Past, Current and Future Contribution of Zooarchaeology to the Knowledge of the Neolithic and Chalcolithic Cultures in South Caucasus

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Introduction

The territories located between the Great Caucasus range and the Araxes river (here after South Caucasus) are, in a geographical perspective, literally linking two major cultural and natural entities: the Eurasian steppes and the Near East. Not only does the South Caucasus act as a bridge it also has a remarkable diversity of geographic, environmental and climatic conditions. The floral and faunal richness of this area, represented by a significant percentage of endemic species, is a strong argument to consider the Caucasus as one of the four hotspots of biodiversity in Europe and Central Asia. Strong vertical zonation and environmental diversity has promoted cultural regionalism in this area. South Caucasus populations went through considerable socio-economic evolutions, sometimes provoked by external (i.e. from nearby regions), or locally developed influences. Substantial transformations of lifestyle and subsistence strategies occurred during the Neolithic and Chalcolithic (also called Eneolithic) periods. The Neolithic is characterised by a production system based on agriculture and stock-breeding (with occasional concomitant appearance of sedentarity, ceramics, and new technical systems), whereas the Chalcolithic corresponds to the emergence of extractive metallurgy and a different pattern of land use with the development of short-term settlements [Hamon, 2008: 86-87; Lyonnet et al. 2012: 3; Kushnareva, 1997: 41]. Zooarchaeology, the discipline dedicated to the understanding of relations between human populations and animal world in the past, contribute with quantitative and qualitative data to the socio-economic characterisation of Neolithic and Chalcolithic cultures of South Caucasus. This paper aims to review the evidence drawn from earlier studies and current analyses of faunal remains as well as forecasting the zooarchaeological research agenda for the coming years.

Current and earlier zooarchaeological investigation in South Caucasus

In this review, the author will endeavour to combine data from recent and earlier reports. Thirteen assemblages from twelve settlements have been studied before the 1990's while ten assemblages from seven sites have been studied after 2000. For various reasons, comparing the patterns of animal exploitation from different settlements has always been a challenge for zooarchaeologists [Lawrence, 1973]. This task is even more difficult as the faunal remains have been analysed by different researchers in various periods. Although many efforts have been made in recent decades in order to standardize the way in which zooarchaeologists record and publish their data, (mainly thanks to the work of the International Council for Archaeozoology (ICAZ), this was not the case in earlier times. Early reports of faunal remains analysis from South Caucasus often omitted information concerning archaeological contexts, recovery methods and determination accuracy of the published assemblage. In some cases, the lack of raw data didn't allow the use of statistical methods in order to compare different assemblages. Improvement of zooarchaeological methods in recent decades should also be highlighted. Therefore one could expect later zooarchaeological analyses for the determination of the species or the ageing of remains to be more finely-tuned than the earlier ones. However, it is not possible to rely solely on recent studies as they are few and are mainly concentrated in the Kura and Araxes rivers basins. Neolithic and Chalcolithic faunal remains from West Georgia, for example, are only known from reports published in the late 1970's. Furthermore, most of the recent studies concern sites which are still under archaeological investigation. Therefore, the results from these studies can only be considered as preliminary. Finally, it has to be stressed that this review is not exhaustive. Some information on faunal remains from further sites are available [Chataigner, 1995: 218, p. 72] but the author, for the purpose of comparing the sites, decided to consider here only reports where raw data (i.e. number of remains or detailed percentages) are published. Remains from Kviriastskali [Varazashvili, 1992: 96-100] and layer I at Aknashen-Khatunarkh [Bălăşescu ... 2010: 34, fig. 9] are not included due to their scarcity. Although their results are not yet available, zooarchaeological investigations are also in progress in several other sites (notably Göytepe, Godedzor and Kültepe I).

