EAST EUROPEAN PLAIN IN THE LATE PLEISTOCENE : ENVIRONMENT AND SETTLEMENT BY ANATOMICALY MODERN HUMANS

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Newly available archaeological and geochronological evidence has considerably modified previously held views concerning the time and character of the initial spread of anatomically modern humans (AMH) in Eastern Europe. The current debate concentrates in three major areas : (1) the initial AMH settlement; (2) settlement at the time of Last Glacial maximum (LGM) and (3) settlement at the time of Glacial recession (GR)

GENERAL BACKGROUND

The 'ex-Africa' scenario remains the most plausible explanation for the initial AMH dispersal. It has a solid foundation in form of the evidence coming from South Africa. The series of fossils from Klasies River and Border Cave are widely acknowledged as representing an archaic population of *Homo sapiens sapiens* within the modern range of variations. The absolute dates of the sites involved lie within 90-120 Kyr (DEACON 1996).

New evidence suggest an early presence of AMH in the Levant. The levels with the remains of 'at least ten Proto-Cro-Magnon' hominids at Skhul rockshelter have yielded a TL date of 119±18 Kyr. The dating of burnt flints with the use of the same technique at Qafzeh Cave has given the age of ca. 90 Kyr. An even earlier age (Oxygen Isotopic Stage 6; ca. 150 Kyr) has been suggested for the finds of AMH at Tabun Cave (VALLADAS *et al.*, 1998). It is significant that the finds of archaic AMH in the Levant were associated with Mousterian-type industries.

The early sites of modern humans in Europe were usually found in a context of archaic Upper Palaeolithic (Aurignacian-type) industries. The radiocarbon measurement (supplemented in rare cases by alternative technique) of the oldest Aurignacian-type industries in various parts of Europe (such as Balkan Peninsula, French-Spanish Cantabria and Central Europe) show recurrently the age of 40-45 Kyr (KOZLOWSKI 1998; RINK *et al.*, 1997).

The above-cited evidence suggest a prolonged cohabitation in the Near East and Europe of populations of Neandertals and AMHs which lasted (at least in Europe) until 34/35,000 BP (MELLARS 1998). The existing mitochondrial GNA evidence places the Neandertals 'well outside modern human variations' thus excluding any genetic relationships between them (KRINGS *et al.*, 1997). The

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analysis of archaeological records (WOLPOFF and CASPARI 1996) suggest that the fundamental distinctions between the Neanderthals and modern humans included social behaviour and cognition. Brooks (1996) argues that the behaviour proper to 'modern humans' covered the ability to live within a 'cognitively' structured world, where pronounced ethnic differences were symbolised in speech and material culture

GEOCHRONOLOGY

In geochronological terms (VAN ALLEN and TZERDAKIS 1996; ARSLANOV 1992), the events described above included Oxygen Isotopic stage 5e (Last Interglacial, Eemian or Mikulino; 116-128 Kyr) and also stages 5d-5a (Early Würm/Valdai stages and interstadials; 116-72 Kyr) and 4 (Sherstikhino cold episode; 72-58 Kyr). The penetration of EMHs into Europe occurred during the prolonged 'megainterstadial' (OIS 3; 40-24 Kyr). Geochronological investigations carried out in the glaciated area of East European Plain (ARSLANOV 1992), have shown that this was a prolonged iceless period of cool and unstable climate with repeatedly occurring minor oscillations:

Krasnogorsky warm interstadial (48-45 Kyr);
Shapki cool stage (45-45.2 Kyr);
Grazhdanski interstadial (45.2-42.5 Kyr);
Lejasciems cool stage (42.5-32 Kyr);
Dunaevo-Bryansk interstadial (32-25 Kyr).

In the extraglacial area, three loess units are distinguishable, separated by the Bryansk palaeosoil and a Trubchevsk gleyed level, all resulting from a weak pedogenetic process (VELICHKO and MOROZOVA 1972). As the pedological, pollen and faunal evidence show, the accumulation of the Bryansk palaeosoil proceeded mostly in a cold periglacial environment (VELICHKO and MOROZOVA 1982; GURTOVAYA 1981; BEZUS'KO *et al.*, 1989). The available data also suggest that the earlier phases of the Bryansk interval (or preceding it) may also have been significantly warmer (VEKLICH 1982; GRICHUK 1989; MALYASOVA and SPIRIDONOVA 1982).

The time-span between 25 and 16.5 Kyr (ARSLANOV 1962) corresponding to OIS 2 featured the maximum advance of the ice-sheet in Eurasia (Würm, Weichselian, Devensian or Valdai). Geochronological investigations in the extraglacial areas of East European lain have shown (VELICHKO 1993) that this stage corresponded to the accumulation of thick series of Loess II (Desnian) in the Central Russian Plain usually found on top of the Bryansk palaeosoil. The sedimentology of the loess have indicated a depositional environment basically similar to that of present-day Yakutia in Central-Eastern Siberia. The common occurrence of polygonal permafrost features is yet another indication of an extremely cold and continental-type climate. Combining the pollen and sedimentological evidence the mean annual temperature in the Central East European Plain at the time of LGM was estimated as below -15°C with the annual precipitation in the order of 200 mm.

The subsequent time-span, 18 - 14 Kyr is referred to as the Glacial recession (GR). The time-limit of 16 Kyr seems to be highly significant : it marks the initial degradation of the ice-sheet, followed by a short-lived Vepsian advance (CHEBOTAREVA and MAKARYCHEVA 1982). This coincided with the formation of the surfaces of lower terraces in the catchment of the Dnieper and, possibly, with the accumulation of the Trubchevsk gleyed horizon separating the Loess II (Desnian) and Loess III (Altynian) (VELICHKO 1973).

