from Kostenki 21 (Voronezh Region, Russia)

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Bone remains of Late Pleistocene lynx (*Lynx lynx*) from the Kostenki 21 site (Voronezh Region, Russia) have been investigated. A fragment of the right mandible with p3, p4, m1 was studied in detail. A comparison with recent lynxes of Eurasia and also with Pleistocene and Villafranchian lynxes was made. Tables of measurements are given. The lynx from Kostenki 21 was a large animal and had sizes and proportions of its lower teeth similar to those typical of recent *Lynx lynx* from Siberia and Northern Europe. At the same time the weakly expressed metaconid - talonid complex on m1 makes it more similar to the Late Pleistocene lynxes from Western and Central Europe and also to recent forms of *Lynx lynx* from Central Asia.

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INTRODUCTION

The first representatives of the genus *Lynx* KERR, 1792 appear in the Early Villafranchian. Fossil remains of lynx of that time are known from many sites in Eurasia (Sotnikova 1979; Werdelin 1981). A detailed description and reconstruction of this peculiar cat were made by Kurtén (1978). Many authors (Kurtén 1968; Werdelin 1981) indicate the large Early Villafranchian *Lynx issidorensis* CROISSET ET JOBERT, 1828 as an ancestral form of all modern and extinct lynxes. Remains of the very similar *Lynx shansius* TEILHARD DE CHARDIN, 1945 have been discovered in Asia in deposits of the Early Villafranchian (Sotnikova 1979). Remains of *Lynx issidorensis* are also common in later deposits of the Middle and Late Villafranchian of Europe (Fabrini 1896; Viret 1954). In faunal assemblages of the Early Pleistocene, however, this lynx is rare. Fragmentary remains are known only from localities of France (Blanzac-

Solilhac; Kurtén 1957) and Germany (Mauer; Voelcker 1930). Middle Pleistocene European lynxes are smaller than the recent ones and are assigned by different authors either to *Lynx spelaea* BONIFAY, 1971 (Bonifay 1971) or to *Lynx pardina spelaea* BOULE, 1910 (Werdelin 1981). *Lynx teilhardi*, similar to the European lynx in size (Pei 1934), is known from deposits of the same geological age from Asia.

The issue of the origin of *Lynx lynx* LINNAEUS, 1758 remains open. *Lynx lynx* is a modern large cat differing from Middle Pleistocene representatives of the subgenus by a number of features in the structure of skull and dentition (Kurtén 1963, 1987; Werdelin 1981). It is assumed that it emerged in Asia in the very beginning of the Late Pleistocene, then penetrated Europe and with time almost completely replaced the small form inhabiting there. In this connection the status of Iberian

lynx *Lynx pardina* TEMMINCK, 1824 is not quite clear. The majority of Russian scientists regard it as a subspecies of *Lynx lynx* (Novikov 1956; Matyushkin 1974). A different point of view is prevailing among West European scientists who place Iberian lynx in the separate species *Lynx pardina* (Werdelin 1981; Garcia-Perea 1985; Kurtén 1987).

Remains of Late Pleistocene *Lynx lynx* are known from caves of southern and central Europe (Terzea 1963; Clot 1974) and Upper Paleolithic sites of the Ukraine (Pidoplichko 1951). Bones of animals of Holocene age are known also from Neolithic settlements in Denmark (Degerbol 1933). In the Middle Ages the distribution range of the species covered the entire forest zone of the temperate region of Eurasia from the Atlantic up to the Pacific Ocean. At present lynx has nearly disappeared in Western Europe; its area in the east also declined (Matyushkin 1974; Festetics 1981).

MATERIAL

The Late Paleolithic sites of Kostenki (Kostenki village, Voronezh Region, Russia) are situated on the right bank of the Upper Don (centre of the Russian Plain). A total of 25 sites are presently known. The age of the most ancient ones is more than 35000 years, the majority of the settlements however are

dated to 21000 to 23000 y. (Praslov & Rogachev 1982). A fragment of a lower jaw of a lynx was discovered at the Late Paleolithic site Kostenki 21 during excavations in 1981. The first information on this discovery was reported by I.E. Kuzmina (see Ivanova *et al.* 1987). This specimen is stored at the History of Fauna Department of the Zoological Institute, RAS, Saint-Petersburg (ZIN RAN No. 34368) and is dated to 21000 to 23000 y. This specimen was compared with skulls of recent *Lynx lynx* from Europe, the Caucasus, Central Asia and Siberia from the collection the Zoological Institute, RAS. Literature data on fossil remains of Villafranchian lynxes (Fabrini 1896; Viret 1954; Kurtén 1978) and Pleistocene lynxes (Boule 1906; 1927; Voelcker 1930; Pei 1934; Paulus 1945; Kurtén 1957, 1987; Terzea 1963; Bonyfay 1971; Vekua 1972; Clot 1974; Sotnikova 1979) have been also used. The measurements and literature data are presented in Table 1.

