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ZOOARCHAEOLOGICAL STUDY OF THE FAUNAL REMAINS FROM TECHIRGHIOL (HAMANGIA CULTURE, DOBROGEA, ROMANIA)

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STUDII ARHEOZOOLOGICE AL MATERIALULUI FAUNISTIC DE LA TECHIRGHIOL (CULTURA HAMANGIA, DOBROGEA, ROMÂNIA)

Rezumat

Fauna analizată în cadrul acestui articol a mai făcut obiectul unui studiu publicat în anul 1962 (Necrasov Olga, Haimovici S., 1962). Unul din considerentele cele mai importante care ne-au făcut să reluăm studierea materialului faunistic de la Techirghiol este faptul ca acesta este din punct de vedere statistic (numeric şi biometric) la acelaşi nivel cu cel de la Cheia (judeţul Constanţa). De asemenea un alt obiectiv extrem de important al studiului nostru a fost şi recalcularea numărului minim de indivizi (NMI) care în precedentul studiu credem că a fost supraevaluat el fiind estimat pe complexe arheologice, la cererea arheologului. Având în vedere numărul mare de astfel de structuri şi pentru a evita suprareprezentarea noi am preferat estimarea NMI pe întreg nivelul cultural Hamangia, considerând că în felul acesta putem obţine o imagine mult mai aproape de adevăr a paleoeconomiei animaliere. Trebuie specificat faptul că fauna a fost prelevată la "ochi", în mod direct la fel ca şi majoritatea artefactelor arheologice, ceea ce presupune o serie de avantaje şi de dezavantaje (Popovici et alii, 2002).

Fauna identificată la Techirghiol este bogată şi variată , dovadă stau taxonii identificaţi care aparţin atât nevertebratelor (clasa *Bivalvia*) cât si vertebratelor (clasele *Pisces, Reptilia, Aves* si *Mammalia*). Acest fapt sugerează ca populaţia preistorică de la Techirghiol exploata toate resursele animale din jurul aşezării. Din păcate lipsa sitării de sediment din anumite structuri arheologice cu caracter menajer ne văduveşte în ceea ce priveşte adevărata importanţă a culesului moluştelor şi a pescuitului şi nu numai.

In cadrul spectrului faunistic mamiferele sunt predominante, iar dintre acestea, animalele domestice au cea mai mare pondere. Resturile de bovine sunt cele mai numeroase, ele fiind urmate de ovicaprine. Însă ca NMI, ovicaprinele şi bovinele îşi dispută primul loc. În schimb procentajele deţinute de suinele domestice sunt extrem de reduse atât ca număr de resturi (NR), cât şi ca NMI..

Astfel, dacă prin prisma vârstelor de sacrificare, bovinele sunt exploatate pentru consumul carnat, dar şi pentru produsele lor secundare, ovicaprinele sunt crescute mai ales pentru lapte, dovadă stând animalele sacrificate la vârste mai înaintate. În ceea ce priveşte porcul acesta este exploatat doar pentru consum, el fiind sacrificat în principal atunci când atingea o greutate ponderală optimă, abia după vârsta de 16-18 luni (51,7 % din indivizi).

Datele biometrice ale cornutelor mari şi mici sunt apropiate cu cele ale animalelor descoperite în aşezarea de la Cheia (figurile 1, 2 şi 3).

Vânatul este slab reprezentat ca NR, dar relativ bine certificat ca NMI. Vânătoarea avea un rol secundar, de suplimentare şi completare a resurselor animale. Se vânau cu precădere, animale de talie mare şi medie, în principal măgarul sălbatic european, dar şi bour, cerb, mistreţ şi căprior.

Fauna sălbatică este extrem de variată din punct de vedere ecologic. Astfel s-au identificat specii de lizieră: căprior, bour, iepure de câmp; specii de pădure: cerb şi mistreţ; specii de stepă: măgarul sălbatic european; specii acvatice: delfinul, dar şi specii eurioece: vulpea. Plecând de la preferinţele ecologice ale mamiferelor sălbatice, de la ponderea acestor taxoni în cadrul spectrului faunistic, dar şi de la fauna domestică, putem spune că mediul din preajma aşezării de la Techirghiol, era în principal deschis, dar cu păduri care se găseau nu la mare depărtare, fiind un biotop propice creşterii cornutelor mari şi mici.

Descoperirea doradei la Techirghiol (cultura Hamangia), dar şi la Năvodari (cultura Gumelniţa) vine să arate că cel puţin în perioadele vechi ale holocenului, Marea Neagră, avea un nivel mai înalt (crescut), iar actualele lacuri erau golfuri mai mult sau mai puţin salmastre în care doradele intrau pentru a se hrăni cu scoici, mai ales cu *Mytillus* (midie), specie care a fost identificată şi ea în materialul nostru.

Din cauza curentului circular al Mării Negre, aceste golfuri în timp au fost închise cu "bare" de nisip, astfel încât cele mai multe au devenit lacuri cu apă dulce, datorită alimentării cu unele pâraie, doar Techirghiolul, neavând la dispoziție pâraie cu un debit ceva mai mare, a devenit cu timpul un lac hipersalin.

Prezența atât a doradei, cât şi a măgarului sălbatic european în staţiunea luată în considerare, dar şi în altele din Dobrogea, dar nu numai, vine să documenteze prin fauna descoperită existența marelui optim climatic postglaciar (aşa numita perioadă atlantică) în evoluția climatică a holocenului. Totuşi nu trebuie să omitem faptul că extincția doradei în timp s-ar putea datora şi dispariției golfurilor marine, în care această specie pătrundea şi se hrănea. În ceea ce priveşte dispariția măgarului sălbatic aceasta s-ar datora în primul rând vânării sale în mod excesiv.

Fauna de la Techirghiol prezintă un spectru similar cu cel din aşezarea de la Cheia. Cu toate că cele două staţiuni preistorice sunt situate în medii geografice diferite, una în centrul Dobrogei, în interiorul provinciei, iar cealaltă pe malul ghiolului litoral Techirghiol, ele au acelaşi tip de paleoeconomie. Astfel cornutele mari şi mici deţin procentaje aproape egale, cu un plus pentru bovine; suinele domestice sunt slab reprezentate, chiar absente la Cheia; vânatul are un rol secundar în paleoeconomia animalieră, suplimentând şi completând dieta acestor populații preistorice (figurile 5 şi 6).

Cuvinte cheie: arheozoologie, cultura Hamangia, creşterea animalelor, vânătoare, *Equus hydruntinus, Sparus aurata*.
Key words: zooarcheology, Hamangia culture, breeding, hunting, *Equus hydruntinus, Sparus aurata*.