AMH SETTLEMENT

Initial Settlement

The current radiocarbon measurement of the age of early UP sites in the Eastern European Plain show that the initial spread of Upper Palaeolithic industries has occurred there during the time-span of 35-40 Kyr (SINITSYN *et al.*, 1997). It is highly significant, that these sites were widely spread in that area including the western Ukraine, Crimea, Kostenki, Sungir and the sites north of the Polar Circle **(Fig. 1)**. Sufficiently early dates (in excess of 30 Kyr) have been obtained for several UP Palaeolithic sites in Siberia (LISITSYN *et al.*, 1997; KUZMIN and TANKERSLEY 1996). It should be remembered that in all these cases the reported dates are considered as the minimal estimate of the age.

Among the early UP sites an archaic group has been identified. This was the case of several sites belonging to the Streletskian tradition in the Kostenki area (Kostenki 12/3; Srteletskaya 3; Kostenki 1/5; Kostenki 11/5; Kostenki 12/1a) as well as, possibly, the site of Sungir. The inventory of all these sites contain archaic Mousterian implements : side-scrapers and triangular points, the blade technique being quasi-totally absent. The radiocarbon dates for these sites range between >32 and 24 kyr BP. Russian scholars found the closest analogies to these archaic tools either in Moldova (Trinka 3 Cave) or in northern Caucasus (Il'skaya) (ROGACHEV and ANIKOVICH 1984). Certain writes view these sites as analogies of Szeletian industries of Central Europe (ALLSWORTH-JONES 1986,1990).

The pollen analysis of the early UP sites in the Kostenki area (SPIRIDONOVA 1991) has shown the variable environment with the wide spread pine forests and broad-leaved elements. As the climate grew colder, the spruce forest became increasingly dominant with the wide areas taken up by cold resistant periglacial-type grassland.

The wild house *(Equus latipes* V. Gromova) constituted the principle hunting prey, its rate in the early Kostenki sites varying between 66.95 and 35.2%. The rate of mammoth was 4-3%, that of reindeer 2-1%, wolf : 5-1%.

Last Glacial Maximum Settlement

There was a general increase in the density of UP sites during the course of the LGM **(Fig. 2)**. One of the main characteristics of settlement at this stage was the clear clustering of Palaeolithic sites in the areas of an intensive loess accumulation. The sites were usually located on elevated well-drained terrace surfaces within lake-like widening of the river valleys (GRIBCHENKO and KURENKOVA 1997). One should bear in mind that at that time a network of large ice-dammed lakes has developed off the ice edge. The water from these basins was channelled to the south through numerous rivers which at least seasonally turned into the chains of lakes. Another peculiarity of UP settlement : in many cases the sites were located within the areas strongly affected by the permafrost.

The existing pollen evidence (GUBONINA 1977; SPIRIDONOVA 1991) suggest that the environment in the immediate vicinity of UP sites was dominated by the periglacial-type grassland with cold-resistant shrubs restricted to deep valleys and ravines.

A considerable diversity in hunting strategies is acknowledgeable. The faunal remains at Kostenki sites were dominated by the mammoth (59.95%), with the reindeer making up 1.65% and the polar fox 7%.

At the same time, one notes the population movement to the south, into the Pontic steppe, where numerous sites arose predominately in the fringes of mixed forests within the valleys of small rivers and the ravines. The site of Anetovka 2 belonged to the hunters who specialised in bison hunting. The hunting prey included also the wild horse, the antelope saiga and the reindeers (STANKO *et al.*, 1989).

Glacial Recession

This time-span corresponds to the degradation of the ice-sheet, whose maximum extension was limited by the Luga moraines (CHEBOTAREVA *et al.*, 1982). At that time the settlements occurred in the basin of the Dnieper, with its tributaries, the Desna and Sudost', being particularly rich in sites. The sites also occurred within the tributaries of the Middle Dnieper, in the catchment of the Dniester, the Don (Kostenki) and on the littoral of the Sea of Azov **(Fig. 3)**.

The sites were found either on high river terraces, close to the watershed surface (*e.g.* Timonovka and Pushkari), in the proximity of the outcrops of flint-bearing Carboniferous sediments, or on the lower terraces whose formation had immediately preceded human settlement (GRIBCHENKO and KURENKOVA 1997). The sites often include structures made of mammoth bones (Eliseevichi, Mezin, Yudinovo, Mezherich, Dobranichevka and others). In some cases, this may be due to the occurrence of several habitation levels (VELICHKO *et al.*, 1977a, 1977b; SERGIN 1987; GREKHOVA 1990). Yet at the majority of sites in the Desna catchment, the stratigraphical division of cultural deposits is obviously due to secondary deformations in the process of degradation of the permafrost (VELICHKO *et al.*, 1977a).

Polygonal-patterned permafrost structures are clearly recognisable on the higher geomorphic levels, while on the lower terraces it usually takes the form of block deformations, resulting from differentiated thawing of ice-saturated rocks. This was particularly the case of the sites of Eliseevichi and Yudinovo, both near the Sudost valley, and showing a similar radiocarbon age, the former being located on the second, and the latter on the first terrace (VELICHKO 1967; GRIBCHENKO and KURENKOVA 1997).

