

THE WILD HORSES OF EASTERN EUROPE AND THE POLYPHYLETHIC ORIGIN OF THE DOMESTIC HORSE

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Summary

Explored here are the controversial issues of the origin of the domestic horse and its wild ancestors. Only one of the hypothetical centres of domestication is satisfactory proved - the one in the Northern Pontic Steppe. Proposed is a new concept of the systematics of the East European Pleistocene and Holocene wild horses. It is based on the typology and the evolutionary trends of the horses of Eastern and Western Europe; the eco-genetic and the zoogeographic approaches are also used. Two species of horses, surviving the Pleistocene in Eastern Europe, can be simultaneously regarded as ancestors of the domestic horse: the broad-hoofed horse - *Equus germanicus transilvanicus* (= *E. latipes*) and the enigmatic "tarpan" - *E. gmelini*. The virtual existence of the *E. gmelini* as a wild form is proved by the studies of finds dating from the Late Pleistocene. The fact of this coexistence gives ground for the polyphyletic hypothesis of the origin of the domestic horse.

Key Words

Equus systematics, Horse domestication, Pleistocene, Holocene.

Résumé

Les chevaux sauvages d'Europe de l'Est et l'origine polyphylétique du cheval domestique.

*Les controverses sur l'origine du cheval domestique et sur son ancêtre sauvage sont discutées. Un seul des centres supposés de domestication semble suffisamment argumenté - celui de la steppe nord-pontique. Nous proposons une nouvelle conception sur la classification des chevaux sauvages du Pleistocène supérieur et de l'Holocène de l'Europe de l'Est, reposant sur les tendances évolutives des chevaux de l'Europe orientale et occidentale et sur une méthode écogénétique et zoogéographique. Deux espèces de chevaux issues du Pleistocène d'Europe de l'Est peuvent être considérées comme ancêtres communs du cheval domestique : le cheval aux sabots larges - *Equus germanicus transilvanicus* (= *E. latipes*) et l'énigmatique "tarpan" - *E. gmelini*. L'existence de ce dernier comme forme sauvage est démontrée par l'étude des découvertes du Pleistocène supérieur. Cela soutient l'hypothèse polyphylétique de l'origine du cheval domestique.*

Mots clés

Classification d'Equus, Domestication du cheval, Pléistocène, Holocène.

Zusammenfassung

Die Wildpferde Osteuropas und die polyphyletische Herkunft des Hauspferdes.

*In diesem Beitrag wird die Herkunft des Hauspferdes und seiner wilden Vorfahren diskutiert. Nur eines der angenommenen Herkunftsgebiete ist bisher ausreichend untersucht worden: die Nordpontische Steppe. Es wird ein neues Konzept zur Systematik der osteuropäischen Wildpferde des Pleistozäns und des Holozäns vorgeschlagen. Es beruht auf der Typologie und den Entwicklungstendenzen der Pferde in Ost- und Mitteleuropa, wobei auch ökogenetische und zoogeographische Faktoren zur Anwendung kommen. Zwei Pferdearten, die das Pleistozän in Osteuropa überlebt haben, können als Vorfahren des Hauspferdes angesehen werden: das Breithufpferd *Equus germanicus transilvanicus* (*E. latipes*) und der rätselhafte "Tarpan" (*E. gmelini*). Die Existenz des Tarpan als reale Wildform wird durch die Untersuchung von Spätpleistozänfunden nachgewiesen. Hieraus folgt die Hypothese, daß das Hauspferd aus verschiedenen genetischen Quellen hervorgegangen ist.*

Schlüsselworte

Systematik der Pferde, Domestikation des Pferdes, Pleistozän, Holozän.

