Adaptive Biological Trends in the European Upper Palaeolithic:
The Case of the Sunghir Remains

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Abstract Sunghir is one of the most important Upper Palaeolithic sites in the world because of its most Northern location, the extraordinary richness of the artifacts, and the state of human bone preservation. The skeletal finds give evidence for the study both of adult and subadult body builds in the group. For the reconstruction of patterns of postcranial morphology, total measurements of bones and X-ray observations have been used. We have determined the basic structural traits typical for Sunghirians: small corticalisation of adult postcranial skeletons; large volume of the bone marrow cavity relative to the general size; quick tempo of attainment in early ontogenesis of large adult size combined with late synostoses ensuring prolonged linear growth; macroskelia combined with extreme andromorphy in the shoulder belt structure; capacious chest. The above traits can be interpreted in terms of adaptation to such formative factors as low temperature stress, deficit of atmospheric oxygen, high protein nutrition, and mechanical loads.

Keywords: Upper Palaeolithic, biological adaptation, Sunghir people

Introduction

As was shown in a classical study by Khrissanfova (1984), chronologically, morphologically and taxonomically the Sunghir 1 find represents Upper Pleistocene Homo sapiens and affiliates with the circle of early Eastern European Neanthropes. The Sunghir find is close to the Cro-Magnons (and to certain similar forms) in such traits as tall stature; longer middle limb segments, compared with their proximal counterparts; greater length and straightness of both femurs; platycnemia; probably, shortening of the spine; relative brachydactylyia with very large components of the 1st digit; the talus type; and certain other features.

Sunghir 1 seems to be most similar to some Central European early modern humans, especially to the “Eastern Cro-Magnon” Predmosti 3. E. Khrissanfova pointed also to a number of distinctive similarities between the Sunghir man and “sapient Mousterians” of the Skhul cluster, such as tall males from Skhul 4 and partly Skhul 5.

Nevertheless, there is a question about the phenotypic and morphological originality of the Sunghirian population. How do the constitutional peculiarities of Sunghirians correspond to the scale of variability in the Upper Palaeolithic?

X-ray examination of human bone remains is an important forming part of a morphological description of normal morphological variety and the pathological state of the bone system. The non-invasive character of radiographic research makes its application necessary in the study of fossil remains.

The aim of this study was to describe all the human skeletal remains from the Sunghir site available for examination. The main goals of our study were: 1) to evaluate the common patterns of postcranial morphology of adult Sunghirians in comparison with other Palaeolithic finds; 2) to evaluate the peculiarities of inner structure in the Sunghir skeletons; 3) to reconstruct some traits of physical activity of Sunghir individuals, reflected in a specific bone tissue microstructure; 4) to study the signs of physiological stress, reflecting the periods of unfavourable influence during childhood; 5) to assess the level of biological adaptation of the Sunghir population to the environment based on morphological patterns and data about climatic conditions.

Methods

We used the methods of standard statistical analysis to compare characteristics of the morphotype from Sunghir 1. The comparison of the Palaeolithic hominids was carried out with the help of cluster analysis and the method of principal components in the programs NTSYS 1.8 and Statistica 5.0. Taking the main features of the analysis—humerus, ulna, radius, femur, tibia and clavicle, we carried out tests of the length of their main segment extremities, reflecting the main
body size, linear proportions and breadth development of the shoulder girdle.

X-ray images of tubular bones were taken in anteroposterior and lateral projections. Small tubular bones of hand and foot were radiographed in anteroposterior projection. The ratio between the sizes of compact tissue and medullar canal was evaluated. The left and right humerus, ulna, radius, femur, tibia, fibula, clavicle, ribs, hipbone, hand and foot bones were studied.

The Nordin index of all tubular bones was evaluated according to the formula: \[ IC = \frac{WCL}{WD} \times 100\% \], where WCL is total width of compact layer, and WD (=T) is roentgenographic width of the bone. The size of the cortical layer area was evaluated according to: \[ C.A. = \frac{p}{4(T^2 - M^2)} = 0.785(T^2 - M^2) \], where M is medullar width. To estimate the specific weight of medullar space in the habitus status of Sunghir people and comparative material the index IC/maximum humeral length was used. Intermetaphyseal lengths of the long bones of the juveniles Sunghir 2 and 3 were measured.