DATABASE

Over the past few decades a considerable amount of radiocarbon date measurements became available for Upper Palaeolithic (UP) sites in all parts of Eastern Europe, including the East European (or Russian) Plain, Russian North, South Russian and Ukrainian Steppe, Northern Caucasus and the Urals. A substantial part of these measurements have been performed at the laboratories in Russia, those at the Institute for History of Material Culture in St. Petersburg (LE) and the Institute of Geology in Moscow (GIN) being particularly active. Several important series were measured at the Laboratory in Groningen, Holland (GrA, GrN), and also in Oxford Unit with the use of Accelerator Mass Spectrometry (OxA). A comprehensive synopsis of UP radiocarbon dates for Eastern Europe has been published by Sinitsyn *et al.* (1997). The date list includes practically all the dates of UP sites available for Eastern Europe to date. In certain cases the synopsis contains detailed commentaries, maps and drawings for the most important series.

Basing on the data published by Sinitsyn *et al.* (1997) an attempt was made (Dolukhanov *et al.* forthcoming) to use a statistical procedure aimed at improving the temporal resolution of radiocarbon age determinations. New age estimated were thus obtained for four sites : Kostenki 1, layers 1 and 3, Avdeevo and Mezherichi. Using these dates as a template, we screened all remaining dated in the Sinitsyn's list. As a result a new datelist for UP sites of East European Plain was developed in which each site was characterised by a *single* date, considered as the most reliable. Apart of that, the database included the sites' co-ordinates, The presence of main animal remains, the presence/absence of dwellings, the pollen (AP/NAP), geomorphic position (floodplain/terrace/watershed/the depositional matrix (loess, palaeosoil, alluvium); type of settlement (RS : rockshelter) (Table 1).

DISCUSSION

After the completion f the database, the frequency of UP sites per millennia was calculated (Table 2). These calculations which were made separately for the Kostenki area and the rest of East European Plain, show that the UP sites in the both areas appear between 36-38 Kyr. They reach their maximum frequency between 26-18 Kyr. The next maximum was attained at 15-14 Kyr. The sites in the studied area totally disappeared after 12-11 Kyr.

During the LGM the overall population density in Central and Northern Europe has markedly decreased with several areas, such as southern Germany and Britain, becoming quasi-totally depopulated (HOUSLEY *et al.*, 1997). Only two areas, Franco-Cantabria in the west and the periglacial Eastern Europe in the east, formed the refugia sustaining considerable population densities.

Is was suggested that the environmental conditions in the greater part of Central/Western Europe during the LGM were highly unsuitable for life; the episode known as the Kesselt Suite (ca. 21 Kyr) consisted of a series of short-lived succession of strong deflation in a cold and dry lifeless environment (GULLENTORPS 1999). The harsh conditions of the Glacial maximum were much buffered in Franco-Cantabria by the softening impact of the Atlantic Ocean (STRAUS 1992). Still more attractive were the areas of East European Plain which included well drained river valleys, the loess-covered dry interfluves and ice-dammed lakes with diversified food resources (GRIBCHENKO and KURENKOVA 1997).

Several writers (e.g. SOFFER 1993; GRIGOR'EV 1993) have suggested a scenario of gradual migrations of UP groups at the initial stage of the LGM from Upper Austria and Moravia in the eastern direction, this movement being archaeologically acknowledgeable in form of a 'Willendorf-Pavlov-Kostenki-Avdeevo cultural unit'.

The available archaeological evidence suggest that the UP population consisted of loose social units which included several 'blood-related' paired families their numbers seasonally fluctuating between 5-10 and 15-20 (KABO 1986, GRIGOR'EV 1968). In several cases one could note the establishment of 'co-residential groups', which included several distinct social units with semi-permanent dwellings within a limited area exceedingly rich in resources (the Kostenki area on the River Don forms the most spectacular example).

The stability of large social UP groups has never been absolute, their life-style included considerable seasonal displacements within an 'exploitation area'. This implied institutionalised encounters with other groups resulting in the establishment of 'negotiated alliances' and mating networks. These networks included a diverse set of social relationships with a regular circulation of persons and goods and ties of variable intensity and duration (GAMBLE 1987). There are numerous material indications for the occurrence of complex exchange network in the UP East European Plain linearly directed along major river systems (SOFFER 1985). Thus one may conclude that the development of 'ethnic entities' with strict maintenance of group identity signalled in stylistic and ritual behaviour, one the one hand, and intensive genetic and cultural interaction between the groups, on the other, were equally important aspects of 'modern' human behaviour acknowledgeable in the UP.

One may also conclude that the UP provinces as outlined above, corresponded to the higher level of 'alliance network'. Notwithstanding their local distinctions, the cultural entities making up each of the UP provinces featured several fundamental similarities in the mode of life and symbolism (GRIGOR'EV 1993). Hence a supposition that the social groups forming each of the UP provinces were in possession of a common communication medium in form of mutually comprehensible dialects or *lingua franca*. According to our hypothesis, these communication media corresponded the oldest non-Indo-

European languages to be known in Europe, namely, the *Proto-Uralic* in the Periglacial and the *Basque-Caucasian* in the Mediterranean province.

