

# Slivnitsa: a new bulgarian late villafranchian locality of vertebrate fauna and the mammalian dispersal events in Europe on the Pliocene/Pleistocene boundary

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## SUMMARY

It seems that Slivnitsa falls into the temporary cooling – known in Georgia as ‘the Meria cooling’ – registered within the frames of the Beregovka warming (2-1,82 million years). There is data that a refreshing of the Black Sea waters had taken place during the Meria. This suggests a temporary closing of the Bosphorus. The faunal contact with Asia Minor that followed may be one of the reasons for the high concentration of *Caprinae* species in Slivnitsa as well as for the appearance of *C. ex. gr. etruscus* and *P. cf. gombaszoegensis*. Probably Slivnitsa marks the earliest presence of *Panthera s. str.* in Europe and the first presence also (together with Seneze) of *Canis s. str.* on the continent. This fact could be explained by geographical location of Bulgaria – on the frontal position of the migratory route from the East via the Bosphorus.

A rich Villafranchian locality was recently discovered in a Karst cavern near Slivnitsa (Kozyaka area). It provides important faunal, zoogeographic and biostratigraphic information.

The *Bovidae* (and especially *Caprinae*) fauna is taxonomically extremely rich. Almost all known subfamily's genera from this time are represented. *Bovidae* obviously dominate over *Cervidae*. This indicates a prevalence of the open landscapes. Furthermore, that fact and other evidence concerning the taxonomic structure make Slivnitsa very close to the famous locality Seneze (France). We could place Slivnitsa at the beginning of late Villafranchian, but, in the same time, at the end of Pliocene (Seneze unit). The biostratigraphic unit of Seneze should be placed in zone MNQ18 as MNQ18-a1, before Olivola Unit (MNQ18-b) (beginning of the Pleistocene) and before the Olduvai episode (MNQ18-a2). We could name it MNQ18-a1.

The work describes *Panthera gombaszoegensis* and *Canis ex gr. etruscus* remains. Slivnitsa's Pliocene age, with those carnivores present suggests that their invasion into Europe from the east begins not in the Early Pleistocene (as usually considered), but by the end of Pliocene. It seems the *Panthera s. str.* remains

are the first in Europe – a fact which could be explained with Bulgaria's advanced geographic position related to the migration zone. This is exactly the time when mass mammal migrations begin from Asia probably with the Bosphorus temporarily closed as a result of the cooling recorded in climatochronological zone SCT10, where Slivnitsa belongs.

## INTRODUCTION

The investigations of the Villafranchian mammal faunas on the Balkans are very important for the clarification of the faunal dispersal events in Europe on the Pliocene/Pleistocene boundary. Up to now, these faunas are practically unexplored in Bulgaria. Two new and very rich Villafranchian localities were discovered recently in this country – that of Varshets (MNQ17) (18 large mammalian species) and that of Slivnitsa (Spassov, 1997). They give an important faunal and zoogeographical information.

## THE SLIVNITSA SITE AND ITS FAUNA

The site is a former cave in a limestone-quarry. The latter is situated in a hilly karst area (“Kozyaka”) within 30 km NW of Sofia, in close vicinity to the western part of the town of Slivnitsa.

The fauna is represented by the remains of 20 bird species (Dr. Z. Boev, National Museum of Natural History – Sofia, personal communication), by rodents (Dr. V. Popov, Institute of Zoology, Bulgarian Academy of Science – Sofia, personal communication) and by Macromammalia. The mammalian megafauna (Tab. 1) is studied on the basis of about 900 discernible bone fragments. (The *Bovidae* taxons are determined by Spassov and Cregut-Bonnoure (paper in preparation) and the rest – by Spassov). Unique is the gathering of *Bovidae* remains (9 species at least) and especially of *Caprinae* – 7 species at least from practically all genera known in Europe from that time. These remains are particularly valuable for the investigation of the poorly studied villafranchian *Caprinae* fauna of Europe. Among the remains *Bovidae* dominate markedly over *Cervidae*.

## BIOSTRATIGRAPHIC ANALYSIS OF THE FAUNA

The fauna of Slivnitsa shows similarities with a number of known West-European sites from the beginning of the Pleistocene, for example those from Olivola unit. The fauna from Slivnitsa shows a particularly close similarity to that from Seneze. The most recent analyses place Seneze together with the sites dated from the final phase of the Pliocene rather than from the beginning of the Pleistocene (Torre et al., 1993; Boeuf, 1997). However, this does not contradict with its being taken as a mark of the MNQ18 zone.

The data from the analysis of the rodents from Slivnitsa show the absence of true (hypso-dont) field-voles and the presence of their Pliocene ancestors. The tooth-morphotypes of the *Mimomys tornensis* correspond to an evolutionary stage placed probably just before the Pliocene/Pleistocene boundary (V. Popov, pers. comm.). This data places Slivnitsa in the Final Pliocene rather than in the beginning of the Pleistocene and as it seems, before the Olivola unit which begins approx. 1.7-1.64 million-year (Azzaroli, 1983; Torre et al, 1993). This circumstance together with the characteristics of the mammalian megafauna (the prevalence of the *Bovidae* over the *Cervidae*; the presence of the *Panthera s. str.* and the *Canis s. str.* genera) give us an opportunity to establish quite close time limits within which the fauna from the Slivnitsa site may be placed. At the same time this shows that some faunal phenomena often taken as characteristic for the beginning of the Pleistocene in Europe (Bonifay, 1990; Turner, 1992), in fact, start as early as the end of the Pliocene. These are the proliferation of the *Bovidae* (*Caprinae*) faunas as well as the entering into the continent of the *Panthera* and the *Canis* genera from the East. The faunal closeness between the Slivnitsa and the Seneze sites indicates again that the fauna characteristic for Seneze ("Seneze faunal unit" of Torre et al., 1992) should be placed at the end of the Pliocene but at the beginning of the Late Villafranchian).

In the period between St.-Vallier/Varshets and Seneze/Slivnitsa the aridity leads to the large-scale invasion of the *Bovidae* (*Caprinae*) mentioned above. With the appearance of some single species (for example *Pachycrocuta brevirostris*), the image of this more "steppe" succession is only affirmed between Seneze and Olivola. From the point of view of the biozonation of the fauna, a biozone MNQ18-A (end of the Pliocene – beginning of the Late Villafranchian) may be established for the Slivnitsa/Seneze Faunal unit and the Olivola unit should represent a MNQ18-B (the Pliocene/Pleistocene boundary) rather than the MNQ19 in which the Tasso faunal unit should be left (Spassov, in press; Fig. 3A). Slivnitsa will be placed more precisely in the first part of MNQ18-A: in MNQ18-A1 (pre-Olduvai cooling). The MNQ18-A2 could include the Olduvai episode (warming): sites Valea Graunceanului (Romania) (Fig. 3B).

#### THE *CANIS* AND *PANTHERA* REMAINS

The remains from members of the *Canis* and of the *Panthera* genera in the Slivnitsa fauna are of particular interest from biostratigraphic point of view.

#### *Canis ex gr. etruscus* Forsyth Major, 1877

Material: right upper C1 (SL100); right lower C1 (SL106); fragment (with preserved paraconæ and metastyl crista of a right upper P4 (SL104); distal fragment of a lower P4; tibia – dist. (SL103).

## COMPARISON AND DISCUSSION

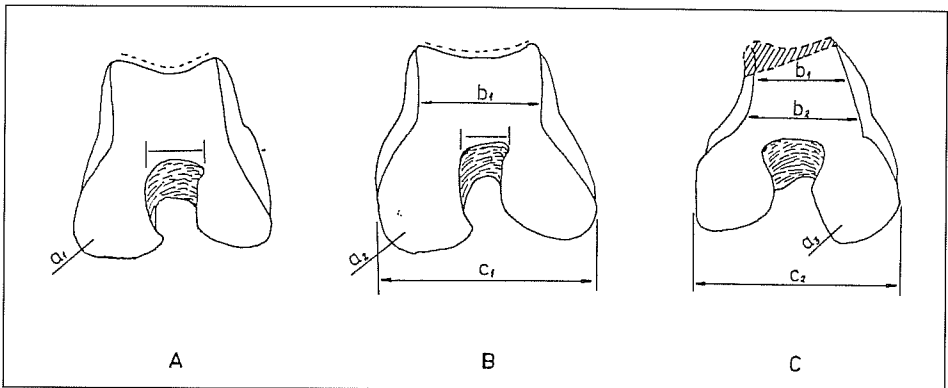
The stratigraphy of Slivnitsa as well as the dimensions (Tab. 2-4) and/or the morphology of the remains, show that they do not belong to any of the known Early Pliocene canids and that here we have *Canis sensu stricto*.

The lower canine corresponds to the smallest specimen from Slivnitsa and may belong to a *C. arnensis*. The upper P4 and possibly even the upper C1 correspond, as it seems, to large animals – weighting about 30 kg (one and the same specimen?) – which does not exclude their belonging to a small *C. falconeri*. However, the tibia is small for the latter species and big for the former one. The tibia together with the lower P4 should be of *C. etruscus*, and as it seems, it falls within the limits of the individual variability of this species together with all the other remains. It is not impossible that the different remains belong to two separate species (see the the next Ch.), but it is more logical to accept in this case that all remains belong to *C. etruscus*. The considerable dimensional differences between the individual remains may be explained by sexual dimorphism.

### THE HISTORY OF THE *CANIS* GENUS IN EUROPE: SLIVNITSA AND THE “*CANIS* EVENT”

With the *C. cipio* Crusafont, 1950, the existence of the *Canis* genus in Europe as early as the Late Miocene was accepted as well established until quite recently. The history of the genus in the Ruscinian fauna on the continent was associated with forms as those of the *C. adoxus* Martin, 1973 (accepted by some authors as *Vulpes*), *C. michauxi* Martin, 1973, and even with that of the enigmatic “*Vulpes*” *odessana* Odintzov, 1967. Most recently, the Early Pliocene “*Canis*” from Central Asia was separated in the more primitive genus *Eucyon* Tedford et Qiu, 1996, (also including the Turolian “*C.*” *monticensis* Rook from Italy and the “*V.*” *odes-*

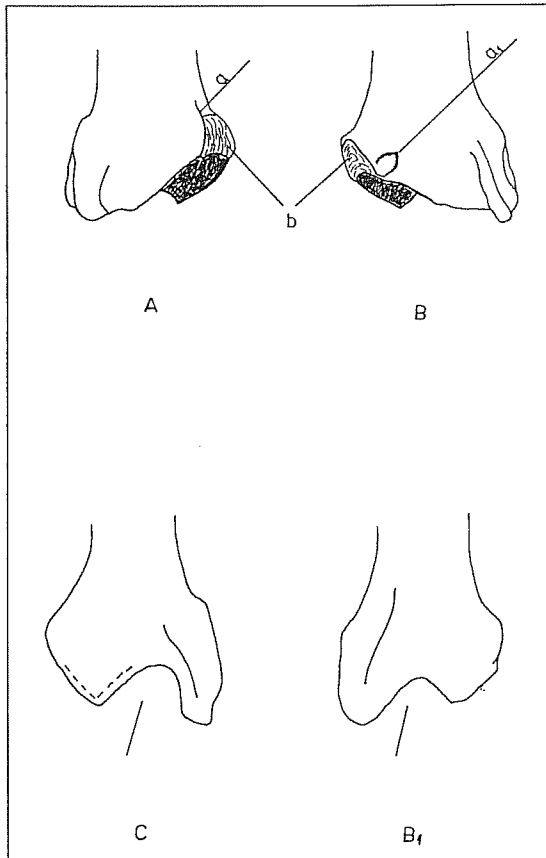
Fig. 1A, B, C.:



sana). At the same time, as it seems, the other European pre-Villafranchian *Canis*-like forms will turn also to be close to but different from *Canis* (Rook, 1992; Torre et al., 1992; Tedford and Qiu, 1996). If the others not very well known Eucyon-like forms as those of *C. adoxus* and *C. michauxi* really turn out to be different from *Canis s. str.*, we will have to accept that *Canis* had made its way to Europe at the beginning of the Late Villafranchian only – the so called “*Canis* event”.

The earliest certain appearance of *Canis s. str.* (*C. etruscus s. str.*) up to now is in Olivola (Torre et al., 1992; Rook and Torre, 1996). It is quite possible that the slightly later *C. mosbachensis* is just a subspecies of the species above.

Until now, the first appearance of *Canis sensu stricto* in Europe – the so called “*Canis* event” (Azzaroli, 1983; Torre et al., 1992; Turner, 1992), associated with the rush of the Asian wave of coyote-/wolf-like *Canis* – is earliest detected in Seneze and in Costa S. Giacomo (“Seneze faunal unit”) and most clearly in the slightly later “Olivola unit”. (As judged from the teeth-dimensions, the elongated rostrum



and the big diastema between the teeth, the problematic *C. senezensis* Martin may turn out to be identical not so much with the *C. etruscus* as with the *C. arnensis* Del Campana. Stratigraphically Seneze is placed earlier than Tasso where the *C. arnensis* appears. However, it should not be forgotten that Koufos (1987) identifies the canid from Gerakarou as a *C. arnensis*. The fauna of this site is biochronologically close to that of the sites from “Olivola unit” and is obviously older than that of Tasso).

Indeed, Kurten and Crusafont Pairo registered earlier the presence of *C. falconeri* – in P. de Valverde (MNQ17) – by the presence of one upper P3 and several other tooth-fragments. However, Masini and Torre

Fig. 2A, B, C.

followed by Rook (1994) have some doubts as to the belonging of these fragments to *C. falconeri*. In our opinion, the remains are indeed wrongly determined. In fact, the tooth assumed as P3 may be interpreted as a lower P4.

It should be also noted that the find from Costa San Giacomo is of not very certain stratigraphic position and it is possible that it is not earlier than that from Olivola (?). The stratigraphic place of Seneze is still disputable. A number of authors distinguish two stratigraphic levels in this site (Dr. V. Eisenmann, Mus. Natl. Hist. Natur., Lab. Pal.-Paris: personal communication). However, we have to point out that according to the most recent studies – including our comparisons – the main (earliest) level of Seneze belongs to the final phase of the Pliocene (Boeuf, 1997) and is comparable to Slivnitsa.

Considering the disputable points mentioned above, it may turn out that Slivnitsa is probably the earliest site marking the Late Villafranchian “*Canis* event” in Europe. At the same time it places the rush in Europe of the small wolf-like primitive forms from the East in the final phase of the Pliocene rather than in the Early Pleistocene. We have also to point out, that we can include Seneze in the final Pliocene, but not in the MNQ17, as it is noted by Rook and Torre (1996). So, the first appearance of *Canis s. str.* (Slivnitsa/Seneze is in MNQ18-a (see Ch. Biostratigraphy).

### *Panthera cf. gombaszoegensis* (Kretzoi, 1938)

**Material** (Col. Natl. Mus. Nat. Hist.-Sofia): Left femur dist. (SL107); left tibia dist. (SL102). Provisionally we may also add here tibia prox. and epistropheus.

## COMPARISON AND DISCUSSION

The remains are clearly distinct from *Hyaenidae* and *Ursidae* and bear felid features. Most probably, these are remains of one and the same specimen – presumably a female – recently grown up with an approximate weight of 85-90 kg. (Tab. 5 and 6).

– Comparison with *Megantereon megantereon* (a specimen from Seneze, Basel Museum of Natural History)

The femur of *Megantereon*: In spite of the wider distal extremity, the trochlea is narrower even in absolute dimensions. In spite of some deformations of the fossil bone, it is notable that the trochlea is narrowing in proximal direction in contrast to the case of SL107. As a result of this and because of the bigger width of the area of the condyls, the distal surface of the bone has a subtrapezium-like shape with a very broad base. The condyls are more asymmetrical and the medial one projects more in caudal direction (Fig. 1C).

The tibia dist. of *Megantereon* – It differs from SL102 by the existence of a longitudinal crest instead of tuberculum on the caudal surface just above the lateral joint facette of the cochlea and by the existence of two instead of three

longitudinal crests on the caudo-mesial surface just above the joint (Fig. 2A). The medial one of these tree crests in *Panthera* may vary in size and is often heavily reduced but is still present.

– Comparison with *Acinonyx pardinensis* (a specimen from Perrier; a cast, coll. MNHN-Paris):

The femur of *A. pardinensis*: the trochlea is narrower, taller and more concave. A longitudinal crest for muscles insertion is formed on the lateral surface above the *condylus lateralis*. The distal end is longer in cranio-caudal direction. *Fossa intercondylaris* is wider (Fig. 1A) (these features are also similar in the contemporary cheetah). The diaphysal part of the bone is more graceful.

The tibia of *A. pardinensis*: The tuberculum on the caudal surface, above the lateral facette of the cochlea existing in SL102 (Fig 2B) is practically absent here (it is quite weak in the recent cheetah). The surface of the joint has different proportions – a smaller mesio-lateral and a bigger cranio-caudal diameters than those of SL102. The incisura on the cranial surface of the distal end (mesial in respect to malleolus medialis) is very broad (Fig. 2C).

– Comparison with *Panthera*:

The features of both bones are very similar to those of the *Panthera* genus species. The tibia particularly resembles that of the tiger but has a more developed supratrochlear tuberculum (see above, Fig. 2B). The femur has mixed features – of a lion and of a jaguar (however, according to Hemmer, the tooth-features of *P. gombaszoegensis* also show such mixt characteristics). The leopard is distinct to the greatest extent from SL107, particularly regarding the proportions between the medial and the lateral length of the femoral distal end (the development of the trochlear rims).

As judged from one deteriorated fragment from La Breche de Château, the shape of the trochlea in *P. gombaszoegensis* is very similar to that of SL107.

The remains may be assigned to the smaller and older Villafranchian subspecies of *P. g. toscana*. Up to now, only the scarce remains from Escale, La Breche de Château (France) and Palan-Tiukan (Azerbaijan), as well as a rather uncertain remain from Laetoli (Tanzania), are associated with the postcranial skeleton of *P. gombaszoegensis*. Judging from the remains from Slivnitsa, the Villafranchian form had been rather a slender and running steppe form.

#### THE SLIVNITSA SITE AND THE EARLY MIGRATION OF THE *PANTHERA* GENUS

As it seems, Slivnitsa marks the earliest presence of *P. gombaszoegensis*. The latter is registered in Tegelen (2.2-1.7 million years) but it looks as if it comes from the upper strata (Turner, 1992). Until now, the earliest more certain find of carnivore of prey was from Olivola, Italy (beginning of the Early Pleistocene) (Torre et al.,

1992; Turner, 1992). This leads us to the suggestion that it is possible to register in Eastern or South-Eastern Europe some migration phenomena from the East even though a little bit earlier.

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