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THE PALAEOECONOMY OF GUMELNIȚA COMMUNITIES ON THE TERRITORY OF ROMANIA

Abstract: Articolul reprezintă o sinteză realizată pe baza materialelor faunistice studiate din stațiunile Gumelnița. Cultura Gumelnița este relativ bine studiată prin prisma numărului de așezări care au beneficiat de analize arheozoologice. Astfel de la cele 16 stațiuni luate de noi în considerație (Bordușani, Bucșani, Carcaliu, Căscioarele, Chitila, Drăgănești-Olt, Gumelnița, Hârșova-*tell*, Însurăței, Luncavița, Măriuța, Năvodari, Șeinoiu, Tangâru, Vitănești, Vlădiceasca) provin 24 de eșantioane faunistice. Cantitatea mare de materiale paleofaunistice, precum și numărul mare de așezări studiate relevă strategii de exploatare ale mediului animal extrem de variate și de diferite. O caracteristică a culturii Gumelnița este faptul că ponderea vânătorii crește la cote neașteptate pentru eneoliticul dezvoltat. În cadrul activității de creștere a animalelor, bovinele sunt predominante în majoritatea așezărilor preistorice. Locul secund este disputat de către ovicaprine și suine a căror pondere variază în limite destul de mari. Ponderea crescută a porcinelor sugerează în perioada eneoliticului dezvoltat existența unor comunități sedentare, stabile, care exploatează din punct de vedere paleoeconomic un anumit teritoriu (regiune) dar care totuși prezintă strategii diferite ce diferă de la o zonă la alta. Astfel, credem că se poate surprinde o evoluție la sfârșitul perioadei eneolitice în sensul trecerii de la niște comunități cu o oarecare mobilitate, caracteristică surprinsă de Alexandra Bolomey (1983) încă de la primele sinteze arheozoologice, la altele sedentare, marcate indubitabil de apariția *tell*-urilor.

Keywords: eneolithic, Gumelnița culture, faunal materials, archaeozoological analyses, palaeoeconomy.

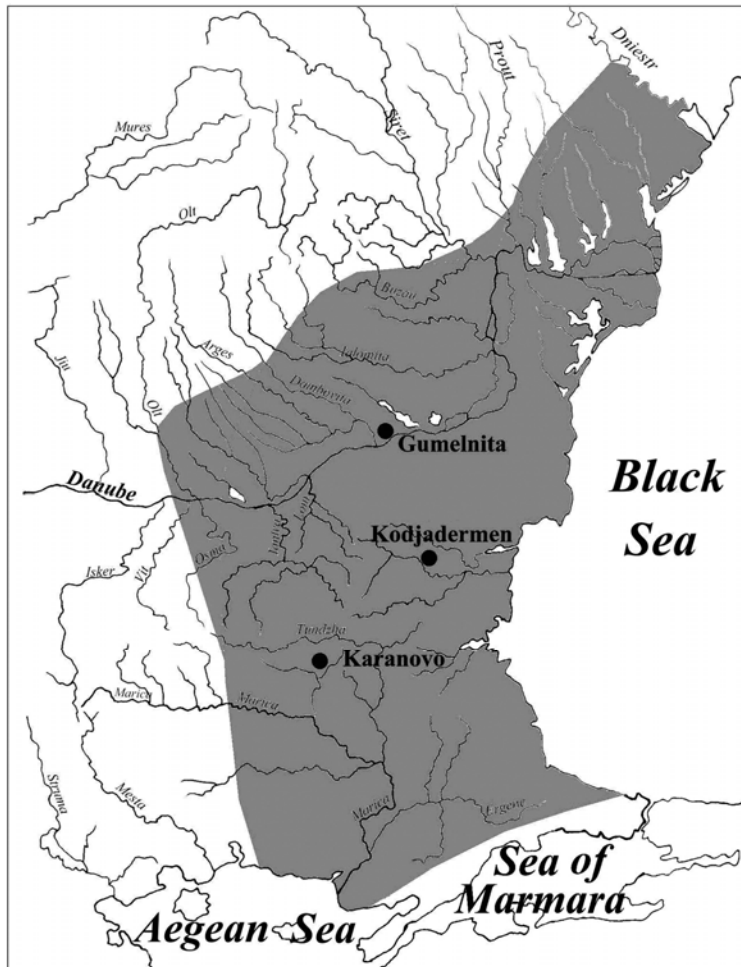
The Gumelnița culture belongs to the Late Eneolithic and dates between about 4,600/4,500–3,800/3,700 BC according to the chronology presented by Mircea Petrescu Dâmbovița (2001: 154), which broadly corresponds with the one proposed by Vladimir Dumitrescu (Dumitrescu et al. 1983; Dumitrescu, Vulpe 1988). This culture emerged on a background provided by the earlier cultures Boian, Hamangia and Marița (Karanovo V). Geographically it was spread over a wide area covering the southern and south-eastern regions of Romania (north-eastern Oltenia, Muntenia, Dobrogea, southern Moldova), the neighbouring regions of the Republic of Moldova and Ukraine, and the eastern part of Bulgaria, where it is known as Kodjadermen and Karanovo VI (Map 1). Within this area diverse regional variants can be found. Two main phases can be distinguished in the evolution of the Gumelnița culture: phase A and phase B, each with two stages. The second stage of the last phase (Gumelnița B2) is attested only in the hills of Muntenia and is known as the Brătești aspect (*Istoria Românilor* 2001: 156).

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1. Material

In the following we present the Gumelnița sites where faunal studies have been conducted allowing for characterization of this culture from a zooarchaeological perspective (Map 2). Because in some of the sites more than one Gumelnița cultural phase/stage were identified, the sites are arranged by cultural affiliation and alphabetically order. In the case of settlements that produced faunal materials from several archaeological levels, materials from all levels are discussed where the settlement is presented based on the oldest level occurring in it. Much of the archaeological research was carried on along many campaigns, by different archaeologists, and sometimes with time lapses of tens of years between them (e.g., Luncavița). Accordingly, the sampling methods and the analysis of zooarchaeological material by different authors show differences that hindered a holistic approach for some sites. In such cases the results of faunal analyses of each author/authoring team are presented separately.



Map 1. The area covered by Gumelnița culture.

1.1. Gumelnița A1

Luncavița (LuncG/Lunc)¹, point *Cetățuie*. *Tell* situated on a salient of the Danube River terrace 4.5 km southeast of Luncavița (Tulcea county). Diameters at base are 70x40 m and the height is 7-12 m.

Archaeological research has been undertaken by Eugen Comșa in 1951 and 1959 (Comșa 1952, 1953, 1962, 1971). Stratigraphically, the tell has six Gumelnița A occupational levels totalling 3.5 m of thickness. Hallstattian pottery fragments and five feudal graves dated to the 18th century were also discovered (Comșa 1962). Comșa (1962) attributed the lower levels (without specifying which) to the A1 phase, and upper levels to the A2 phase. Starting in 1999 excavations were resumed at Luncavița by Cristian Micu (Micu, Maille 2002).

An initial lot of faunal remains, unfortunately not detailed by cultural phases (LuncG), has been studied by Sergiu Haimovici and Geanina Dardan (Haimovici, Ghiorguiu 1969; Haimovici, Dardan 1970). Upon resuming of excavations by Micu, the Gumelnița A2 faunal material (Lunc) was studied by Adrian Bălășescu and Valentin Radu (Bălășescu 2003; Radu 2003a, 2003b) (table 1).

Vlădiceasca (VlaG), point *Ghergălăul Mare*. Neo-Eneolithic *tell* situated in the floodplain of Mostiștea River, southwest of Vlădiceasca (Valea Argovei, Călărași county).

The archaeological research has been undertaken by George Trohani and Done Șerbănescu between 1973-1984 (Trohani 1975; Șerbănescu, Trohani 1978).

Faunal material belonging to the Gumelnița culture (phases A1, A2, B1) has been studied in a first stage by Mircea Udrescu and then by Dragoș Moise (Moise 2000a, 2000b; Udrescu and Moise unpublished data) (tables 1 and 2).

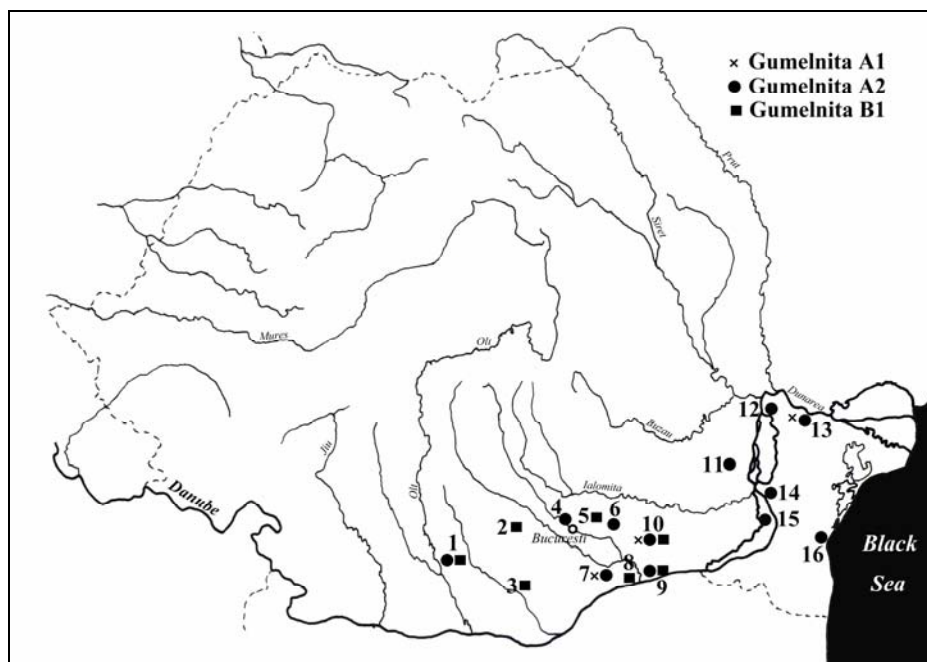
1.2. Gumelnița A2

Bordușani (Bord), point *Popina*. *Tell* situated in Balta Ialomiței (a floodplain island bordered by the Borcea channel and Danube River), about 2.5 km northeast of Bordușani (Ialomița county). The *tell*, of oval shape, is 180x70 m in diameter at base and 15.4 m high, and was formed on an erosional remnant.

Archaeological excavations started in 1986 conducted by a team led by Silvia Marinescu-Bîlcu, George Trohani and Gheorghe Matei. They continue at present, conducted by a team led by Dragomir Popovici (Popovici et al. 2003), using a method implemented for the first time at Hârșova-*tell* (Randoiu et al. 2000; Popovici et al. 2002). At the base of the *tell* there are vestiges of Boian occupation, followed by the Gumelnița A2 level, which has the greatest stratigraphic thickness (Marinescu-Bîlcu 1997; Marinescu-Bîlcu et al. 1997). Overlying the Gumelnița A2 level there are archaeological vestiges attributed to the Cernavoda II, Hallstatt and La Tène periods, as well as a sarmatic grave (Marinescu-Bîlcu 1997; Trohani 1997).

The faunal material from the Gumelnița A2 level (table 1) has been studied by a team, as follows: mammals – Dragoș Moise (Moise 1997, 2000a, 2000b) and Adrian Bălășescu and collaborators (Bălășescu et al. 2003a); birds – Eugen Kessler and Erika Gál (Kessler, Gál 1997; Gál, Kessler 2002, 2003); reptiles – Marton Venczel (Venczel 1997); fish – Valentin Radu (Radu 1997, 2003c and unpublished data); molluscs – Andrei Sárkány-Kiss and Florina Boloș (unpublished data).

Carcaliu (Car), point *Vadu Mare*. The settlement is situated on a hilltop in the immediate vicinity of the Danube River floodplain, 2.5 km southeast of Carcaliu (Tulcea county).



Map 2. Geographical distribution of the Gumelnița settlements (phases A1, A2, B1):

1. Drăgănești-Olt, 2. Bucșani, 3. Vitănești, 4. Chitila, 5. Măriuța, 6. Șeinoiu,
7. Tangâru, 8. Căscioarele, 9. Gumelnița, 10. Vlădiceasca, 11. Însurăței,
12. Carcaliu, 13. Luncavița, 14. Hârșova tell, 15. Bordușani-Popină, 16. Năvodari.

Archaeological excavations conducted by Elena Lăzurcă between 1980-1985 identified only one cultural level, about 30-60 cm thick, dated toward the end of phase A2 of the Gumelnița culture, and revealed that occupation lasted only for a short period of time. Gumelnița B1 potsherds representing the only attestation of this phase of the Gumelnița culture in Dobrogea were also uncovered by these excavations (Lăzurcă 1984).

The Gumelnița A2 faunal material has been studied by Sergiu Haimovici (Haimovici 1996) (table 1).

Chitila (Chi), point *Fermă*. The site lies on the right bank of Colentina River, northwest of Chitila (Ilfov county).

In 2002 a section was reopened at the north edge of the *tell*, resuming the rescue excavations conducted between 1982-1985 by Vasile Boroneanț (Boroneanț 1993). The cultural level investigated was dated as Gumelnița A2 and artefacts belonging to the Boian and Tei cultures were discovered (Boroneanț 2000).

The faunal material of the Gumelnița A2 level (table 1) has been studied by Adrian Bălășescu and collaborators (Bălășescu et al. 2003b).

Drăgănești-Olt (DO GA/DO GB), point *Corboaița*. *Tell* located on the right bank of Sâi Creek (Olt county).

The greatest part of archaeological deposits belong to the Gumelnița culture (phases A and B); the last cultural level is attributed to the Sălcuța IV period (Nica et al. 1995).

The faunal material from the two Gumelnița phases (A2 and B1) has been studied by Georgeta El Susi (El Susi 2002) (tables 1 and 2).

Gumelnița (GumA/GumB). The eponymous site of the Gumelnița culture is a *tell* (*Măgura Gumelnița*) situated on a rounded hillock set apart from the high terrace of Danube River, about 5 km east of Oltenița (Călărași county).

Archaeological research was undertaken by Vladimir Dumitrescu in 1925 and 1960. The *tell* has an area of about 2 ha and includes three Gumelnița A2 levels with a total thickness of 3 m, overlain by a Gumelnița B1 level. The discovery of some Boian potsherds may indicate that an older layer, belonging to this culture, could exist in the unexplored portions of the *tell* (*Enciclopedia arheologiei ...* 1996: 207-208).

The Gumelnița A2 and B1 faunal material has been studied by Olga Necrasov and Sergiu Haimovici (Necrasov, Haimovici 1966) (tables 1 and 2).

Hârșova (HvaG). Neo-Eneolithic *tell* situated on the right bank of Danube River, in the south-eastern outskirts of the town of Hârșova (Constanța county). It is noteworthy that this is one of the largest *tells* in Europe, the archaeological deposits measuring approximately 12 m of thickness. Formed on a rock basement, the *tell* had diameters of about 200x150 m in the past. Later, the Danube River shifted its course to the north, eroding more than a half of the *tell*. Chronologically, the stratigraphy is as follows: Boian-Vidra at the bottom, overlain by Boian-Spanțov with a strong Hamangia III presence, Gumelnița A1, Gumelnița A2 and topped by a Cernavoda I layer (Galbenu 1962, 1966; Popovici et al. 1992, 2000; Hașotti 1989, 1997).

Ongoing archaeological research was started by Doina Galbenu (1961-1963, 1971, 1975, 1985), continued by a team led by Dragomir Popovici and Puiu Hașotti (between 1985-2000) and from 2001 up to present by a team led by Dragomir Popovici. Starting in 1993, research is conducted under the auspices of a Romanian-French archaeological cooperation programme (Popovici, Rialland 1996), marking the beginning of complex interdisciplinary studies.

The Gumelnița A2 osteologic material belonging to mammals has been initially studied by Alexandra Bolomey by Dragoș Moise between 1993-2000 (Moise 2000a, 2000b, 2000c) and by Adrian Bălășescu and Valentin Radu (unpublished data) starting with 2001 (table 7). It is important to note that the zooarchaeological material recovered from this settlement has benefited by specialised studies (tables 3-6) of malacology (Sárkány-Kiss and Boloș unpublished data), ichthyology (Desse-Berset, Radu 1996; Haită, Radu 2003; Radu 2000, 2003b) and ornithology (Gál, Kessler 2002). The coprolites had also been subject of study (Tomescu 2000a; Tomescu et al. 2003).

Însurăței (Ins), point "Popina I". *Tell* formed on an erosional remnant, in the floodplain of Călmățui Creek, 7 km north of Însurăței (Brăila county). The *tell* is 250 m long and 11 m high, and is divided into two zones (conventionally named Popina IA and Popina IB) by a trench approximately 20 m wide and 3.5 m deep.

Archaeological research started in 1994 and is ongoing, conducted by Stănică Pandrea, Valeriu Sîrbu and Marian Neagu. The *tell* harbours neo-eneolithic vestiges belonging to the Boian culture, phase Giulești, and Gumelnița culture, phase A2, the latter being the best represented in terms of thickness of the archaeological deposits. A sporadic getic occupation was also documented (Pandrea et al. 1997, 1999; Sîrbu et al. 1997).

The Gumelnița A2 faunal material (table 1) has been studied by Dragoș Moise (Moise 1999) and Valentin Radu (Radu 1999).

Năvodari (Năv). Eneolithic *tell* located on the *La Ostrov* islet, on Tașaul lake (Constanța county). It has an ellipsoidal form, with diameters of 250x120 m at base and a height of about 4.6 m.

Archaeological research started in 1999, conducted by a team led by Valentina Voinea and Silvia Marinescu-Bîlcu. The cultural level investigated was dated to the Gumelnița A2 period (Marinescu-Bîlcu et al. 2001).

The Gumelnița A2 faunal material (table 1) has been studied by Dragoș Moise (Moise 2001a) and Valentin Radu (Radu 2001).

Șeinoiu (Sei). Eneolithic settlement situated on the high terrace of Mostiștea River, 6 km south of Târnăveni (Călărași county). The settlement is surrounded by steep slopes on three sides and an old riverbed lies in immediate vicinity.

Archaeological excavations were undertaken by Mihai Șimon between 1981-1984 and two Gumelnița occupational levels (phases A2 and B1) were identified (Parnic et al. 2002).

The Gumelnița A2 faunal material (table 1) has been studied by Dragoș Moise (Moise 2000a, 2000b).

Tangâru (TanG), point *Măgura*. Eneolithic *tell* formed on an erosional remnant in the floodplain of Călniștea Creek, northeast of Tangâru (Giurgiu county). It is likely that Călniștea Creek flowed right at the base of the *tell* in the past, surrounding it from three sides. Presently the creek flows about 500-600 m south of the *tell* which has diameters of 90x50 m at base and a height of 9-10 m.

Archaeological research was conducted by Dumitru Berciu between 1933-1957. The 21 archaeological levels identified have a total thickness of 4 m and provided the framework for the initial subdivision of the Boian and Gumelnița cultures. Sparse material dated as Gumelnița "IV", Cernavoda I and early Bronze Age was also discovered (Berciu 1935, 1959a, 1959b).

The faunal material of the Gumelnița levels (table 1) has been studied by Olga Necrasov and Sergiu Haimovici (Necrasov, Haimovici 1959). Those authors also performed a comparative analysis of zooarchaeological material representing the Boian and Gumelnița cultures. Unfortunately, species frequencies of wild mammals are not given by cultures, so that except for a horse phalange 1 reported from the Gumelnița II b level we do not know which of the species identified were found in the Gumelnița material.

Vitânești (Vit), point *Măgurice*. Eneolithic *tell* situated in the floodplain of Teleorman River, in a marshy area, near Vitânești (Teleorman county). The diameter is about 40-45 m at base and the height is 5.5 m.

Archaeological research started in 1993, conducted by a collective led by Silvia Marinescu-Bîlcu, and after 1996 led by Radian Andreescu. Excavations ascertained that the archaeological deposits belong to the Gumelnița culture, phases A1, A2 and B1 (Andreescu et al. 2001, 2003).

Only Gumelnița A2 (Moise, Bălășescu, Radu, unpublished data) and Gumelnița B1 (Bălășescu, Radu 2003; Kessler, Gál unpublished data) faunal material was studied (tables 1 and 2).

1.3. Gumelnița B1

Bucșani (BucG), point *La Pod*. *Tell* situated in the floodplain of Neajlov River, between the riverbed (at about 75 m of current bed) and the left terrace, 300 m south of the Bucșani village outskirts (Giurgiu county). The *tell* was formed on a sand bank, has diameters of 67x56 m at the base, and a stratigraphic thickness of 2.80 m.

Rescue archaeological excavations were conducted since 1998 by Cătălin Bem, in the area where a bridge over Neajlov River is planned. The settlement was dated Gumelnița B1 and also includes a short post-Gumelnița occupation dating to the Bronze Age (Marinescu-Bîlcu et al. 1998; Bem et al. 2002; Haită 2002).

The faunal material of the Gumelnița B1 layer (table 2) comes from the cultural level and from four dwellings, and has been studied by Adrian Bălășescu (Bălășescu 1998) and Valentin Radu (unpublished data).

Căscioarele (CasG). *Tell* located on an islet (*Ostrovelul*), in a gulf of the former Cătălui lake, in the vicinity of Căscioarele (Călărași county). The *tell* has 57x103 m in diameter at base and consists of neo-eneolithic cultural layers with a cumulated thickness of 5 m.

At the base there is a Boian-Spanțov level, followed by Gumelnița levels attributed to phases A2 and B1 (Dumitrescu 1986). Archaeological research was conducted by Gheorghe Ștefan in 1925 and Vladimir and Hortensia Dumitrescu between 1962-1969.

The Gumelnița faunal material has been studied by Alexandra Bolomey (Bolomey 1964, 1968, and unpublished data). However, these published studies only introduce general considerations and present preliminary results on the material, without detailing the number of remains or the minimal number of individuals for the identified species (tables 1 and 2). For this reason here we are presenting only Bolomey's unpublished data on the Gumelnița B1 material, which include species frequencies, detailing both NR and MNI (tables 8 and 10). The presence of bivalves, fish and tortoises is mentioned without specification of numbers. Only the total number of remains (1129) is given for the Gumelnița A2 material.

Măriuța (Măr). Eneolithic settlement situated 250 m northeast of Măriuța (Călărași county), on a salient of the Mostiștea River terrace.

Excavations conducted here by Mihai Șimon between 1984-1991 revealed the two archaeological levels, Gumelnița A and B (Șimon, Paveleț 2000). In 2000 excavations were resumed by Valentin Parnic, Dumitru Chiriac and Eugen Paveleț, and the upper (Gumelnița B1) level was investigated (Parnic, Chiriac 2001; Parnic et al. 2002).

The faunal material from Gumelnița B1 level (table 2) has been studied by Dragoș Moise (Moise 2001b).

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As one can see from the above, the Gumelnița culture is relatively well studied from a zooarchaeological perspective. A total of 16 sites (Borduşani, Bucşani, Carcaliu, Căscioarele, Chitila, Drăgănești-Olt, Gumelnița, Hârșova, Însurăței, Luncavița, Măriuța, Năvodari, Șeinoiu, Tangâru, Vitănești and Vlădiceasca) have produced 24 faunal lots. The disparity of these numbers results from the fact that many of the archaeological sites are pluri-stratified (*tell*-type), containing more than one phase/stage of Gumelnița occupation, and the faunal lots consist of material belonging to only one Gumelnița stages/phase each. Settlements that provided more than one faunal lot are: Căscioarele (A2 and B1), Drăgănești-Olt (A2 and B1), Gumelnița (A2 and B1), Vlădiceasca (A1, A2 and B1) and Vitănești (A2 and B1). Some of the settlements, like Borduşani and Luncavița, have hosted several zooarchaeological analyses, done by different workers, in time.

The distribution of the faunal lots by Gumelnița cultural phases is rather uneven. For Gumelnița A1 only one faunal lot has been studied: that of Vlădiceasca, comprising 483 remains. Gumelnița A1 levels are also present at Luncavița, but rather that being analysed separately by cultural phases, the

material was pooled together (phases A1 and A2) at this site (Haimovici, Gheorghiu 1969; Haimovici, Dardan 1970). Availability of only one studied faunal lot for Gumelnița A1 precludes discussion of the animal economy of this period.

By contrast, the Gumelnița A2 phase can be characterized based on 15 faunal lots. Quantitatively these lots vary widely, from some tens of remains at Șeinoiu (NR=97), to more than two hundred thousand at Hârșova (NR=283,492). The most complete Gumelnița A2 faunal lots are those of Bordușani (Moise 1997, 2000a, 2000b; Radu 1997, 2003; Bălășescu et al. 2003; Kessler, Gál 1997; Gál, Kessler 2002, 2003; Venczel 1997, Sárkány-Kiss and Bolos unpublished data), Hârșova (Moise 2000a, 2000b, 2000c; Radu 2000, 2003; Desse Berset, Radu 1996; Gál, Kessler 2002; Haită, Radu 2003; Sárkány-Kiss and Bolos unpublished data), Luncavița (Bălășescu 2003; Radu 2003a) and Năvodari (Moise 2001a; Radu 2001). These lots allow for complex and detailed studies of the main economic activities of the Gumelnița communities. A broad spectrum of animals has been documented at these sites: bivalves and gastropods, crustaceans, fish, reptiles, birds and mammals. Collection of remains representing very small animal species was made possible by sieving of the archaeological sediment which served diverse research purposes, including seasonality studies (Radu 2000; Tomescu et al. 2003).

A total of seven faunal lots have been studied to date for the Gumelnița B1 period. Exception for the Bucșani settlement, where some of the material was sieved, all other material was obtained by direct collection during excavations. Because of that, particular aspects of the palaeoeconomy (e.g., fishing) cannot be assessed in detail. These lots nevertheless provide valuable data on mammal husbandry and hunting.

Comparison of the Gumelnița A2 and B1 faunal material, both well represented quantitatively, shows that differences in the representation of the different classes of animals directly reflect differences in sampling methods. The totality of the Gumelnița A2 material considered comprises over 350,000 remains, of which 77,2% represent fish, followed by mammals, molluscs and other classes (Fig.1). It is noteworthy that almost 79,6% (283,492 remains) of the Gumelnița A2 material comes from the excavations at Hârșova. By comparison, the Gumelnița B1 material comprises only 17,000 remains, in which mammals are predominant (88,4%), followed by molluscs, fish and other classes (Fig.2).

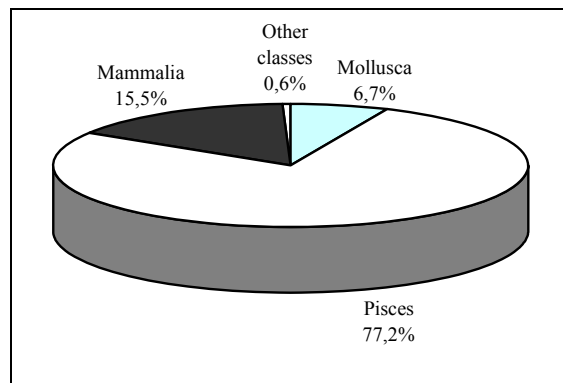


Fig.1 Faunal spectrum (percentages) of the Gumelnița A2 material by animal classes for (NR=356,010). Other classes: Scaphopoda, Crustacea, Amphibia, Reptilia and Aves.

The marked quantitative and qualitative differences between the Gumelnița A2 and B1 faunal material are explained by the fact that the four most complete faunal lots representing the Gumelnița A2 phase come from settlements situated in the vicinity of large bodies of water (three are near the Danube River – Bordușani, Hârșova and Luncavița – and one near the Black Sea, on a lagoon islet – Năvodari), which are also the sites where the archaeological sediment was extensively sieved. This resulted in the collection of a great number of fragments of small dimensions representing especially fish and molluscs. By contrast, sediment was sieved in only one station of the Gumelnița B1 phase, at Bucșani. Interestingly, although this settlement is located near a comparatively small river, sediment sieving resulted in higher frequency of fish remains.

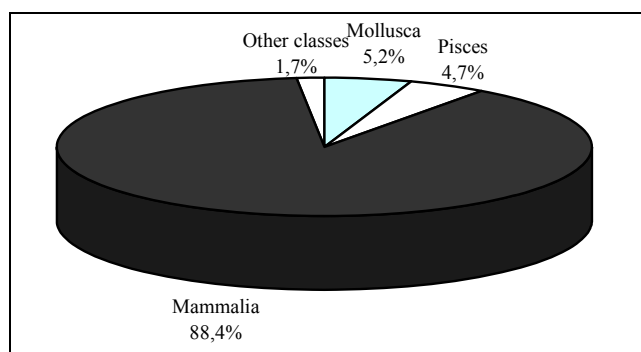


Fig.2 Faunal spectrum (percentages) of the Gumelnița B1 material by animal classes for (NR=17,740). Other classes: Scaphopoda, Amphibia, Reptilia and Aves.

2. Aspects of the animal economy

2.1. The gathering of molluscs for consumption was an activity present along the entire time extent of Gumelnița culture, as demonstrated by the frequency of shells in many settlements (tables 3 and 4). Depending on the method of collection of animal remains during excavation, detailed information on the use of molluscs is available only for a few of the settlements – Bordușani, Hârșova and Luncavița. Freshwater shellfish, especially genus *Unio*, are the best represented, their remains being found by the tens of thousands in the middens of Hârșova-*tell*. Here, biometric analysis of these remains was undertaken, together with a detailed study of the characteristics and seasonal patterns of harvesting of these animals (Radu 2003b; Bălășescu, Radu 2004). The impressive accumulations of shells (of up to half a tonne) discovered at Hârșova-*tell* (Bălășescu et al. 2004) are undoubtedly the result of intensive gathering. The shells were sought after especially by the communities living near the Danube Rivers or other big rivers, where they were abundant. These animals represented an important alternative food source in the warm season, when other sources (such as the domestic stock) had to be spared for more difficult times. *Unio* shells were also used for manufacturing adornments, such as beads, pendants etc.

A remarkable finding is the discovery, at Bordușani and Hârșova, of perforated valves of a marine shell, *Cardium* (*Cerastoderma*) *edule*, coming from the Black Sea (Moise 2000a). In these two sites and at Vitănești (Moise 2000a; Bălășescu, Radu

2003) *Dentalium* shells have been also found, most of them processed. These probably came from the Mediterranean rather than from the Black Sea. Such vestiges are very likely proofs of trade with other communities, or may indicate the ancestry of the communities inhabiting these settlements.

Gastropods have a much lower representation. Many of these have been brought accidentally in the settlements, and only two species: *Helix pomatia*, of the terrestrial snails, and *Viviparus acerosus*, of the aquatic snails, seem to have been consumed (Sárkány-Kiss and Boloş unpublished data).

2.2. Fishing. Although the studied materials (table 6) do not allow for in-depth assessment of the importance of fishing for many of the settlements, the complex archaeo-ichthyological analyses conducted at some of them (Borduşani, Bucşani, Hârşova, Luncaviţa, Năvodari) reveal the importance of this activity. The Gumelniţa communities captured fish living in the nearby rivers, lakes and lagoons. The greatest taxonomic variety (19 species) is documented at Hârşova-*tel*. The dimensions of the fish captured are generally large and very large. Overfishing was not detected, the fish populations being able to renew from one year to another.

Fishing tools and the methods of capture they involved seem to diversify in this period. Even if many of the tools are difficult to reconstruct because of poor preservation of the materials from which they were made (generally of vegetal origin), it was deducted that, beside harpoons and line hooks, fishing nets were also used (Radu 2003b). The use of fishing nets seems to intensify towards the end of the Eneolithic. This evolution is logical, since nets are the most efficient fishing tools in a context of growing demand. The phenomenon is related especially to the increasing sedentarity of human communities and to demographic growth. The demand for food, and implicitly for fish, being high, fishing tools and methods that led to quantitatively important captures were used intensively, the quality (i.e., size of captured individuals) becoming less important. We do not know if fishing hooks of modern shape were used at that time, because of lack of evidence. However, we believe that a tool with similar function but with different shape was used for line hook fishing.

For individual sites the captured fish generally reflect resources available in the vicinity of the settlements and taxonomic fish spectra are therefore specific for each settlement: fishing of sturgeons (Acipenseridae), cyprinids (Cyprinidae) and catfish (*Silurus glanis*) in the Danube, of pike (*Esox lucius*), cyprinids (Cyprinidae) and perch (*Perca fluviatilis*) in smaller rivers, or of cyprinids (Cyprinidae), zander (*Stizostedion lucioperca*) and gilthead seabream (*Sparus aurata*) in the littoral lagoons of the Black Sea.

The information produced by archaeo-ichthyological studies contributed to the discovery of new aspects of the economic relations within or between communities. Combined with the results of zooarchaeological studies it reveals some subtle aspects of the economy otherwise difficult, if not impossible, to detect only from the study of artefacts. An example for this is the situation revealed by analysis of fish bones at Luncaviţa, a settlement located 5 km from the Danube River, where fish bones, many representing species characteristic exclusively of the Danube, were discovered in large quantities. Fishing with such results could have been performed only by groups of fishermen established, perhaps temporarily, on the Danube banks during the warm season, and therefore the fish could have reached the settlement as a result of trade or exchanges with other community. We believe that only exhaustive collection in the field and concerted, in-depth

analysis of faunal materials are capable of producing a maximum of information from the archaeological structures studied and allow for uncovering of such concealed aspects of the economy at other settlements currently studied.

2.3. Hunting. The mammal bones present in large numbers in the studied settlements illustrate two important occupations of the Gumelnița communities: animal husbandry and hunting (tables 7-10). Considerable variability is conspicuous in the distribution of mammal remains by domestic and wild species. The frequency of domestic mammals varies between 31.7 % of the total NR² at Vitănești and 97.3%NR at Tangâru in the Gumelnița A2 phase (Fig.3), where in phase B1 it varies between 15.9%NR at Căscioarele and 96.2%NR at Vlădiceasca (Fig.4).

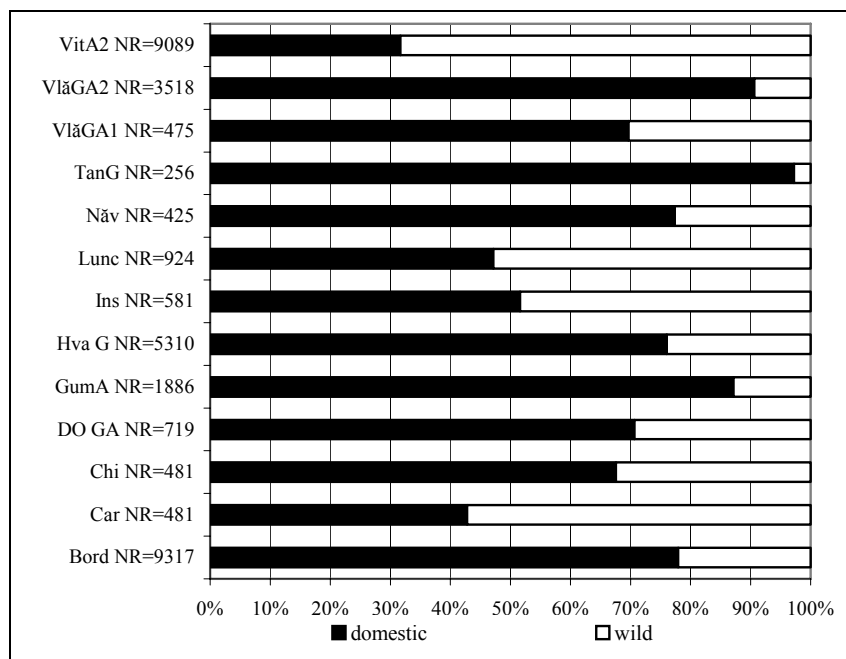


Fig.3 Domestic/wild mammal ratios (%NR) in Gumelnița A settlements.

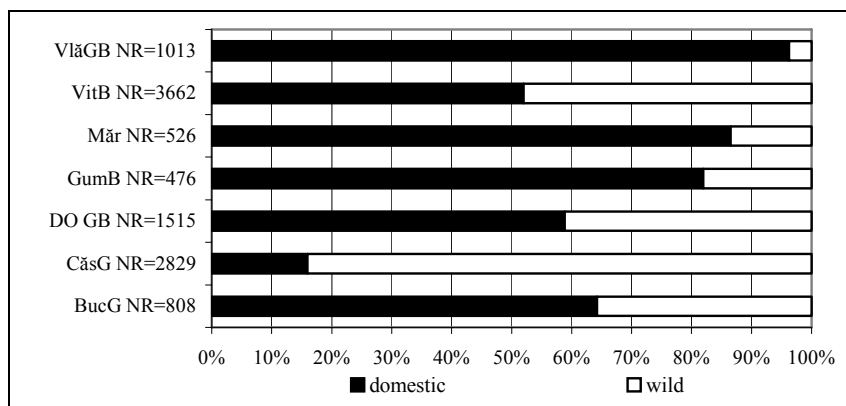


Fig.4 Domestic/wild mammal ratios (%NR) in Gumelnița B1 settlements.

Domestic/wild mammal ratios expressed as % of the total MNI broadly mirror those reflected by the % of the total NR. The participation of domestic mammals in faunal spectra varies between 45.2%MNI at Carcaliu and 96.4%MNI at Tangâru in the Gumelnița A2 phase (Fig.5), and in phase B1 between 28.4%MNI at Căscioarele and 83.3%MNI at Vlădiceasca (Fig.6). An MNI was not computed for Hârșova and the Gumelnița A2 level at Vitănești as excavations are ongoing in these settlements and the numbers are likely to change in the future.

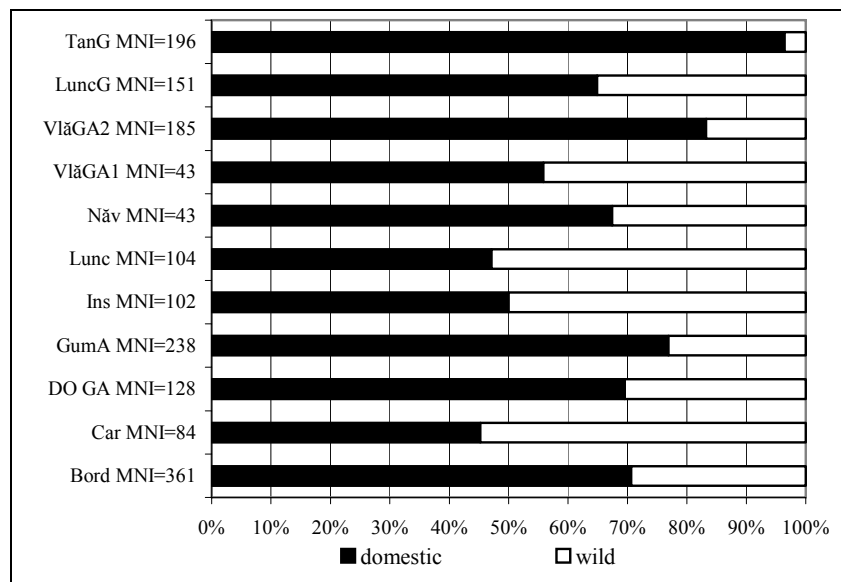


Fig.5 Domestic/wild mammal ratios (%MNI) in Gumelnița A settlements.

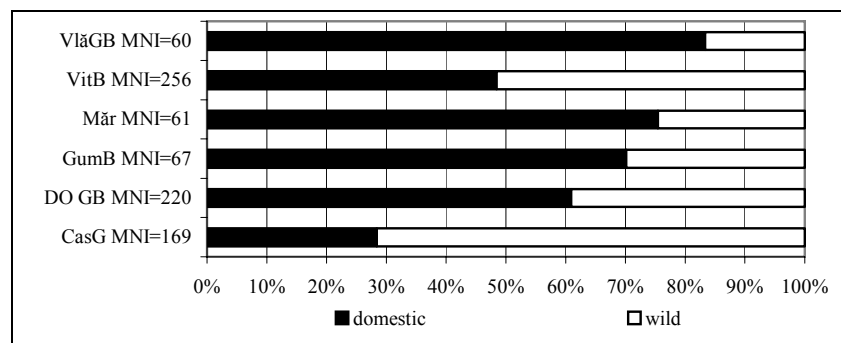


Fig.6 Domestic/wild mammal ratios (%MNI) in Gumelnița B1 settlements.

The hunting is attested by the bones of wild animals present in archaeological deposits. The proportion of wild mammals varies from one site to another, with a maximum attained at Căscioarele (B1 level): 84.1%NR. At the opposite pole, the settlement at Tangâru features only 2.7%NR wild mammals. Other sites where wild mammals are present in high numbers are Vitănești A2 (68.3%NR) and B1 (48%NR), Carcaliu (57.2%NR), Luncavița A2 (52.8%NR) and Însurăței (48.4%NR). These numbers seem to indicate that hunting played an important role in the

animal economy of some Gumelnița communities, a fact that becomes more obvious if one compares the faunal spectra of Gumelnița settlements with those of the Hamangia and Boian settlements, two cultures that precede the Gumelnița culture in much of its geographic area.

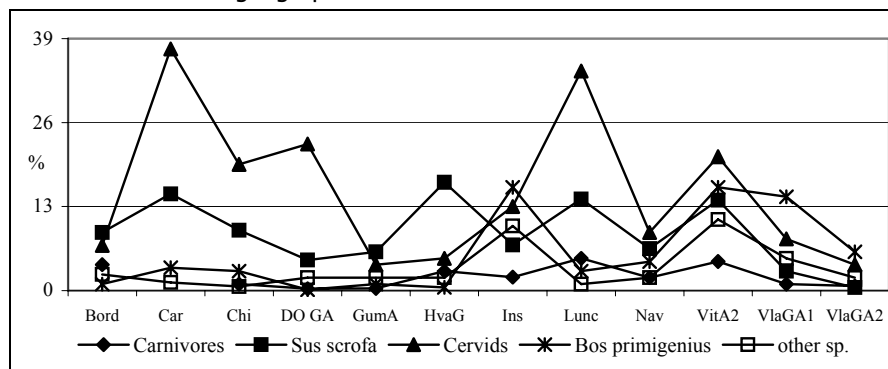


Fig.7 Species frequencies (%NR) of wild mammals in Gumelnița A settlements. Carnivores: *Canis lupus*, *Vulpes vulpes*, *Lynx lynx*, *Felis silvestris*, *Meles meles*, *Martes martes*, *Mustela putorius*, *Mustela nivalis*, *Lutra lutra*, *Ursus arctos*; Cervids: *Cervus elaphus*, *Capreolus capreolus*, *Alces alces*, *Dama dama*; Other species: *Castor fiber*, *Lepus europaeus*, *Equus ferus*.

Compared with the Gumelnița sites in Romania, the Karanovo VI settlements in Bulgaria generally show lower percentages of game remains. These do not exceed 45 %NR in any of the Bulgarian sites (Durankulak, Goljamo Delčevo, Ovčarovo, Drama, Târgoviște, Ezero), and vary between 7.3 %NR at Drama and 44.5 %NR at Goljamo Delčevo (Manhart 1998).

Overall, the red deer (*Cervus elaphus*) is the species best represented as NR in most of the Gumelnița stations. At Bordușani, Gumelnița and Hârșova red deer are outnumbered by the wild boar (*Sus scrofa attila*), and by the aurochs (*Bos primigenius*) at Vlădiceasca (A1 and A2 levels) and Însurăței. The situation is broadly similar to that reflected by the MNI (Fig.7-10).

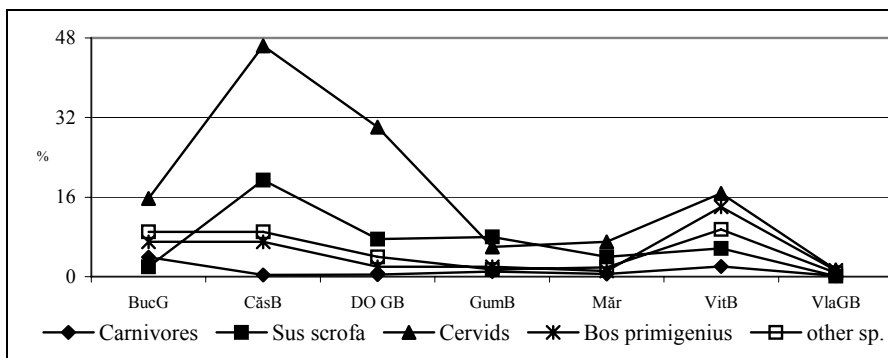


Fig.8 Species frequencies (%NR) of wild mammals in Gumelnița B1 settlements. Carnivores: *Canis lupus*, *Vulpes vulpes*, *Lynx lynx*, *Felis silvestris*, *Meles meles*, *Martes martes*, *Mustela putorius*, *Mustela nivalis*, *Lutra lutra*, *Ursus arctos*; Cervids: *Cervus elaphus*, *Capreolus capreolus*; Other species: *Castor fiber*, *Lepus europaeus*, *Equus ferus*.

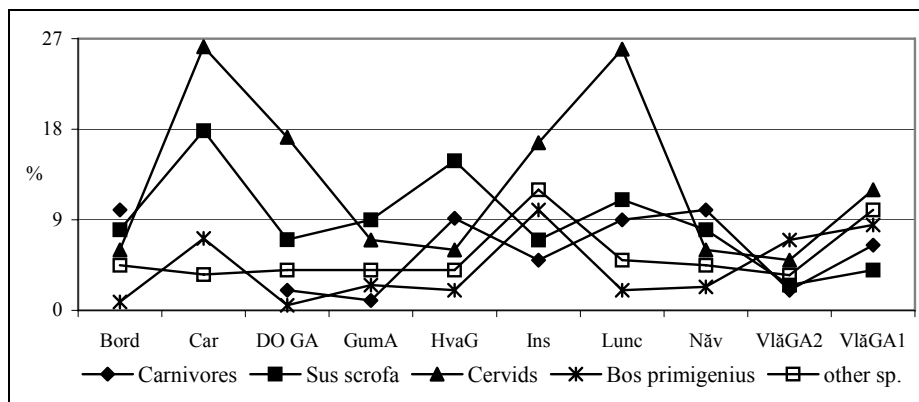


Fig.9 Species frequencies (%MNI) of wild mammals in Gumelnița A settlements. Carnivores: *Canis lupus*, *Vulpes vulpes*, *Lynx lynx*, *Felis silvestris*, *Meles meles*, *Martes martes*, *Mustela putorius*, *Mustela nivalis*, *Lutra lutra*, *Ursus arctos*; Cervids: *Cervus elaphus*, *Capreolus capreolus*, *Dama dama*; Other species: *Castor fiber*, *Lepus europaeus*, *Equus ferus*.

The numerous complete metapodials and calcanei of red deer allowed for estimation of shoulder height (Chaix, Méniel 1996; Wilkens 2002). The average shoulder height, based on metapodials (Godinicky index), is 133.1 cm (n=3, range 128.1-139.7 cm), and 130 cm (n=62, range 113.6-141.6 cm), if using calcanei (Wilkens index). A considerable amount of biometric data for the post-cranial skeleton was also obtained. Biometric values obtained for red deer in the Gumelnița sites generally fall within the dimensional range available for the Romanian Neolithic (Necrasov, Haimovici 1963). The species exhibits wide dimensional variability due to sexual dimorphism, indicated by the bimodal

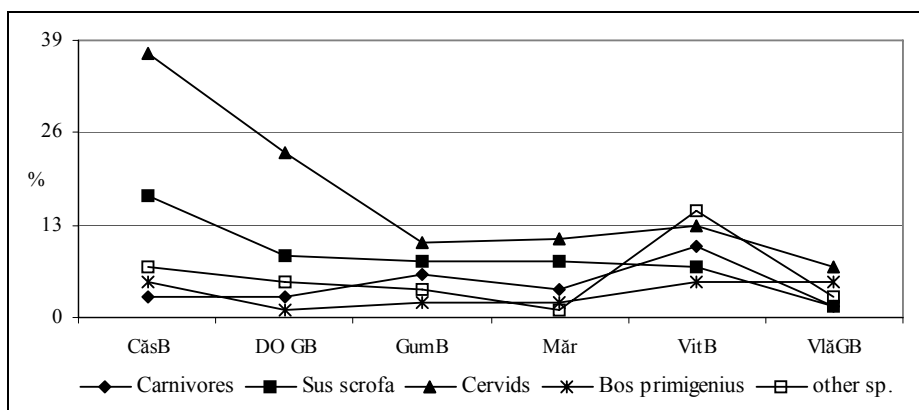


Fig.10. Species frequencies (%MNI) of wild mammals in Gumelnița B1 settlements. Carnivores: *Canis lupus*, *Vulpes vulpes*, *Lynx lynx*, *Felis silvestris*, *Meles meles*, *Martes martes*, *Mustela putorius*, *Mustela nivalis*, *Lutra lutra*, *Ursus arctos*; Cervids: *Cervus elaphus*, *Capreolus capreolus*; Other species: *Castor fiber*, *Lepus europaeus*, *Equus ferus*.

distributions conspicuous in histograms of some measurements (Fig.11 a-b). It is worth noting that most such histograms show males slightly outnumbering females, which could indicate selective hunting because of larger size (greater amounts of meat) and for the antlers used to manufacture numerous tools and weapons.

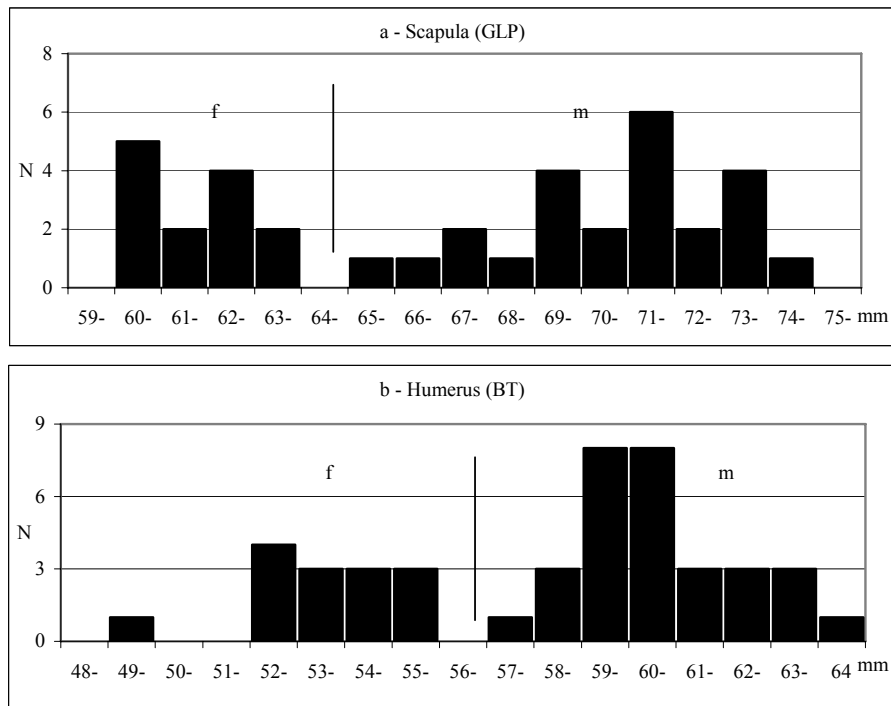


Fig.11 a-b. Dimensional variability of red deer as reflected by different anatomical elements (m-male; f-female).

The wild boar (*Sus scrofa*) is also a well represented species. Numerous complete bones of this species (radiuses, ulnae, astragali, calcanei and metapodials) allowed for estimation of shoulder height applying the Teichert index (Udrescu et al. 1999). The average shoulder height is of 99.5 cm (n=247, range 88.1-112.9 cm), almost identical with that obtained for the Boian culture (99.4 cm; n=14, range 91.3-105.3 cm). The size of wild boars shows very similar values among the different Gumelnița stations, the slight differences being probably due to the size of faunal lots and to sexual dimorphism.

The aurochs (*Bos primigenius*) was identified in all Gumelnița settlements. Some complete bones discovered allowed for estimation of shoulder height. At Vitănești, a metacarpal belonging to a male yielded a shoulder height value of 158.5 cm, and a female metatarsal 156.2 cm (the Matolcsi index was used in both cases; Chaix, Méniel 1996). To these two values we add the shoulder height of the male aurochs ritually buried at Bucșani³, 143.7 cm (n=12 : 2 humeruses, 2 radiuses, 2 metacarpals, 2 femurs, 2 tibias, 2 metatarsals; range 137.0-149.2 cm). This last value is rather modest, compared with the size of other male aurochs documented in the Romanian Neo-Eneolithic (Bălășescu et al. 2004).

The wild horse (*Equus ferus*) is present in all Gumelnița settlements, which contrasts with the settlements of the preceding Hamangia and Boian cultures. Generally, the frequencies of this species (as expressed by NR) within the mammal assemblages do not exceed 3- 4%, yet this value is exceeded in five stations: Vitănești A2 (8.5%) and B1 (6.0%) levels, Căscioarele B1 level (8.7%), Însurăței (12.9%) and Șeinoiu (9,3%). The average shoulder height of horses (Kiesewalter index) at Vlădiceasca and Vitănești is 130.1 cm (n=5, range 124.4-136.8 cm), which corresponds to a small size on the Brauner scale (Bibikova 1970), close to that of the tarpan (*Equus ferus gmelini*). The broad dimensional range demonstrates the presence of gracile, semi-robust and robust individuals (Brauner and Cerski scales; Udrescu et al. 1999).

In all the studied settlements the carnivores do not exceed 5%NR in the mammal assemblages. Perhaps some of these animals (small carnivores) were only occasionally hunted, mainly for the fur, while others (large carnivores) were killed to reduce their predation on the livestock.

The taxonomic diversity of wild mammals (20 species) reveals that Gumelnița populations hunted in diverse environments surrounding the settlements. The habitat preferences of most of the hunted species (red deer, wild boar, marten, wild cat, lynx, bear) indicate the presence of forests near the settlements. Hunting was performed all year round, as proved by the cervid skull remains bearing antlers, found at Hârșova, Măriuța, Vitănești and Luncavița, which also suggest permanent occupation of the *tells*.

A comparison of the wild mammal spectra between Gumelnița B and A phases does not show important differences. Cervids are generally predominant in both periods, the wild boar slightly decreases from B to A, whereas the wild horse slightly increases and the aurochs remains at about the same level (Fig.12).

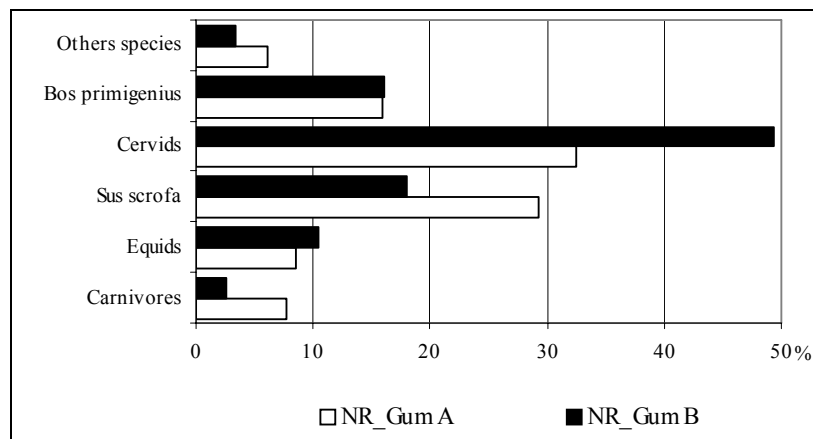


Fig.12 Comparison of the wild mammal spectra (%NR) between Gumelnița A and B.

* * *

Other animals used for food by the Gumelnița communities were crayfish, tortoises and birds (Bălășescu et al. 2004). However, the discontinuous presence and reduced frequencies of these animals (tables 4 and 6) suggest that they were captured only accidentally or occasionally during fishing (water tortoise, Prummel 1994) or hunting campaigns (small birds). Others, such as crayfish and larger birds, may have been sought for actively.

2.4. Animal husbandry is attested by the numerous bones of domestic animals found in the archaeological excavations. In the majority of Gumelnița settlements the cattle (*Bos taurus*) remains are most abundant. The lowest presence of these animals by NR is 7.1%NR, recorded at Căscioarele (Gumelnița B1), the highest being of 62.6%NR at Gumelnița (A2 level) (Fig.13-14). Cattle also predominate by MNI, with less distanced extreme values than for NR: 8.9%MNI at Căscioarele and 42.9%MNI at Gumelnița (per total A2 level) (Fig.15-16).

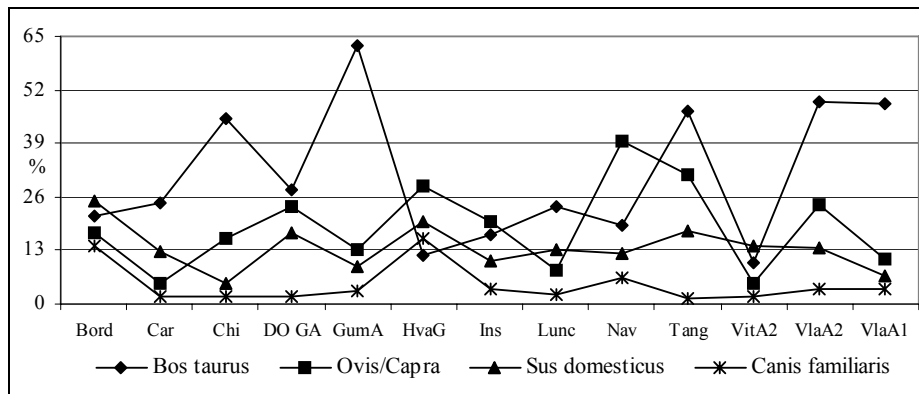


Fig.13 Species frequencies (%NR) of domestic mammals in Gumelnița A settlements.

The slaughtering ages of cattle as reported in different zooarchaeological studies are widely variable. At Borduşani (Bălăşescu et al. 2003a) juveniles are preponderant, suggesting an exploitation related to a possible food shortage (Fig.17). At Însurăței (Moise 1999), Vitănești (Bălăşescu, Radu 2003) and Luncavița (Bălăşescu 2003) the best represented are sexually mature animals, kept mainly for their secondary products (milk) and reproduction (Fig.17). At Năvodari (Moise 2001a) a mixed exploitation of the bovines was documented.

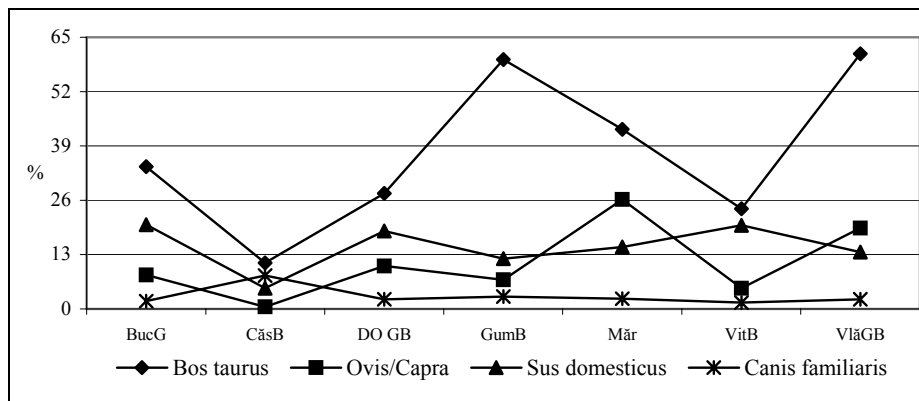


Fig.14 Species frequencies (%NR) of domestic mammals in Gumelnița B1 settlements.

The domestic bovines in Gumelnița settlements are of medium to small size. The average shoulder height (Matolcsi index) of these animals for the Gumelnița

culture is 118.6 cm (n=18, range 109.7-131.6 cm), lower than that reported for the Boian culture (Bălăşescu, Radu 2004). This documents a decrease in size and gracilisation of domestic bovines during the Gumelnița period. Discussing this progressive gracilisation Alexandra Bolomey proposed that it could represent a result of the use of animals for traction starting at an early age (Bolomey 1983).

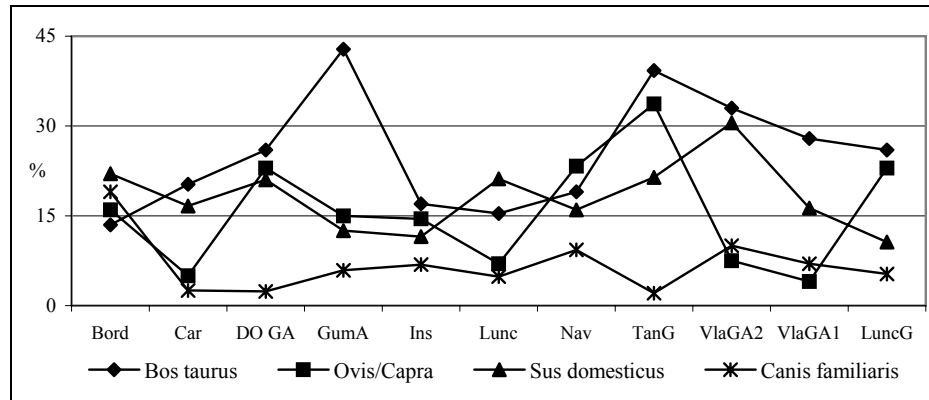


Fig.15 Species frequencies (%MNI) of domestic mammals in Gumelnița A settlements.

To this we argue that one cannot talk about the use of bovines for traction during the Neo-Eneolithic, as no clear related pathological signs (e.g., Bartosiewicz et al. 1997; De Cupere et al. 2000) were observed. We are inclined to believe that during this period bovines were only occasionally, if at all, used for such purposes (Bălăşescu et al. in press). However, at this stage of research there is no clear explanation for the gracilisation of domestic bovines in the Gumelnița period, and other undetected factors, such as poor management, could be invoked as well.

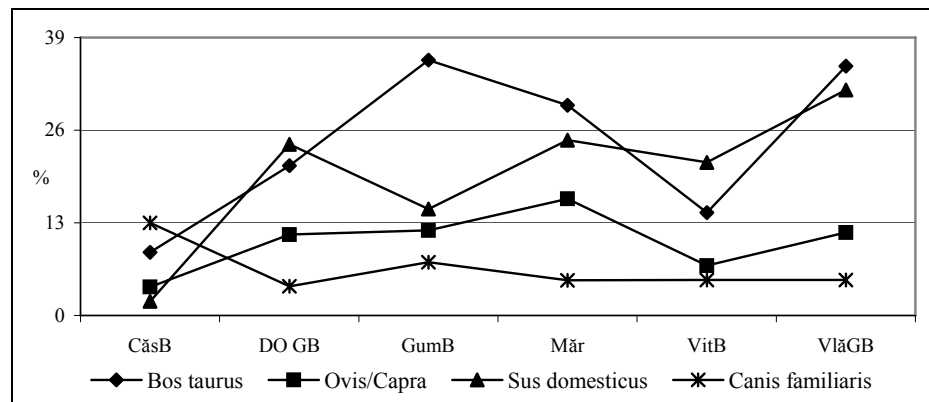


Fig.16 Species frequencies (%MNI) of domestic mammals in Gumelnița B1 settlements.

The ovicaprinae are documented by numerous remains, among which sheep (*Ovis aries*) is better represented than goat (*Capra hircus*). The ovicaprinae dominate domestic stocks only in three settlements: Însurăței, Năvodari and

Hârșova (Moise 1999, 2000a, 2001a). The presence of this group varies between 1%NR at Căscioarele (B1 level) and 39.6%NR at Năvodari.

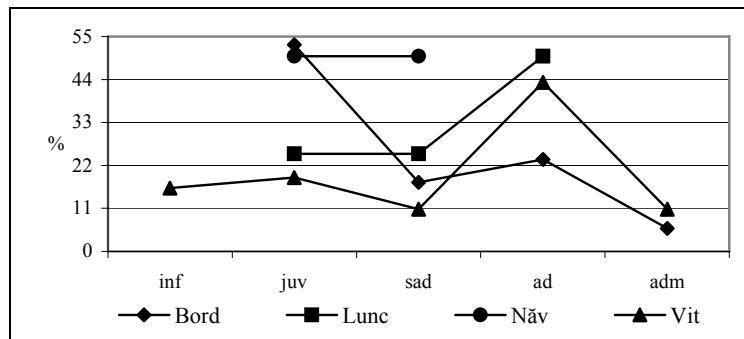


Fig.17 Slaughtering ages for domestic cattle (%MNI) in Gumelnița settlements (inf-infans, juv-juvenile, sad-subadult, ad-adult, adm-mature adult).

Slaughtering ages of sheep and goats indicate different uses of these animals, reflecting different priorities (Fig.18). At Bordușani it was observed an exploitation was likely directed mainly toward securing the meat supply (Bălășescu et al. 2003a), whereas at Luncavița and Vitănești animals seem to have been kept mainly for their secondary products (milk, wool), and for reproduction (Bălășescu 2003; Bălășescu, Radu 2003).

The average shoulder height of the Gumelnița sheep (Teichert index) is 58.8 cm (n=89, range 50.0-76.4 cm), close to that obtained for the Boian (58.2 cm, n=34, range 52.1-69.5 cm) and Hamangia cultures (58.9 cm, n=13, range 55.3-64.6 cm) (Bălășescu, Radu 2004). Except for the Durankulak settlement (Manhart 1998), the shoulder height of sheep from Karanovo VI stations in Bulgaria is lower than that of the Gumelnița stations in Romania.

Although numerous sheep horncores have been found in Gumelnița settlements, only a few have been analyzed morphologically and biometrically because of advanced fragmentarity (Haimovici 1996; Moise 1999; Bălășescu et al. 2003a). Several skull fragments belonging to unhorned females were also found (Moise 2001a; Bălășescu et al. 2003a). The unhorned sheep, representing an advanced stage of domestication, is attested in Southeastern and Central Europe since the early Neolithic (Bököny 1973). Noteworthy is the discovery of bones that could have belonged to wethers (castrated males) at Însurăței and Năvodari (Moise 1999, 2001a).

The average shoulder height of goats (Schramm index) in the Gumelnița culture is 58.8 cm (n=16, range 52.0-64.4 cm). This value is slightly lower for the Boian culture: 57.5 cm (n=12, range 50.5-62.6 cm). The shoulder height of goats from Karanovo VI stations in Bulgaria (Tărgoviște, Ovcharovo and Durankulak; Manhart 1998) is slightly higher than that of Gumelnița stations in Romania.

The goat horncores found in Gumelnița settlements belong to both the *aegagrus* and *prisca* types (Moise 1997; Bălășescu 2003; Bălășescu et al. 2003a, 2004).

Domestic swines (*Sus domesticus*) are predominant by NR within the domestic stock in two Gumelnița A2 stations: Bordușani (Bălășescu et al. 2003a) and Vitănești (Bălășescu, Radu 2003). Their representation varies between 2% of the

total NR at Căscioarele (B1 level) and 24.9%NR at Bordușani, and between 3% of the total MNI at Căscioarele (B1 level) and 31.7%MNI at Vlădiceasca (A2 level) (Fig.13-16).

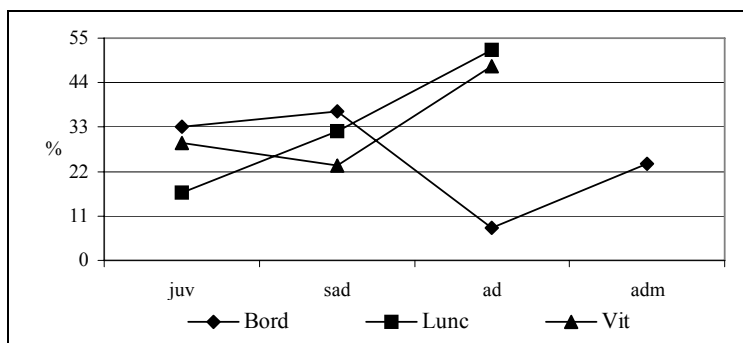


Fig.18 Slaughtering ages of ovicaprinae (%MNI) in Gumelnița settlements (juv-juvenile, sad-subadult, ad-adult, adm-mature adult).

Most of the domestic swines were slaughtered at ages that span between 10 and 18 months (Bălășescu 2003; Bălășescu, Radu 2003). Adult individuals of up to three years, possibly kept for reproductive purposes, are poorly represented (Haimovici 1996; Moise 2001a; Bălășescu et al. 2003a). Overall, the slaughtering ages do not revealed any pattern of exploitation of these animals, which were probably killed according to the food demand of the moment.

The domestic swines found in Gumelnița settlements represent a primitive type of medium size exhibiting wide dimensional variability. The average shoulder height (Teichert index) is 75.5 cm (n=79, range 64.9-85.3 cm), close to that calculated for the Boian culture, and higher than that documented for the Starčevo-Criș and Vinča cultures (Bălășescu et al. 2004).

These animals seemingly roamed free near the settlements, and cross-breeding with wild boars was probably frequent. Such hybrids are suspected to be present in the zooarchaeological material from Bordușani, Hârșova and Vitănești (Moise 2000b; Bălășescu, Radu 2003; Bălășescu et al. 2004).

The presence of the dog (*Canis familiaris*) varies between 1%NR at Șeinoiu and 16.9%NR at Hârșova, and between 2%MNI at Tangâru and 18%MNI at Bordușani (Fig.13-16). In the majority of Gumelnița settlements the frequencies (%NR) of this species do not exceed 5% of the mammal assemblages. It is worth noting that the dog is the best represented (%MNI) domestic mammal at Căscioarele (B1 level, Bolomey unpublished data) and Bordușani (Bălășescu et al. 2003).

The numerous dog remains found in Gumelnița settlements allowed for detailed osteometric analysis of the species. In this period the dogs were sub-medium to medium-built (Udrescu 1990a, 1990b), exhibiting wide dimensional variability. The basal cranial length has an average of 131.9 mm (n=92, range 98-179 mm; Dahr index), and of 131.4 mm (n=57, range 110.1-155 mm; Brinkman index), lower than those obtained for the Boian culture (Bălășescu, Radu 2004). The average shoulder height (Koudelka index) is 40.2 cm (n=39, range 33.4-46.8 cm).

Interestingly, incisions present on bones from some settlements (Hârşova-*tell*, Borduşani-*Popină*, Măriuţa and Vităneşti) provide strong evidence that the flesh of these animals was eaten (Moise 1997, 2000b, 2001b; Bălăşescu et al. 2003a; Bălăşescu, Radu 2003).

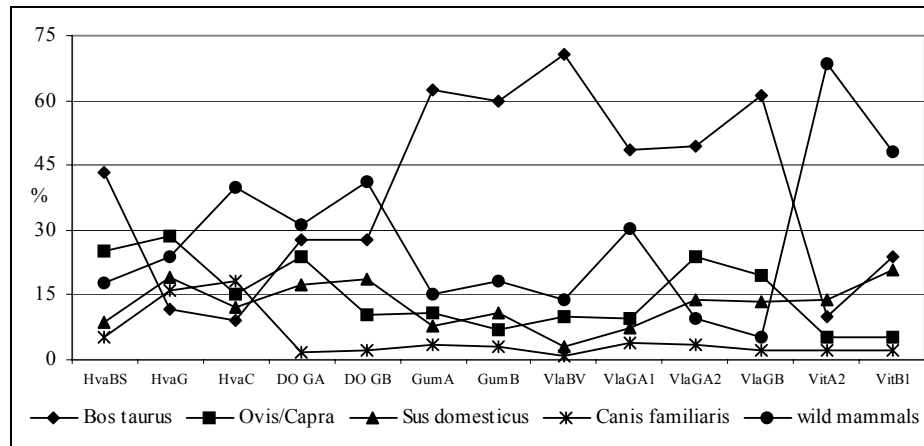


Fig.19 Mammalian faunal spectra in *tell*-type settlements of the lower Danube River basin.

The evolution of the animal economy can be documented mostly in *tell*-type settlements that include several cultural levels, such as Hârşova (Boian-Spanţov, Gumelniţa A2 and Cernavoda I levels), Căscioarele, Drăgăneşti-Olt, Gumelniţa, Vităneşti (Gumelniţa A2 and B1 levels) and Vlădiceasca (Boian-Vidra, Gumelniţa A1, A2 and B1 levels). At Hârşova-*tell* (Fig.19) the proportions of domestic mammals increase from the Boian-Spanţov level (HvaBS) to the Gumelniţa (HvaG) level, but then decline dramatically in the Cernavoda I level (HvaC), where wild mammals predominate (Bolomey unpublished data). At Căscioarele, a dramatic overturn in the animal economy during the B1 phase leads to predominance of the hunted wild mammals (Bolomey 1968). At Drăgăneşti-Olt, an increase of game from 29.3 % of the total NR in Gumelniţa A2 to 41.1%NR in Gumelniţa B1 is documented together with a decrease of ovicaprinae from 23.6%NR to 10.3%NR (El Susi 2002). At Gumelniţa the A2 and B1 levels are not significantly different (Necrasov, Haimovici 1966). At Vităneşti, wild mammals decrease from 68.3%NR in Gumelniţa A2 to 48%NR in Gumelniţa B1, while cattle and domestic swines increase in NR (from 11.6% to 23.0%, and from 13.1% to 22.1% respectively) (Bălăşescu, Radu 2003). At Vlădiceasca (Fig.19) the presence of wild mammals increases from the Boian Vidra level (VlăBV) - to the Gumelniţa A1 level (VlăGA1), to decrease dramatically in the Gumelniţa A2 level (VlăGA2) and slightly more in the Gumelniţa B1 level (VlăGB1). Changes can be observed in the proportions of domestic mammals as well. Bovines decrease dramatically from 70.7%NR in VlăBS to 48.6%NR in VlăGA1, remain constant (49.3%NR) in VlăGA2, and rise again (61%NR) in VlăGB1. The ovicaprinae are characterized by a lower presence of about 10%NR in VlăBS and VlăGA1, increase to 24%NR in VlăGA2, and decrease slightly to 19.3%NR in VlăGB1. Swines increase from 2.8%NR in VlăBS to 7.6%NR in VlăGA1, to 13.7%NR in VlăGA2, and then stay constant (13.6%NR) in VlăGB1 (Bălăşescu, Udrescu 2005; Moise 2000b).

3. Conclusions

Compared with the other prehistoric cultures present on the territory of Romania, the Gumelnița culture is well documented from a zooarchaeological perspective. The important quantities of faunal material uncovered in various settlements reveal diverse strategies in the exploitation of animal resources. A noticeable characteristic of this culture is that the importance of hunting rises to levels unparalleled in the Upper Eneolithic. The number of settlements in which the game remains total 50%NR and over is relatively high: 6 settlements that is more than one third of the total studied. To this we have to add the fact that in the majority of Gumelnița settlements the wild mammals exceed 15% of the mammal remains. Thus, hunting played an important role in the animal palaeoeconomy of Gumelnița communities, a fact that becomes more evident when compared with the situation documented in the preceding Hamangia, Boian and Stoicani-Aldeni cultures. In many respects the animal economy in the Gumelnița culture is similar to that of the contemporaneous Sălcuța culture southwest Romania (Bălășescu et al. 2004). This intensification of hunting in the Late Eneolithic is difficult to explain. In the following we present a scenario that possibly accounts for the recrudescence of hunting in the Gumelnița and Sălcuța cultures.

One cause that might have led to the increase of wild mammal proportions is represented by climatic changes that could have dramatically influenced the vegetation, altering animal habitats. According to data presented by Mihai Tomescu (Tomescu 2000b), the time interval between 6,450-6,000 cal B.P. was characterized by summers with high rainfall, which could have determined the extension of forested areas. From a climatic point of view, the end of the Gumelnița period is marked by the beginning of a period of frequent long and droughty summers. All these climatic changes undoubtedly affected the economy of human communities. However, the climatic factor did not have the same effect on all communities. For instance, in settlements of the Danube Valley characterized by similar geographic and environmental conditions, the proportion of wild mammals varies considerably. While at Căscioarele the game totalizes over 80% of the total NR, at Carcaliu and Luncavița it represents a little over 50%NR, and at Hârșova and Bordușani wild mammals account for only a quarter of the total mammal remains. The same situation is observed along the Danube tributaries where there are settlements in which hunting played an important role in the economy (Vitănești and Însurăței), but also settlements in which hunting is poorly represented (Vlădiceasca, Gumelnița, Măriuța and Tangâru).

These quantitative differences reflect different economic strategies. Hunting involves a great deal of effort, skill in hunting techniques and a good knowledge of animal behaviour. At Vitănești, where hunting played an important role, preliminary study of the lithic material revealed a predominance of hunting weapons, especially arrowheads (Radian Andreescu, pers. comm.), suggesting that a specialization of certain individuals in hunting existed in this settlement. The same situation could have been present in other settlements as well and just needs to be documented by concerted studies of the animal remains and hunting weapons.

For the majority of Gumelnița communities animal husbandry was probably the most important component of the animal economy. As in the case of hunting, different strategies can be observed with respect to animal husbandry. Different groups of domestic animals were exploited at different intensities from one settlement to another, and this was probably largely determined by geographic and environmental conditions. Thus, the community at Bucșani was oriented

toward bovines, the one at Hârşova toward ovicaprinae, and the Borduşani community toward swines, as documented by the abundance of remains belonging to these animals uncovered in each of the three stations.

As a general trend, Gumelniţa communities were oriented toward the exploitation of cattle, whereas ovicaprinae and swines occupied secondary roles in their animal husbandry. The same trend has been observed in contemporaneous Karanovo VI settlements in Bulgaria (Manhart 1998). Compared with the preceding Hamangia and Boian cultures, the exploitation of domestic swines increases in the Gumelniţa period, as observed particularly in *tell*-type settlements. This increase, documented at Hârşova, Vităneşti, Vlădiceasca and Drăgăneşti-Olt, indicates an advanced state of sedentarity.

Elements that characterize complex and well-organized societies (Tchernov 1993) become significant alongside sedentarization. The exploitation of limited geographic areals results in different strategies of management of the local resources. Hunting and fishing intensify in the good years and seasons. Management of the livestock becomes oriented both towards the meat and the secondary products, according to necessities. The exploitation of swines intensifies now, and the dog becomes part of the diet for some communities. The transition from communities with certain mobility to sedentary settlements during the Neo-Eneolithic is obvious, as noted by Alexandra Bolomey as early as the first zooarchaeological synthesis (Bolomey 1983).

The factors and mechanisms that determined the sedentarization of populations (also marked by the apparition of *tell*-type settlements), are complex and not very well understood, the more so as contrasting aspects have been noted in the animal economy of some of the Gumelniţa communities. On one hand we can invoke here the climatic changes. The increase in rainfall probably indirectly led to more intense exploitation of natural resources that became more profitable than animal husbandry, in some communities. On the other hand, it is possible that the agricultural system adopted by Neo-Eneolithic communities became deficient in some places, and consequently the survival strategies followed different trends, as those identified in some of the Gumelniţa settlements. The latter illustrate a diverse and complex animal economy, influenced by different factors among which the most important was the surrounding environment. The characteristics of the animal economy suggest stable and well-organized communities and relatively were well consolidated interactions with the environment, as reflected by the efficient exploitation of local resources.

Certainly, several additional aspects (for instance, the importance of animals in the spiritual life and beliefs of communities) will have to be detailed or even discovered in order to achieve a deeper understanding of the man-animal interactions of Gumelniţa populations. We are confident that future research will lead to better characterization of various aspects, leading to broader and deeper insights into the life of Gumelniţa communities.

Notes

1. The site name is followed by the abbreviation used on maps, in parentheses.
2. The values are percents of total NR or MNI for mammals.
3. The aurochs from Bucşani is the subject of another article in this volume (Bem and Bălăşescu).

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Taxa	Bord	Car	Cas GA	Chi	DO GA	GumA	HvaG	Ins	LuncG	Lunc	Năv	Sein	TangG	VitA2	Vlă GA1	Vlă GA2
Gastropoda	521			3		16	1964			1	16			208	1	84
Bivalvia	6677	7		249	5	228	13588	10	5	16	14			39	2	31
Scaphopoda	1						17			1						
Crustacea	13						724				1					
Pisces	10976	41		3		30	260478	212	39	1853	1278			56		1
Amphibia	10						13				4					
Reptilia	260			4		3	206	11	1	39	8			107		
Aves	267	4		1		4	179	7	3	7	53			85	5	4
Mammalia	14168	481	1129	1766	766	1909	6323	1551	555	1761	445	97	256	20602	475	3518
Total NR	32893	533	1129	2026	771	2190	283492	1791	603	3678	1819	97	256	21097	483	3638

Taxa	Bord%	Car%	Cas GA%	Chi%	DO GA%	GumA%	HvaG%	Ins%	LuncG%	Lunc%	Năv%	Sei%	TangG%	VitA2%	Vlă GA1%	Vlă GA2%
Gastropoda	1,58			0,15		0,73	0,69			0,03	0,88			0,99	0,21	2,31
Bivalvia	20,30	1,31		12,29	0,65	10,41	4,79	0,56	0,83	0,44	0,77			0,18	0,41	0,85
Scaphopoda	0,003						0,01			0,03						
Crustacea	0,04						0,26				0,05					
Pisces	33,37	7,69		0,15		1,37	91,88	11,84	6,47	50,38	70,26			0,27		0,03
Amphibia	0,03						0,005				0,22					
Reptilia	0,79			0,20		0,14	0,07	0,61	0,17	1,06	0,44			0,51		
Aves	0,81	0,75		0,05		0,18	0,06	0,39	0,50	0,19	2,91			0,4	1,04	0,11
Mammalia	43,07	90,24	100,00	87,17	99,35	87,17	2,23	86,60	92,04	47,88	24,46	100,00	100,00	97,65	98,34	96,70
Total NR%	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Table 1. Absolute and relative frequencies of faunal remains by classes in the Gumelnjita A1 and A2 settlements studied.

Taxa	BucG	CasG	DO GB	GumB	Mar	Vit B1	Viă B1
Gastropoda	22			4		32	2
Bivalvia	477	+	35	25		326	2
Scaphopoda						2	
Crustacea							
Pisces	759	+		7	1	58	
Amphibia	29						
Reptilia	61	+			1	108	
Aves	28			1	1	72	
Mammalia	878	3092	1725	482	529	7968	1013
Total NR	2254	3092	1760	519	532	8566	1017
Taxa	BucG%	CasG%	DO GB%	GumB%	Mar%	Vit B1%	Viă B1%
Gastropoda	0,98			0,77		0,37	0,20
Bivalvia	21,16		1,99	4,82		3,81	0,20
Scaphopoda						0,02	
Crustacea							
Pisces	33,67			1,35	0,19	0,68	
Amphibia	1,29						
Reptilia	2,71				0,19	1,26	
Aves	1,24			0,19	0,19	0,84	
Mammalia	38,95	100,00	98,01	92,87	99,44	93,02	99,61
Total NR%	100	100	100	100	100	100	100

Table 2. Absolute and relative frequencies of faunal remains by classes in the Gumelnița B1 settlements studied. (+ = present but not quantified).

Taxa	Gumelnița A1		Gumelnița A2											Gumelnița B1						
	LuncG	Viă GA1	Bord	Car	Chi	DO GA	Guma	HvaG	Ins	Lunc	Năv	Vit A2	Via GA2	Buc	Căs G	DO GB	GumB	Măr	Vit B1	Viă B1
<i>Viviparus danubialis</i>							+										+			
<i>Viviparus acerosus</i>			306					1415					82							
<i>Viviparus contectus</i>			1					4												
<i>Valvata piscinalis</i>			10					20												
<i>Valvata pulchella</i>								18												
<i>Lithoglyphus naticoides</i>			33																	
<i>Bithynia leachi</i>			12					8												
<i>Bithynia tentaculata</i>								1												
<i>Esperiana esperi</i>			10					119												
<i>Esperiana acicularis</i>			6					15												
<i>Radix peregra</i>			10																	
<i>Radix ovata</i>				1																
<i>Planorbarius cornuus</i>			1		2			5												
<i>Planorbis planorbis</i>								2												
<i>Theodoxus danubialis</i>								132												
<i>Theodoxus fluviatilis</i>								21												
<i>Oxychilus inopinatus</i>			1																	
<i>Euomphalia strigella</i>			10																	
<i>Lindholmiola corcyensis</i>			10																	
<i>Lithoglyphus naticoides</i>								173												
<i>Campilex balcanica</i>			4																	
<i>Campilex faustina</i>								3												
<i>Cepaea vindobonensis</i>			63					7			8		1	2					16	
<i>Condrula tridens</i>								2												
<i>Helix pomatia</i>			44				+			1	8		1	20			+		16	
<i>Helicella obvia</i>								19												
Gastropoda total		1	521	3			16	1964		1	16	208	84	22			4		32	2

Table 3. Distribution of gastropod remains in the Gumelnița settlements studied.

Gumelnița A1			Gumelnița A2										Gumelnița B1									
Taxa	LuncG	Viă GA1	Bord	Car	Chi	DO	GA	Guma	HvaG	Ins	Lunc	Năv	Vit A2	Via GA2	Buc	Căs G	DO	GB	GumB	Măr	Vit B1	Viă B1
<i>Unio tumidus</i>			789						3756		1				8						27	
<i>Unio pictorum</i>			1375					+	4614		2							+			45	
<i>Unio crassus</i>	5		131		242			+	199						260				+		184	
<i>Unio</i> sp.		2	4283	7	2	5			3264	10	13			31	206		35				70	
<i>Anodonta cygnaea</i>			35						900													
<i>Anodonta anatina</i>			20																			
<i>Anodonta</i> sp.				1																		
<i>Pseudanodonta complanata</i>			1																			
<i>Sphaerium lacustre</i>				2											3							
<i>Sphaerium solidum</i>									3													
<i>Spondylus gaederopus</i>				2																		
<i>Dreissena polymorpha</i>			42						824													
<i>Cerastoderma (Cardium) edule</i>			1						28			13										
<i>Mytilus galoprovincialis</i>												1										
Bivalvia total	5	2	6677	7	249	5	228	13588	10	16	14	39	31		477	+	35	25		326	2	
<i>Dentalium</i> sp.			1						17		1										2	
Scaphopoda total			1						17		1										2	
<i>Astacus fluviatilis</i>			13						724			1										
Crustacea total			13						724			1										

Table 4. Distribution of mollusc and crayfish remains in the Gumelnița settlements studied.

Gumelnița A1		Gumelnița A2											Gumelnița B1									
Taxa	LuncG/Viă GA1	Bord	Car	Chi	DO	GA	Guma	HvaG	Ins	Lunc	Năv	Vit A2	Via	GA2	Buc	Căs	GDO	GB	GumB	Măr	Vit B1	Viă B1
<i>Rana esculenta</i>		4																				
<i>(Rana sp.)</i>		6						13			4				23							
<i>Bufo</i> sp.															3							
<i>Pelobates</i> sp.															3							
Amphibia total		10						13			4				29							
<i>Emys orbicularis</i>		259		4			+	199	11	39	8				55				1	106		
<i>Testudo graeca ibera</i>	1	1						3												2		
<i>Ophidia</i>								2							2							
<i>Sauria</i>								2							4							
Reptilia total	1	260		4			3	206	11	39	8	107			61	+			1	108		
<i>Podiceps cristatus</i>		1																				
<i>Phalacrocorax carbo</i>		9						10			8											
<i>Phalacrocorax pygmaeus</i>		1																				
<i>Pelecanus</i> cf. <i>onocrotalus</i>								1														
<i>Nycticorax nycticorax</i>								1														
<i>Botaurus sttelaris</i>								1														
<i>Egretta alba</i>		9						5														
<i>Ardea cinerea</i>		15						6			1									1		
<i>Ardea purpurea</i>		4						3														
<i>Ciconia ciconia</i>								2														
<i>Ciconia nigra/ciconia</i>		6																				
<i>Platalea leucorodia</i>																						
<i>Ardeiformes</i> indet.		2													25							
<i>Cygnus olor</i>		26						6														
<i>Cygnus cygnus</i>								30														
<i>Cygnus</i> sp.							+				1								1	5		
<i>Anser albifrons</i>								1														
<i>Anser anser</i>		33						41														
<i>Branta</i> cf. <i>leucopsis</i>								2														
<i>Anas</i> cf. <i>penelope</i>		1																				
<i>Anas platyrhynchos</i>		43									2									5		
<i>Anas acuta</i>		4																				
<i>Anas clypeata</i>																						
<i>Anas querquedula</i>		4																				
<i>Anas crecca</i>		1																				

Taxa	Gumelnița A1			Gumelnița A2										Gumelnița B1							
	LuncG	Viă GA1		Bord	Car	Chi	DO GA	Gum A	HvaG	Ins	Lunc	Năv	Vit A2	Vla GA2	Buc	Căs G	DO GB	GumB	Măr	Vit B1	Viă B1
Anas sp.				6				1													
Aythya nyroca				2																	
Aythya marila/ferina				1																	
Pernis apivorus									1												
Haliaeetus albicilla				5					5												
Gypaetus barbatus									1												
Aquila hellaca				1					1												
Aquila pomarina									2												
Aquila clanga									1												
Pandion haliaetus				1																	
Accipiter gentilis									1												
Buteo buteo									3												
Falco tinnunculus												1									
Strix aluco																				1	
Hieraetus pennatus									1											1	
Tetrao urogallus																					
Tetrao tetrix				3					1												
Perdix perdix				2																	
Fulica atra				12																	
Grus grus				1								1								1	
Otis tarda				1					1												
Columba palumbus									1												
Upupa epops				2																	
Garrulus glandarius									2												
Pica pica				3																	
Corvus frugilegus/corone				18																	
Corvus monedula									4												
Corvus corone									8												
Corvus frugilegus									4												
Corvus sp.																				4	
Aves IND	3			50	4	1		3	31	7	7	39			3				1	54	
Aves total	3	5		267	4	1		4	179	7	7	53	85	4	28			1	1	72	

Table 5. Distribution of amphibian, reptile and bird remains in the Gumelnița settlements studied.

Gumelnita A1		Gumelnita A2										Gumelnita B1							
Taxa	LuncG	Vlă GA1	Bord	Car	Chi	DO GA	Guma	HvaG	Ins	Lunc	Năv	Vit A2	Vla GA2	Buc	Căs G	DO GB	GumB	Măr Vit B1	Vlă B1
Acipenseridae IND			140					866		1	2								
<i>Huso huso</i>			4																
<i>Acipenser stellatus</i>			5					15											
<i>Acipenser guldenstaedti</i>			1																
<i>Acipenser ruthenus</i>								3											
<i>Alosa pontica</i>								2											
<i>Esox lucius</i>			698					9001	16	106	3			65				1	
<i>Aspius aspius</i>			13					102		2									
<i>Abramis brama</i>			32					1868	1	7									
<i>Alburnus alburnus</i>								14											
<i>Barbus barbus</i>														1					
<i>Blicca bjoerkna</i>			9					491						1					
<i>Carassius carassius</i>								2											
<i>Cyprinus carpio</i>	1		1827	+			+	6448	31	212	114						+	1	
<i>Leuciscus idus</i>			2					78		1									
<i>Leuciscus cephalus</i>														10					
<i>Leuciscus sp.</i>														6					
<i>Pelecus cultratus</i>								166											
<i>Rutilus rutilus</i>			11					1680		4	46			28					
<i>Scardinius erythrophthalmus</i>			1					421	1	1									
<i>Tinca tinca</i>			3					47		6									
<i>Vimba vimba carinata</i>														2					
Cyprinidae IND			1542		3			77843		127	133			415					
<i>Silurus glanis</i>	21		1556	+			+	6888	35	248	12			1			+	1	56
<i>Gymnocephalus (Acerina) sp.</i>								1447											
<i>Perca fluviatilis</i>	1		29					1350		2	95			47					
<i>Stizostedion lucioperca</i>	1		267					9305	8	38	81								
Percidae IND								467											
<i>Sparus aurata</i>											18								
Pisces IND	15		4836					141974	120	1098	774			183					
Pisces total	39		10976	41	3		30	260478	212	1853	1278	56	1	759	+		7	1	58

Table 6. Distribution of fish remains in the Gumelnița settlements studied

Taxa	Bord		Car		Chi		Hva G		Ins		Lunc		LuncG		Náv		Sein		TanG	
	NR	%	NR	%	NR	%	NR	%	NR	%	NR	%	NR	%	NR	%	NR	%	NR	%
<i>Bos taurus</i>	1996	21,4	118	24,5	217	45,1	618	11,6	107	18,4	218	23,6	166	30,3	81	19,1	59	60,8	120	46,9
<i>Ovis aries</i>	219	2,4	4	0,8	1	0,2	255	4,8	17	2,9	8	0,9	10	1,8	30	7,1	3	3,1		
<i>Capra hircus</i>	73	0,8	2	0,4	6	1,2	77	1,5	12	2,1	9	1,0	5	0,9	19	4,5	1	1,0		
Ovicaprine	1312	14,1	8	1,7	69	14,3	1182	22,3	84	14,5	58	6,3	97	17,7	119	28,0	6	6,2	80	31,3
<i>Sus domesticus</i>	2320	24,9	61	12,7	24	5,0	1009	19,0	60	10,3	122	13,2	48	8,8	53	12,5	8	8,2	45	17,6
<i>Canis familiaris</i>	1343	14,4	13	2,7	8	1,7	896	16,9	20	3,4	21	2,3	16	2,9	27	6,4	1	1,0	4	1,6
Total domestics	7263	78,0	206	42,8	325	67,6	4037	76,0	300	51,6	436	47,2	342	62,4	329	77,4	78	80,4	249	97,3
<i>Canis lupus</i>	64	0,7					26	0,5	5	0,9	6	0,6	2	0,4	12	2,8				
<i>Vulpes vulpes</i>	143	1,5					14	0,3	5	0,9	4	0,4	1	0,2	4	0,9				
<i>Lynx lynx</i>	8	0,1					6	0,1			1	0,1								
<i>Felis silvestris</i>	49	0,5					20	0,4	2	0,3	3	0,3			6	1,4				
<i>Meles meles</i>	16	0,2					15	0,3			6	0,6								
<i>Martes martes</i>	3	0,03			5	1,0	8	0,2			1	0,1								
<i>Mustela putorius</i>	2	0,02																		
<i>Mustela nivalis</i>							1	0,02												
<i>Lutra lutra</i>	38	0,4			1	0,2	2	0,04			1	0,1								
<i>Equus ferus</i>	35	0,4	2	0,4	1	0,2	20	0,4	75	12,9	4	0,4			13	3,1	9	9,3	x	
<i>Sus scrofa</i>	757	8,1	72	15,0	45	9,4	890	16,8	41	7,1	131	14,2	50	9,1	19	4,5	3	3,1		
<i>Cervus elaphus</i>	540	5,8	174	36,2	68	14,1	78	1,5	55	9,5	291	31,5	142	25,9	15	3,5				
<i>Capreolus capreolus</i>	160	1,7	5	1,0	26	5,4	66	1,2	16	2,8	23	2,5	6	1,1	7	1,6	1	1,0		
<i>Dama dama</i>	1	0,01	1	0,2					2	0,3										
<i>Bos primigenius</i>	75	0,8	17	3,5	8	1,7	55	1,0	76	13,1	12	1,3	1	0,2	19	4,5	6	6,2		
<i>Castor fiber</i>	97	1,0	4	0,8			32	0,6	1	0,2	2	0,2			1	0,2				
<i>Lepus europaeus</i>	66	0,7			2	0,4	40	0,8	3	0,5	3	0,3	4	0,7						
Total wild	2054	22,0	275	57,2	156	32,4	1273	24,0	281	48,4	488	52,8	206	37,6	96	22,6	19	19,6	7	2,7
Total	9317	100,0	481	100,0	481	100,0	5310	100,0	581	100,0	924	100,0	548	100,0	425	100,0	97	100,0	256	100,0
<i>Bos taurus/Bos primigenius</i>	14																			
<i>Bos primigenius/Cervus elaphus</i>	606				8		250		65		75				12					
Ovicaprine/Capreolus capreolus	188				29		203				48									
<i>Sus domesticus/Sus scrofa</i>	722				27		560		5		54		7		8					
<i>Canis familiaris/Vulpes vulpes</i>	91																			
Undeterminables	3230				1221						660									
Total mammals	14168		481		1766		6323		651		1761		555		445		97		256	

Table 7. Absolute and relative frequencies of mammal remains (NR) in the Gumelnița A1 and A2 settlements studied.

Taxa	Buc		Cas G		Mär		DO GA		DO GB		GumA		GumB		VitA2		VitB1		Viä GA1		Viä GA2		Viä GB1	
	NR	%	NR	%	NR	%	NR	%	NR	%	NR	%	NR	%	NR	%	NR	%	NR	%	NR	%	NR	%
<i>Bos taurus</i>	275	34	201	7,1	226	43	200	27,8	419	27,7	1180	62,6	284	59,7	1055	11,6	843	23	231	48,6	1733	49,3	618	61
<i>Ovis aries</i>	6	0,74	17	0,6	28	5,32									83	0,9	57	1,56	1	0,2	34	1,0	19	1,88
<i>Capra hircus</i>	4	0,5	3	0,11	14	2,66									30	0,3	27	0,74	2	0,4	36	1,0	7	0,69
Ovicaprines	56	6,93	7	0,25	96	18,3	170	23,6	156	10,3	226	12,0	43	9,03	268	2,9	77	2,1	43	9,1	776	22,1	170	16,8
<i>Sus domesticus</i>	163	20,2	57	2,01	78	14,8	124	17,2	282	18,6	176	9,3	49	10,3	1190	13,1	809	22,1	36	7,6	483	13,7	138	13,6
<i>Canis familiaris</i>	15	1,86	166	5,87	13	2,47	14	1,9	35	2,31	62	3,3	14	2,94	252	2,8	90	2,46	18	3,8	127	3,6	23	2,27
Total domestic	519	64,2	451	15,9	455	86,5	508	70,7	892	58,9	1644	87,2	390	81,9	2878	31,7	1903	52	331	69,7	3189	90,6	975	96,2
<i>Canis lupus</i>			3	0,11							2	0,1	2	0,42	72	0,79	18	0,49			3	0,1		
<i>Vulpes vulpes</i>	5	0,62	1	0,04	3	0,57	1	0,1	2	0,13	3	0,2	2	0,42	61	0,67	19	0,52	4	0,8	15	0,4	2	0,2
<i>Lynx lynx</i>															8	0,09								
<i>Felis silvestris</i>	3	0,37	1	0,04											28	0,31	2	0,05			4	0,1		
<i>Meles meles</i>	10	1,24	4	0,14					3	0,2					208	2,29	33	0,9						
<i>Martes martes</i>	1	0,12	1	0,04			1	0,1							1	0,01	2	0,05						
<i>Mustela putorius</i>	2	0,25													1	0,01								
<i>Mustela nivalis</i>																								
<i>Lutra lutra</i>	1	0,12													11	0,12								
<i>Mustelidae ?</i>																			2	0,4	3	0,1		
<i>Ursus arctos</i>	10	1,24	1	0,04					1	0,07	1	0,1	1	0,21	21	0,2	1	0,03						
<i>Equus ferus</i>	33	4,08	245	8,66	10	1,9	9	1,3	25	1,65	31	1,6	6	1,26	773	8,5	220	6,01	17	3,6	25	0,7	5	0,49
<i>Equus sp.</i>																	2	0,05						
<i>Sus scrofa</i>	22	2,72	550	19,4	17	3,23	34	4,7	115	7,59	111	5,9	34	7,14	1326	14,6	209	5,71	13	2,7	16	0,5	1	0,1
<i>Cervus elaphus</i>	109	13,5	1193	42,2	30	5,7	156	21,7	450	29,7	62	3,3	28	5,88	1732	19,1	595	16,2	27	5,7	36	1,0	9	0,89
<i>Capreolus capreolus</i>	18	2,23	121	4,28	5	0,95	7	1,0	6	0,4	12	0,6	4	0,84	148	1,6	18	0,49	7	1,5	21	0,6	5	0,49
<i>Alces alces</i>															4	0,04								
<i>Bos primigenius</i>	51	6,31	239	8,45	6	1,14	1	0,1	15	0,99	19	1,0	8	1,68	1368	15,1	515	14,1	69	14,5	190	5,4	13	1,28
<i>Castor fiber</i>	21	2,6	16	0,57			2	0,3	5	0,33			1	0,21	363	4,0	115	3,14						
<i>Lepus europaeus</i>	3	0,37	3	0,11					1	0,07	1	0,1			89	1,0	10	0,27	5	1,1	16	0,5	3	0,3
Total wild	289	35,8	2378	84,1	71	13,5	211	29,3	623	41,1	242	12,8	86	18,1	6211	68,3	1759	48	144	30,3	329	9,4	38	3,75
Total	808	100	2829	100	526	100	719	100	1515	100	1886	100	476	100	9089	100,0	3662	100	475	100	3518	100	1013	100
<i>Bos taurus/Bos prim.</i>			67						2								166							
<i>Bos/Cervus</i>	49				2		4		40								25							
<i>Ovicaprines/Capreolus</i>	4				1																			
<i>Sus domesticus/Sus scrofa</i>	17		196				1		8		23		6				53							
<i>Canis/Vulpes</i>																								
Undeterminables																								
Total mammals	878		3092		529		766		1725		1909		482		20221		7968		475		3518		1013	

Table 8. Absolute and relative frequencies of mammal remains (NR) in the Gumelnița A1, A2 and B1 settlements studied.

Taxa	Bord		Car		Ins		Lunc		LuncG		Năv		TanG	
	MNI	%	MNI	%	MNI	%	MNI	%	MNI	%	MNI	%	MNI	%
<i>Bos taurus</i>	55	15,24	17	20,24	16	15,69	16	15,38	38	25,17	8	18,60	77	39,29
<i>Ovis aries</i>	28	7,76			9	8,82	4	3,85	6	3,97	5	11,63		
<i>Capra hircus</i>	10	2,77			6	5,88	2	1,92	3	1,99	5	11,63		
<i>Ovicaprine</i>	25	6,93	4	4,76					27	17,88			66	33,67
<i>Sus domesticus</i>	72	19,94	14	16,67	13	12,75	22	21,15	16	10,60	7	16,28	42	21,43
<i>Canis familiaris</i>	65	18,01	3	3,57	7	6,86	5	4,81	8	5,30	4	9,30	4	2,04
Total domestics	255	70,64	38	45,24	51	50,00	49	47,12	98	64,90	29	67,44	189	96,43
<i>Canis lupus</i>	5	1,39			2	1,96	1	0,96	2	1,32	1	2,33		
<i>Vulpes vulpes</i>	10	2,77			2	1,96	2	1,92	1	0,66	1	2,33		
<i>Lynx lynx</i>	2	0,55					1	0,96						
<i>Felis silvestris</i>	6	1,66			2	1,96	2	1,92			2	4,65		
<i>Meles meles</i>	3	0,83					2	1,92						
<i>Martes martes</i>	2	0,55					1	0,96						
<i>Mustela putorius</i>	2	0,55												
<i>Lutra lutra</i>	6	1,66					1	0,96						
<i>Equus ferus</i>	3	0,83	1	1,19	7	6,86	1	0,96			2	4,65		
<i>Sus scrofa</i>	25	6,93	15	17,86	7	6,86	11	10,58	16	10,60	3	6,98		
<i>Cervus elaphus</i>	14	3,88	19	22,62	7	6,86	21	20,19	27	17,88	2	4,65		
<i>Capreolus capreolus</i>	8	2,22	2	2,38	8	7,84	6	5,77	4	2,65	1	2,33		
<i>Dama dama</i>	1	0,28	1	1,19	2	1,96								
<i>Bos primigenius</i>	3	0,83	6	7,14	10	9,80	2	1,92	1	0,66	1	2,33		
<i>Castor fiber</i>	9	2,49	2	2,38	1	0,98	2	1,92			1	2,33		
<i>Lepus europaeus</i>	7	1,94			3	2,94	2	1,92	2	1,32				
Total wild	106	29,36	46	54,76	51	50,00	55	52,88	53	35,10	14	32,56	7	3,57
Total	361	100,00	84	100,00	102	100,00	104	100,00	151	100,00	43	100,00	196	100,00
<i>Sus domesticus/ Sus scrofa</i>									3		2			
Total mammals	361		84		102		104		154		45		196	

Table 9. Absolute and relative frequencies of mammal remains (MNI) in the Gumelnița A1 and A2 settlements studied.

Taxa	Cas G		Mär		VitB1		DO GA		DO GB		Guma		GumB		Viä GA1		Viä GA2		Viä GB1	
	MNI	%	MNI	%	MNI	%	MNI	%	MNI	%	MNI	%	MNI	%	MNI	%	MNI	%	MNI	%
<i>Bos taurus</i>	15	8,88	18	29,51	37	14,45	31	24,22	48	21,82	102	42,86	24	35,82	12	27,91	60	32,43	21	35,00
<i>Ovis aries</i>	3	1,78	6	9,84	10	3,91									1	2,33	10	5,41	4	6,67
<i>Capra hircus</i>	1	0,59	4	6,56	7	2,73									1	2,33	7	3,78	3	5,00
Ovicaprine	2	1,18					28	21,88	25	11,36	34	14,29	8	11,94						
<i>Sus domesticus</i>	5	2,96	15	24,59	55	21,48	27	21,09	52	23,64	33	13,87	10	14,93	7	16,28	59	31,89	19	31,67
<i>Canis familiaris</i>	22	13,02	3	4,92	15	5,86	3	2,34	9	4,09	14	5,88	5	7,46	3	6,98	18	9,73	3	5,00
Total domestics	48	28,40	46	75,41	124	48,44	89	69,53	134	60,91	183	76,89	47	70,15	24	55,81	154	83,24	50	83,33
<i>Canis lupus</i>	1	0,59			6	2,34					2	0,84	1	1,49			1	0,54		
<i>Vulpes vulpes</i>	1	0,59	2	3,28	5	1,95	1	0,78	2	0,91	2	0,84	1	1,49	2	4,65	3	1,62	1	1,67
<i>Felis silvestris</i>	1	0,59			2	0,78											1	0,54		
<i>Meles meles</i>	3	1,78			10	3,91			2	0,91										
<i>Martes martes</i>	1	0,59			1	0,39	1	0,78												
<i>Mustelidae ?</i>															1	2,33	2	1,08		
<i>Ursus arctos</i>	1	0,59			1	0,39			1	0,45	1	0,42	1	1,49						
<i>Equus ferus</i>	7	4,14	1	1,64	17	6,64	3	2,34	5	2,27	7	2,94	2	2,99	3	6,98	3	1,62	1	1,67
<i>Equus sp.</i>					2	0,78														
<i>Sus scrofa</i>	29	17,16	5	8,20	21	8,20	9	7,03	19	8,64	19	7,98	5	7,46	2	4,65	3	1,62	1	1,67
<i>Cervus elaphus</i>	53	31,36	4	6,56	29	11,33	20	15,63	48	21,82	11	4,62	5	7,46	2	4,65	3	1,62	2	3,33
<i>Capreolus capreolus</i>	10	5,92	2	3,28	5	1,95	2	1,56	3	1,36	5	2,10	2	2,99	3	6,98	3	1,62	2	3,33
<i>Dama dama</i>																				
<i>Bos primigenius</i>	10	5,92	1	1,64	14	5,47	1	0,78	3	1,36	7	2,94	2	2,99	4	9,30	9	4,86	2	3,33
<i>Castor fiber</i>	3	1,78			14	5,47	2	1,56	2	0,91			1	1,49						
<i>Lepus europaeus</i>	1	0,59			5	1,95			1	0,45	1	0,42			2	4,65	3	1,62	1	1,67
Total wild	121	71,60	15	24,59	132	51,56	39	30,47	86	39,09	55	23,11	20	29,85	19	44,19	31	16,76	10	16,67
Total	169	100,0	61	100,0	256	100,0	128	100,0	220	100,0	238	100,0	67	100,0	43	100,0	185	100,0	60	100,0
<i>Sus domesticus/Sus scrofa</i>	11								7				2							
Total mammals	180		61		256		128		220		245		69				185		60	

Table 10. Absolute and relative frequencies of mammal remains (MNI) in the Gumelnița A1, A2 and B1 settlements studied.