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Nos	Sitename	Nci	Si	Xdeg	Xmin	Ydeg	Ymin	Mam	Reind	Ho	Rhino	Bis	Dwel	SP	AP	NAP	Fpl	Ter	WS	Lo	PS	Al	PF
1	*Kostenki 1/1	22458	762	51	22	39	2	10	1	1	0	0	1	1	20	80	0	1	0	1	0	0	1
46	Kostenki 2	23800	150	51	22	39	2	10	1	1	0	0	1	1	20	80	0	1	0	1	0	0	1
48	Kostenki 3	19800	210	51	22	39	2	10	1	1	0	0	1	1	20	80	0	1	0	1	0	0	1
50	Kostenki 4	23000	300	51	22	39	2	10	1	1	0	0	1	1	20	80	0	1	0	1	0	0	1
53	Kostenki 5	22920	140	51	22	39	2	10	1	1	0	0	1	1	20	80	0	1	0	1	0	0	1
54	Kostenki 8	22000	160	51	22	39	2	10	1	1	0	0	1	1	20	80	0	1	0	1	0	0	1
57	Kostenki 10	28250	300	51	22	39	2	10	1	1	0	0	1	1	20	80	0	1	0	1	0	0	1
63	Kostenki 11	19900	350	51	22	39	2	10	1	1	0	0	1	1	20	80	0	1	0	1	0	0	1
64	Kostenki 11/2	21800	200	51	22	39	2	10	1	1	0	0	1	1	20	80	0	1	0	1	0	0	1
68	Kostenki 11/3	20500	300	51	22	39	2	10	1	1	0	0	1	1	20	80	0	1	0	1	0	0	1
72	Kostenki 14	22780	250	51	22	39	2	10	1	1	0	0	1	1	20	80	0	1	0	1	0	0	1
80	Kostenki 19	18700	600	51	22	39	2	10	1	1	0	0	1	1	20	80	0	1	0	1	0	0	1
83	Kostenki 21/2	22900	150	51	22	39	2	10	1	1	0	0	1	1	20	80	0	1	0	1	0	0	1
76	Kostenki 18	21020	180	51	22	39	2	10	1	1	0	0	1	1	20	80	0	1	0	1	0	0	1
	*Kostenki 1/3	24886	450	51	22	39	2	10	1	1	0	0	1	1	20	80	0	1	0	1	0	0	1
114	Kostenki 8	23020	320	51	22	39	2	1	1	10	1	1	1	1	60	40	0	1	0	0	1	0	1
117	Kostenki 12/1	26300	300	51	22	39	2	1	1	10	1	1	1	1	60	40	0	1	0	0	1	0	1
128	Kostenki 12/1a	32700	700	51	22	39	2	1	1	10	1	1	1	1	60	40	0	1	0	0	1	0	1
135	Kostenki 14/ii	28580	420	51	22	39	2	1	1	10	1	1	1	1	60	40	0	1	0	0	1	0	1
139	Kostenki 14/iii	30080	590	51	22	39	2	1	1	10	1	1	1	1	60	40	0	1	0	0	1	0	1
141	Kostenki 15	25700	250	51	22	39	2	1	1	10	1	1	1	1	60	40	0	1	0	0	1	0	1
145	Kostenki 16	28200	500	51	22	39	2	1	1	10	1	1	1	1	60	40	0	1	0	0	1	0	1
155	Kostenki 1/5	37900	2800	51	23	39	2	1	1	10	1	1	1	1	60	40	0	1	0	0	1	0	1
157	Kostenki 6	31200	500	51	22	39	2	1	1	10	1	1	1	1	80	20	0	1	0	0	1	0	1
159	Kostenki 12/iii	36280	360	51	22	39	2	1	1	10	1	1	1	1	80	20	0	1	0	0	1	0	1
161	Kostenki 14/iv	27710	410	51	22	39	2	1	1	10	1	1	1	1	80	20	0	1	0	0	1	0	1
164	Kostenki 14/iva	33280	660	51	22	39	2	1	1	10	1	1	1	1	80	20	0	1	0	0	1	0	1
167	Kostenki 17	36780	1700	51	22	39	2	1	1	10	1	1	1	1	80	20	0	1	0	0	1	0	1
168	Gagarino	21800	300	52	42	38	54	10	1	0	1	1	1	1	nd	nd	0	1	0	1	1	0	0
	*Avdeevo	20990	900	51	44	36	3	10	1	10	1	1	1	1	20	80	0	1	0	1	1	0	0
198	Peny 1	21600	350	51	2	35	50	nd	nd	nd	nd	nd	nd	nd	nd	nd	1	0	0	0	0	1	1
222	Yudinovo	14870	150	52	40	33	14	10	0	1	0	1	1	1	nd	nd	0	0	1	0	1	0	nd
230	Yeliseevichi	15600	1350	53	13	33	44	10	1	1	0	0	1	1	40	60	0	0	1	0	1	0	1
236	Suponevo	13920	140	53	11	34	23	nd	nd	nd	nd	nd	1	1	nd	nd	nd	nd	nd	nd	nd	nd	nd
241	Timonovka 1	14530	120	53	11	34	22	10	1	0	0	0	1	1	20	80	0	0	0	1	0	0	1

Table 1. The Upper Palaeolithic sites of East European Plain. Database.