DESCRIPTION AND COMPARISONS

The fragment of mandibular bone of the lynx from Kostenki 21 is half destroyed, permitting the examination of structure and proportions of the premolars and the carnassial tooth only (Fig. 1). The teeth have the following sizes. p3: L = 9.5 mm, W = 5.1 mm; p4: L = 13.0 mm, W = 5.8 mm; m1: L = 15.7 mm, W = 6.9 mm.

Table 1. Measurements (mm) and proportions (%) of lower teeth of the Villafranchian, Pleistocene and Recent lynx of Eurasia.

| | Villafranchian <i>Lynx cf. issidorensis</i> | | | Middle -Late Pleistocene <i>Lynx cf. pardina</i> | | | Late Pleistocene - Recent <i>Lynx lynx</i> | | |
|---------|--|-----------|-----------|---|-----------|-----------|---|-----------|-----------|
| | n | lim | M ± m | n | lim | M ± m | n | lim | M ± m |
| 1 L P/3 | 16 | 9.0-11.3 | 10.2±0.17 | 25 | 7.1-9.3 | 8.5±0.12 | 76 | 8.5-11.6 | 10.0±0.06 |
| 2 W P/3 | 16 | 4.9-6.1 | 5.3±0.08 | 25 | 4.2-5.3 | 4.6±0.06 | 76 | 4.4-6.0 | 5.3±0.04 |
| 3 L P/4 | 16 | 1.5-14.3 | 12.6±0.20 | 25 | 9.8-12.0 | 10.9±0.1 | 76 | 1.4-13.8 | 12.4±0.06 |
| 4 W P/4 | 16 | 5.7-7 | 6.2±0.08 | 25 | 4.6-7.3 | 5.4±0.10 | 76 | 5.5-6.6 | 5.9±0.03 |
| 5 L M/1 | 16 | 13.5-16.5 | 15.1±0.20 | 25 | 13.0-15.2 | 13.9±0.12 | 76 | 13.2-17.5 | 15.6±0.10 |
| 6 W M/1 | 16 | 6.0-7.8 | 6.7±0.1 | 25 | 5.3-6.5 | 6.0±0.06 | 76 | 5.4-7.5 | 6.7±0.05 |
| 7 :5 | 6 | 62.1-74 | 67.6 | 25 | 48.6-68.2 | 61.2 | 76 | 56.8-77.3 | 64.1 |
| 8 3:5 | 16 | 77.4-89.7 | 83.9 | 25 | 68.4-90.2 | 78.2 | 76 | 72.2-90.2 | 79.3 |

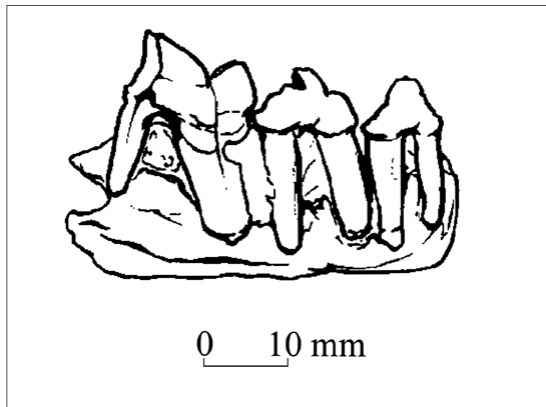


Fig. 1 Fragment of mandible of lynx, *Lynx lynx* from Late Pleistocene site Kostenki 21 (Voronezh Region, Russia)