The postcranal remains of individuals Sunghir 1, 4 (adult males), Sunghir 2 and 3 (subadults, correspondingly 13–14 and 9–10 years at death) were studied. X-ray films were made by a portable Arman-1 type device with Kodak film.

**Results**

**Total morphology of adult form**

At the first stage of the statistical analysis we determined the indices of similarity of the Upper Palaeolithic males, with good bone preservation, suitable for the measurements. The examined sample was divided into two main clusters (Mednikova, 2000). The first cluster contains the pair-group Grotte des Enfants 4–Barma Grande 2 and Predmosti 3–Sunghir 1. The second cluster contains pairs Predmosti 9–Gough’s Cave, Predmosti 14–Oberkassel 1 and Arene Candide 5 separated from them. The method of principal components confirmed the designated grouping. It outlined that the morphological type of Predmosti 3 is less differentiated then Cro-Magnons from Grimaldi on the one hand, and Sunghir 1 on the other.

At the second stage of analysis we added the data of more ancient male hominids to the fossils from the Upper Palaeolithic. The clusterisation revealed two large samples. The first consists of Grimaldi males, Predmosti 3–Skhul 4, Skhul 5–Kebara 2 and something apart–Sunghir 1. The second cluster includes Predmosti 9–Shanidar 1, Predmosti 14–Oberkassel 1, Gough’s Cave–Neanderthal 1, Le Regourdou 1, Shanidar 4, 5 and Arene Candide.

At the planes of the first and the second principal components the dichotomous division of Grimaldi people and Predmosti 3–Sunghir 1 with the connecting point Skhul 4 is notable. The other Near Eastern hominids as in those from Skhul 5 and Kebara 2 are closer to the group, uniting Shanidar 1 and 3 with the European Neanderthals Le Regourdou, and

Neanderthal 1 together with the males from the Early Upper Palaeolithic (Predmosti 9, 14, Oberkassel 1). Shanidar 4 and 5, Arene Candide 5, the representative of the late Upper Palaeolithic population, and Mesolithic Gough’s Cave are isolated abruptly. In the light of the three principal components Skhul 4 seems to be closer to the main nucleus of morphological variability.

**Some patterns of inner structure in postcranial skeletons of Sunghir 1 and 4**

The cross-section in the mid-shaft of the left femurs Sunghir 1 and 4 individuals had a shape typical for Upper Palaeolithic Cro-Magnon humans. The spherical shape of the medullary canal and the extent of pilaster development are most similar to those of Pavlov 1. Among early hominids from the Near East a similar morphological pattern is typical for Qafseh 9, 8 and Skhul 5.

To estimate the peculiar traits of the inner structure in

![Fig. 1 Differentiation of Palaeolithic male hominids according to postcranial traits. 1st and 2nd principal components.](image1)

![Fig. 2 Cross-sectional geometry in the midshaft of left femurs Sunghir 1 and Sunghir 4 in comparison with archaic and Upper Palaeolithic hominids.](image2)
tubular bones of the adult Sunghir 1, data on fossil hominids and later representatives of *Homo sapiens sapiens* have been used.

The Sunghir 1 individual was more “lightly built” than the majority of groups under comparison.

The relatively wide medullary canal together with large lengths of tubular bones contributed to a sharp increase of bone marrow cavity. Judging by the size of the bone marrow cavity of the humerus, Sunghir 1 is located between Arctic Mongoloids and the Bronze Age Caucasian highlanders from Altai. On the other hand, the trend towards inner gracilisation of the skeleton is registered in the inhabitants of the ancient taiga of Southern Oleny Ostrov and in Khants—fishermen, hunters and deer-breeders well adapted to severe, extremely continental conditions of the taiga zone in Western Siberia. The higher volume of bone marrow cavity in the Sunghir man testifies to the intensity of hemopoietic function and, possibly, of heat exchange.

Some basic traits of postcranial morphology in subadults of Sunghir

All materials taken for comparison are taxonomically homogenous and belong to late *Homo sapiens sapiens*. However, these materials include postcranial series from different territories and subsistence types, thus enabling attention to be paid to polymorphism in modern humans. Comparative data consist of ancient inhabitants of Northern Africa (Negroid), early- and late-medieval Europeans (Europeoids), natives of Alaska, the Aleutian Islands and North America (Mongoloids), and modern descendants of Europeoid settlers in North America.