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245	Pushkari 1	20600	1300	52	11	33	17	10	1	5	0	0	1	1	nd	nd	1	0	0	1	0	0	1
247	Pogon	18690	770	52	11	33	17	1	0	0	0	0	0	0	nd	nd	nd	nd	nd	nd	nd	nd	nd
248	Novg.Sev.	19800	350	51	59	33	17	10	10	5	10	1	1	1	nd	nd	0	1	0	1	0	0	0
249	Chulatovo	14700	250	51	51	33	7	10	1	1	1	1	0	0	nd	nd	0	1	0	1	0	0	0
255	Khotylevo 2	23300	300	53	12	34	19	10	1	0	1	1	1	1	10	90	0	1	0	1	0	0	0
260	Berdyzh	15100	250	52	50	30	58	10	1	1	1	1	1	1	nd	nd	0	1	0	0	1	0	0
263	Yurevichi	26470	420	51	57	29	33	10	0	1	0	0	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
265	Sevsk	13950	70	52	9	34	27	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
	*Mezhirichi	14131	500	49	43	31	25	10	1	1	0	1	1	1	10	90	1	0	0	1	0	0	1
280	Dobranichevka	12700	200	50	10	31	44	10	1	1	0	1	1	1	10	90	1	0	0	1	0	0	0
283	Mezin	27500	800	51	42	33	9	10	10	10	1	1	1	1	nd	nd	0	1	0	1	0	0	0
293	Kirillovskaya	14350	190	49	59	33	0	10	10	0	0	1	0	0	nd	nd	0	1	0	1	0	0	0
294	Radomyshl	19200	250	50	22	30	32	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
298	Korolevo 1a	19000	300	50	32	29	14	10	1	1	0	1	1	1	nd	nd	0	1	0	1	0	0	nd
299	Korolevo II	25700	400	48	8	23	4	nd	nd	nd	nd	nd	nd	nd	nd	nd	0	1	0	1	0	0	0
289	Goncy	38500	1000	48	8	23	4	nd	nd	nd	nd	nd	nd	nd	nd	nd	0	1	0	1	0	0	0
329	Amvrosievka	18700	220	47	30	38	0	0	0	0	0	10	0	0	nd	nd	0	1	0	1	0	0	0
333	Muralovka	19630	200	47	16	38	40	0	1	0	0	10	0	0	nd	nd	0	1	0	1	0	0	0
340	Anetovka	18040	150	47	38	31	6	0	1	0	0	10	0	0	nd	nd	0	1	0	1	0	0	0
345	Sagaidak	20300	200	47	41	32	21	0	1	0	0	10	0	0	nd	nd	0	1	0	1	0	0	0
351	Molodova 5-II	11900	230	·48	31	26	10	0	10	1	0	1	1	0	nd	nd	0	1	0	0	0	1	0
352	Molodova 5-III	13370	540	48	31	26	10	1	10	1	0	1	0	0	nd	nd	0	1	0	1	0	0	0
353	Molodova 5-IV	17100	1400	48	31	26	10	5	10	5	0	1	0	0	nd	nd	0	1	0	1	0	0	0
355	Molodova 5-VI	16750	250	48	31	26	10	5	10	5	1	1	1	0	nd	nd	0	1	0	1	0	0	0
360	Molodova 5-IX	29650	1320	48	31	26	10	1	1	1	1	1	1	0	nd	nd	0	1	0	1	0	0	0
368	Korman 4-V	18000	400	48	34	27	14	1	5	10	0	10	0	0	nd	nd	0	1	0	1	0	0	0
370	Korman 4-VII	24500	500	48	34	27	14	0	0	10	0	10	0	0	nd	nd	0	1	0	1	0	0	0
378	Kosauci II	17230	140	48	13	28	17	0	10	1	0	5	0	0	nd	nd	0	1	0	1	0	0	0
381	Kosoucy 1/2b	18200	500	48	13	28	17	1	10	5	0	0	0	0	nd	nd	0	1	0	1	0	0	0
390	Kosoucy 3/4	17100	250	48	13	28	17	1	10	5	0	0	0	0	nd	nd	0	1	0	1	0	0	0
392	Kosoucy 4	17950	100	48	13	28	17	0	10	5	0	0	0	0	nd	nd	0	1	0	1	0	0	0
395	Kosoucy 5/6	19200	130	48	13	28	17	0	10	1	0	0	0	0	nd	nd	0	1	0	1	0	0	0
398	Kosoucy 9	19400	100	48	13	28	17	0	10	1	0	0	0	0	nd	nd	0	1	0	1	0	0	0
408	Brynzeni	26600	370	48	6	27	7	1	1	5	0	1	1	1	nd	nd	RS	@	@	@	@	@	@
426	Sungir'	25500	200	56	10	40	29	10	1	1	0	1	1	1	20	80	0	1	0	0	0	1	1
443	Zaraisk	22300	300	54	45	38	52	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd

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457	Kapovaya	13930	300	53	26	57	45	1	0	0	0	0	0	0	30	70	RS	@	@	@	@	@	@
455	Talicky	18700	200	58	16	57	27	1	1	1	1	1	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
465	Ignat'evskaya	14038	192	54	47	57	35	1	1	1	1	1	0	0	nd	nd	RS	@	@	@	@	@	@
499	Cave Bear	17960	200	62	2	59	16	1	1	1	1	1	0	0	nd	nd	RS	@	@	@	@	@	@
495	Byzovaya	25740	500	65	1	57	24	1	1	1	1	1	0	0	nd	nd	RS	@	@	@	@	@	@

LEGEND

Mam - Mammoth;
Reind - Reindeer;
Ho - Horse;
Rhino - Rhinoceros;
Bis - Bison;
Dwel - Dwellings;
SP - Storage pits;
AP - arboreal pollen;
NAP - non-arboreal pollen;
Fpl - floodplain;
Ter - terrace;