All sizes are within the limits of variation of the recent *Lynx lynx* (Table 1). On m1 there is a distinct talonid, metaconid is weakly pronounced (Fig. 1). The slight development of the talonid and the weakly pronounced metaconid on m1 of the lynx from the centre of the Russian Plain suggests its similarity with recent lynxes from Central Asia, the majority of which have the same morphotype. A similar shape of the lower carnassial tooth is also typical of lynxes from the Late Pleistocene deposits of caves in the French Pyrenees (Clot 1974) and the Roumanian Carpathians (Terzea 1963). In recent lynxes of Europe this type of structure of m1 is extremely rare. Multi-factor analysis has not revealed any statistically significant differences in sizes and proportions of lower teeth of *Lynx lynx* assigned to different subspecies. Based upon the available material it appears infeasible, therefore, to define a probable systematic position of the lynx from the centre of the Russian plain within the group of recent lynxes. It should be noted, however, that specimens similar in size and proportions of teeth to Late Pleistocene lynxes are more common among 'northern' lynxes or 'taiga' lynxes. Such forms are most rare in the sample from Central Asia. Teeth of the lynx from the centre of the Russian Plain are much larger than teeth of the largest representatives of *Lynx cf. pardina* from Western Europe (Table 1). Although B. Kurtén (1963, 1987) indicates

the possible presence of the very large 'par-del' lynx in Europe in the Middle Pleistocene, no material is available for comparison with the fragment from Kostenki 21. It can be seen in Figure 2 that in the ratio of length of p4 and m1 the mandibular fragment from Kostenki cannot be assigned to *Lynx cf. pardina*.

CONCLUSION

Our studies have shown that all fossil representatives of the genus *Lynx* from Eurasia can be conventionally split into three groups by the sizes and proportions of the lower molars (Table 1). These are large ancient lynxes *Lynx cf. issidorensis* from the Villafranchian - Early Pleistocene; small lynxes *Lynx cf. pardina* from the Middle - Late Pleistocene; and large lynxes *Lynx lynx* from the Late Pleistocene.

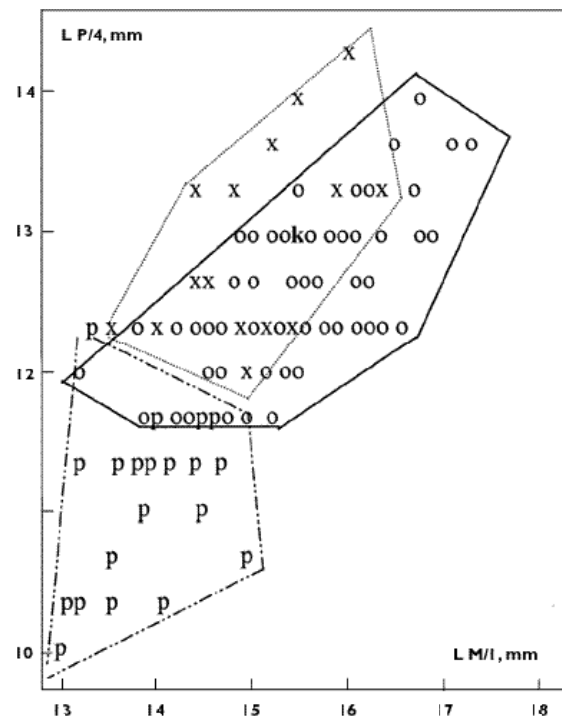


Fig. 2 Scatter diagram of p4 and m1 lengths of the Villafranchian, Pleistocene and Recent lynx of Eurasia: **x** - *Lynx cf. issidorensis* (Villafranchian - Early Pleistocene); **p** - *Lynx cf. pardina* (Middle- Late Pleistocene); **o** - *Lynx lynx* (Late Pleistocene - Recent); **k** - *Lynx lynx* from Late Pleistocene site Kostenki 21 (Voronezh Region, Russia).

The presently studied lynx from the centre of the Russian Plain had sizes and proportions of the lower molars similar to those of modern *Lynx lynx* of Northern Europe and Siberia. At the same time the relatively weakly pronounced metaconid-talonid complex on m1 shows its similarity with Late Pleistocene lynxes that inhabited Western and Central Europe and with recent Central Asian forms.

In the Late Pleistocene epoch *Lynx lynx* in the centre of the Russian Plain probably inhabited coniferous and small-leaved groves in the flood plain and in ravines with overgrown slopes situated on the terrace above the flood plain. The large spaces of the cold steppe predominant at that time were of little use for its existence. In contrast, lynx had abundant fodder supply. The numerous bones of the large Don hare *Lepus tanaiticus* GUREEV, 1964 in the sites of ancient man (Praslov & Rogachev 1982) indicate the abundance of this major prey item for the European lynx.

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