The fauna analysed in this study had previously been the subject of a work published in 1962 (Necrasov Olga, Haimovici S., 1962). The faunal remains came from the Hamangia settlement at Techirghiol investigated by a group of archaeologists led by Eugen Comşa (Comşa E. et al., 1962). The Hamangia Culture had been discovered as a result of excavations in the eponymous settlement at Baia (Hamangia) in 1953 (Berciu D., 1966). This is the first Neolithic culture discovered in Dobrogea and is dated to the second half of the sixth millennium B.C. (Haşotti P., 1997).

The Hamangia Culture is poorly studied from a zooarchaeological point of view (Map 1). The studied lots are few and the numbers of remains vary widely among them: Cernavoda, with over 500 remains (Necrasov Olga et al., 1959 a; Necrasov Olga et al., 1959b); Techirghiol, with 1434 (Necrasov Olga, Haimovici S., 1962); Ceamurlia de Jos, with 147 (Necrasov Olga, Bulai Maria, 1970); Goloviţa, with 92 (Necrasov Olga, Bulai Maria, 1970); Hamangia, with 105 (Haimovici S., 1987a); and Cheia, with 1947 (Bălăşescu A., Radu V., 2003). Most of these lots (except for the Cheia lot) resulted from archaeological excavations undertaken between 1950-1960, when zooarchaeology was still in the stage of defining the most adequate methods of investigation and analysis. Of these early lots, only the one from Hamangia, was studied in a complex mode (Haimovici S., 1987a). Based on these data, Sergiu Haimovici has produced the only zooarchaeological synthesis of the Hamangia culture, at the end of the last century (Haimovici S., 1997, 2000).

Considering the situation of zooarchaeological studies of the Hamangia culture, the present authors decided that re-evaluation of the faunal material from Techirghiol, very similar numerically and biometrically to the Cheia material, was much needed. An important objective of the present study was to recalculate the minimum number of individuals (MNI), which we believe was over-evaluated in previous studies due to use of archaeological complexes as the basis for calculus, at the archaeologist's request. Taking into account the high number of archaeological complexes defined for the settlement, and in order to avoid over-representation, we chose to estimate the MNI based on faunal remains form the entire Hamangia cultural level as a whole. In our opinion this approach is likely to reflect a much more realistic image of the animal palaeoeconomy of the settlement. It must be noted that at Techirghiol the faunal material

was collected directly, piece by piece, as the excavation went on, same as the other archaeological artifacts. This determines certain advantages, as well as shortcomings of the sample, from a zooarchaeological viewpoint (Popovici D. et al., 2002).

The taxa identified in the Techirghiol faunal lot belong to invertebrates (Bivalvia) and vertebrates (Pisces, Reptilia, Aves and Mammalia). The list of species demonstrates a rich and diverse fauna, and mammal remains are predominant (Tables 1 and 2). The fragmented state of the mammal is indicative of veritable "kitchen middens". However, fine cutting (fleshing) traces are inconspicuous on the majority of the bones, because bones are highly degraded, profusely fissured, and altered by numerous root traces. By contrast, traces left by gross cutting (disjointing) are much more conspicuous, particularly on epiphyses. Also, the diaphyses of some of the bovine long bones exhibit unusual girdling traces which suggest that circular transverse sections were attempted to obtain bone rings of different diameters (depending on the caliber of the bone – humerus, femur, tibia) (Photo 6). Girdling traces of he same kind were documented in the Cheia material and indicate activities related to the bone and antler industry whose artefacts are relatively scarce in the Hamangia culture.

In the following section we present a review of the identified faunal material organized by systematic groups.

Bivalves are represented by 20 remains belonging to *Unio pictorum* (9), *Unio crassus* (6), *Cardium* sp. (1), *Mytilus* sp. (2) and *Venus galinae* (1) (Photo 1). The low number of remains indicates that bivalves did not represent an important resource in the diet of the Hamangia population. However, this might as well represent an artefact of the prelevation system (prelevation by hand, piece by piece), used in the 60s. The presence of Unionidae in the Techirghiol lot is nevertheless an argument in favor of the presence of fresh water springs and biota in the vicinity of the settlement; even today several springs are supplying Techirghiol Lake[1]. The 1962 study reported eight remains belonging to class Gasteropoda, but we consider their presence in the archaeological levels accidental, i.e., they probably represent recent biota.

Fishes are present with 17 remains belonging to *Aurata aurata* (gilthead seabream), *Silurus glanis* (wels catfish), *Abramis brama* (carp bream) and *Stizostedion lucioperca* (zander)[2] (Photo 2). The gilthead seabream is represented by six remains (four premaxillar bones and two large teeth) that belonged to six individuals. Presently, this species is extremely rare in the Black Sea, near the Romanian seacoast: only one-two individuals are fished here per year (Necrasov O., Haimovici, 1959a; Bălăşescu A. et Radu V., 2004). Relative to this situation it is worth noting that the gilthead seabream has no vernacular name in Romanian or in Russian, and ichthyologists consider its presence in the Black Sea accidental. The number of gilthead seabream remains at Techirghiol indicates that the species was relatively frequent, or maybe even a common presence, in the vicinity of the Romanian seacoast in the Hamangia period. This suggests that the climate in Dobrogea was much milder during Hamangia time, in accord with the dating of this cultural level to a time interval that falls within the Atlantic period, the climatic optimum of the Holocene. The gilthead seabream was also identified in a settlement belonging to the Gumelnița culture (posterior to the Hamangia culture), at Năvodari-Taşaul (Radu V., 2001). Another interesting fact is that the gilthead seabream, a mainly carnivorous (shellfish-eating), accessorily herbivorous fish (Bauchot M.-L., Hureau J.C., 1990), enters the lagoons connected with the sea in spring, in search of food. Thus, the ecology of the species, indicates that the present-day lake was communicating with the sea in the Neolithic

[1] "-ghiol" in the name Techirghiol comes form Turkish (golu = lake) and means a lake with a high content of sapropelic mud.

[2] We thank Dr. Valentin Radu (National Center for Pluridisciplinary Research – National History Museum of Romania) who helped with identification of fish remains and reconstruction of sizes of Silurus glanis, Abramis brama and Stizostedion lucioperca.

period, and therefore salinity was lower than today.

The wels catfish (*Silurus glanis*) is present with three precaudal vertebrae. Sizes reconstructed biometrically based on these for two individuals are 996 mm length and 6.6 kg, respectively 1357 mm length and 16.6 kg. The carp bream (*Abramis brama*) was identified on one precaudal vertebra that allowed for reconstruction of size: 499 mm length and 1.6 kg. The zander (*Stizostedion lucioperca*) is documented by a cleitrum belonging to a medium-sized individual. These three species also indicate that the salinity of Techirghiol Lake was lower during Hamangia time than today. The taxonomic diversity and the sizes of individuals suggest that fishes represented a significant source of food during the warm season. However, the importance of the group in the alimentation of the Hamangia population is hard to assess because of the inconsistency inherent to the sampling methodology.

Four shell fragments belonging to the Greek tortoise (*Testudo graeca ibera*, Photo 3) indicate a minimum number of two individuals for this unique representative of the **reptiles** in the Techirghiol lot.

Birds are represented by 18 remains. Although these are quite fragmented, their dimensions suggest a species of large size. *Grus* sp. and *Anser* sp. were identified, but the lack of a reference collection for birds precluded further identification of bird bones. We nevertheless consider that most of these belong to aquatic species.

Mammals yielded the largest number of remains, dominated by domestic species (NR = 93.33%; MNI = 67.57%) (Table 2).

Domestic Mammals

Bovines are well represented in the faunal spectrum: approximately 543 remains (49.63%) and 32 MNI (28.83%) (Photos 4 and 5). The height of individuals could not be estimated in the absence of long bones from the studied sample. However, all other biometrical data indicate that the animals were medium-robust. Comparison of biometrical data from Techirghiol and Cheia (Bălăşescu A., Radu V., inedit) reveals that the average values for the two settlements are very similar, suggesting a homogeneous population within the species (Figure 1). Differences in epiphysis breadth of diverse anatomical elements were noted between the domestic bovines of the Hamangia culture and those of the Boian culture. On average, Hamangia cattle seem to have been superior to the Boian cattle, being characterized by higher robustness (Bălăşescu A. et Radu V., 1999; Bălăşescu A., Udrescu M., 2005; Bălăşescu, 2005).

Only two bovine horncores were discovered at Techirghiol. They preserve only the inferior part and can be assigned morphologically and biometrically to the *brachyceros* type. Both horncores are oval in section and one belongs to a female.

Sacrificing ages of cattle where estimated based on teeth and apendicular skeleton. The sexually immature: mature (potentially reproductive) individuals ratio is 1:1.1 (or 15:17) indicating that cattle where bred for meat, as well as for their secondary products, probably milk (Table 3). The majority of sacrificed individuals are about three years old (28%), the age at which the primitive breeds of that time were probably reaching optimum weight for sacrifice.

Ovicaprines are also well represented with 449 remains (41.04%), the second most abundant group after bovines. The high degree of fragmentation of bones rendered the specific identification difficult. Ovicaprine remains belong to 33 individuals, of which 10 are positively *Ovis aries* (based on the axis, scapulae, etc.) and seven *Capra hircus* (based on distal fused tibias) (Boesnneck J. et al, 1964; Prummel W., Frisch J.-H., 1986; Halstead P. et al, 2003). As is common with these two species, the specific identification of the remaining individuals is ambiguous. Sacrificing ages of ovicaprines, as reflected by the immature:mature individuals ratio (1:2,6 i.e., 9:24), suggest that animals were bred especially for their secondary products and to a lesser extent for meat (Table 3).

Ovis aries (sheep) is represented by 95 remains. Seven horncores are present and their morphology and biometry indicate high dimensional variability which present some. Horncores 1 through 4 exhibit similar

morphology characterized by two longitudinal edges, a long anterior edge and a shorter posterior one, and a semicircular base. The internal face of the horncore is flat or slightly convex, whereas the external face is highly convex, which results in the semicircular aspect of the section. The anterior edge of the horncore is conspicuous, whereas the posterior edge is less prominent face toward the base and becomes more obvious toward the backward oriented apex. By contrast, horncore 5 has the two edges rounded, but is characterized by a similar semicircular section at the base. Horncores 1 through 5 belong to males and horncore 5 potentially repersents a castrated male, suggesting that this practice was in use for sheep/goats as well. Horncores 6 and 7, much smaller in size (<1.5 cm), represent females. On living animals horncores of this size are not they visible and they can only be ascertained by palpation. A hornless female was also identified in the Techirghiol sample. These observations indicate that sexual dimorphism as reflected by horns was quite marked in *Ovis aries* during Hamangia time (Photos 7-9).

Complete bones (4 calcanei and 4 metatarsi; Photo 11) allowed for estimation of shoulder height of *Ovis aries* (Teichert index) (Chaix L. et Meniel P., 1996). The average stature is 58.3 cm (55.3-63.3 cm), almost identical with the value obtained in the other settelement of the Hamangia culture, at Cheia (Bălăşescu A., Radu V., 2003). In fact, all of the biometrical data of sheep indicate high similarity between the animals at Techirghiol and those at Cheia (Figure 2). Based on these we consider that the sheep of the Hamangia populations were small sized, characterized by average shoulder heights lower than 60 cm.

Capra hircus (goat) is a more discrete presence at Techirghiol. This species was identified on a single horncore: 62 mm long with a broken apex. The horncore has two conspicuous longitudinal edges that separate the rather flat internal surface from the highly convex external surface. A complete metacarpal (Photo 12) allowed for size estimation - the value obtained is 55.9 cm (Schramm index) (Chaix L. et Meniel P., 1996). Again, comparison with goats from Cheia reveals average almost identical values that indicate a homogeneous population of relatively small-sized individuals (Figure 3).

Sus domesticus (pig) remains are sparse (22, i.e. 2.01%). The bones represent seven individuals (6.31%) and ages based on dentition (Photo 10) range 6-24 months (Table 3). It is noteworthy that most sacrificed individuals were older than 16-18 months (57.1%), age at which the animals were probably reaching optimum weight. The low number of remains and their state of advanced fragmentation preclude further considerations on the morphology of this species. One viscerocranium piece nevertheless exhibits an elongated morphology of the lachrymal bone (length= 28.4 mm; height= 20.5 mm) that suggests a long muzzle similar to that of the wild counterpart, the wild boar.

Canis familiaris (dog) is present with very few remains (0.64%) attributed to three individuals (2.71%): one immature and two mature (Photo 13). Cutting traces (e.g., disjointing and fleshing traces) suggestive of use in alimentation were not observed. The low representation of this species at Techirghiol mirrors the situation documented in other Hamangia settlements and, more generally, for all of the Romanian Neolithic.

Wild mammals

This group is taxonomically diverse at Techirghiol. We have identified eight taxa: fox, dolphin, European wild ass, boar, deer, roe deer, aurochs and hare. This list adds two more wild mammal taxa, the deer and the aurochs, to the list compiled for the 1962 study. The wild fauna is poorly represented as number of remains (6.67%), but the number of individuals reaches higher percentages (32.43%). This structure of the faunal spectrum is comparable with that documented at Cheia (figures 5 and 6).

Vulpes vulpes (fox), present with 14 remains (1.28%) from five adult individuals (5 left coxals), is a wide-spread species.

Eight vertebrae with low size variability (BFcr/cd = 25-30 mm) represent remains of a small dolphin species, possibly ***Phocena phocena***. Dead or injured individuals were probably brought to shore by waves and taken

by the prehistoric people to the nearby settlement.

Equus hydruntinus (the European wild ass) known from the Palaeolithic of Mediterranean Europe, it reaches the Mesolithic, as revealed by remains discovered in Crimeea. At the end of the Mesolithic the species is present along the Danube, in Romania (Haimovici S., 1987b). In the Neolithic it was first discovered in southern Hungary and Voievodina, and in large amounts in the Hamangia area, including at Techirghiol (Necrasov Olga, Haimovici, 1959b, 1960). Here *Equus hydruntinus* is represented by 13 remains (Necrasov Olga, Haimovici S., 1962). The same authors provisionally assigned nine additional remains of equivocal affinity to a small equid. Such assignment is due to the fact that the European wild ass is a fossil species for which some of the skeletal parts are still unknown to date. Recent studies reported the presence of *Equus hydruntinus* both in Banat, in the Vinča area (El Susi Georgeta, 1985; idem, 1996), and in the Hamangia settlement at Cheia. Unsure of the exact identity of the remains the authors (Bălăşescu A., Radu V., 2003), assigned six of the remains discovered at Cheia to a small sized equid and only one fragment was attributed beyond doubt to *Equus hydruntinus*. This species was also reported among remains representing offerings in the necropolises at Cernavoda (Romania; Necrasov Olga et al, 1959a, 1959b) and Durankulak (Bulgaria; Spasov N., Iliev N., 2002). The species was apparently quite widely used in alimentation and it is no unlikely that excessive hunting during the Neolithic caused its extinction in Dobrogea.

Sus scrofa (wild boar) is represented by a small number of remains (3) from two adult individuals (1.8%). A complete astragalus probably representing a female (Photo 15) yielded a shoulder height of 98,8 cm (Teichert index) (Udrescu et al., 1999).

Cervus elaphus (deer) is also rare with only by three remains (0.27%) that attest the presence of two individuals (1.8%) determined on astragali of two different sizes. One of these exhibits traces of polishing on the plantar face.

Capreolus capreolus (roe deer) is better represented than the deer: nine remains (0,82%) attributed to three adult individuals (three dimensionally different fused scapulae; Photo 14).

The biometrical survey of bovine bones at Techirghiol allowed for identification of four remains assignable to ***Bos primigenius*** (aurochs): a horncore, a distal humerus (Photo 6) and two calcanei. In the absence of measurements, remains of this species were overlooked and counted among the cattle remains in the 1962 study. The aurochs bones represent at least two individuals (two fused calcanei), one of which is a female considering the morphology and size of the horncore.

Lepus europaeus (hare) is present with only ten remains (0,91%) from a minimum of five adult individuals (4,5%) identified based on five right coxals (Photo 16).

Discussions and conclusions

The fauna identified at Techirghiol is rich and varied, indicating the exploitation of all animal resources available in the vicinity of the prehistoric settlement. However, the real importance of mollusk gathering, fishing and other activities in the economy of this Hamangia community eludes us in the absence of comprehensive zooarchaeological sampling based on sediment sieving, particularly for midden deposits.

Mammals dominate the faunal spectrum, and among them domestic species are most widely represented. Bovine remains are the most numerous, followed by those belonging to ovicaprines. These two groups also dispute for the first place with respect to minimum numbers of individuals. It is noteworthy that the biometry of the Techirghiol bovids and ovicaprines is very similar to that documented for the sample of the Cheia settlement representing another Hamangia community (Figures 1, 2 and 3).

The potential yields in terms of meat and secondary products (probably only milk), indicate that bovines were very important in the animal palaeoeconomy of the settlement. Sacrificing ages indeed suggest that bovines were exploited for meat, as well as for their secondary products, whereas ovicaprines were bred primarily for milk, and sacrificed at

advanced ages. The pig was exploited only for meat, being sacrificed when it reached optimum weight, after 16-18 months (51,7% of individuals).

An important feature of the faunal spectrum at Techirghiol is the very low percentage of suines. Two explanations can be envisioned for this scanty presence of suines that characterizes several Hamangia settlements. The first is related to the fact that domestic suines are generally interpreted as indicating a high level of sedentarisation in prehistoric populations. Thus, the absence or reduced percentages of domestic suines may reflect higher mobility of populations, a hypothesis corroborated by the high percentages of bovines and ovicaprines documented in the same settlements. The second explanation may be simply that the Hamangia populations were neglecting domestic suines as a source of food, and then the reduce percentages of pig would directly reflect a characteristic of diet of this culture. Why was the domestic pig neglected as a source of food is a difficult question. We cannot ignore that even today there are human communities where certain animal species have a particular status. The Hindu have the sacred cow, whereas in the Islamic world the pig is considered a dirty animal that cannot be consumed, and the examples can go on.

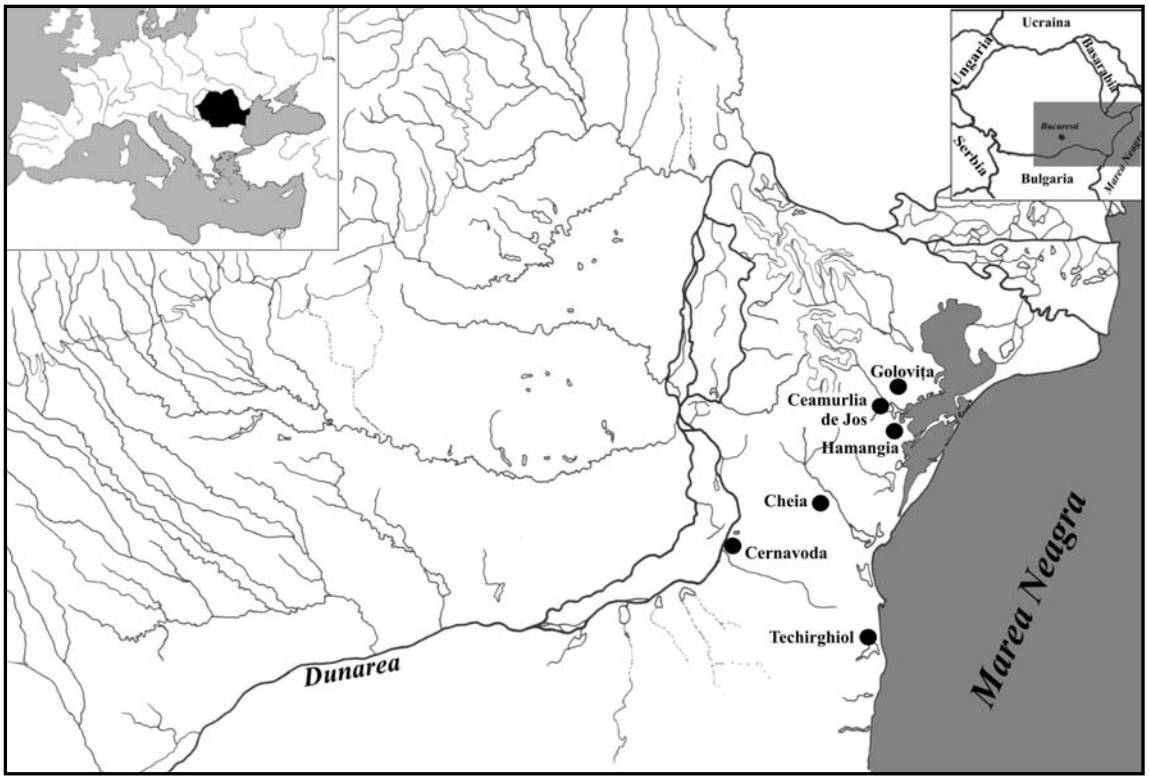
The products of hunting are poorly represented in terms of numbers of remains, but relatively well represented in terms of minimum numbers of individuals. Hunting probably held a secondary role in the economy of the Hamangia population at Techirghiol, that of complementing animal food resources. Large and medium-sized animals seem to have been hunted predominantly, in particular the European wild ass, but also the aurochs, deer, wild boar and roe deer.

The wild fauna is extremely varied ecologically. Forest edge species (roe deer, aurochs, hare) are present along with forest species (deer, wild boar), steppe species (European wild ass), aquatic species (dolphin), as well as more ubiquitous specie (fox). Based on these ecological affinities of wild mammals, as well as on the domestic mammal section of the faunal spectrum, we suggest that the environment surrounding the Hamangia settlement at Techirghiol was generally open, with some forests not too far away, a favorable biotope for breeding bovines and ovicaprines.

The discovery of the gilthead seabream (*Sparus aurata*) at Techirghiol, in the Hamangia culture, and at Năvodari, in the Gumelnița culture, corroborates sealevels higher that today reconstructed for the Black Sea during this period of the Holocene. It also suggests that the present-day lakes along the Black Sea shore were at the time gulfs explored by seabreams in search of shellfish (particularly the mussel (*Mytilus*) identified among the Techirghiol material). These gulfs were subsequently closed by sandbars built by the strong longshore currents characteristic of this sector of the Black Sea. Most of them, characterized by steady freshwater supplies from inland streams and springs, became freshwater lakes, whereas some, such as Techirghiol Lake, became very saline due to scarce freshwater inputs.

Presence of the gilthead seabream and of the European wild ass at Techirghiol and in other excavations in Dobrogea is consistent with the mild climate of the postglacial climatic optimum (the Atlantic period) of the Holocene. The retreat of the gilthead seabream could have been caused by the closing of gulfs, whereas extinction of the European wild ass may be due to excessive hunting.

The faunal spectrum reconstructed for the Techirghiol settlement is similar to that of another Hamangia settlement in Dobrogea, at Cheia. Although the two settlements are separated by 50 km and are located in geographically distinct areas (Cheia in the middle of Dobrogea and Techirghiol very close to the Black Sea shore), they reflect the same type of palaeoeconomy: bovines and ovicaprines with almost equal percentages and a domination by bovines; domestic suines very poorly represented (absent at Cheia); and hunting holding a secondary role, that of complementing the diet of these prehistoric populations (Figures 4 and 5).



Map 1. Geographical distribution of the Hamangia settlements studied from an archaeozoological view point.

Taxon	**NR**	**%**
Unio pictorum	+	
Unio crassus	+	
Cardium sp.	+	
Venus galinae	+	
Mytilus sp.	+	
Theba carthusiana	+	
Zebrina sp.	+	
Jaminia sp.	+	
Mollusca	**28**	**1.95**
Sparus aurata	6	
Abramis brama	1	
Silurus glanis	3	
Stizostedion lucioperca	1	
Indet pisces	6	
Pisces	**17**	**1.19**
Testudo sp.	4	
Reptilia	**4**	**0.28**
Grus sp.	1	
Anser sp.	1	
Indet aves	18	
Aves	**20**	**1.39**
Mammalia	**1365**	**95.19**
Total	**1434**	**100.00**

Table 1. Numerical and percentage repartition of the fauna remains of each animal class discovered at Techirghiol (Hamangia culture).

Species	**NR**	**%**	**MNI**	**%**
Bos taurus	543	49.63	32	28.83
Ovicaprine	318	29.07	16	14.41
Ovis aries	95	8.68	10	9.01
Capra hircus	36	3.29	7	6.31
Sus domesticus	22	2.01	7	6.31
Canis familiaris	7	0.64	3	2.70
Total domestic	**1021**	**93.33**	**75**	**67.57**
Vulpes vulpes	14	1.28	5	4.50
Equus hydruntinus	13	1.19	8	7.21
Equideu mic	9	0.82	4	3.60
Phocaena phocaena	8	0.73	5	4.50
Sus scrofa	3	0.27	2	1.80
Cervus elaphus	3	0.27	2	1.80
Capreolus capreolus	9	0.82	3	2.70
Bos primigenius	4	0.37	2	1.80
Lepus europaeus	10	0.91	5	4.50
Total wild	**73**	**6.67**	**36**	**32.43**
Total mammals det.	**1094**	**100.00**	**111**	**100.00**
Total mammals indet.	**271**	**-**	**-**	**-**
Total mammals	**1365**	**-**	**-**	**-**

Table 2. Numerical and percentage repartition of the remains (NR) and of the minimum number of individuals (MNI) of each species of mammals discovered at Techirghiol (Hamangia culture).

	Bos taurus			***Ovis/Capra***			***Sus domesticus***		
	MNI	**SA**	**BD**	**MNI**	**SA**	**BD**	**MNI**	**SA**	**BD**
< 0 months		foetal			foetal			foetal	
0-6 months	1	neonat, infans			neonat, infans		2	neonat, infans	
6 months – 1 year	3	juvenile		7	juvenile	SM	1	juvenile	SM
1 - 1.5 years	7	juvenile	SM	2	juvenile		3	juvenile	PR
1.5 - 2 years	3	juvenile		9	subadult	PR	1	subadult	
2 - 2.5 years	1	subadult			subadult			subadult	
2.5 - 3 years	9	subadult	PR	5	subadult			subadult	
3 - 3.5 years		subadult			subadult			subadult	
3.5 - 4 years		adult		2	adult			adult	
4 - 5 years	2	adult			adult			adult	
5 - 6 years	3	adult		6	adult			adult	
6 - 8 years		adult		2	mature			mature	
8 - 10 years	3	mature			mature			mature	
> 10 years		mature			mature			mature	
Total	**32**			**33**			**7**		

Table 3. The correlation between the skeletal age and the biological data for cattle (*Bos taurus*), sheep/goat (*Ovis aries/Capra hircus*) and pig (*Sus domesticus*) discovered at Techirghiol (Hamangia culture) (Forest V., 1997); SA- skeletal age, BD- biological data, SM- sexual mature, PR- potentially reproductive.

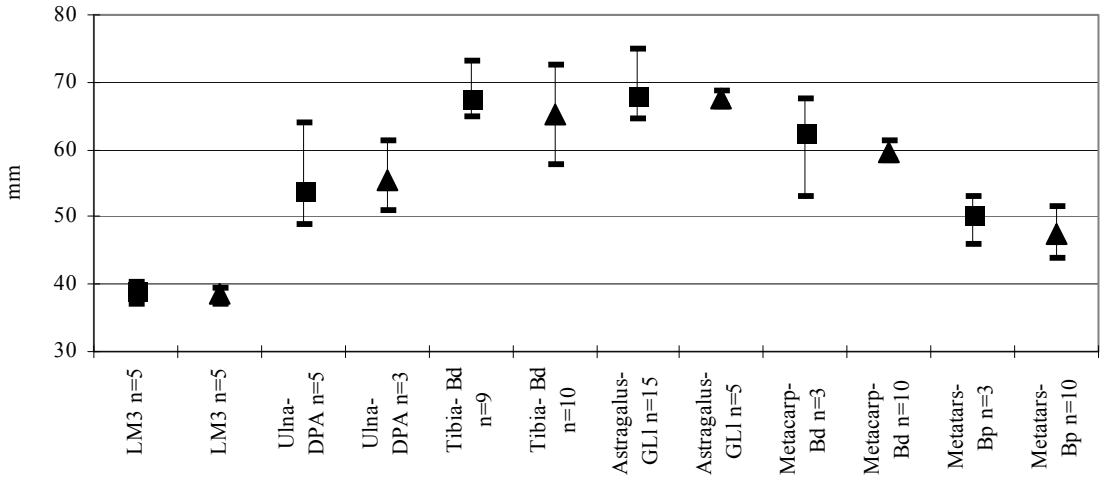


Figure 1. Comparison diagrams for the biometric data of cattle (*Bos taurus*) on different anatomic elements in the settlements of Hamangia culture: Techirghiol (square), Cheia (triangle); measurement code according to Angela von den Driesch 1976).

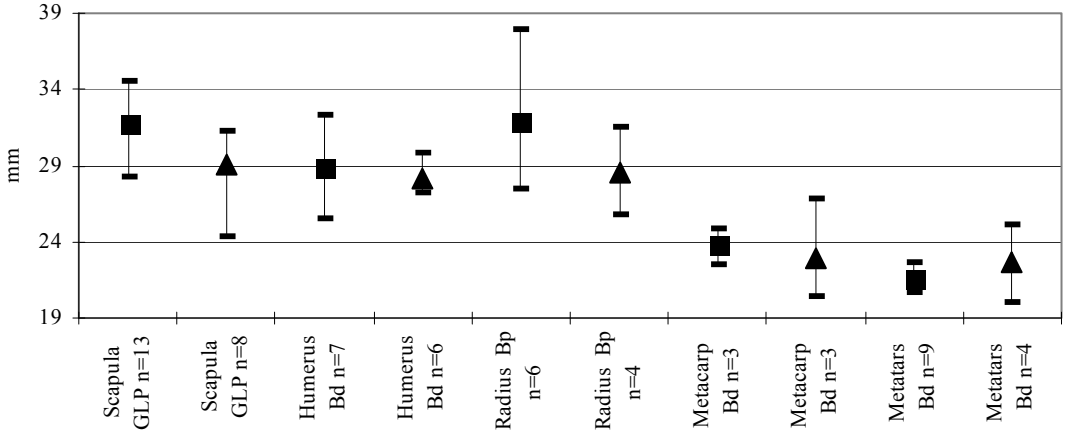


Figure 2. Comparison diagrams for the biometric data of sheep (*Ovis aries*) on different anatomic elements in the settlements of Hamangia culture: Techirghiol (square), Cheia (triangle); measurement code according to Angela von den Driesch (1976).

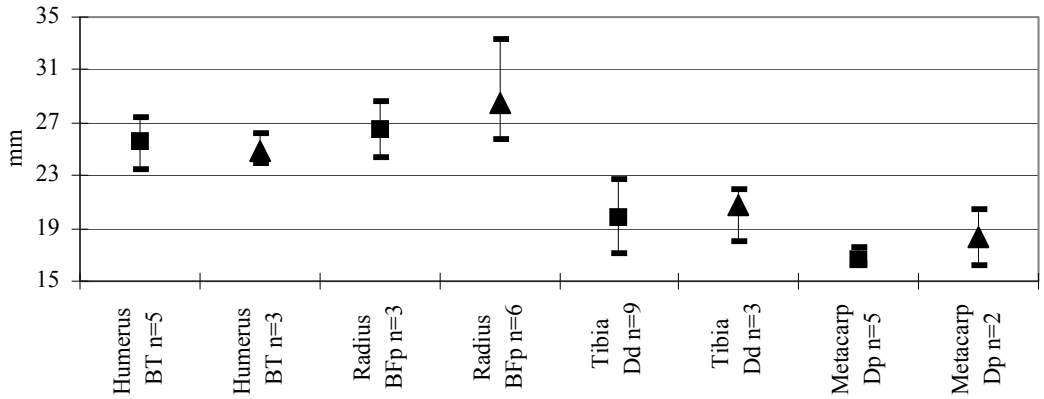


Figura 3. Comparison diagrams for the biometric data of goat (*Capra hircus*) on different anatomic elements in the settlements of Hamangia culture: Techirghiol (square), Cheia (triangle); measurement code according to Angela von den Driesch (1976).

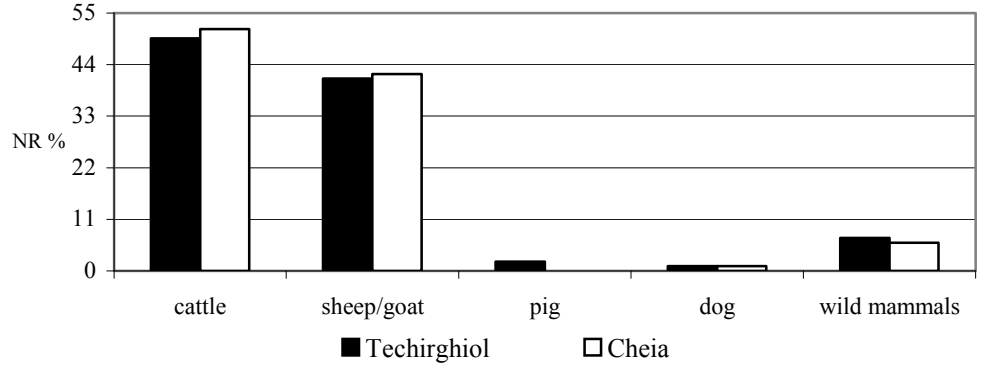


Figure 4. Comparative diagram between number of mammalian remains (NR) discovered at Techirghiol and Cheia (Hamangia culture).

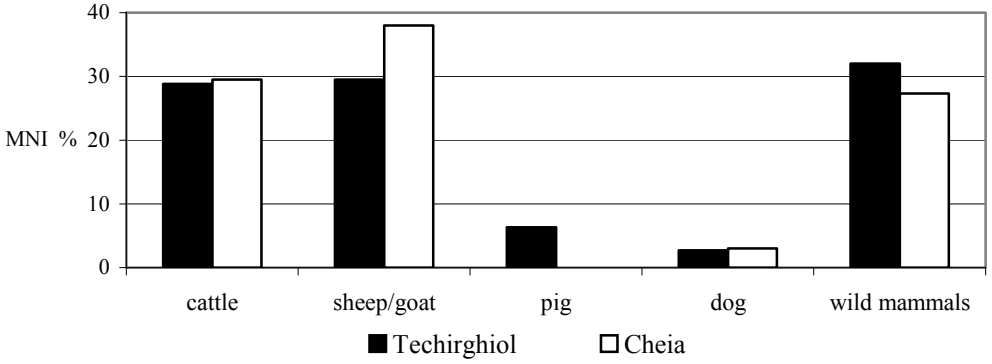


Figure 5. Comparative diagram between minimal number of mammal individuals discovered at Techirghiol and Cheia (Hamangia culture).

Photo 1 : *Unio* sp. (left) and *Cardium* sp. (right) valves.

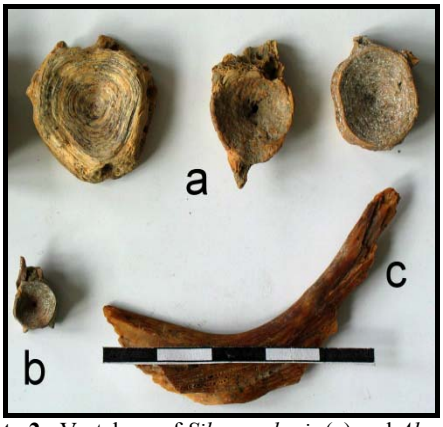


Photo 2 : Vertebrae of *Silurus glanis* (a) and *Abramis brama* (b), cleitrum of *Stizostedion lucioperca* (c).

Photo 3 : Shells fragments of *Testudo graeca ibera*.

Photo 4 : Comparaison between the calcaneus *Bos taurus* (up) and *Bos primigenius* (down) (medial view).

Photo 5 : *Bos taurus,* left femur (cranial view).

Photo 6 : *Bos primigenius*, left humerus (cranial view).

Photo 7 : *Ovis aries*, male horn processes (lateral view).

Photo 8 : *Ovis aries*, sexual dimorphism at the level of horn processes (female - left and male - right) (lateral view).

Photo 9 : *Ovis aries*, female horn processes (left) and hornless sheep neurocranium(right - lateral view).

Photo 10 : *Sus domesticus*, maxilar right aged 14-16 months (basal view).

Photo 11 : *Ovis aries*, metatarsals (dorsal view).

Photo 12 : *Capra hircus*, metacarpals (dorsal view).

Photo 13 : *Canis familiaris*, right mandibles (lateral view).

Photo 14 : *Capreolus capreolus*, right mandible (lateral view).

Photo 15 : *Sus scrofa*, right astragalus (plantar view).

Photo 16 : *Lepus europaeus,* left coxals (lateral view).

Osteometrical data - all measuremets in milimeters, taken after von den Driesch (1976).

Bos taurus

Craniun	n	range	mean
44	2	155; 185	170
45	2	56; 62.2	59.1
46	2	40; 47	43.5

Mandible	n	range	mean
8	1	90.3	90.3
9	1	56.6	56.6
10L	5	37.1- 40.4	39.3
10B	5	14- 14.7	14.2

Scapula	n	range	mean
GLP	3	67.4- 75.2	71
LG	3	55.4-63.7	59.5
BG	3	47.6-54.3	50.2
SLC	3	52.2-63.7	56.9

Radius	n	range	mean
Bp	5	75.7-93	86.3
BFp	5	71-86	79.3
SD	5	38.3-47.7	43.4
Bd	2	72.7-86.1	79.4
BFd	2	69.4-79.7	74.6
Dd	2	38.3-49.5	43.9

Ulna	n	range	mean
LO	4	91.5-132	111
SDO	5	59.4-78.9	68.2
DPA	5	48.9-64	54
BPC	5	40.6-73.3	52.9

Metacarpus	n	range	mean
Bp	2	64; 64.5	64.25
DAP p	2	40; 41	40.5
Bd	2	67; 67.5	67.3
Dd	3	31.5-36.5	34.5

Pelvis	n	range	mean
LAR	2	54.3-58.8	56.6
LA	2	66.7-74	70.4

Femur	n	range	mean
Bp	2	121.4; 132	127
DC	3	42.9-58.8	51.5
Bd	3	90-93	91.4
Dd	3	119-135	127

Patella	n	range	mean
GL	2	69.8; 69.9	69.85
GB	2	57; 60.6	58.8

Tibia	n	range	mean
Bp	3	92-102	96.2
Dp	2	80.5; 81	80.8
Bd	9	65-73.2	67.7
Dd	9	48.2-54.5	51.3

Calcaneus	n	range	mean
GL	2	129.5; 130	129.8
GB	2	40; 45	42.5

Astragalus	n	range	mean
GLl	15	64.5-75	68.2
GLm	18	57-70	63
Dl	16	30.2-42	37.3
Dm	18	34-44	38.9
Bd	16	35.5-52.2	44

Centrotarsus	n	range	mean
BG	5	51.5-61	57.3
DAP	5	48.5-60	55

Metatarsus	n	range	mean
Bp	3	46-53	50.3
Dp	3	43-49.5	47

Phalanx 1	n	range	mean
GL	25	54-68.6	60
Bp	25	24.3-37.4	31.2
SD	24	20.2-30.9	26.2
Bd	22	22.6-34.2	29.1

Phalanx 2	n	range	mean
GL	21	37.2-45.1	40.8
Bp	21	27.6-42	31.7
SD	21	21.3-32.5	25.5
Bd	21	23.5-35.2	26.8

Phalanx 3	n	range	mean
DLS	13	61.8-85.3	75.3
Ld	12	46.9-65.6	58.6
MBS	17	19.6-29.7	25.3

Atlas	n	range	mean
GB	1	158	
GL	2	92; 97	94.5
BFcr	2	100; 109	105
BFcd	1	103	
GLF	1	92	
H	2	73; 75	74

Ovis aries

Cranium	**1**	**2**	**3**	**4**	**5**	**6**	**7**
40	167	138	129	132	169	68	
41	58,5	46	45	47,5	60	22	
42	38	29,5	27	25	43	14	14
43	218	200		190			19
sex	m	m	m	m	m/c ?	f	f

Scapula	n	range	mean
GLP	13	28.3-34.5	31.8
LG	13	23.4-27.3	24.9
BG	12	17.3-22.3	19.8
SLC	13	15.7-20.8	18.5

Humerus	n	range	mean
Bd	7	25.5-32.3	28.9
BT	7	24.6-28.9	27.2
Dd	7	22.5-26.4	24.3

Radius	n	range	mean
Bp	6	27.5-38	31.9
BFp	6	24.5-34.7	28.6
Dp	6	14.2-18.6	15.8

Ulna	n	range	mean
LO	1	39.6	
SDO	1	20.4	
DPA	1	23.9	
BPC	1	17.1	

Coxal	n	range	mean
LA	9	23.9-30.6	27.6

Metacarpus	n	range	mean
Bd	3	22.5-24.9	23.9
Dd	3	13.1-16.4	14.9

Femur	n	range	mean
Bp	4	38.4-47.3	43.7
DC	4	19.2-20.1	19.6
Bd	4	33-37.7	35.2
Dd	4	40.2-43.6	42.2

Tibia	n	range	mean
Bp	3	37.4-39.3	38.6
Dp	3	38.8-41.7	40.1
Bd	7	23.2-28.3	25.2
Dd	7	17.7-22	19.6

Calcaneus	n	range	mean
GL	4	50.5-55.5	52
GB	4	16.2-19.2	17.9
Shoulder height	4	575.7-633	593

Metatarsus	n	range	mean
GL	4	121.7-131	126
Bp	3	17.8-18.1	18
Dp	3	17.8-18.6	18.1
SD	4	10.5-11.3	10.8
Bd	9	20.7-22.6	21.7
Dd	9	13.3-15	14.3
Shoulder height	4	552.5-597	574

Capra hircus

Craniun	n	range	mean
44	1	115	
45	1	38	
46	1	24	

Scapula	n	range	mean
GLP	2	28.8; 31	29.9
LG	2	22.2; 24.7	23.5
BG	2	18.6; 20.5	19.6
SLC	2	18.1-19.6	18.9

Humerus	n	range	mean
Bd	5	24.6-28.2	26.5
BT	5	23.5-27.5	25.6
Dd	5	21.3-26.4	23.8
Radius	n	range	mean

Metacarpus	n	range	mean
GL	1	97.3	
Bp	5	20.4-24.6	22.7
Dp	5	16.3-17.6	16.7
SD	1	15.5	
Bd	5	23.8- 27.3	26
Dd	5	14.9-16.2	15.4
Shoulder height	1	559.4	

Femur	n	range	mean
Bp	1	39.8	
DC	1	17.9	
Bd	1	31.3	
Dd	1	40.2	

Tibia	n	range	mean

Bp	3	26.7-32	29.2
BFp	3	24.4-28.6	26.6
Dp	3	13.5-16.5	14.9

Bd	9	21-29.5	24.7
Dd	9	17.1-22.8	19.9

Calcaneus	n	range	mean
GL	2	55; 58.5	56.8
GB	2	18; 19.5	18.8

Ovis aries/Capra hircus

Mandible	n	range	mean
7	2	65.6; 71.8	68.7
8	8	44.2-50.8	47.8
9	3	20.1-20.9	20.6
10L	14	20.2-23.1	21.6
10B	14	7.7-9.1	8.4

Radius	n	range	mean
Bd	6	24.5-29	26.5
BFd	6	21-24.8	22.6
Dd	6	15.4-18.7	17

Metacarpus	n	range	mean
Bp	10	19.1-22.5	20.9
DAP p	10	13.3-15.7	14.6

Tibia	n	range	mean
Bp	3	35.2-39	36.9
Dp	1	36.3	

Metatarsus	n	range	mean
Bp	4	17.1-19.7	18.2
Dp	4	17.1-19.2	17.9
Bd	5	22.9-24.3	23.4
Dd	5	14.1-16.3	15.6

Sus domesticus

Scapula	n	range	mean
GLP	1	35.5	
LG	1	29.4	
BG	1	24.1	
SLC	1	23.7	

Humerus	n	range	mean
Bd	3	36.7-39.4	38.1
BT	3	27.9-29.5	28.9
Dd	3	35.7-39.6	38.1

Pelvis	n	range	mean
LA	2	31.7; 36	33.8

Phalanx 2	n	range	mean
GL	1	28.7	
Bp	1	18.7	
SD	1	15.2	
Bd	1	16.3	

Phalanx 3	n	range	mean
DLS	1	44.5	
Ld	1	29.9	
MBS	1	14.8	

Vulpes vulpes

Mandible	n	range	mean
10	1	28.5	
14	1	15.7	

Sus scrofa

Astragalus	n	range	mean
GLl	1	53.9	
GLm	1	48.1	
Dl	1	28.5	
Dm	1	29	
Bd	1	30	
Shoulder height	1	987.8	

Patella	n	range	mean
GL	1	50	
GB	1	30	

Capreolus capreolus

Mandible	n	range	mean
7	1	69	
8	2	38.5; 40.6	39.6
9	2	27.8; 29.9	28.85
10L	2	15.9; 16.2	16.1
10B	2	7.9; 8.1	8

Radius	n	range	mean
Bp	1	28.1	
BFp	1	25.6	
Dp	1	15.6	
Bd	2	26.4; 28.2	27.3
BFd	2	22.7; 22.8	22.75
Dd	2	17.1; 18.2	17.6

Scapula	n	range	mean
GLP	3	30-31.9	31.1
LG	3	22.7-24.8	23.8
BG	3	21.8-22.4	22.1
SLC	3	18.3-19.3	18.7

Cervus elaphus

Astragalus	n	range	mean
GLl	2	61.4; 61.7	61.55
GLm	2	56.2; 57.6	56.9
Dl	1	32.6	
Dm	2	31.8; 32.2	32
Bd	2	37.1; 39.4	38.3

Phalanx 2	n	range	mean
GL	1	43.6	
Bp	1	23.9	
SD	1	16.9	
Bd	1	20.4	

Bos primigenius

Craniun	n	range	mean
44	1	225	
45	1	76	
46	1	65	

Calcaneus	n	range	mean
GL	2	149.5; 156	152.7
GB	2	50; 50.5	50.25

Humerus	n	range	mean
Bd	1	101.5	
BT	1	84.7	
Dd	1	93.3	

Lepus europaeus

Mandible	n	range	mean
1	1	66.8	
2	4	18.7-20.7	19.7
3	3	45.6-46.1	45.9
4	3	24-27.5	26.1
5	1	47.2	
5a	1	46.9	

Pelvis	n	range	mean
GL	2	100; 101	100.5
LA	7	12.1-14.7	13.2

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Date biometrice – toate măsurătorile sunt în milimetri, după Angela von den Driesch (1976).

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