In comparative study the Sunghir children have shown an undifferentiated set of morphological characteristics when compared to later representatives of Homo sapiens sapiens. “African” proportions in limb structure are combined with “Arctic” ratios of arm to leg lengths and with “Hypereuropean” shoulder width.

### Table 1 Comparative study of humeral compactisation in the middle of diaphysis in adult Sunghirian, anterior-posterior view

<table>
<thead>
<tr>
<th>Males</th>
<th>IC Right/left</th>
<th>WCL Right/left</th>
<th>IC: bone length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sunghir 1</td>
<td>41.7/45.8</td>
<td>10/11</td>
<td>11.6/—</td>
</tr>
<tr>
<td>Natufians (Mesolithic Near East)</td>
<td>65.9/62.1</td>
<td>12.1/11.3</td>
<td>20.9/19.8</td>
</tr>
<tr>
<td><em>Southern Oleniy Ostrov</em></td>
<td>49.3/48.0</td>
<td>10.1/9.6</td>
<td>14.4/—</td>
</tr>
<tr>
<td><em>Vassilyevka 2</em></td>
<td>56.8/52.1</td>
<td>12.9/12.0</td>
<td>16.5/—</td>
</tr>
<tr>
<td>Kurota 2</td>
<td>44.8/44.4</td>
<td>11.9/11.6</td>
<td>12.8/12.9</td>
</tr>
<tr>
<td><em>Chernaya Gora</em></td>
<td>51.3/55.6</td>
<td>10.0/10.8</td>
<td>15.0/16.2</td>
</tr>
<tr>
<td><em>Yasykovo</em></td>
<td>56.7/57.4</td>
<td>10.2/10.5</td>
<td>17.7/—</td>
</tr>
<tr>
<td><em>Karavaikha</em></td>
<td>54.5/50.5</td>
<td>11.4/10.6</td>
<td></td>
</tr>
<tr>
<td><em>Sakhtysh, Lyalovo people</em></td>
<td>60.0/64.5</td>
<td>12.0/11.8</td>
<td>19.3/20.9</td>
</tr>
<tr>
<td><em>Sakhtysh, Volosovo people</em></td>
<td>54.5/50.0</td>
<td>12.0/11.0</td>
<td>16.4/14.9</td>
</tr>
<tr>
<td><em>Sakhtysh 2a, Early Lyalovo culture</em></td>
<td>70.2/41.9</td>
<td>13/12.5</td>
<td>21.1/12.5</td>
</tr>
<tr>
<td><em>Sakhtysh 2a, Early Volosovo culture</em></td>
<td>58.0/54.9</td>
<td>12.7/11.3</td>
<td>17.4/16.5</td>
</tr>
<tr>
<td><em>Sakhtysh 2a</em></td>
<td>62.7/60.5</td>
<td>12.8/12.4</td>
<td>18.8/18.2</td>
</tr>
<tr>
<td>Jebel Qa-'aqir</td>
<td>47.8/50.8</td>
<td>9.6/9.8</td>
<td>15.0/16.0</td>
</tr>
<tr>
<td>Sasa, Meiron</td>
<td>52.7/56.6</td>
<td>9.9/10.5</td>
<td>17.7/18.7</td>
</tr>
<tr>
<td>Arabs</td>
<td>49.8/50.6</td>
<td>9.4/9.5</td>
<td>15.4/15.5</td>
</tr>
<tr>
<td><em>Russians</em></td>
<td>49.2/51.8</td>
<td>9.8/10.3</td>
<td>15.0/15.9</td>
</tr>
<tr>
<td><em>Mordovians</em></td>
<td>50.5/53.9</td>
<td>10.4/10.4</td>
<td>15.5/—</td>
</tr>
<tr>
<td><em>Khants</em></td>
<td>44.7/42.9</td>
<td>10.9/10.9</td>
<td>14.3/14.0</td>
</tr>
<tr>
<td><em>Eskimos</em></td>
<td>30.4/—</td>
<td>14.9/—</td>
<td>10.1/—</td>
</tr>
</tbody>
</table>

* IC was calculated according to published means.

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**Fig. 3** Ulnar-humeral diaphyseal length relation of Sunghir 2 in comparison with indices of 13-year-old children. 