Geographical distribution of the sites

South Caucasus can be roughly divided into four geographic provinces [Smith et al. 2009: 5-6]. In the West, the Colchian plain, drained by the Rioni and Enguri rivers, is surrounded by forested and humid mountains. Toward the East, in the valley situated in the middle part of the Kura River and in the northern highlands, hot dry summers and mild dry winters support temperate grasslands. Further to the East, low-lying open steppes, crossed by the Kura and Araxes rivers, experience a rather dry climate. South-West of the Lesser Caucasus, the climate of the middle Araxes River and nearby highlands is characterized by hot and dry summers while the

winters are long and severe. This mosaic of very distinct geographical and environmental conditions led to a complex variety of socio-economic adaptations. Therefore, one can expect regional differences in the patterns of animal resources exploitation. This question can however only be investigated if a comparable amount of information is available from each area. The faunal assemblages included in this review are not evenly distributed throughout South Caucasus (Fig. I, Tab. I). Eight studies (two recent and six dating prior to the 2000's) concern seven sites located in the middle Kura river valley. One site is situated north of the Kura River in the highlands on the southern flanks of the Greater Caucasus. Seven assemblages (all recently studied) come from four sites situated in the middle Araxes river area. Western South Caucasus is characterised by badly preserved bones in archaeological sites due to humid climate and soil acidity that led to a limited number of faunal assemblages available for study [Kiguradze et al. 2004: 349]. However, five assemblages from four cave sites located in Imereti have been analysed before the 1980's. Finally, the Eastern steppes are represented by only two sites.

The dating of both Neolithic and Chalcolithic periods in South Caucasus has been much debated and the position of each single site in the sequence is still being discussed today [Chataigner, 1995; Kiguradze et al. 2004; Kushnareva, 1997; Hamon, 2008]. The Neolithic period is traditionally associated with the emergence of agro-pastoral subsistence systems, increasing sedentarity and strong identity in a completely renewed material culture (ceramics, lithic and bone tools, ornament, etc.). Although the production of copper artefacts has been a traditional criterion for defining the Chalcolithic period, a few copper artefacts and ores have also been found in Neolithic layers dated to the 6th millennium B.C. [Badalyan et al. 2010: 199]. Therefore metal finds only cannot be used as a clue to sort the Neolithic layers from the Chalcolithic ones. It should be emphasised that the transition between the Mesolithic and Neolithic periods is much clearer in the apparition of new technological and economic systems than the transition between the Neolithic and Chalcolithic periods. Hence, the definition of these two later periods and their chronological limits is still subject to much fluctuation and debates [Chataigner, 1995: 29-34; Smith et al. 2009: 21-3]. It has been decided here to assign the different assemblages either to the Neolithic or to the Chalcolithic periods according to cultural similarities [following Chataigner, 1995; Kiguradze et al. 2004; Kushnareva, 1997] and recent ^{14}C dates. It appears that occupation layers currently considered to be Neolithic date to the 6th millennium B.C., while occupation layers currently considered to be Chalcolithic are dated between the mid-5th and mid-4th millennia B.C. (Tab. I). The situation is less clear for the first half of the 5th millennium B.C. In the Kura river area, pottery dated to this phase is considered to be related to the Chalcolithic material [Lyonnet et al. 2012: 97-98].

The earliest assemblage considered in this paper comes from the aceramic Neolithic layer (layer IV) at Darkveti rockshelter. Although no absolute dating is available, the study of the stratigraphy indicates that this layer is later than the Mesolithic and earlier than the Chalcolithic [Kiguradze et al. 2004]. The Neolithic assemblages of the middle Kura river area belonging to the Shulaveri-Shomu culture (Shulaveri, Aruhklo I, Shomu Tepe, Toyre Tepe, Baba-Dervish,