WS - watershed;
Lo - loess;
PS - palaeosoil;
Al - alluvium;
PS - palaeosoil;
PF - permafrost features;
RS - rockshelter;
10 - predominant;
5 - many;
1 - present;
0 - absent;
nd - no data

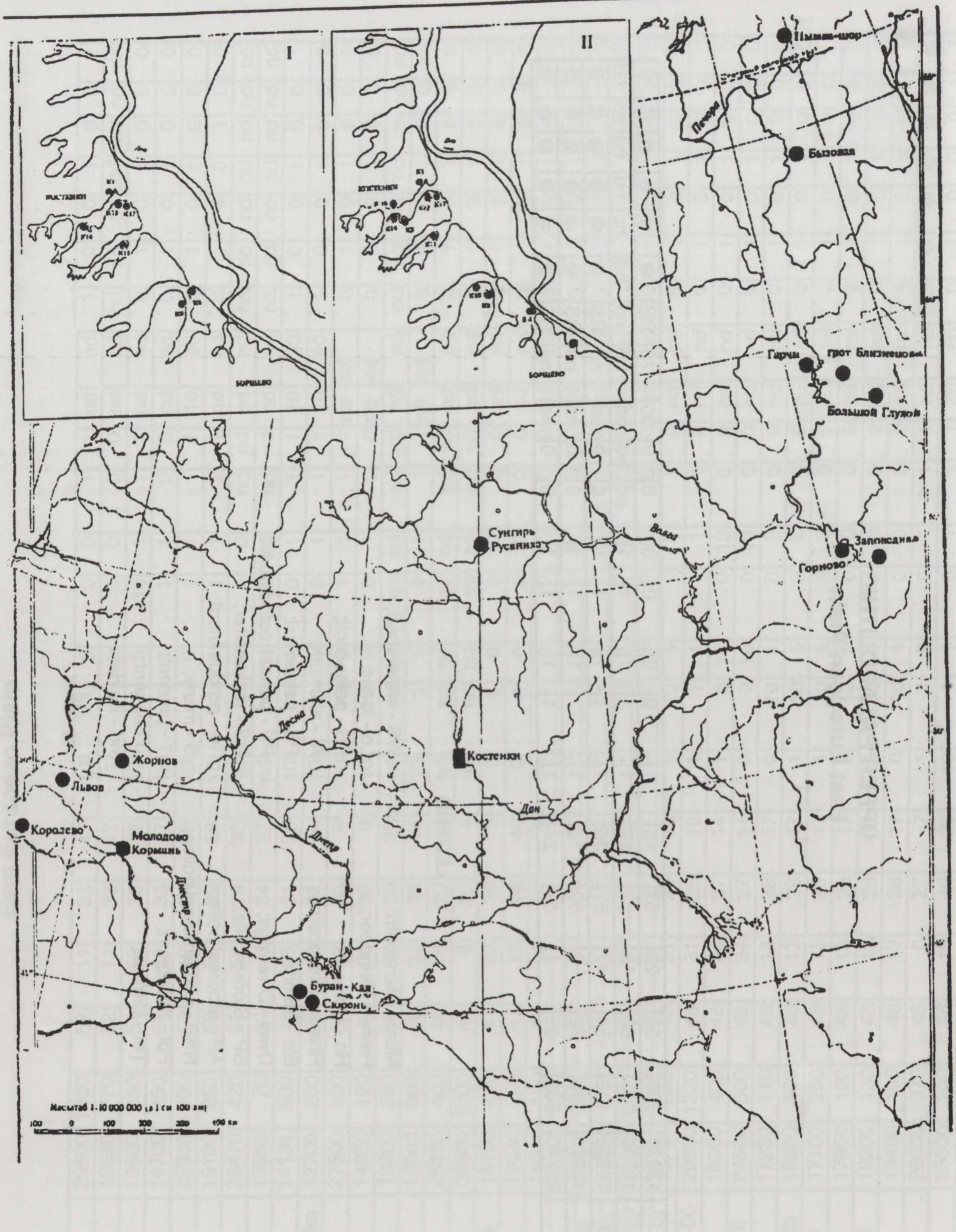

Fig. 1. Initial Upper Palaeolithic settlement of East European Plain. I - Kostenki sites 36-32 Kyr; II - Kostenki sites 32-27 Kyr. (from SINITSYN *et al.* , 1997).

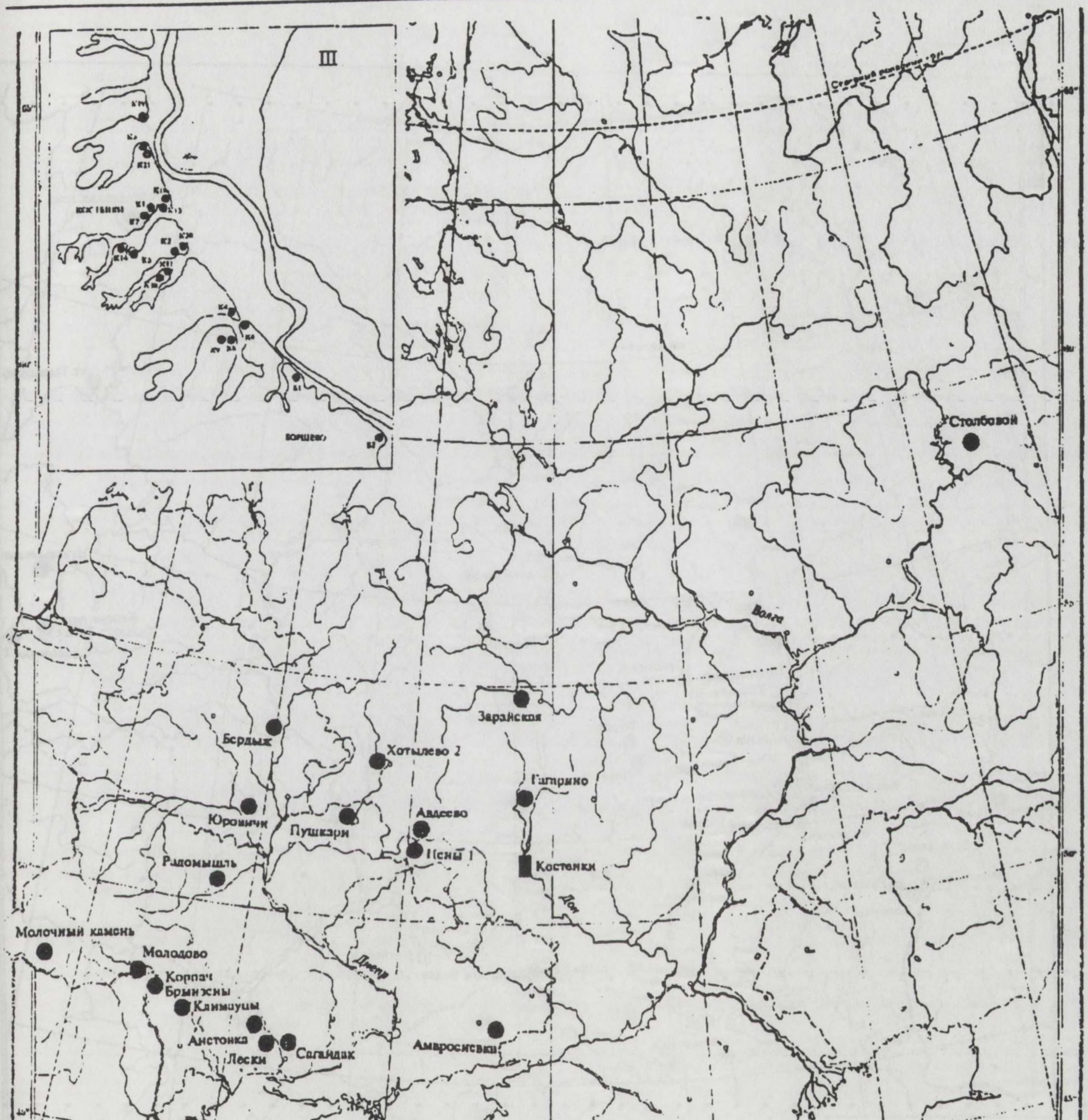

Fig. 2. The settlement of East European Plain at the time of the Last Glacial maximum. III - Kostenki sites 27-21 Kyr. (from SINITSYN *et al.* , 1997).

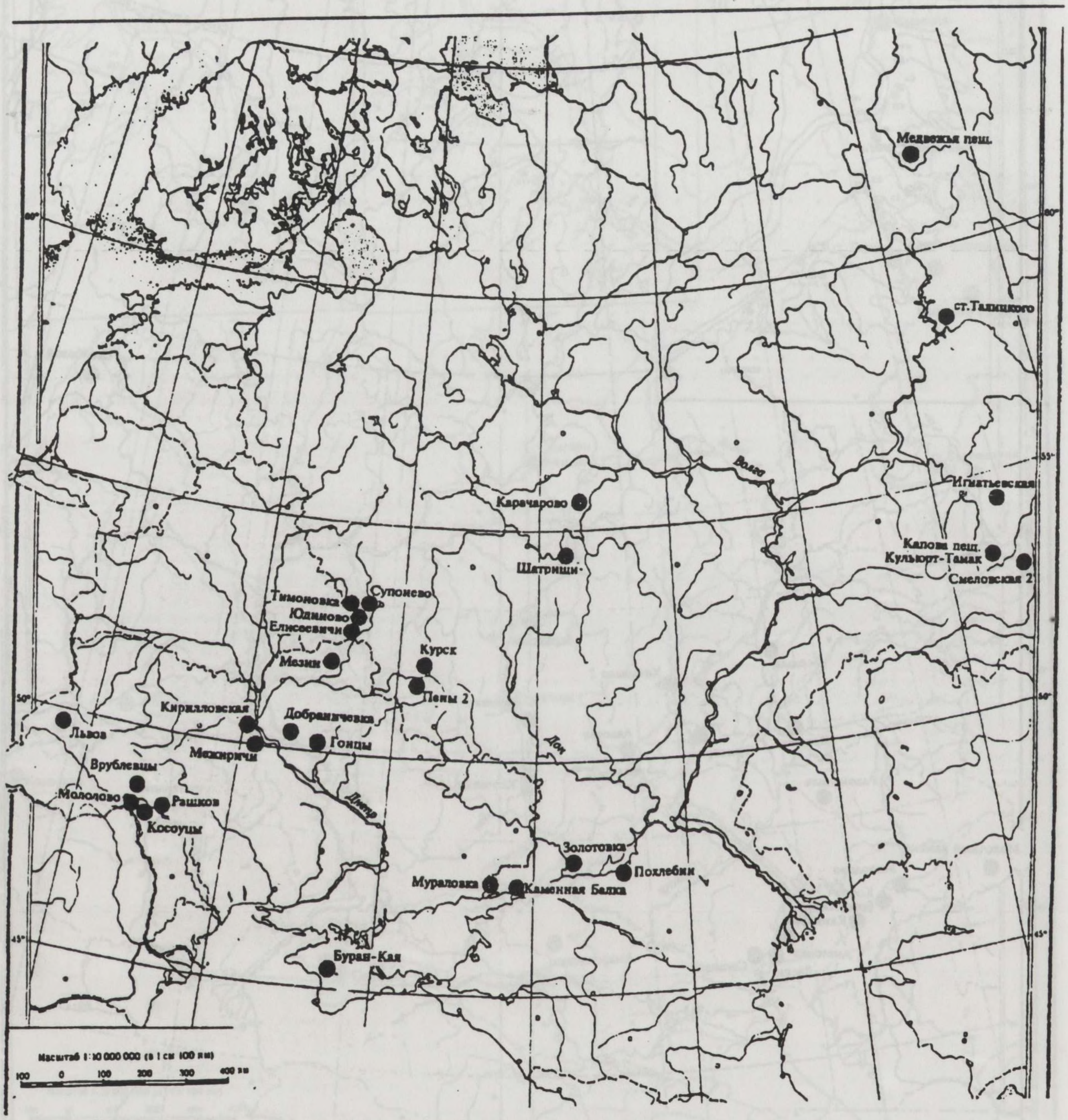

Fig. 3. The settlement of East European Plain at the time of Glacial recession (from SINITSYN *et al.* , 1997).

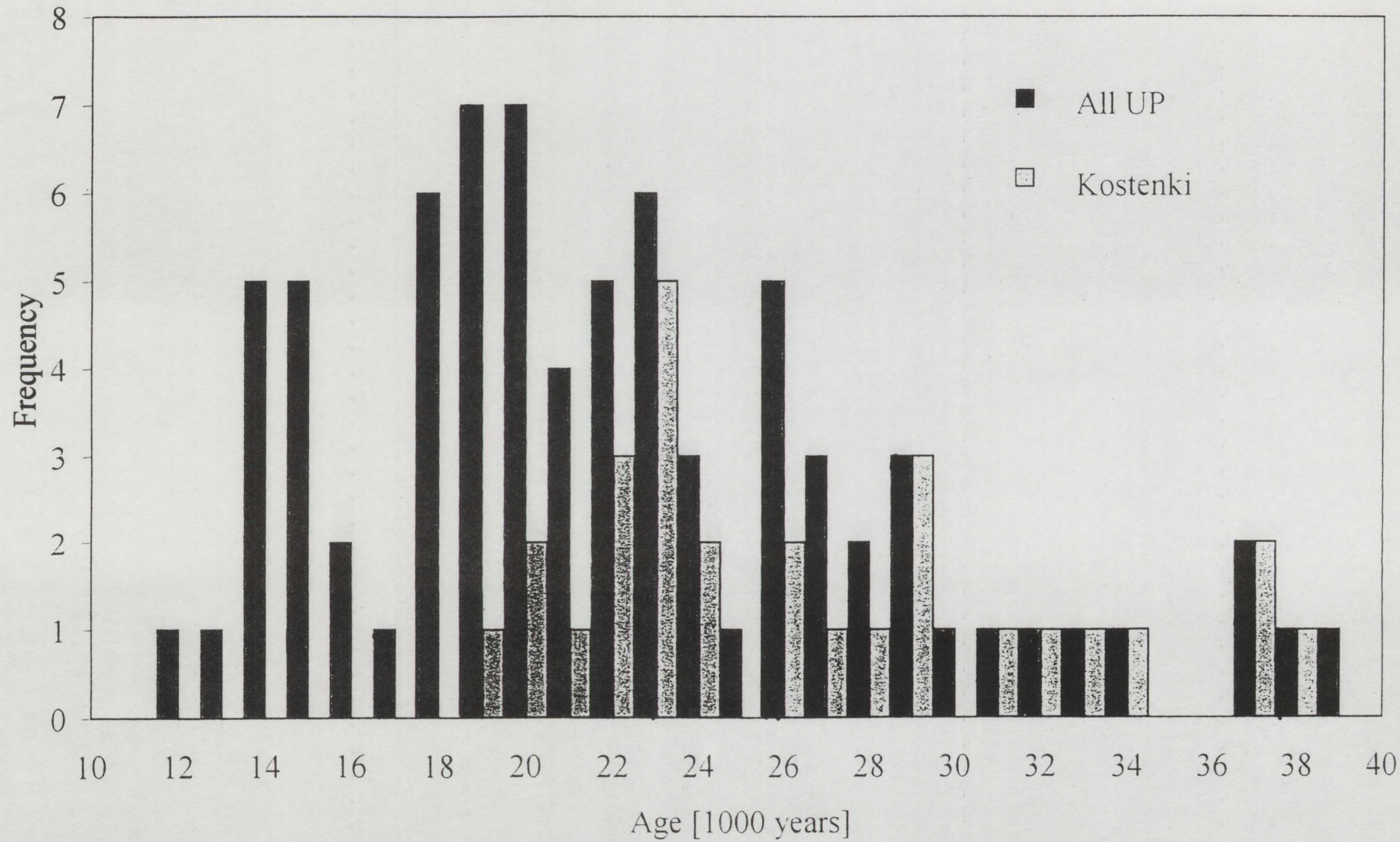

Fig. 4. Frequency of UP sites in the East European Plain (number of sites per millennia).