*Sunghir*—1; *Africa*—2 – Nubia, 3 – Kulubnarti; *Europe*—4 – Miculcice, 5 – Alitus, 6 – Altenranding; *North American aborigens*—7 – Knoll; *Alaska and Aleut islands*—8; *Caucasian inhabitants of North America*—9 – American boys with epiphyses, 10 – American girls with epiphyses.

**Fig. 4** Length of Sunghir 3 clavicula (C) in comparison with lengths of 10-year-old children. 

*Africa*—1 – Nubia; *Europe*—2 – Alitus, 3 – Altenranding; *North American aborigens*—4 – Knoll.
“Tropical” traits in total linear body proportions are not found in the Sunghir children: their arm length to leg length ratios resemble those of ancient Indians and Arctic Mongoloids.

Owing to their large body size, young Sunghirians are close to modern Europeoid children of the North American continent. Sunghir 2 has many common features with modern thirteen-year-old teenagers, Sunghir 3 with 10-year-old children. The critical difference between Sunghirian immatures and modern children consists in the fact that the Sunghirians did not stop longitudinal growth, because their epiphyses were not yet fused. Furthermore modern 13-year-old teenagers of the same body sizes demonstrated epiphyseal fusion in a great number of cases (Maresh, 1955).

According to different authors, the arm to leg lengths ratio, as well as more segmented linear proportions, are the direct result of adaptation to climatic conditions. In arm length to leg length proportions the Sunghir children are most similar to Eskimos and Amerindians; the adult man is relatively short-armed.

Some patterns of inner structure in the postcranial skeletons of Sunghir 3 and 2

Sunghir 3

In the metadiaphyseal parts of the humeri, massive trabecules oriented at an angle of 30° to the horizontal plane are present. An increase in internal massiveness at the level of *m. pectoralis major* is registered. Local thickening of the cortical layer in the right ulna at the attachment site of *m. pronator quadratus* is evident. The femora are strongly bent in the anterior-posterior direction. The structure of the Sunghir 3 femora is a somewhat hypertrophied version of the morphological variations typical for this particular group of people as a whole. Accenatured thickening of the posterior compact layer is evidence of a compensatory reaction, thus balancing the abnormal high shaft bend and stabilising locomotion. In the metaphyseal zone of the femur there are two Harris lines up to 3 mm thick. Another extensive area of sclerotisation is adjacent to the growth plate at the distal edge. Three indistinctive sclerotisation lines are localised in the femur neck area. At least three physiological stress markers are noted on the tibial radiograms.

Sunghir 2

In the metaphyseal parts of the humeri, massive trabecules are present. Unlike the rest of the Sunghirians with straight clavicles in the lateral view, the Sunghir 2 collarbones are bent. The spongy tissue is proliferated with horizontal bands that go along the diaphysis repeating the external contours of the clavicle. They may be taken as evidence of increased mechanical load on the costoclavicular ligament.

Reconstruction of the growth process in the Sunghir palaeopopulation

At 10 years, the size of the humerus in Sunghir 3 attained over 73% of the adult Sunghir 1 size; in 13-year-old Sunghir 2 it reached 84.7% of the adult size.

Growth of the ulna in length was slightly retarded comparative to the proximal upper limb segment. Femoral linear growth in Sunghir 3 was also retarded compared with...
the upper limb tempos of growth. It might be strongly affected by an abnormal bending of the femora; the actual length achieved as a percentage of the adult size should have been bigger. On the other hand, distal segments of the lower limbs in Sunghir 3 have stronger development. Linear growth of the tibia in the Sunghir 3 individual is higher than in 10-year-old hunter-gatherers of the Bt-5 group dated 4,000–3,000 BC, or in Libben Indians (76.7% and 70.5% of the adult size correspondingly—Mensforth, 1978). In 13-year-old Sunghir 2 the development of the lower limb bones is ahead of that of the upper limb. Clavicular linear growth in the 10-year-old Sunghir 3 child clearly demonstrates that limb bones surpassed biacromial growth.

### Discussion

The main pattern of the Sunghirians is their prolonged period of linear growth provided by late epiphyseal growth. Their large size and dolichomorphic constitution, together with the already mentioned late appearance of synostoses, could indicate some hypogonadism. However, these traits are combined with such “andromorphic” indicators as extreme values of shoulder width, increased corticalisation of the skeleton and quick attainment of definitive size. In modern humans, increased levels of sex hormones, though bringing the same morphological consequences, prevent the activity of somatotropic hormones and stop diaphyseal growth, which did not happen in the Sunghir children.

The prolonged linear growth of the Sunghirians may be considered also as an “archaic” feature. The study of juvenile forms of the Neanderthals from Teshik Tash 1 and Le Moustier 1 confirms that together with advanced maturation of the dental system, growth of the postcranial skeleton is slow and gradual compared to modern children (Nelson and Thompson, 1999, 2000). On the other hand, 11-year-old (according to his dentition) Homo erectus KNM WT 15000, dated 1.6 million years ago, has a suggested stature characteristic of modern 15-year-olds (Smith, 1993). Such inconsistency, according to our data, also typical for young Sunghirians, lies within the normal range of variation for modern humans (Glegg and Aiello, 1999).

Following the ontogenetic development of the Sunghirian children and patterns of Neanderthal children growth, discussed in the literature, one can see different life strategies with the traits of r- and K-selection. In the r-life-strategy, natural selection favours quick development, early reproduction, small body sizes, short life, and high speed of population renewal or high population numbers. Such a pattern is common with the life strategy reconstructed for the Neanderthal population of Europe (Nelson and Thompson, 2000; Thompson and Nelson, 1999). In the K-strategy, natural selection promotes slower development, later reproduction, large body sizes and higher life expectancy. This is the complex of traits that is characteristic of Sunghir people.

The prolonged linear growth of the Sunghirians also has some modern analogies in populations adapted to low-oxygen concentration in the air. In the Peruvian Andes, the medullary canal continues to grow up to 22 years in males and 18 years in females, while in the plains, synostoses come to an end in 16- and 10-year-olds respectively (Frisancho, 1981). Populations adapted to hypoxic conditions also manifest significantly high indicators of tidal lung volume (Frisancho et al., 1999). It should be stressed that life in the modern Arctic is also influenced by a hypoxic environment.

The Sunghir people are an early, and at the same time the northernmost European group of the Upper Palaeolithic. The latest reconstruction of geologo-paleoecological events in the area of the Sunghir site testifies to a complicated soil-cultural

### Table 2 X-ray lengths of Sunghir children’s long bones

<table>
<thead>
<tr>
<th>Length, mm</th>
<th>Sunghir 3 % from adult size</th>
<th>Sunghir 2 % from adult size</th>
<th>Sunghir 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clavicle</td>
<td>134</td>
<td>68.7</td>
<td>195</td>
</tr>
<tr>
<td>Humerus</td>
<td>263</td>
<td>73.1</td>
<td>305</td>
</tr>
<tr>
<td>with upper epiphysis</td>
<td>263</td>
<td>74.1</td>
<td>285</td>
</tr>
<tr>
<td>without upper epiphysis</td>
<td>246</td>
<td>246</td>
<td></td>
</tr>
<tr>
<td>Ulna</td>
<td>247</td>
<td>81.0</td>
<td>305</td>
</tr>
<tr>
<td>with epiphyses</td>
<td>353</td>
<td>71.3</td>
<td>437</td>
</tr>
<tr>
<td>Femur</td>
<td>312</td>
<td>70.1</td>
<td>396</td>
</tr>
<tr>
<td>with epiphyses</td>
<td>325</td>
<td>29.5</td>
<td></td>
</tr>
<tr>
<td>without epiphyses</td>
<td>325</td>
<td>405</td>
<td></td>
</tr>
<tr>
<td>Tibia</td>
<td>281</td>
<td>79.5</td>
<td>368</td>
</tr>
<tr>
<td>with epiphyses</td>
<td>307</td>
<td>88.9</td>
<td>414</td>
</tr>
<tr>
<td>without epiphyses</td>
<td>307</td>
<td>324</td>
<td></td>
</tr>
<tr>
<td>with lower epiphysis</td>
<td>307</td>
<td>347</td>
<td></td>
</tr>
<tr>
<td>with lower epiphysis</td>
<td>307</td>
<td>348</td>
<td></td>
</tr>
</tbody>
</table>
structural complex, and to the presence of faunal remains associated with different habitats—with both open territories and forests. Such a mixture of faunal remains may be explained by later deformations but also by the possible—in space and time—closeness of different ecosystems. 

Palinological analysis has revealed two separate spore-pollen combinations associated with the site cultural layer. In the lower part of the cultural layer the pollen of arboreal species dominates, predominantly of fir-trees, as well as of motley grass and cereals. This cycle corresponds to the time of the interstadial optimum of the early Valdai with a cool, damp, almost boreal climate. An upper part of the cultural layer contains a different combination of pollen spectra with pines, firs, birches and also motley grass and cereals contributing. Such a floral set is associated with different environmental conditions, apparently accompanied by a fall of temperature and an increase in humidity (Bader, 1998: 208).

Theoretically, in cold conditions, natural selection should lead to a decrease in body surface, first of all by limb shortening, as seemingly occurred in Neanderthals and in the late Palaeolithic. The large body sizes of the Sunghir people as well as their large medullary canal volumes testify to another morphophysiological means of cold adaptation, which, judging by the consequences, turned out to be more effective at the beginning of the Upper Palaeolithic. Moreover, similar morphological trends did appear in later Homo sapiens sapiens: in humid and cold conditions “Proto-Cro-Magnon” somatotypes were dominant (e.g., during the early Bronze Age in the Eurasian steppes (Mednikova, 1995)), while in extreme Arctic conditions—“Proto-Neanderthal” ones (Eskimos) were.

The limb shortening of Magdalenians in comparison with earlier Upper Palaeolithic humans has often been discussed. Various evolutionary reasons of diachronic body changes have been considered. For example, Formicola and Gianecchini (1999) proposed the leading role of nutritional factors in morphological differences between Aurignacians and Magdalenians. The possible influence of population density and gene drive has also been analysed.

The large contrast between the life conditions of humans during the Early and Late Upper Palaeolithic periods was caused by periglacial climate changes from 19 to 10 thousand years BP. Human existence in the period of maximal coldness was complicated. The lower “life quality” among Magdalenians in comparison with the earlier paraperiglacial period was indicated by a high frequency of physiological stress markers (Brennan, 1991). Without excluding the influence of nutritional, demographic or genetic factors, we should note that body size reduction of the Late Upper Palaeolithic humans can be explained by adaptive variability under cold stress influence (Hollyday, 1999; Mednikova, 2000).

The structural characteristics of the Sunghir people, as revealed by X-ray, might suggest a high physiological adaptability to the local environment. Under fixed ecological parameters and biocenotic interrelations the stabilising form of natural selection comes into play, favouring average variation. Such a balance between population and environment normally does not last long (Shmalgausen, 1969). Apparently the conditions in which Sunghirians lived were more suitable for the moving form of natural selection which favoured versions other than the average ones produced under the former conditions of population survival. In those latter conditions hereditary deviations were dominant, being more suitable to environmental changes. Constant adaptation of the organism takes place at various stages of its development; polymorphism increases. This is exactly the case of the Sunghir site inhabitants—such polymorphism was typical for people living in conditions of a continuing fall in temperatures.

**Conclusion**

The Sunghir people are an early, and at the same time the northernmost European group of the Upper Palaeolithic. The X-ray study suggests their high physiological adaptability to the local environment. Because of the higher volume of bone marrow cavity in adult forms an intensity of hemopoietic function and, possibly, of heat exchange can be supposed.

In our opinion, the conditions in which Sunghir people lived were more suitable for the moving form of natural selection which favoured versions other than the average ones produced under the former conditions of population survival. In those latter conditions, hereditary deviations were dominant, being more suitable to environmental changes. Constant adaptation of the organism takes place at various stages of its development; polymorphism increases.

The longitudinal development and body proportions of Sunghir 1 are typical for representatives of the Early Upper Palaeolithic and differ from the body composition of Magdalenians. Sunghir 1 belongs to the group of the giant “Cro-Magnon” population. Even the extremely large length of clavicle did not influence the estimation of the similarity of Sunghir 1 to the people of the Early Upper Palaeolithic. The large shoulder breadth may reflect an adaptation to cold stress. The intensification of the breadth development of the shoulder girdle, demonstrated by Sunghir 1 (56° North) and Magdalenians, existed in most cold conditions of the Upper Palaeolithic, as by European Neanderthals could be not accidently, indicating similar morphological trends. There are no other specific traits connecting Sunghir 1 and European Neanderthals (opposite to Mousterians from Levant).

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