Gargalar Tepesi and Mentesh Tepe) date from the beginning up to the third quarter of the 6th millennium B.C. [Lyonnet et al. 2012: 3]. Neolithic assemblages from the middle Araxes river area and Mil steppe such as Kamiltepe, Aratashen and Aknashen-Khatunarkh also belong to the same chronological period [Badalyan et al. 2007; Badalyan et al. 2010: 210; Lyonnet et al. 2012: 3]. Alikemek Tepesi stands at the transition between the Neolithic and Chalcolithic periods, although it might date to the late-6th – early-5th millennia B. C., some architectural and ceramic evidence link the settlement to the 5th millennium Chalcolithic cultures [Lyonnet et al. 2010: 225; Lyonnet et al. 2012: 96-98]. Chalcolithic assemblages from West Georgia (Darkveti layers II-III, Dzudzuana, Samele-Klde layers I-III, and Sagvardzhile) are not finely dated within the Chalcolithic period [Nebieridze, 1978]. It is however likely that Dzudzuana cave was inhabited in the third quarter of the 5th millennium B. C. whereas the site of Damtsvari Gora is slightly later and probably dates to the very late-5th of first half of the 4th millennium B. C. [Kiguradze et al. 2004: 358-9]. Radiocarbon dates from the Chalcolithic occupations at Ovçular Tepesi and Areni-1 are in the same *ca*. 4350-3800 cal. B.C. range [Marro et al. 2009: 48, fig. 8; Marro et al. 2011: 62, fig. 6; Wilkinson et al. 2012: 23, tab.1].

Exploitation of animal resources in Neolithic and Chalcolithic South Caucasus

Hunting and animal husbandry

The various biotopes of South Caucasus have always been the home of numerous wild animal species. Several of them, in particular large and small game, could have been included in the diet of human populations [Vereshchagin, 1967]. Although the wild species spectra from archaeological sites are strongly related to human selection, they still provide valuable information of the exploitation of various habitats. Wild mammal remains from Neolithic and Chalcolithic sites will not be reviewed here in detail as it has previously been done in Georgia [Bendukidze, 1979] and summarised at the scale of South Caucasus [Chataigner, 1995: 213]. There is evidence of simultaneous exploitation of various habitats at most of the sites although there are some regional trends. Sites located in West Georgia are characterised by the exploitation of the forest with species such as red deer (*Cervus elaphus*), roe deer (*Capreolus capreolus*) and wild boar (*Sus scrofa*) [Nebieridze, 1978: 91-93, tab. 2-3]. The habitats mainly represented at Arukhlo I in the middle Kura area are forested habitats with red deer (*Cervus elaphus*), roe deer (*Capreolus capreolus*) and European bison (*Bison bonasus*), and open woodlands with aurochs (*Bos primigenius*) [Lyonnet et al. 2012: 155]. Such a mixed exploitation of various habitats is also attested in the middle Araxes area [Bălăşescu et al. 2010] while a grassland species, gazelle (*Gazella* sp.), dominates the wild mammal fauna at Kamiltepe in the Eastern steppes [Lyonnet et al. 2012: 155]. Besides hunting, there is also evidence of fishing. Most of the sites yielded a few fish remains and there is a larger assemblage at Ovçular Tepesi [Berthon et al. 2013; Kovács et al. 2014]. Bird bones are found only in small quantities at most of the sites with the exception of

Kamiltepe where fowling was of some importance and was specifically focussed on the little bustard (*Tetrax tetrax*) [Lyonnet et al. 2012: 155].

As food production based on the husbandry of domestic mammals is characteristic of the Neolithic and subsequent periods, the relative representation of wild fauna in the assemblages is of some importance for the definition of (early) Neolithic cultures. In this respect, a shift is clearly visible in South Caucasus assemblages (Tab. II, Fig. II). The aceramic Neolithic assemblage of Darkveti (layer IV) is notably characterized by the preponderance of hunting with 83% of the Number of Identified Specimens (here after NISP) being wild mammals. The shift in the relative representation of wild mammals is, however, a regional one rather than a chronological one. Indeed, hunting is important in both Neolithic and Chalcolithic assemblages from Imereti (*ca*. 30-90% of the NISP) and provided a significant part of the meat diet even long after the arrival of domesticates [Nebieridze, 1978: 91-93, tab. 2-3]. This might be due to the densely forested environment and, therefore, abundance of game in this area, but other factors should also be considered. All of these assemblages are from cave or rock shelters and therefore they cannot be directly compared to open-air sites. In this case the importance of hunting would correspond more to a settlement-type pattern than to a regional one. The other issue concerns the place of these cave sites in the chronological sequence. The Dzudzuana assemblage, which likely dates to the third quarter of the 5th millennium B.C. [Bar-Yosef et al. 2011: 336, tab. 2], could theoretically reflect a decrease of hunting through time. However, this hypothesis requires an accurate dating of the other sites as well as the study of additional Imeretian faunal assemblages contemporary with the one from Dzudzuana.

In contrast, no assemblage from the middle Kura, Eastern steppes or middle Araxes areas yielded more than 12% of wild mammals. Although no aceramic Neolithic assemblage is known from these regions, it is obvious that husbandry replaced hunting for the acquirement of meat diet by the late-7th millennium B. C. The variability in the relative representation of wild mammal remains (from *ca*. 0 to 12% of the NISP) is quite difficult to explain. Although some diachronic changes occurred (see *infra*), it is not possible to demonstrate clear chronological or geographic patterns behind this phenomenon.

Replacement of hunting by animal husbandry has been necessarily preceded by domestication that is the last phase in a long process consisting of a repeated intensification in the relationship between animal sub-populations and human societies. Domestication includes the appropriation and control of an animal sub-population reproduction by a human society and leads to significant physiological and ethological modifications. Zooarchaeologists traditionally use size decrease in order to evidence biological changes but the recognition of earlier phases of the domestication can be more challenging [Vigne, 2011: 172-174]. In Neolithic South West Asia, the domestic species of importance for subsistence strategies are sheep (*Ovis aries*), goat (*Capra hircus*), cattle (*Bos taurus*), and pig (*Sus domesticus*). In South Caucasus these domestic species can have three origins i) a local domestication process considering that all the wild ancestors of these domestic species were locally available, ii) an importation of already domestic specimens

from the main domestication centres located in the Near East, or iii) an importation of already domestic specimens from a putative domestication centre located North of the Great Caucasus range [Lombard et al. 2005: 69]. For the same domestic species more than one of these hypotheses can be true according to the different cultural zones of South Caucasus. Likewise all the domestic species in a single area do not necessarily have the same origin. In any case, there is still a considerable time span between the earliest recognised domestic specimens from the Near East and the South Caucasus Neolithic cultures considered here. The upper limit of the radiocarbon range at Arukhlo I is 2500 years later than the earliest sheep, goat and pig in the Upper Euphrates region and 1500 years later than the earliest domestic cattle in the same region [Conolly et al. 2011]. Osteological remains of domestic sheep or goat, cattle and pig from the aceramic Neolithic layer at Darkveti are hypothetically (i.e. without any radiocarbon dating) the earliest specimens in South Caucasus at this stage of research. No information is provided for the criteria used for the determination of the domestic status of these bones but the fact that they were confidently identified as domestic, probably based on their size, means that they were in a well-advanced stage of domestication (i.e. being under human control for a long time) as it is the case for the remains from Arukhlo I [Lyonnet et al. 2012: 155]. Preliminary results of palaeogenetic investigations evidence a high variability in mitochondrial haplotypes in sheep and cattle remains from Arukhlo I. It might suggest that domestic sheep and cattle in the middle Kura area did not originate from a small domestic population quickly spread out from a remote centre of domestication [Geörg, 2011 and Scheu, 2011 cited in Lyonnet et al. 2012: 155]. If domestication occurred in or nearby South Caucasus, faunal remains corresponding to this process are still to be discovered and analysed.

Herding strategies

Little information is available for understanding the herding strategies used for different domestic species. Concerning the caprinae (sheep and goat) it is interesting to look at the ratio between the two species (Tab. II). In most of the cases sheep remains are 2 to 5 times more numerous than the ones of goat. Knowing that sheep are faster than goat on flat terrain, this ratio could evidence some kind of selection towards greater mobility of the herds. In the early study of animal bones at Arukhlo I, sheep remains were 62 times more numerous than goat [Vekua, 1984: 94, tab. 18] but in a more recent study the ratio is around 4 sheep remains for 1 of goat [Lyonnet et al. 2012: 154]. This difference can probably be explained by the improvement of the criteria used for the discrimination of the two species. Another ratio outside the mean is found at Areni-1. There, goat remains are clearly more numerous than the ones of sheep [Wilkinson et al. 2012: 23, tab. 1]. Although the results are still preliminary, this prevalence of goat over sheep might be linked with the rugged terrains surrounding the cave.

Sorting the sheep from the goats is important for understanding the herding strategies because the two species are not necessarily exploited for the same products (i.e. meat, wool,

milk). Slaughtering age profiles [Helmer et al. 2007; Vigne et al. 2007] as well as sex ratios are usually used to define which product was mainly targeted. Sheep and goat seem to have been primarily exploited for their meat but also their milk in Neolithic Arukhlo I [Lyonnet et al. 2012: 154-5]. At Neolithic Aratashen and Aknashen-Khatunarkh slaughtering age profiles show significant differences that might be linked with settlement status or occupation seasonality. While a selection leading toward the gain of tender meat is evidenced at Aknashen-Khatunarkh, Aratashen is characterised by a mixed exploitation and the slaughtering of animals from all age classes [Bălăşescu et al. 2010: 29-30]. At Chalcolithic Ovçular Tepesi, the slaughtering age profile suggests exploitation focussed on individuals with an optimal weight for meat production [Berthon et al. 2013].

Regional peculiarities

In the Neolithic period, the study of architectural evidence and material culture demonstrates some cultural discontinuity between the middle Kura and middle Araxes areas [Badalyan et al. 2004; Lombard et al. 2005]. It is also clear that different processes of neolithisation occurred in West Georgia and the middle Kura area [Hamon, 2008: 85-6, 110].Therefore one could expect differentiated managements of animal resources in these particular cultural provinces. As stated above, the first obvious regional peculiarity consists in the importance of hunting in the subsistence strategies in Imereti (Fig. II). For the other areas where the exploitation of animal resources is focussed on domestic ungulates (sheep, goat, cattle and pig), regional peculiarities have to be searched for in the relative representation of these domestic species. Assemblages from the middle Araxes area seem characterised by the importance of sheep and goats and the lack of pigs compared to the other sites (Fig. III). A correspondence analysis, performed by the software CAPCA, allows the investigation of associations between objects (i.e. the faunal assemblages) and variables (here the importance of wild mammals, caprinae, cattle and pig). When all assemblages are plotted, the ones from Imereti are better separated from the others when using factor 1 (horizontal axis, explains 66.4% of the variability) and factor 3 (vertical axis, explains 5.7% of the variability) (Fig. IV). Factor 1 reflects the opposition between herding caprinae (34% of factor's inertia) and hunting or raising pigs rather than another domestic species (37.4% and 27.8% of factor's intertia). Imeretian assemblages rely primarily on hunting. Pig is the favoured domestic animal in some of them. Only Dzudzuana stands in an intermediate position in factor 1 because it contains less wild mammal and domestic pigs than nearby sites. Factor 3 reflects the contrast between hunting (49.2% of factor's inertia) and raising pigs (47% of factor's inertia). The assemblage from Sagvardzhile stands apart from the other Imeretian assemblages due to its complete lack of pigs. Another correspondence analysis that does not take into account Imeretian sites has been performed in order to investigate better the variability of the other assemblages (Fig. V). