

Management of animal resources by Precucutenian communities and their impact on the environment based on recent research in sites from eastern Romania

Georgeta EL SUSI*

Abstract: Based on 33,693 animal bones from seven Precucutenian settlements (tab. 1, 2) the main features of the animal management and its impact on the environment have been established. A large scale of animal resources as cattle, sheep, goat, pig, small and big game, fish, mollusks would have been exploited. Considering the wild/domestic species report, relative to biotope, the statistics reveal some interesting aspects. The sample from Costi a individualizes by its high percentage of hunting, about 70.1%, of which 41.1% is assigned to red deer. Târpe ti site is placed on the opposite, with a rate of hunting of 5.34%. The settlements from Isaiia, Andrie eni, Mândri ca and Târgu Frumos occupy an intermediate position with 14-30% participation of game. Related to domestic segment, a higher cattle rate is registered at Traian "Dealul Viei" - 79.89%, Andrie eni - 71.92%, and a reduced one, around 55-66% at Târpe ti, Târgu Frumos and Isaiia. Costi a registers the lowest percentage of 20.6%. The Precucutenian communities were cattle breeders, less clear to Costi a. To mention that in all the above sites, management of sheep, goats and pigs was practiced on a small scale, their weight ranging from 0.4-11% for small ruminants and pigs 0.4-13%. Insignificant differences were recorded between sites about the strategy of mammals exploitation. Specifically, a similar cattle management, with an emphasis on meat and byproducts is evident in almost all cases. In small ruminants, published data are not sufficient for a proper statistical processing.

Rezumat: Pe baza a 33693 oase de animale din apte a ez ri Precucuteni (tab. 1, 2), au fost stabilite principalele caracteristici ale gestion rii animalelor i impactul acesteia asupra mediului. O gam larg de resurse de origine animal , incluzând bovine, ovine, caprine, porcine, vânat mic i mare, pe ti, molu te au fost exploatate. Având în vedere raportul de specii s lbatice/domestice, în raport cu biotopul, statisticile relev o serie de aspecte interesante. E antionul de la Costi a se individualizeaz prin procentul ridicat de vân toare, aproximativ 70,1%, din care 41,1% este atribuit cerbului. Situl de la Târpe ti se plaseaz la polul opus, cu o rat a vân torii de 5,34%. A ez rile de la Isaiia, Andrie eni, Mândri ca i Târgu Frumos ocup o pozi ie intermediar , cu o rat de 14-30% a speciilor vâmate. Referitor la segmentul domestic, o rat mai mare a bovinelor este înregistrat la Traian "Dealul Viei" – 79,89%, Andrie eni – 71,92% i o cot mai mic , de 55-66% la Târpe ti, Târgu Frumos i Isaiia. Costi a înregistreaz cel mai mic procent, de 20.6%. Comunit ile precucuteniene erau cresc toare de vite, mai pu in cele de la Costi a. S mai amintim c , în toate site-urile de mai sus, cre terea ovinelor, caprinelor i porcului a fost practicat la scar redus , ponderea acestora variind între 0,4-11%, în cazul rumeg toarelor mici i 0,4-13% a porcinelor. Asupra strategiei de exploatare a mamiferelor au fost identificate diferen e nesemnificative de la caz la caz. Concret, o gestionare similar a vitei, cu accent pe carne i produse secundare este evident în aproape toate cazurile. În privin a rumeg toarelor mici, datele publicate nu sunt suficiente pentru o prelucrare statistic adecvat .

Keywords: Precucuteni culture, animal management, age profiles, selective hunting, landscape.

Cuvinte cheie: Cultura Precucuteni, gospod rirea animalelor, profile de sacrificare, vân toare selectiv , mediu.

Precucuteni culture (about 5100-4500 cal. BC) "gradually unveiled with an important role in the formation of the main features of the Eneolithic in Eastern Carpathians, reached the maximum development in the following period that of the splendid Cucuteni civilization" (N. Ursulescu 2008, p. 207). Evolving over a period of 1500 years it occupies an important place in the Southeast and Eastern European Neo-Eneolithic by opening the lasting evolution of the Cucuteni-Ariu d-Tripolje cultural complex. This culture has gradually spread from West to East, but its presence in each region requires, at the same time, specific characteristics and different evolutionary patterns (N. Ursulescu et alii 2005, p. 217). In terms of archaeological excavations, many settlements have been investigated, but in terms of fauna their number is limited. Based on about 34,000 bones harvested from seven

* „Vasile Pârvan” Institute of Archaeology, 11 Henri Coand street, sector 1, 010667, Bucharest, Romania; getasusi@yahoo.com

Precucutenian settlements in Moldavia, some common features of animal exploitation and its impact on the environment will be presented below (tab. 1, 2). The settlements developed in the extra-Carpathian regions of Moldavia, on floodplains of rivers, or on high terraces, but necessarily near a water source (fig. 1). The sector located westward of Siret river is well documented in archaeological terms, but relative to fauna only four sites are concerned: Costi a (G. El Susi 2009), Traian "Dealul Viei", Tîrpe ti (O. Necrasov, M. tirbu 1981) and Mândri ca-Valea Seac (A. Coroliuc, S. Haimovici, 2005). By and large, they are located in Moldavia sub-Carpathian hills, altitudes of 200-300 meters dominating the surroundings. Costi a commune is located to the south-eastern limit of Neam County, inside Crac u-Neam Depression. The term "Cet uia" designates two plateaus, A and B; the first one is higher (the "Cet uia" itself), oval-shaped (70×36 m), visible from all directions, 3-4 km away. The second sector is shorter and measures 56×52 m, making connection with Bistri a terrace. West, south and eastern sides of the promontory are steeply, the northern slope is smoother (A.D. Popescu, R. B jenaru 2008, p. 6). The landscape is dominated by altitude with terraces, alluvial plains and deciduous forests, particularly sessile oak and beech. Much of the forests have been cut over time, replaced by grassland, secondary meadows and crops (G. Posea et alii 1982, p. 609-615). About 3,038 bones from the Precucuteni- Phase III were collected during 2001-2008s campaigns.

Taxa (%NR)	Precucuteni II-III			Precucuteni III			Andrie eni
	Isaia			Târgu Frumos			
	2002	2003	2005	pit 26	2003-04	2005	
Bos taurus	65.98	52.61	70.26	55.59	65.4	60.08	71.92
Ovis/Capra	5.48	12.75	10.77	11.08	11.03	15.46	0.43
Sus scrofa domesticus	6.12	8.65	7.81	2.28	4.26	5.24	0.43
Canis familiaris	0.38	0.22		1.94	0.11	0	
Cervus elaphus	10.07	8.86	5.52	6.73	6.58	6.85	8.65
Sus scrofa ferrus	7	8.86	0.94	5.75	5.01	5.51	5.4
Capreolus capreolus	1.78	3.45	1.08	7.36	3.98	1.75	0.86
Bos primigenius	1.27	3.45	1.61	7.86	2.48	3.63	11.24
Lepus sp.	0.13		0.27		0.04		
Castor fiber			0.4	0.32	0.04		
Ursus arctos	0.38	0.23		0.4	0.06		
Felis silvestris			0.13				
Martes martes					0.02		
Meles meles					0.02		
Vulpes vulpes					0.02		
Canis lupus				0.08			
Erinaceus sp.		0.23					
Alces alces							0.21
Domestics	77.96	74.23	88.84	70.9	80.8	80.78	73.16
Wilds	20.63	25.09	9.95	28.52	18.25	17.74	25.98
Equus caballus*	1.41	0.68	1.21	0.58	0.95	1.48	0.86
Total sample	1050	981	895	1312	6743	772	463

*not included in wild species group

Tab. 1. Taxa distribution in Precucutenian sites from lowlands.
Distribu ia taxonilor în situri precucuteniene din zonele joase.

The single sites dated in the first phase of the Precucuteni culture (N. Ursulescu 2008, p. 225) is that from Traian – "Dealul Viei" (commune Z ne ti), located in Crac u-Bistri a Depression, on the middle terrace of Bistri a River, in an area rich in springs that feed the Bahna stream. Prehistoric habitation developed on a plateau, naturally defended by steeply slopes on two sides and an artificial ditch barring the access from the plateau. Bio-geographically conditions are similarities with Costi a site, southward located, in the same valley. A substantial sample counting for 7650 bones, collected during 1956-1960s campaigns was published long ago (O. Necrasov, M. Bulai- tirbu

1965). Subsequently, another sample of 5,533 bones from 1960-1961s campaigns was introduced into scientific circulation (O. Necrasov, S. Haimovici 1970). The settlement at Tîrpe ti (commune Petricani) is positioned in Neam depression, on the middle terrace of Topolna River, in a named point "Râpa lui Bodai", 500 meters east of the village. Heights of 300-500 meters dominate the landscape, the agricultural lands substituting the ancient oak forests over time. The occupants of the terrace seriatim belonged to Linear Pottery, Precucuteni III and Cucuteni Cultures (S. Marinescu-Bîlcu 1981). A summary study about fauna from Precucuteni layer referring to a consistent sample of 4320 pieces (O. Necrasov, M. Tirbu 1981, p. 174) was published some time ago. The settlement at Mândri ca-Valea Seac is dated in Precucuteni II, beginning of Precucuteni III (S. Marinescu-Bîlcu 1974, p. 63), its faunal sample counting for 703 bones. Mândri ca is a village in the south of Bac u County, near the Valea Seac stream, a tributary on the right side of Siret River. The archaeological site is located on a hill, pertaining to the last extension of Culmea Pietricic i (Moldavia Subcarpathians), altitudes above 200 m dominating the landscape. Current vegetation includes secondary meadows, patches of floodplain forest (*Quercus petraea* in particular), agricultural lands (A. Coroliuc, S. Haimovici 2005a, p. 343).

Taxa (%NR)	Precucuteni III		Precucuteni II-III	Precucuteni I	
	Costi a	Târpe ti	Mândri ca	Traian 1956-60	Traian 1960-61
<i>Bos taurus</i>	20.6	69.84	69.72	79.89	78.58
<i>Ovis/Capra</i>	7.2	10.58	8.48	3.42	3.93
<i>Sus scrofa domesticus</i>	1.8	13.77	10.66	1.51	1.74
<i>Canis familiaris</i>	0.3	0.46	0.33	0.33	0.38
<i>Cervus elaphus</i>	41.1	3.33	6.32	8.86	9.28
<i>Sus scrofa ferrus</i>	15.8	0.332	2.66	4.37	4.06
<i>Capreolus capreolus</i>	2.8	1.11	0.83	0.84	0.69
<i>Bos primigenius</i>	4.4	0.28		0.23	0.16
<i>Castor fiber</i>	3.1	0.11		0.4	0.4
<i>Ursus arctos</i>	0.6	0.09		0.01	0.07
<i>Martes martes</i>	0.1				0.02
<i>Vulpes vulpes</i>				0.02	
<i>Canis lupus</i>	0.04	0.02		0.09	0.11
Domestics	29.9	94.65	89.19	85.15	84.63
Wilds	67.9	5.28	9.81	14.8	14.79
<i>Equus caballus*</i>	2.2	0.07	1	0.05	0.07
Total sample	3038	4550	703	7650	5533

*not included in wild species group

Tab. 2. Taxa distribution in Precucutenian sites from hilly regions.

Distribu ia taxonilor în situri precucuteniene din zonele deluroase.

The second group includes settlements at Isaiia, Târgu Frumos, Andrie eni, located to the East of Siret River, in the lower extra-Carpathian regions. Isaiia "Balta Popii" (R duc neni commune) habitation is located about three kilometers northeast of Isaiia village, on the right Jijia River terrace, nearby the confluence with Prut, in southeastern part of Ia i County. Geographically it is about midway among the eastern boundary of the Central Moldavian Plateau and the Jijia-Prut plain. Altitudes of 50 m characterize the landscape and chernozem soils with brown spots are evidence of a forested area in the past. The vegetation is dominated by "Quercetum mixtum" type with tartar maple, a thermophilic element. About one km away there is a salted place, "Gârla S r turii", important source of salt for community and livestock (N. Ursulescu, A.-F. Tencariu 2006, p. 12). In our approach we used information provided by 2,926 animal bones from 2002, 2003 and 2005s campaigns (S. Haimovici, A.-F. Tencariu 2004, p. 301; S. Haimovici, F.-A. Tencariu, 2003, p. 152-153; S. Haimovici, A. Vornicu 2006, p. 190-191), dated in Precucuteni II-III (N. Ursulescu 2008, p. 225). The settlement Târgu Frumos – "Baza P tule" is located in the south-western part of the Moldavian Plain in " aua Ruginoasa-Strunga" subunit that connects the Siret corridor to Jijia-Bahlui basin. The Precucutenian site developed on a

fragment of high cuesta, in the north-est of Târgu Frumos town, on the right side of Adâncata stream, a tributary of Bahlui River. The site covers an area of ten hectares across and it entered the archaeological literature as "the vastest habitat by now in the area of the Precucuteni Culture" (N. Ursulescu et alii 2002, p. 29). It is dating in the third phase of the culture, different levels providing rich faunal samples throughout the research. An interesting material totalling 1,312 fragments was collected from the ritual pit no. 26, during 1998-1999 campaigns (S. Haimovici, A. Coroliuc 2000). Another large sample counting for 6,743 bones was brought to light during 2004-2005s campaigns. It comes from several waste pits and dwellings (A. Coroliuc, S. Haimovici 2005b, p. 289-290). Overall, 8,055 fragments will be taken into consideration in the following. The site at Andrie eni is located to the east from Jijia River, in the sector where it just flows from high to low plain. Currently, the vegetation consists of soft trees as willow and poplar, nearby salted soils also existing. The sample of bones includes 463 pieces, exclusively from mammals, dated in Precucuteni III (A. Coroliuc 2005, p. 8). The listed settlements together have provided about 33,963 bones, the figure is relative, and some samples have not yet been published. Far and away, the material is more than suffice for the proposed approach.

Given the frequency of wild taxa relative to various biotopes, some interesting aspects have been revealed by statistics. Already the usual distribution of wild mammals according to their major requirements¹ for a particular biotope in: stenoecious - forest² taxa (red deer, boar, bear, wild cat in our case), stenoecious - forest-steppe/steppe (roe deer, hare, aurochs, horse), stenoecious - aquatic medium (beaver) or euryoecious taxa (wolf, fox, badger, marten), put forward some interesting aspects. Everywhere, the report among these groups shows the prevalence of species, pointing out a forested environment, despite location, uplands or lowlands. Sometimes, there are some oscillations, even within the same site. The sites from lowlands show a rather constant proportion of the game, ranging among moderate limits: 18.7% in Isaiia (three samples' average), 21.51% in Târgu Frumos, and a maximum of 26% in Andrie eni (fig. 2, 6). Hunting rate significantly varies from one sample to another in case of Isaiia, with a maximum of 20.63% in 2004s sample, and a minimum of 9.96% in 2005s sample. In parallel the "forest" grouping noticeable decreases from 17.45% in 2002s sample to 6.6% in 2005s sample (fig. 3, 6). According to the authors, the surrounding landscape was forested and given the site altitude, it was composed of oak and other hardwood species. Beaver also lived about the same environment: meadow forest, consisting of softwood on "dead channels" of Jijia and Prut rivers. "The inhabitants used to clear the area for agriculture, and the wooden vegetation was redoing over time" (S. Haimovici, A. Vornicu 2006, p. 192).

The sample from Târgu Frumos is more homogenous. The wilds' share decreases from 28.53% to 17.74%, in consonance, about 11-12% is the share of the "forest" item opposite 6-7% that of forest-steppe (fig. 4). Just the pit 26 gives a different image, namely an increase of opened-landscape taxa frequency (aurochs and roe deer) up to 16%. Taking into account its special character "worship pit, at least in a stage of its filling" (S. Haimovici, A. Coroliuc 2000, p. 169), it would provide a certain explanation. The faunal analysis also suggests "the area around the settlement was heavily forested; the steppe which are lying over the region at present was not yet developed. At the same time, the hydrographical network was far richer compared with the present, the rivers and streams would have had larger floodplains, with softwood trees, favorable conditions for beaver" (Coroliuc, Haimovici 2006, p. 367).

A lower percentage (14%) of wooden biotope mammals is found in Andrie eni (fig. 5, 6). Instead, the other grupment reaches a close value, 13%. Aurochs itself sum up 11.24% compared to 8.65% - the rate of red deer. A fragment from an elk antler was found in the sample. The animal to whom belonged it, being probably a specimen wandered through the area. "It came accidentally during winter migration from north to south. Even today, specimens of elk, wanders sometimes longer Jijia Valley or in the Danube Delta". Anyway the elk identification, a taxon of wet forest or wetlands suggests such conditions in the surroundings of Andrie eni (A. Coroliuc 2005, p. 10). At present the landscape has changed a lot, compared to Eneolithic epoch due to intense human activities. Over extra-Carpathian region, the decrease in forest areas has led to steppisation. Zooarchaeological observations confirm these data. In the osteological materials there were identified a lot of wild taxa,

¹ The distribution is somewhat arbitrary, for example red deer entered into "stenoecious – forest" grouping was widespread both in open deciduous and mixed woodland and in grasslands, meadows, river valleys and flood plains.

² Woodlands like form of patches, not necessarily compact.

characteristic for forest-steppe with large hardwoods; the forests, both primary and secondary with brush and many clearings, margins and many shrubs and leas.

On the other group of settlements located in the sub-Carpathian hilly regions, the share of the game varies between wide limits, 5.28% in Tirpe ti, 9.81% in Mândri ca, 14.8% in Traian "Dealul Viei" and 67.9% in Costi a (fig. 7). In this context, red deer reaches a minimum of 3.3% in Tirpe ti, 6.3% in Mândri ca, 8-9% in Traian, and maximum of 41.1% in Costi a. The small rate of the game in Tirpe ti may be correlated with some sporo-pollinic data. According them, the tree pollen consistently reduced from 43.5% to 21.2%, starting with Precucuteni phase in the habitation, suggesting important clearings. "Reducing forest areas are correlated with progressive highlighting of grain, which in turn are consistent with periods of intense habitation". A significant decrease in arboreal pollen and grain, possibly due to climatic deterioration, meaning aridity, is visible at the end of Precucutenian and beginning of Cucutenian levels. The forest regains ground along the Cucuteni inhabiting, but not on a large surface as before. As a significant fact, there is a balance between forest and cultivated areas, throughout habitation, resulting from the ratio of arboreal pollen (slightly varying between 16.7 - 23.2%) and cereals (11.3 - 12.3%) (M. Cărciumaru 1996, p. 120).

Related to Costi a, it astonishes the unusual rate of hunting, more than two thirds of bones originating in wild species. It may suggest that Costi a community was specialised in hunting and secondly, in husbandry. Hunting was focused on red deer exploitation, which share is 41% in Costi a. According to present data, hunting was practicing mostly at the end of autumn (rather becoming winter) and in spring - late spring. His capture was little done in summer, the mammal migrating to the highlands. It could suppose a seasonal hunting, inferring a certain strategy adapted to its behaviour. The unexpectedly high rate of young/ sub-adult exemplars probably suggests either a preference for meat of good quality or points toward certain difficulties appeared at a moment, in the community food supplying. Anyway the statistics reflect a higher density of red deer in the area, as a result of propitious living conditions, suggesting less deforestation as well. The wild boar has a significant participation in the game by 15%. An important share of beaver of 3.1% in contrast with a reduction below 0.5% in other samples it is worth mentioning. Overall, the grouping of "forest" mammals accounts for 57.5%, the highest value of all listed sites (fig. 7). Certainly the proportion of hunting not only reflects a certain type of biotope but rather an obvious occupational structure of the community. Certainly a well-defined segment of the community was specialized in game capture. But one cannot ignore the large number of remains from red deer, wild boar, which reflects a more wooded environment than present. Remember that, horse' frequencies are separately inserted into statistics, hereby I'm complying with authors' decision and therefore we used this system everywhere.

Horse contribution in the diet was minor, its bones accounting less than 2% in all settlements, excepting Costi a with 2.2%. Its frequency is too low, even for an element of wildlife. Domestication problem is thorny, with pros and cons. The taxon is considered under domestication/ timing or wild, in the mentioned settlements, according authors. Incidentally, I think the horse bones from Costi a, rather come from captured animals than domestics. About 38% of its remainder originates in meaty regions of legs, as well one third from horse bones come from immature exemplars, most part of them originating in exemplars that reached the complete body maturity. An individual of small stature - 132 cm and „half-massive" extremities (metatarsal slenderness index - 12.8) was found (G. El Susi 2009, p. 120). The horses' metacarpals-the cannon bones on domestic horses are thinner, more gracile than those of wild horses. A.K. Outram and his stuff describe the shin bones from Botai as being closer in shape and size to those of the Bronze Age (domestic) horses. According to A.K. Outram and his stuff, "three independent lines of evidence demonstrating domestication in the Eneolithic Botai Culture of Kazakhstan, dating to about 3500 B.C. Metrical analysis of horse metapodials shows that Botai horses resemble to Bronze Age domestic horses rather than Palaeolithic wild horses from the same region. The leg bones of the Botai horses are thinner than those of wild horses. Pathological characteristics show that some Botai horses were bridled, perhaps ridden". Evidence of horse milk was found in Botai as fatty lipid residues insides of ceramic vessels, as well evidence for the consumption of horse meat in rider burials (A.K. Outram et alii 2009, p. 1332-1335). These data support domestication of the horse among about 3500-3000 BC sites in today Kazakhstan. Corresponding with some views, after the domestication in the North Pontic steppes, about 1000 years later the horse would have reached the Central and Eastern Europe, and probably our regions. According to some archaeozoological data, published some time ago, bones of horse, sporadically appear in the lowlands of northern Balkans during Eneolithic (Baden culture, c. 3300 BC). For the first time, domesticated horse bones came to light in pits, dating from the Early Bronze Age, from Nova ka

uprija and Crkvina, at around 2800 BC (J.H. Greenfield 2006, p. 230). However, from the beginning of the Bronze Age the bones become more numerous (J.H. Greenfield 2006, p. 230). In the central Balkan horse bones do not appear earlier than Early Bronze Age, so the Eneolithic levels at Petnica, Nova ka uprija and Vin a did not include domestic or wild horse bones. In Hungary, numerous remains appear in the lower levels from Töszeg and in the Early Bronze settlement from Tiszaluc-Dankadomb, not to mention the Bell Beaker type site from Csepel-Haros focused on "horse keeping" (S. Bökönyi 1974, p. 241). In sites across Romania, fully domesticated horse materials occasionally appear in some Early Bronze Age settlements from Transylvania, for instance in habitation of Schneckenberg type at H rman-"Dealul Lempe " (S. Haimovici, G. Gheorghiu-Dardan 1970, p. 501), or of Iernut group from Zoltan (D. Moise 1997, p. 239). In the South-West Romania only three bones (impossible to tell if domestic) were identified in the Late S lcu a level at Ostrovul Corbului (personnel data). In the lower regions of the Romanian Banat, domestic horse bones earliest were found only in Gornea-Orle ti type settlement from Foeni – "Cimitirul Ortodox" (G. El Susi 2001, p. 224).

Domestic segment prevails in almost all cases, regardless of site location, lowlands or uplands. Costi a is an exception as will be seen further along. Constantly in all settlements on the plain, the share of domestics little varies, between 71-88%. The rule partially applies to the other group of settlements, which the variation is broad, 30-95%. In lowland sites, cattle reach the maximum rate in Andrie eni, 71.92%, somewhat lower in Isaiia, 62.95%³ and 60.36% in Târgu Frumos (fig. 8). In the upland, in terms of numbers of fragments, there are sites with a much higher rate of cattle, on average 80% in Traian, around 69% in Tirpe ti and Mândri ca. Costi a is an exception by its 20.6% cattle rate. It is obvious that Precucuteni communities widely practiced cattle breeding, regardless of geographical location. In fact, it is one of the defining features of the husbandry. Invariably, they were practicing a proper management of food resources and their maintenance as well. Certainly, the climate situation and environment were conducive to management of numerous herds, probably they were the subject of an active intertribal trade. Breeding of small-sized mammals, i.e., sheep, goat and pig was less important for precucutenian tribes. Usually ovicaprids rank the second in almost all samples, their share ranges from 0.43% in Andrie eni⁴, and 9.66% in Isaiia (mean of the three samples). Târgu Frumos contrary to exception records 12.5%. Small ruminants do not reach large values, even in hilly regions. About 3.6% records in Traian sample, 7.2% in Costi a, 8.5% in Mândri ca and 10.58% in Tirpe ti (fig. 9). Perhaps the environment, less soughty, was not befitted for their breeding. In terms of pig exploitation the percentages are reduced like those of ovicaprids. If so there were plenty of oak forests thereabout, proper for feeding, pig breeding would have been little practiced in most part of settlements. The species records reduced rates in Andrie eni (0.43%) Târgu Frumos, Traian, Costi a (between 1-4%), something more in Isaiia (7.5%) and Mândri ca (10.6%). The taxon outnumbers the small ruminants in frequency by 13.77% in Târpe ti (fig. 6, 7). It seems that, beef and venison would have been able to cover the needs of communities, in terms of meat requirements, along this epoch.

With regard to mammals' exploitation, the "strategies" little differ from case to case. In almost all cases the slaughter of cattle took account of keeping an important stock for by-products (about 30%). As regards the proportion of animals kept for meat, over a year old specimens, usually sub-adults, were selected for slaughter. When interpreting the faunal remains from cattle one cannot compulsive suggest that the large number of their bones everywhere shows the using exclusively as meat source. About age of slaughter, in some articles one specifies like that: "the presence of females kept to an old age for milk, castration of males (sometimes indirectly proven), the shortage of youth, many adults especially mature, so at the optimal age for the economical activity, but lesser individuals between 5-7 and 7-10 years showing of very similar curve to the one of Târgu Frumos" (Haimovici, A.-F. Tencariu 2004, p. 302; S. Haimovici 2004, p. 100), or "regarding the age of slaughter of cattle, the determined fragments are only from adults and matures, probably keeping the youth"⁵ (A. Coroliuc 2005, p. 9). In Traian and Târpe ti the cumulative share of cattle slaughtered over two years is about 67.9% (O. Necrasov, M. Bulai- tirbu 1965, p. 26). Distribution by age classes is presented in the following way to Costi a. There is a small proportion of individuals culled in their first year, 5.26%. The share increases up to 36.84% between 1–3 years. 26.3% is recorded between 3-4.5 years and 26.3% over limit. Also slaughters occurred mainly during warm season, starting with late

³ Average of three samples.

⁴ Reduced sample would provide an explanation for this small value.

⁵ Talking about Andrie eni.

spring. The proportion decreases towards the end of autumn, two individuals are concerned in our case. The ratio sub-adult/ adult is 1/1.25, suggesting cattle employment for beef, dairying, working and breeding. A similar management of cattle, focused on meat and by-products is found in Mândri ca (fig. 10). No animals under one year, a percentage of 34.37% up to three years, 37.5% to 4.5 years, and 28.13% over. Were also identified, bones from animals 7-10 years old (S. Haimovici 2005, p. 345). About castration in cattle, information are scattered and evidence is indirectly. For instance, two broad proximal phalanges, slightly deformed from Costi a sample would suggest cattle using at traction. Also, five horn-cores from gelds individuals are ascertained in Târgu Frumos (S. Haimovici, A. Coroliuc 2000, p. 176). Unfortunately metapodials from gelds have not yet been identified nowhere, the evidence about that practice being, we keep repeating, indirect. Obviously, the scanty samples from small ruminants have not provided sufficient data on age-class distribution. Let us remind that, out of five specimens, one is a lamb and four reached 3-4 years at death in Isaiia (S. Haimovici 2004, p. 100).

The mortality profiles in sheep/goat suggest an exploitation of milk (goat + sheep) and meat in equivalent proportions at Costi a. One goat killed between 2-3 years and two over 3-4 years were identified at the site. Sheep sample provided bones from two exemplars 6-10 months old, one between 12-18 months, two between 18-24 months and another two by 3-4 years (G. El Susi 2009, p. 117). Almost an identical age-class distribution was found in Târgu Frumos. The graph from fig. 11 shows two peaks, between 1-2 years, and over 3-4 years, suggesting an equal proportion between immature and mature presumed specimens. That is, only 13.3% individuals under one year, 40% between 1-2 years, about 10% between 2-3 years, and 36.7% over 3-4 years. Even four exemplars, over 5-7 years were presumed (S. Haimovici, A. Coroliuc, 2000, p. 201). In the other sites, the published data are not sufficient for detailed considerations.

	Isaiia				Tg. Frumos		
	2002	2003	2004	2005	pit 26	2003-04	2005
Mammals	74.77	44.75	64.59	83.02	99.52	96.7	96.37
Birds, Reptiles	0.09	0.4	0.24	0.22	0	0.02	3.63
Fish		22.32	1.13	0.45	0	0.01	0
Molluscs	25.14	32.51	34.03	16.31	0.48	3.24	0

	Andrie ni	Costi a	Târpe ti	Traian, 1960-61	Mândri ca
Mammals	100	99.11	94.32	99.73	100
Birds, Reptiles	0	0	0	0.02	0
Fish	0				0
Molluscs	0	0.89	5.68	0.25	0

Tab. 3. Distribution of animal groups in Precucuteni sites.
Distribu ia grupelor de animale în situri Precucuteni.

In case of the pig, data are non-itemized for an appropriate statistical processing. Let recall the results of the sample at Costi a. One third of pig specimens were slaughtered in their first year of life, especially between 6-12 months, 20% in the second year, (mainly in the first half) and one third after two years. Only two animals were heavily worn dentitions, the others medium, light. Likely, the animals were kept for feeding in the adjacent forests during warm season. In this context interbreeding with the boar (numerous in the zone) happened. A different use of the pig is noted in the case of Isaiia (fig. 12). That is, a maximum slaughter of animals under a year (27.6%), and another between 2-4 years, 55.56% (S. Haimovici 2004, p. 100). If the site Târgu Frumos, it has also retained a rate of 50% meaning adult and mature specimens (S. Haimovici, A. Coroliuc 2000, p. 185). Only in the case of Costi a, the percentage of individuals kept for reproduction is reduced, 15.39%. The same prevalence of young people and adults (87.5%) were also found at Mândri ca (A. Coroliuc, S. Haimovici 2005a, p. 346). Anyway, the pig breeding was focused on meat and lard, as usual.

About the exploitation of animal resources other than mammals, the statistics set forth the following. At Isaiia the shells were collected, possibly for human consumption, though their gathering was a predatory (valves originate in very young specimens, useless as food), of course, as raw

limestone material, for pottery "industry". Mollusks' share ranges between 16.31%-34.03% in Isaiia, in various campaigns (tab. 3). It is the highest value recorded in Precucuteni settlements, the other ones reaching below 5.6% (Târpe ti). About the shellfish sample from Târgu Frumos one supposed they were used, only as source of calcium for ceramics, due to valves' size variability and small quantity. Fishing was occasionally practiced, the sites being located in the rivers' proximity. Unfortunately the fish remains were not preserved in all cases. They record a maximum in Isaiia, 22.32%, campaign 2004. According to the authors "although fish are relatively numerous, they are small specimens, one summer old, which were caught in early autumn. The question is why the fish bone remains belong to the category-minnow, knowing that Jijia and Prut rivers have been providing optimal conditions. Does the inhabitants of the settlement were not able to catch large individuals?" (S. Haimovici 2004, p. 154), or simply, for various reasons fishery production was weak. Reptiles (turtles) and birds occasionally appear in our contexts. A percentage of 3.63% - birds is noted in Târgu Frumos, campaign 2005. In point of fact, there were few big-sized specimens that could be edible in the vicinity of the settlement. From the outset, researchers highlighted that, Precucuteni tribes exploited a large scale of animal resources, produced by husbandry, hunting, fishing, gathering of molluscs. First and foremost they were cattle breeders, covering in excess of 60% the food requirement. Hunting was practiced in the alternative, and occasionally in several cases. But only the faunal analysis at Costi a sketched a new type of animal economy for the Precucutenian milieu, modulated on management of natural resources in a profitable way: it is based on high contribution of hunting to meet the needs, substituting to domestic stocks, mainly kept for secondary purposes. Forasmuch the archaeological investigations in mentioned sites carry on, for sure the new campaigns of excavations will complete the database with other interesting information.

◆ Bibliography

- S. Bökönyi 1974 History of domestic Mammals in Central and Eastern Europe, Akadémiai Kiadó, Budapest, 594 p.
- M. Cărciumaru 1996 Paleobotanica. Studii în Preistoria și Protoistoria. României, Editura Helios, Iași.
- A. Coroliuc 2005 Andrieeni - un sit precucutenian în care a fost găsit specia sâlbatică Alces alces (elanul), Forum Cultural, anul V, 4, decembrie 2005 (19), p. 8-10.
- A. Coroliuc, S. Haimovici 2001 Studiul preliminar arheozoologic al materialului animalier descoperit în așezarea precucuteniană de la Isaiia-"Balta Popii" – campania 2000, CCA, p. 112-113.
- A. Coroliuc, S. Haimovici 2005a Studiul materialului arheozoologic provenit din așezarea precucuteniană de la Mândrița, Valea Seacă (jud. Bacău), Carpica, 34, p. 343-356.
- A. Coroliuc, S. Haimovici 2005b Studiul materialului arheozoologic provenit din campaniile 2003 și 2004, CCA, p. 289-290.
- A. Coroliuc, S. Haimovici 2006 Analiza materialului arheozoologic provenit din săpăturile efectuate în anul 2005 de la Târgu Frumos – „Baza Putei”, CCA, p. 367.
- G. El Susi 2001 Cercetări arheozoologice în situl de la Foeni "Cimitirul Ortodox" (jud. Timiș). Fauna din nivelele de epocă bronzului, Thraco-Dacica, t. 22, 1-2, p. 223-237.
- G. El Susi 2009 New data on livestock and hunting in the precucutenian settlement at Costița-"Cetăuie" (Neam County), SP, 6, p. 113-134.

- J.H. Greenfield 2006 The Social and Economic Context for Domestic Horse Origins in Southeastern Europe: A View from Ljuljaci in the Central Balkans, in S.L. Olsen (ed.), *Horses and Humans, The Evolution of Human-Equine relationships*, p. 221-244.
- S. Haimovici 2004 Archaeozoological study: eneolithical site from Isaiia, in L. Bejenaru (ed.) *Archaeozoology and Palaeozoology Summercourses, Socrates Intensive Programme, Academic Year 2002-2003, Ia i*, p. 97-112.
- S. Haimovici, A. Coroliuc 2000 The Study of the Archaeo-zoological Material founded in the Pit no. 26 of the Precucuteni III settlement at Târgu Frumos-Baza P tute, SAA, VII, p. 169-206.
- S. Haimovici, G. Gheorghiu-Dardan 1970 L'élevage et la chasse à l'Âge du Bronze en Roumanie, *Des Actes du VII^{eme} Congres International Des Sciences Anthropologiques et Ethnologiques*, Août, 1964, Moscou, p. 557-567.
- S. Haimovici, A.-F. Tencariu 2003 Studiu preliminar al materialului arheozoologic, campania 2002, CCA, p. 159-160.
- S. Haimovici, A.-F. Tencariu 2004 Studiul resturilor animale g site în situl precucutenian de la Isaiia (Campania 2002), *Carpica*, XXXIII, p. 301-316.
- S. Haimovici, A. Vornicu 2006 Studiul materialului arheozoologic din campania 2005 de la Isaiia, CCA, p. 190-191.
- S. Marinescu-Bilcu 1974 *Cultura Precucuteni pe teritoriul României*, Editura Academiei Republicii Socialiste România, Bucure ti, 270 p.
- S. Marinescu-Bilcu 1981 Tirpe ti. From Prehistory to History in Eastern Romania, *BAR (IS)*, 107, 173 p.
- D. Moise 1997 The faunal remains from Zoltan, *Thraco-Dacica*, t. 18, 1-2, p. 239-241.
- O. Necrasov, M. Bulai- tirbu 1965 Unele aspecte ale vie ii triburilor neolitice din zona Subcarpa ilor Orientali, *SCA, T. 2*, nr. 1, p. 19-28.
- O. Necrasov, S. Haimovici 1970 Studiul resturilor de faun neolitic deshumate la antierul arheologic Traian, *MCA*, IX, 1970, p. 59-66.
- O. Necrasov, M. tirbu 1981 The characteristic Paleofauna from the Settlement of Tirpe ti (Precucuteni and Cucuteni A1-A2 Cultures), in S. Marinescu-Bilcu, *Tirpe ti from Prehistory to History in Eastern Romania*, *BAR*, 107, p. 174-187.
- A.K. Outram et alii 2009 A.K. Outram, N.A. Stear, R. Bendrey, S. Olsen, A. Kasparov, V. Zaibert, N. Thorpe, R.P. Evershed. The Earliest Horse Harnessing and Milking, *Science*, 6 March 2009, vol. 323, no. 5919, p. 1332-1335, www. DOI: 10,1126/science.1168594
- A. Popescu, R. B jenaru 2004 Cercet rile arheologice de la Costi a, jud. Neam , din anii 2001-2002, *MemAnt*, 23, p. 277-294.
- G. Posea et alii 1982 G. Posea, N. Popescu, M. P troescu, N. Florea, S. Ciulache, M. Ielenicz, *Enciclopedia Geografic a României*, Editura Academiei R.S.R., Bucure ti.

- N. Ursulescu et alii 2002 N. Ursulescu, D. Boghian, S. Haimovici, V. Cotiug , A. Coroliuc, Cercet ri interdisciplinare în a ezarea precucutenian de la Tg. Frumos (jud. Ia i). Aportul arheozoologiei, Acta Terrae Septemcastrensis, I, p. 29-54.
- N. Ursulescu et alii 2005 N. Ursulescu, D. Boghian, V. Cotiug , Problèmes de la culture Précucuteni a la lumière des recherches de Târgu Frumos (dép. de Ia i), in V. Spinei, C. Magda Lazarovici, D. Monah (eds.), Scripta Praehistorica. Miscellanea in honorem nonagenarii magistri Mircea Petrescu-Dîmbovi a oblata, Trinitas Publishing House, Ia i, p. 217-260.
- N. Ursulescu, A.-F. Tencariu 2006 Religie i magie la est de Carpa i acum 7000 de ani. Tezaurul cu obiecte de cult de la Isaiia, Seria Archaeologia Interdisciplinaris, 2, Casa Editorial „Demiurg”, Ia i.
- N. Ursulescu 2008 Modèles d’organisation de l’espace aux habitations de la culture Précucuteni entre Siret et Prut, in V. Chirica, M.C. V leanu (eds.), Etablissements et habitations préhistoriques. Structure, organisation, symbole, Bibliotheca Arheologica Moldaviae, IX.

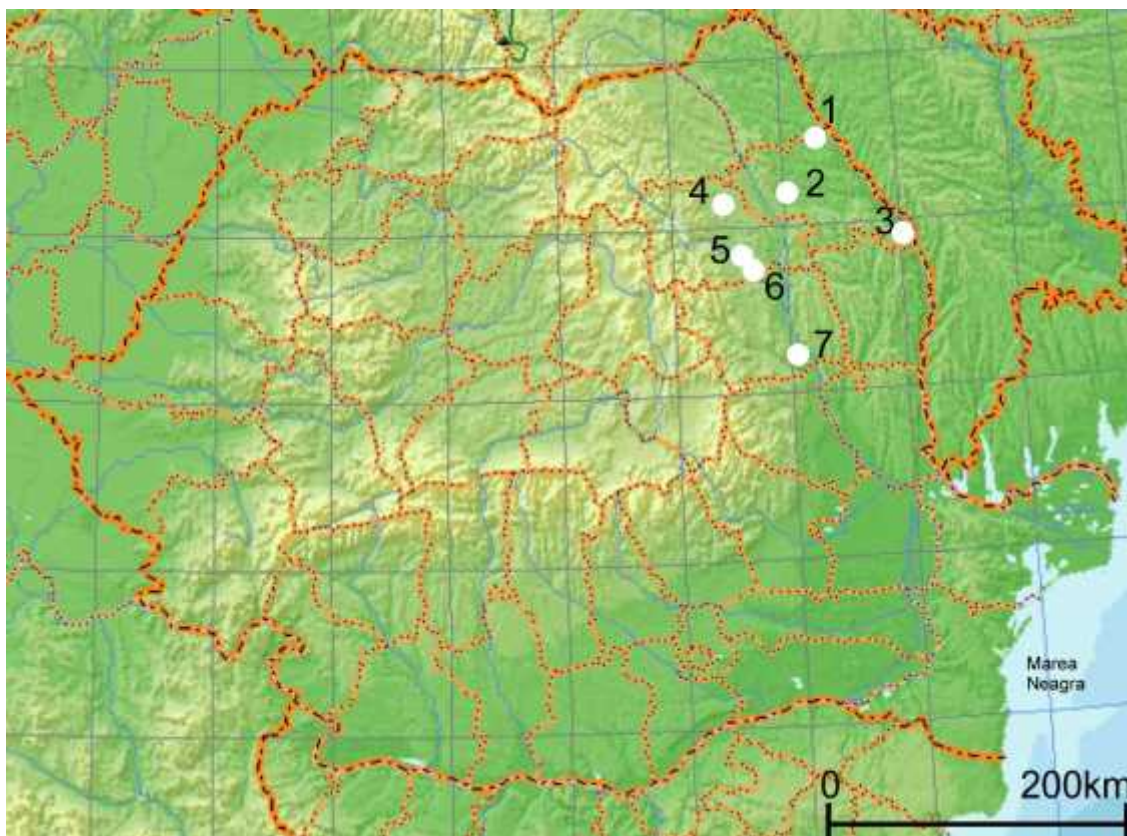


Fig. 1. Map of investigated sites / Harta cu siturile analizate: 1- Andrie eni; 2- Târgu Frumos; 3- Isaiia; 4- Târpe ti; 5-Traian; 6- Costi a; 7- Mândri ca.

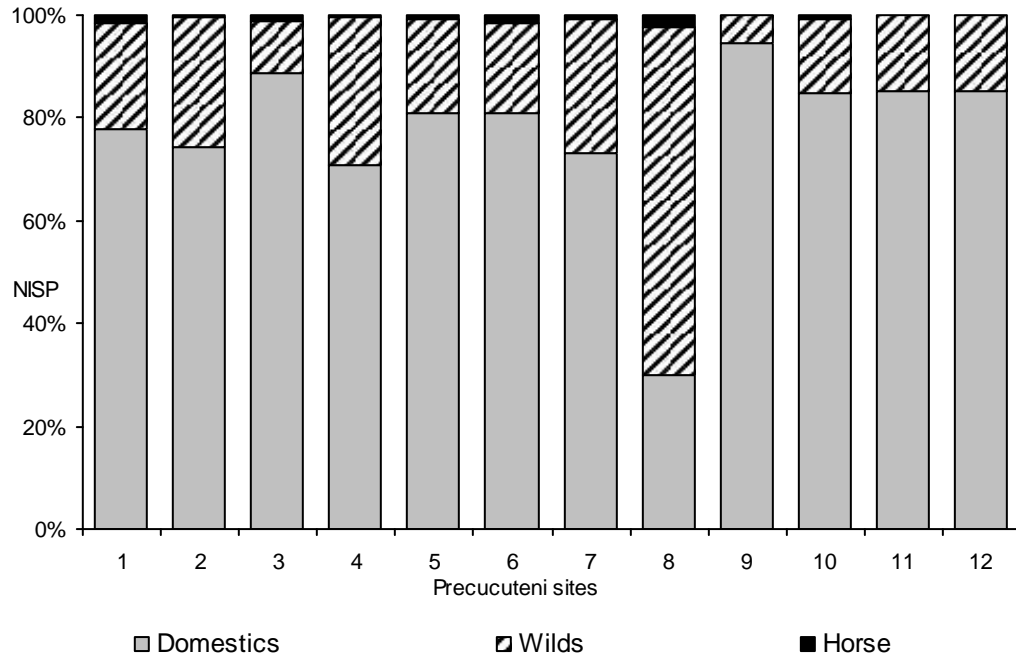


Fig. 2. Domestic/wild report in Precucuteni sites / Raportul specii domestice/ s lbatice în situri Precucuteni: 1 - Isaiia 2002; 2 - Isaiia 2004; 3 - Isaiia 2005; 4 - Târgu Frumos pit. 26; 5 - Târgu Frumos 2003-2004; 6 - Târgu Frumos 2005; 7 - Andrie eni; 8 - Costi a; 9 - Târpe ti; 10 - Mândri ca; 11 - Traian 1956-1959; 12 - Traian 1960-1961.

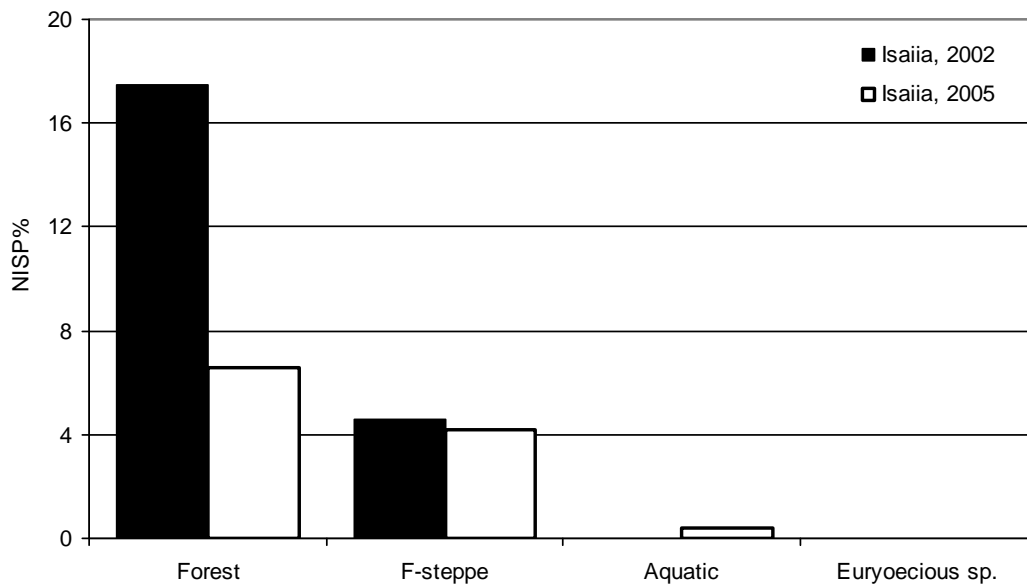


Fig. 3. Distribution of ecological groups in lowland sites (Isaiia). Distribu ia grupelor ecologice în a ez ri din zonele joase (Isaiia).

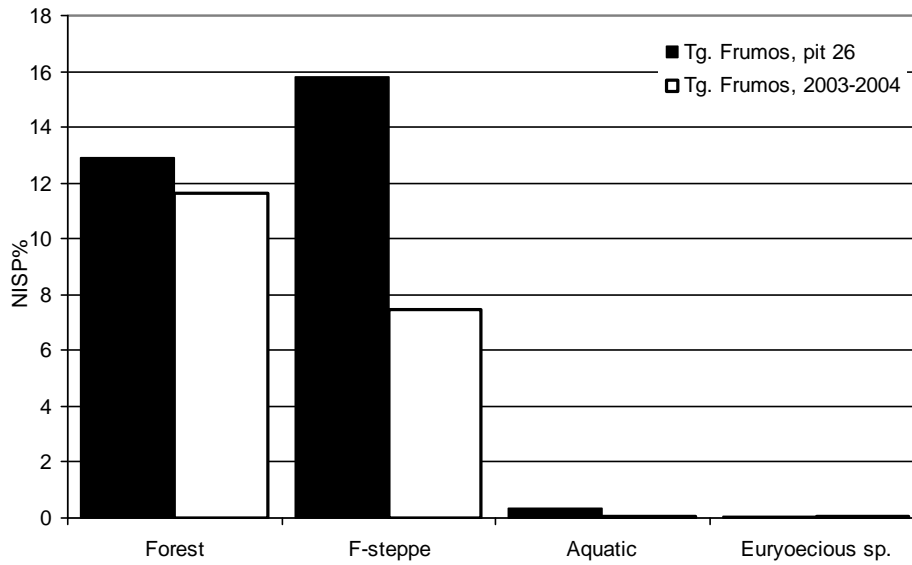


Fig. 4. Distribution of ecological groups in lowland sites (Târgu Frumos). Distribu ia grupelor ecologice in a ez ri din zonele joase (Târgu Frumos).

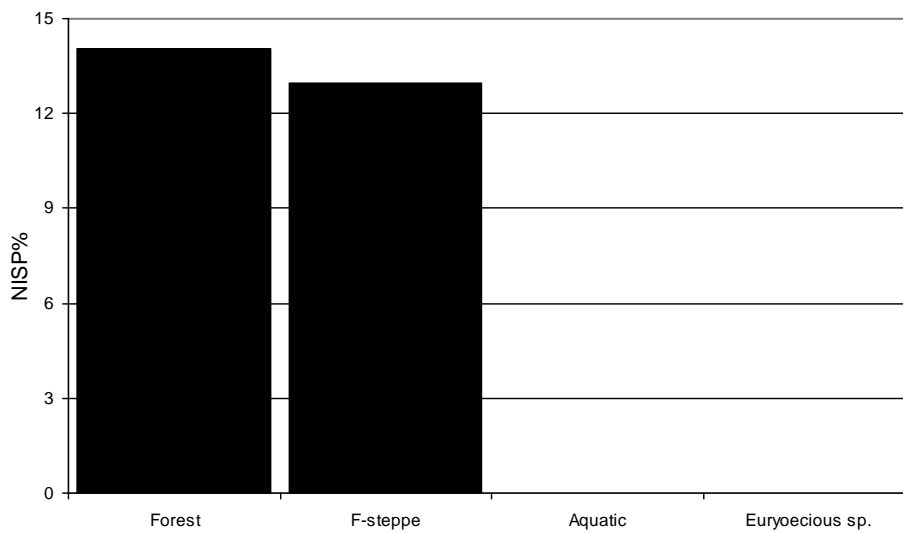


Fig. 5. Distribution of ecological groups in lowland sites (Andrieseni). Distribu ia grupelor ecologice in a ez ri din zonele joase (Andrie eni).

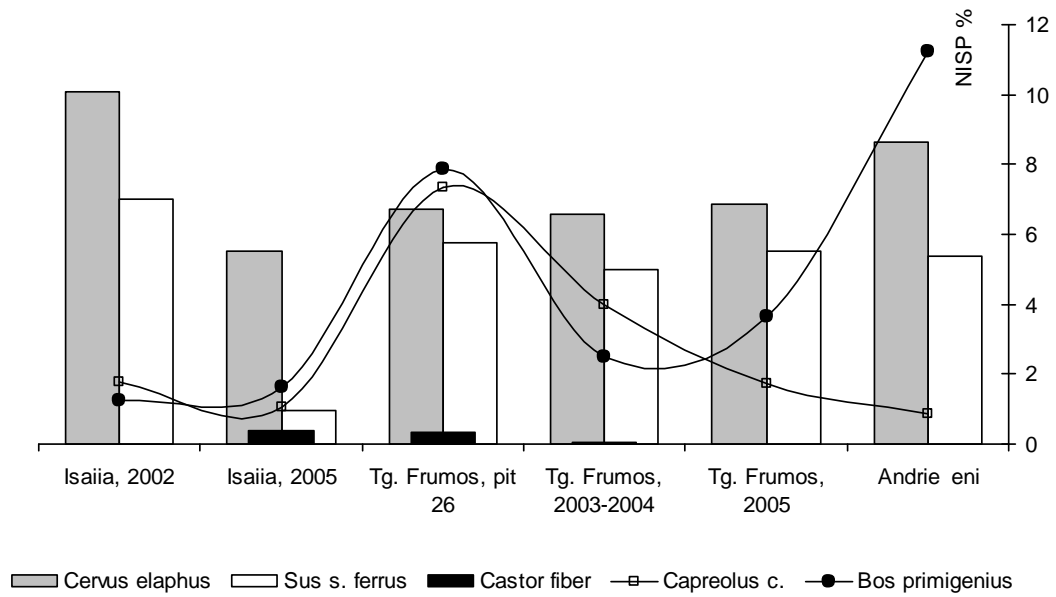


Fig. 6. Distribution of wild taxa in lowland sites.
Distribu ia speciilor s lbatice în a ez ri din zonele joase.

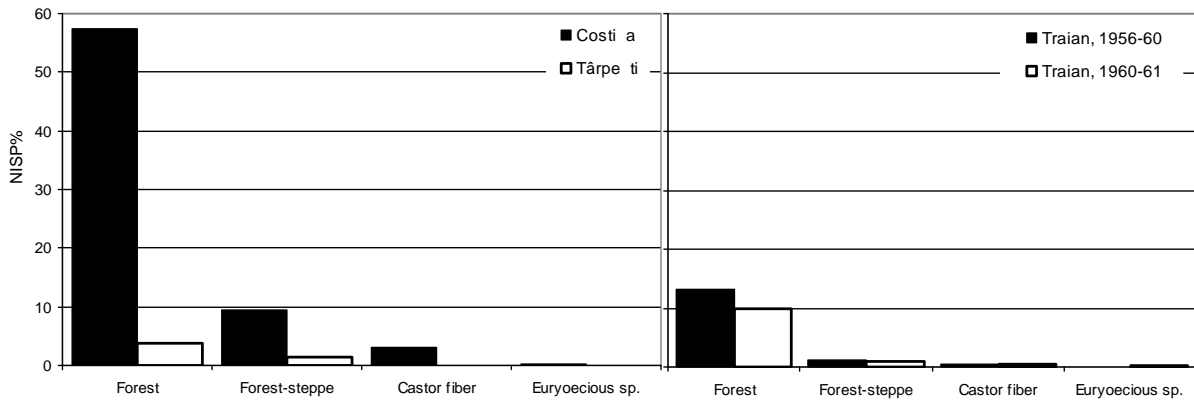


Fig. 7. Distribution of ecological groups in upland sites.
Distribu ia grupelor ecologice în a ez ri din zonele înalte.

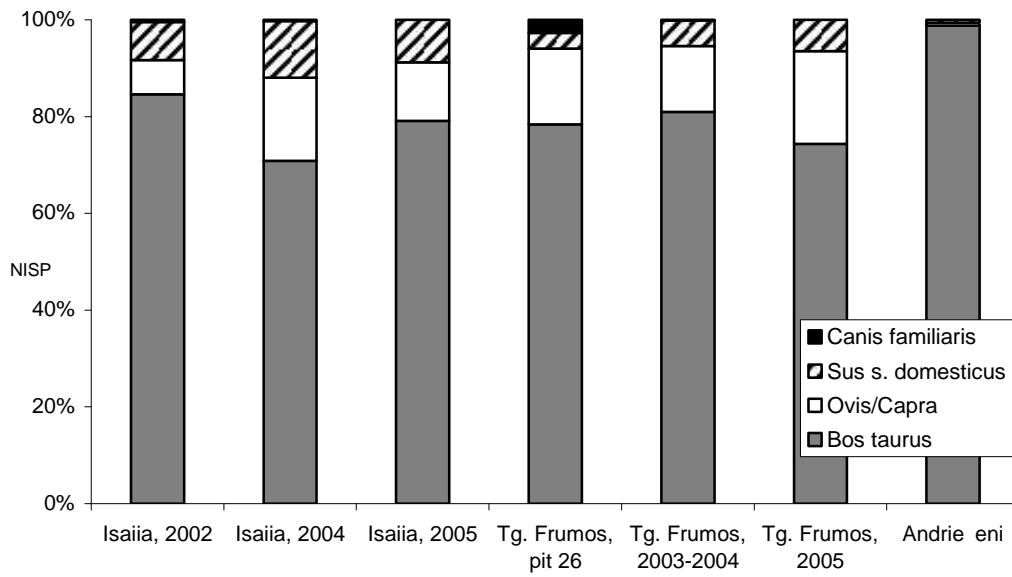


Fig. 8. Domestic species frequencies in lowland sites.
Frecven ele speciilor domestice în a ez ri din zonele joase.

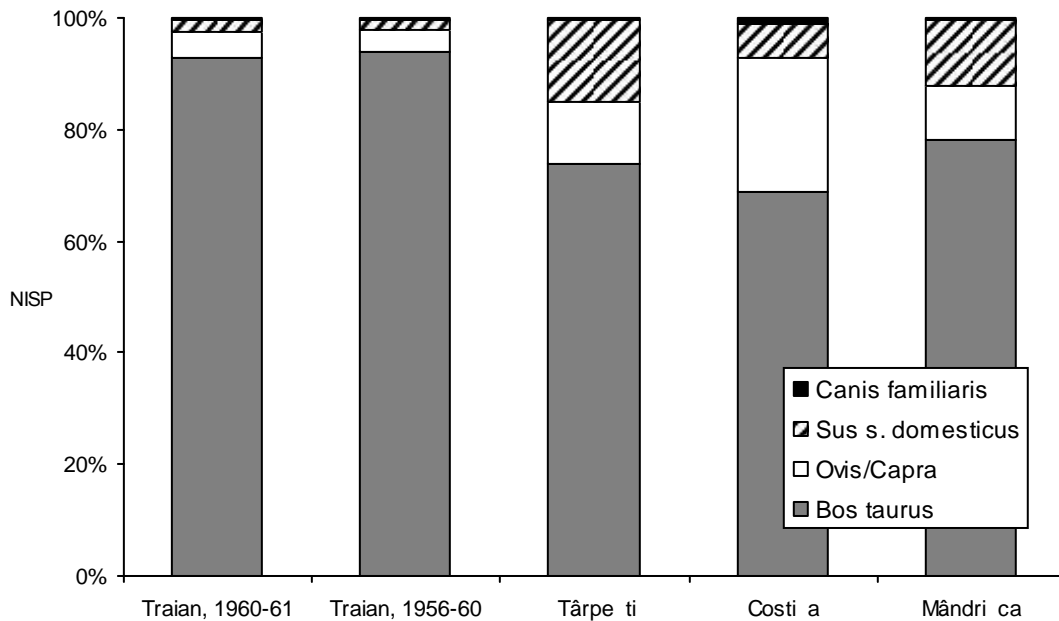


Fig. 9. Domestic species frequencies in upland sites.
Frecven ele speciilor domestice în a ez ri din zonele înalte.

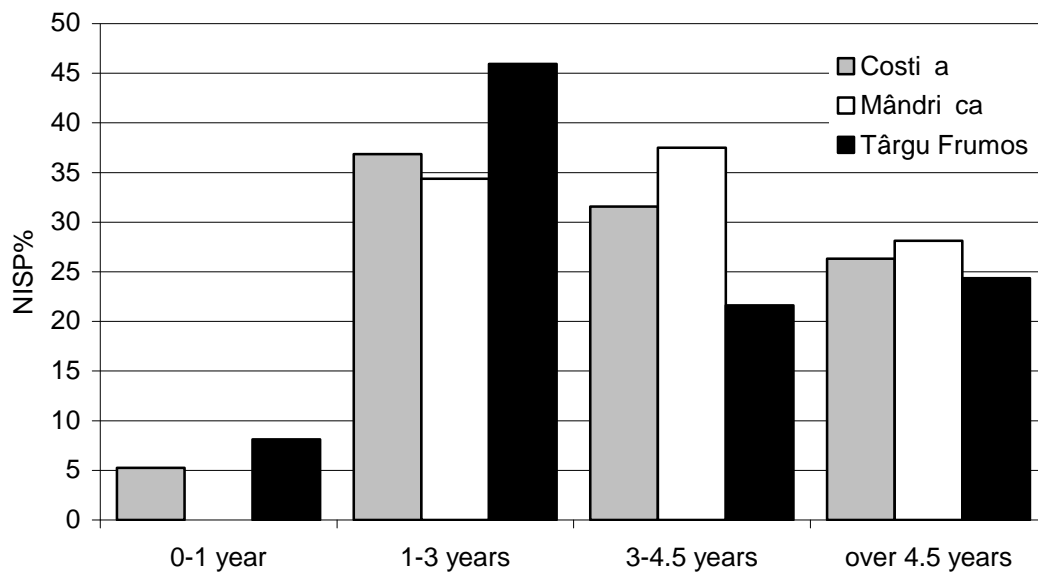


Fig. 10. Cattle, mortality profiles.
Profile de sacrificare la vit .

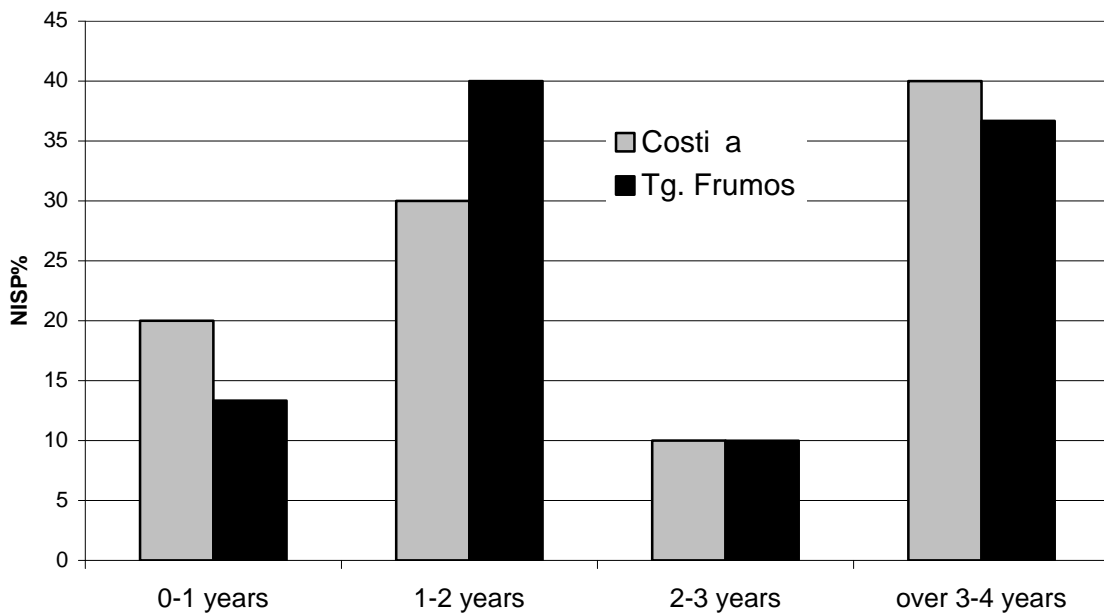


Fig. 11. Small ruminants, mortality profiles.
Profile de sacrificare la rumeg toare mici.

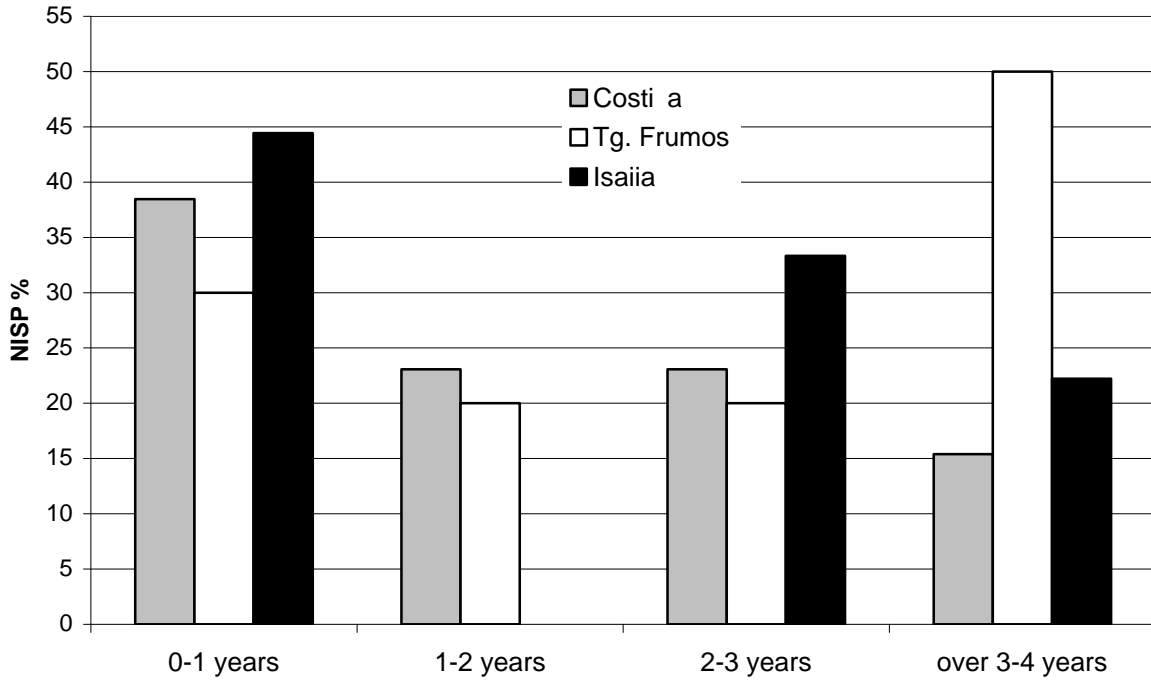


Fig. 12. Pig, mortality profiles.
Profile de sacrificare la porc.