The horse's domestication centre

It is widely accepted that the domestication of the horse took place in the Northern Pontic region (Bibikova, 1967, 1970; Nobis, 1971; Bökönyi, 1988 a; Levine, 1990a). It is stated that the earliest known domesticated horses are those discovered in Dereivka (Bibikova, 1967; Bökönyi,

1988b). The site is dated to the Sredniy Stog II Culture (Telegin, 1973) and this age corresponds to the Moldovian Cucuteni A4. The latter, dated by the ¹⁴C method, dates from 5450-5300 bp or about 4100 cal. BC (Bojadziev, 1992). The traces of bit cheekpieces found on the mandibular P2 of the stallion from one of the ritual burials in

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Dereivka (D. Anthony - Hartwick College, N.Y., pers. comm.) support the former conclusions that the earliest domestic horses are the ones found there. Such traces though are registered only on this mandible of all found in Dereivka. It could be that this mandible is not compatible with the cranium of the stallion. It may be suggested (Eisenmann and Arbogast, 1997) that it is of earlier age than the other horse remains: their sexual and age structure questions the generally accepted view that the Dereivka horses have been domesticated (Levine, 1990b). However, a number of archaeological proofs indicates that the culture of Sredniy Stog should be connected with the beginning of the domestication of the horse (Merpert, 1982; Bökönyi, 1988 b) and that this domestication has begun not later than the beginning of the IVth millennium BC.

According to some suggestions, it is also possible that an independent domestication has taken place on the Balkan Peninsula (Uerpman, 1990). The existing archaeological data are contrary to such a presumption: they show that the native populations having inhabited the lands of present Bulgaria in the Late Aeneolithicum did not know the domestic horse (Todorova, 1986). It is possible, however, that secondary sites of domestication, occurring within a common circum-Pontic centre, were gradually formed there. Given the evident contacts between the Late Aeneolithicum cultures of the Northern and the Western Pontic regions (Todorova, 1986), it can be assumed that the domestic horse could have migrated to the Western Pontic region in quite a short period. The first horse-head-shaped stone sceptres on the Balkans do have connection with the steppe invaders from North-East and date from the first half of IVth millennium BC (Todorova, 1986). The domestic horse migrated from Ukraine to the West towards Moldova and Romania and, in the middle of IVth millennium BC, reached even more westward, to the Carpathian region, the culture of Tiszapolgar (Bökönyi, 1988a).

There are presumptions based on new controversial data as for an independent horse domestication in the Late Neolithic of Western Europe (i.e. much later than the Neolithic in the south-eastern part of the continent), for example in Spain (Uerpman, 1990). The existence of a domestication centre in Asia Minor is supposed as well (Uerpman, 1990) on the basis of the recently found there first horse remains (dating from the end of IVth - the beginning of IIIrd millennium BC). However, it is quite possible that the above mentioned horse remains belonged to wild horses (Boessneck and Driesch, 1976). Even if they are from domestic ones, which is not excluded, there are certain reasons to presume that such domestic horses have

appeared there as a result of the contacts with the Pre-Caucasian cultures (Bökönyi, 1988a).

Recently, another domestication centre is being discussed, the one in the Asian part of ex-Soviet Union. A great quantity of remains of high horses with considerable variability of limbs distal segments has been found in the settlements from the end of IVth millennium and IIIrd millennia BC in Northern Kazakhstan and Northern Caspian Region (Makarova and Nurumov, 1987; Bökönyi, 1988a, 1988b). Having in mind the most likely later age of these finds, i.e. later than the time of domestication in the Northern Pontic region, we cannot exclude the possibility that horse-breeding was transferred here from the Eastern European domestication centre.

As a conclusion, up to now we can consider only one proved domestication centre: the region of Northern Pontic steppe, probably even more spread out eastward.

The horse's wild ancestor

The question of the domestic horse's wild ancestor is controversial, unclear and not well-sustained on zoogeographical, morphological or systematic grounds.

There is a wide-spread opinion that the wild Holocene horses in Eurasia, the disappeared in the nineteenth century European "tarpan" and the preserved only in the zoological gardens Mongolian horse of Przewalskii, differ only on the subspecific level and belong to the same species (Heptner et al., 1961; Nobis, 1971). Indeed, these horses have some common characteristics. These characteristics are related probably to certain ecological similarities of life or plesiomorphic conditions of some features. The morphological and morphometric analyses reveal, however, that the two horses differ on the species level (Gromova, 1963; Bibikova, 1967; Kuzmina, 1989; Eisenmann, 1991 a, b).

A wide-spread statement exists that fossil populations of *Equus przewalskii* Poljakov have reached Europe during the Late Pleistocene (Cordy, 1982; Forsten, 1988). Some authors also refer separate remains from the Early Holocene of eastern Europe to this horse (Nekrasova, 1961). It is supposed that the same horse has probably taken part in the process of domestication (Bogoliubskiy, 1959; Bökönyi, 1988 a, b).

The analysis of fossil remains does not prove, however, the statement of former existence of *E. przewalskii* in Europe (Gromova, 1965; Nobis, 1971; Eisenmann, 1991 a). Up to the present moment the hypothesis about the participation of this horse in domestication process is not confirmed either. The early domestic horses of the Ukrainian "kurgans" and Ural and the investigations on the primitive contemporary Kirghiz horse reveal that these horses differ

very much from Przewalskii horse (Bibikova, 1967). At the same time the domestic horses show considerable genetic differences with Przewalskii horse (Matthew and Ryder, 1986). As far as the hypothesis is concerned that the newly discovered "domestication centre" in Central Asia is created as a result of domestication of Przewalskii horse (Bökönyi, 1988a), it should be noted that morphological proofs do not exist. If domestic horses were not spread out there from the Pontic region (see above), it is more likely that *E. uralensis* Kuzmina, 1975 should be considered as the wild ancestor of those big domestic horses. Quite recently it was proved that this larger horse had survived until the Vth - IIIrd millennia BC in Northern Caspian region (Kuzmina, 1989). As far as Przewalskii horse is concerned, probably its distribution has been always limited within comparatively small area in the far East of Central Asia.

Up to now the concept about the wild European horse remains unclear and is usually being connected with the "tarpan" *E. gmelini*. This species, that once inhabited the East European steppe, was described judging from a "wild" horse skull from the nineteenth century. Traditionally, but quite often without proofs, the tarpan is considered to be the wild ancestor of the domestic horse (Zeuner, 1963). Some authors (Kowalski, 1967), however, consider it as a feral domestic animal. There is an opinion that the type of the species has not the exact features of a wild form, because of probable cross-breeding between the wild horses and the domestic ones for a long period of time (Nobis, 1971).

The existence of the tarpan as a wild horse is sustained by some rare finds having "tarpan" characteristics (slenderer metapodials than those of the broad-hoofed horses, smaller cheek-teeth, shorter protocone) from the Early Holocene of Eastern and probably Central Europe (Gromova, 1949; Bibikova and Belan, 1981; Kuzmina and Kasparov, 1987).

Anyway, the questions remain: where and when appears this enigmatic wild horse? Is the tarpan a real wild horse or the myth about it is sustained by separate morphotypes, a result of considerable individual variability? The palaeontologists (with some rare and uncertain exceptions; Musil, 1962; Bibikova and Belan, 1981) do not mention it when describing Pleistocene remains and rarely pay attention on Holocene data. There is a slight possibility that such a well differentiated form like the tarpan (Gromova, 1949, 1963), different from the Late Pleistocene dominating morphological types of horses, evolved since less than 10,000 years. That is why the real existence of the tarpan could be proved by Late Pleistocene finds. There is a good reason to search for such finds mainly in Eastern Europe. Nobis (1971) considers that the tarpan originates from the

Late Pleistocene horse from Mezin. This conclusion contradicts the morphological characteristics of both forms and is evidently erroneous.

Concepts for the systematics of Late Pleistocene horses

A great number of forms have been described yet in Palearctic and even only in Europe. Not less in number are the contradicting opinions about their taxonomic status (species or subspecies) and phylogenetic relationships, also the numerous synonyms are much perplexing (Gromova, 1949; Prat, 1968; Nobis, 1971; Samson, 1975; Forsten, 1988; Eisenmann, 1988, 1991a; Azzaroli, 1990). The problem is complicated also because the studies of the fossil forms take place quite independently in western and eastern Europe.

Horses described in Western Europe

Numerous studies in Western Europe result in the description of many forms. The Eisenmann's classification (1991a) is a successful contemporary attempt to resolve the synonymous problem. We accept this classification with minor objections. We consider that there is one principle form (one species?) in Western European Würm with relatively massive metapodials - *E. germanicus* Reichenau, 1915 with 2-3 successive varieties (subspecies?) including also the *E. arcelini* form (Spassov and Iliev, in print).

Horses described in Eastern Europe

In her classic study, Gromova (1949) describes the subspecies *E. c. latipes* (the type of the ssp. from Kostenki) from Late Palaeolithic sites of the European part of former Soviet Union. Like *E. germanicus*, it has broad metapodials and hoofs and a long protocone of the cheek-teeth (fig. 1). As we suggest, some separate finds related to this form (from the Palaeolithic of the Uzbekistan and probably from Southern Ural) have different characteristics and will be described while examining the tarpan type (see below). Nowadays, the horse described by Gromova, called broad-hoofed ("broad-toed"), has been given a specific level by the recent authors (Kuzmina, 1980; Belan, 1985). It inhabited in the Late Pleistocene Moldavia, the Russian Plain and Ukraine (David, 1974; Belan, 1986; Kuzmina, 1989). The data from literature (Belan, 1986; Eisenmann, 1991a) and our comparisons (see below) show that the broad-hoofed horses of the early sites (the Don river: Kostenki) and the later ones (the Desna river: Mezin and others) show some differences and perhaps represent different forms. Therefore, we will call these forms early *latipes* and late *latipes* (fig. 2).

The problem is complicated by the four species of horses with subspecies, determined for the Late Pleistocene of Romania (Samson, 1975). The precise study of Samson gives a good material for analysis. As we will demonstrate below, however, in some cases the finds are referred provisionally to one or another form and at the same time the taxonomic fragmentation is being exaggerated. Most of these finds at once reveal resemblance with the described broad-hoofed forms of the Russian steppe, but some of them have another structure and we will discuss them while describing the tarpan type.

It is not clarified yet whether the discovered horses of South-Eastern Europe (the Balkans) are closer to the western or to the eastern forms (Spasov and Iliev, in print).

Systematic analysis

General statements

The evolution and the systematics of the Late Pleistocene horses can be analysed according to the following considerations:

1. The horses in Eastern and Western Europe show some common evolutionary trends:

1.1. In both groups the distal limb segments are robust (i.e. the horses are broad-hoofed, except the mentioned cases) and the protocones of the upper teeth are elongated. These features can be explained through the ecology of the above mentioned species as related to the degree of food abrasivity and ground compactness (Gromova, 1949; Eisenmann, 1988, 1991b).

1.2. In both groups there are trends of gradual reduction of the body and teeth sizes.

2. The environment in Western Europe at that time should be considered as a periphery of the Eurasian continental Late Pleistocene tundra-steppe. Eastern populations lived under optimal conditions. Migrations from east to west could be expected. Degeneration or localisation and isolation of forms are possible in the western periphery. Degeneration and size reduction obviously occur in the end of the Würm related to the environmental changes and the decrease of the grass complexes bioproductivity.

3. It is quite improbable - under such conditions - for so many varieties to have been located in Eastern Europe where conditions for isolation were not suitable.

4. Together with the remains of broad-hoofed horses, remains of horses rather different in morphology with shorter protocones and slenderer metapodials have been found in several locations of Eastern Europe. So far as these features have not only ecological, but also taxonomic importance (Gromova, 1949; Eisenmann, 1979; Eisenmann and Karchoud, 1982; Forsten, 1988), we can suggest the

existence of another horse type as well, having different morpho-functional characteristics. This horse resembles the tarpan.

Typology of East European horses from the Late Pleistocene and the wild horses from the Holocene

The morphological and morphometric analyses suggest that these horses should be separated into two types. The teeth qualitative differences are more distinguished on the upper cheek-teeth (especially P³ - M¹) and less on the lower ones. Because of the great individual variability they can be considered more as trends than constantly established differences.

I. Broad-hoofed ("*E. latipes*") type: fig. 1 (1 - 5)

Upper cheek-teeth: Protocone - usually long, narrow, with relatively long front part, with often undulate lingual margin, with mesio-vestibular border usually almost parallel to the longitudinal axis of the tooth, with vestibulo-distal border more straight (not arched), with sharpened front and back ends. *Pli caballin* usually well developed. Hypocone (not only of M³) with a trend of curving its end backwards to almost distal direction. Rarely it reaches, in lingual direction, the level of the greater part of the protocone width. Well expressed trend (especially on the premolars) of mesostyle splitting.

Lower cheek-teeth: *Valis externa* usually shallow and metaconide most often in the form of a "drum-stick".

Metapodials and phalanges: robust, large hoof phalanges, long first phalanges.

To this horse type we can refer the broad-hoofed Würm horses from the East European Plain - *E.c. latipes* Gromova, 1949 (= *E. latipes* Gromova): the early *latipes* form from the Don river and the latest one from the Desna river, the remains from Moldavia, those from Kodak, from the Late Palaeolithic of Crimea (Gromova, 1949; David, 1974; Kuzmina, 1980; Belan, 1985, 1986); *E. transilvanicus* Teodoreanu, 1926 and *E. cf. transilvanicus* Teodoreanu from the Early till the Late Würm in Romania; *E. spelaeus* ssp. from the second half of the Würm of the Romanian Dobroudja; *Equus* sp. from the Late Würm and (?) the Early Holocene of the Romanian Dobroudja (Samson, 1975). To this group should be related the horse from the Neolithic of Malo Pole and probably *E. caballus* from the Late Würm of the Temnata Dupka cave (Delpech and Guadelli, 1992) - both horses are from North-Western Bulgaria, as well as those from the Neolithic necropolis in Durankulak and the Final Aeneolithicum of Dolnoslav (eastern Bulgaria; Spasov and Iliev, in print).

II. Tarpan (*E. gmelini*) type: fig. 1 (6 - 12)

Upper cheek-teeth: Protocone usually short, broad, with relatively short front part, with usually straight, sometimes sharply folded buccally lingual margin, with mesio-vestibular border usually oblique toward the longitudinal axis of the tooth, with vestibulo-distal border sharply arched (protocone in the form of a toe-cap shoe), with usually rounded back end. *Pli caballin* with some trend of reduction, especially these of the molars. Hypocone: the end usually is not curved backwards and is directed distal-lingually. Very often in lingual direction it reaches the level of the greater part of the protocone (drawn lingually). Mesostyle - with a trend of splitting for the premolars and relatively rarely for the molars.

Lower cheek-teeth: *Valis externa* with some trend to be preserved deep and with a large bottom. *Valis externa* can almost reach the bottom of the depression dividing the double knot in two parts. The metaconide usually regularly becomes larger to the end.

Metapodials and phalanges: narrow hoof phalanges, short and narrow metapodials and first phalanges.

To this type we refer:

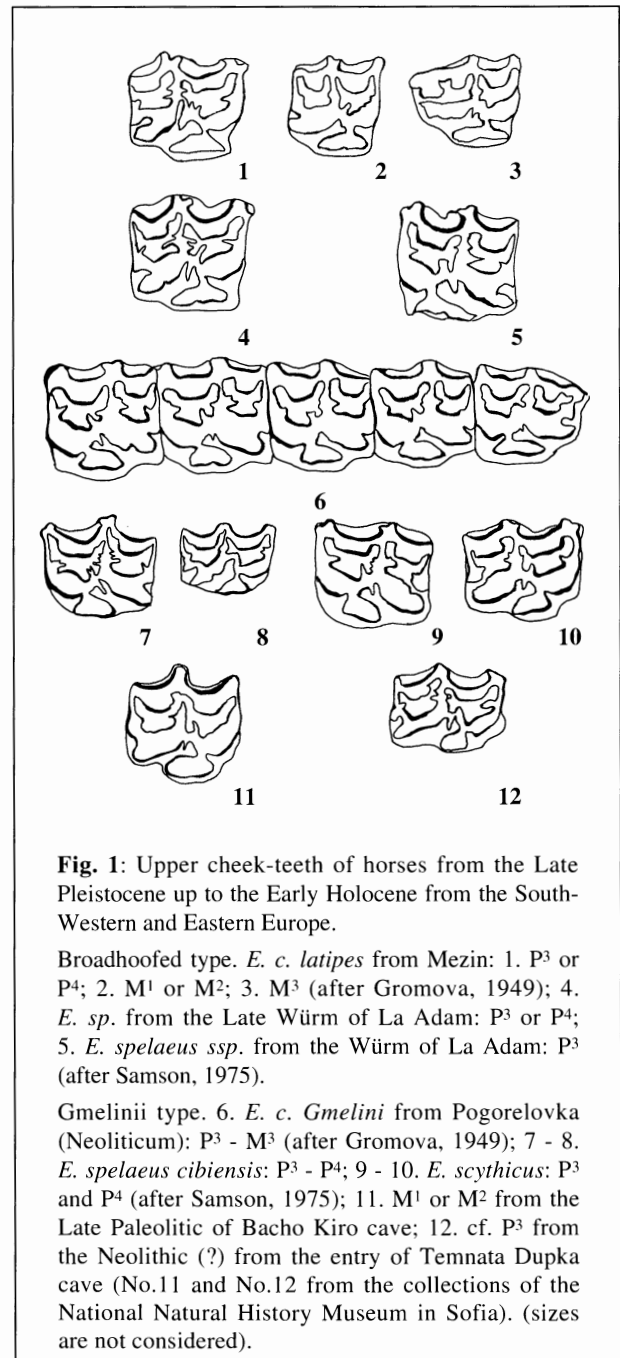
I - Horses from the Late Pleistocene described as *E. scythicus* Radulesco et Samson, 1962 from the Middle and Late Würm of the Romanian Dobroudja and Transilvania; *E. spelaeus cibiensis* Samson (1975) from the Late Würm of Romania (Samson, 1975); *E. c. germanicus* (pars? with some *E. przewalskii* features?) from the Bacho Kiro cave in north-eastern Bulgaria (Forsten, 1982); it is possible that teeth of separate drillings have belonged to broad-hoofed horses; most of the finds are not preserved); the Late Pleistocene finds from Teshik-Tash (S. Uzbekistan) and perhaps Kochkari II (Southern Ural; Gromova, 1949); the referred probably reasonably by Musil (1962) to "*E. cf. gmelini*" remains from the Würm III of Sveduv Stul (Moravia);

II - Holocene horses (besides the tarpan type - the skeleton 521 of the Zool. Institute collections, St. Petersburg): the Neolithic *E. c. aff. gmelini* from Pogorelovka (Ukraine; Gromova, 1949); *E. gmelini* from the Mesolithic of Mirnoe and Girjevo (Ukraine); the premolars from the Neolithic (?) of the entry of Temnata Dupka cave and probably the remains from the Final Aeneolithicum (Telish, Northern Bulgaria; Spassov and Iliev, in print). Most probably here should be related a part of the horse remains from Kopanishte and Cherkaskaya (the region of Voronej), Neolithic age (Kuzmina and Kasparov, 1987).

The comparison of the enamel plication between both *gmelini* and *latipes* types does not show excessive differences when comparing the features one by one. But, as a whole the trend of increasing the enamel plication of the

latipes type is more expressed (Spassov and Iliev, in print).

We could note that probably the tarpan type preserves plesiomorphic features of the teeth morphology. (In this respect it is similar to some fossil zebras like *E. mauritanicus*) The short protocone and the narrow hoofs at the same time indicate an origin in drier, typical steppe conditions with more xerophytic vegetation and compact ground.



The broad-hoofed horse type is formed under the conditions of softer ground typical highly bioproductive tundra-steppe and the forest-steppe.

Morphometric evidences

The metric comparison of the premolars, the sizes and proportions of the molars and the metapodials shows that *E. transilvanicus*, *Equus* sp., the smaller late *latipes*-type from Mezin and the larger *latipes*-type from the Don river form one group that differs to one or other extend from the tarpan type (the Holocene tarpans, Sveduv Stul and *E. scythicus*). The *E. spelaeus* with two subspecies, described by Samson (1975), evidently represent an artificial sum including the two described types. The Holocene tarpans probably have endured some Post Pleistocene degeneration and they are smaller than the Pleistocene ones. The Przewalskii horse is clearly differentiated with its extremely narrow metapodials (Spassov and Iliev, in print).

Taxonomic conclusions

The Late Pleistocene broad-hoofed horses in Eastern and Western Europe are very similar and probably belong to the same species, *E. germanicus* Reichenau, 1915, with several subspecies.

E. latipes sensu lato (probably consisting of two different taxonomic forms - early and late) perhaps represents a form of *E. germanicus* from the optimal east European habitats. Probably the successive migrations of these east European broad-hoofed horses toward Western Europe lead to the formation of local west European subspecies (fig. 2).

Both in the east and in the west the broad-hoofed horses become smaller at the end of the Pleistocene, but westward the degeneration is more expressed. There is no reason to consider the Romanian broad-hoofed horses (*E. transilvanicus*, *E. spelaeus* (pars), *E. sp.*) as different species. *E. transilvanicus* and *E. latipes* (especially its early form) show great morphologic and stratigraphic similarity. Probably, *E. transilvanicus* is identical with *E. latipes* of Kostenki. If this is true, the name of the east European broad-hoofed horse should be *E. germanicus transilvanicus* Teodoreanu, 1926. It is quite possible for the late *latipes* (the Desna river, Mezin and others) to be satisfactorily differentiated from the earlier one so as to form a separate subspecies: the very same one that has migrated

westward and has given the *arcelini* form (fig. 2).

Although the forms of the broad-hoofed horses dominate in the Late European Pleistocene, in Eastern Europe of the time another horse exists too. That is the tarpan - *E. gmelini*. The name *E. ferus* given by Boddaert in 1785 for the wild recent horse, though it is prior, has to be abandoned as shows Belan (1985), because of the rule concerning the forgotten names of the *International Code of the Zoological Nomenclature*. That is why the tarpan should have the name *E. gmelini* Antonius, 1912 (= *E. caballus gmelini* = *E. ferus gmelini* = *E. przewalskii gmelini*)⁽¹⁾. The tarpan is formed as a species still during the Pleistocene. The teeth morphology of *E. gmelini* resemble very much that of the Middle or Early Late Pleistocene *E. missi* M. Pavl., (according to a photograph of the specimen of Vernadsky Geological Museum, Moscow, kindly given to us by Dr. V. Eisenmann). *E. missi* could be the tarpan ancestor. The tarpan, as it seems, defers on species level from the broad-hoofed horse, which is confirmed by their coexistence. The two forms were found together in the Late Pleistocene remains of La Adam cave in Dobroudja (see *E. scythicus* and *E. sp.*; Samson, 1975) and perhaps in those of the Bacho Kiro cave. They existed simultaneously in the Early Holocene of Bulgaria and obviously as well of Romania and of the Northern Pontic region (see below). According to Kuzmina and Kasparov (1987) they have been found together in the Neolithic of Voronej region.

As far as both horses have probably been a part in the process of domestication (see below), the name *E. caballus* L. should be restricted only for the domestic horse.

The Tarpan in the European Holocene

The external morphology of this horse is known from the historical descriptions (Heptner *et al.*, 1961). As we have noted, except for the historical data, one skeleton and two skulls of a recent tarpan, there are separate sub-fossil remains from the Eastern European steppe, and probably from the Mesolithic of the Moravian steppe (Gromova, 1949; Bibikova and Belan, 1981; Kuzmina and Kasparov, 1987).

Data about the tarpan type horses from Bulgaria are shown and discussed in Spassov and Iliev (in print).

⁽¹⁾ Given, the changes in the latest issue of the *International Code of Zoological Nomenclature*, the abolishment of the Article on the forgotten names, the initially given name *Equus ferus*, Bodaert, should remain in use. Therefore, the used in the present paper junior synonym *Equus gmelini*, should be read *Equus ferus*. The use of the later name by Nobis (1971) for the Late Palaeolithic horses of Solutré and Mezin was not rather correct for taxonomic and nomenclature reasons (Samson, 1975; Belan, 1985).

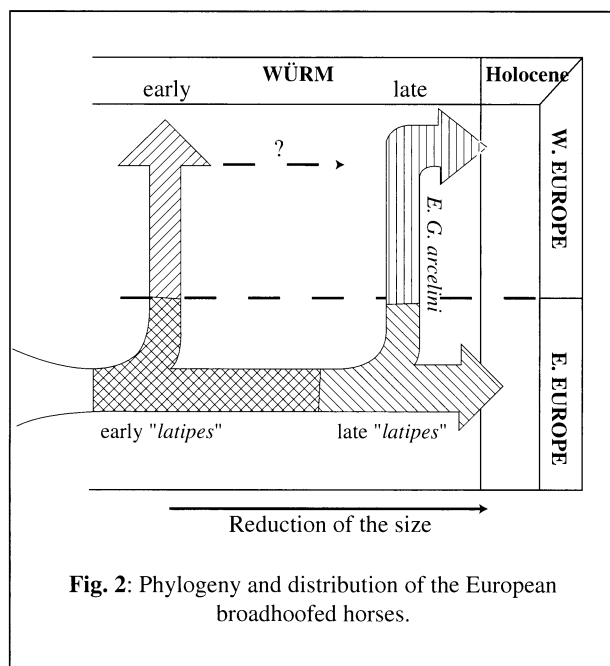


Fig. 2: Phylogeny and distribution of the European broadhoofed horses.

The broad-hoofed horse in the European Holocene

Contrary to the tarpan, which traditionally has been considered to be a recent horse as if suddenly appeared in the Holocene, the broad-hoofed horses are supposed to have disappeared in the end of glacial times. Because of insufficient data and unclear systematics of the subfossil European horse, the statements for discovered horses of "germanicus" type from the Early Holocene of Romania (Makarovici and Semaka, 1969) remain almost unconsidered. Samson (1975) notes as well that *E. sp.* (i.e. the *latipes* type) from the Late Würm of La Adam (Romanian Dobroudja) is being also found in the Mesolithic deposits. Moreover, even Gromova (1949) mentions about an Early Neolithic find near the Ladoga Lake with features of *E. "c. latipes"*. We may suppose that such north-western relict forest populations give ground to Matheus Sarmathius (1457 - 1523) and to Vetulani to speak about lived in historical time European forest "tarpans" and "wild ponies". The tarpan is not a forest horse, but the robust phalanges of the broad-hoofed horse adapted to soft forest-steppe ground indicate that exactly this horse could have survived within the forest biotopes of Central and Northern Europe.

Data about the "*E. latipes*" survival in the Early Holocene also of the Russian Plain were reported later (Kuzmina, 1989).

We have presented reliable data about the *latipes* type horse from the Holocene of Bulgaria as well (Spasov and Iliev, in print). They confirm once again that this horse survives in Eastern Europe till the Holocene. At the same time they show its existence at the time even more to the west and to the south of the Western Pontic region.

The polyphyletic origin of the domestic horse

The above facts and analysis show the coexistence of the tarpan and the broad-hoofed horse in the Holocene of Eastern Europe. This coexistence indicates that both species could have been part of the domestication process and thus gives us ground to suggest a polyphyletic origin of the domestic horse.

E. gmelini, which survived in a pure state or mixed with domestic horses in the area of the earliest domestication as late as the nineteenth century, certainly has been domesticated. Radulesco and Samson (1962) found the features of "*E. scythicus*" in the domestic horses of Romania from the tenth century AD.

We have some reasons to see morphological evidences for the domestication of the broad-hoofed horse. Eisenmann (1991b) and Eisenmann and Arbogast (1997) note that the horse from Dereivka have elongated first phalanges like the Mezin *latipes*, as well as other characterizing features. The massive sizes and proportions of the remains of the early domestic horses from the Early Bronze Age of Urdovisa 3000 - 2000 cal. BC in south-eastern Bulgaria give reason to Ribarov (1991) to suggest that they probably originate from the *latipes* horse.

Perhaps the origin from two different constitutional types at the beginning of the domestication robust (from the broad-hoofed horse) and slender (from the tarpan), is the precondition for the creation of two principal lines of domestic horses. Certainly, the numerous cross-breedings and the selection activity make it difficult to search for the ancestors' features in more recent breeds. These features should be searched in the period of early domestication.

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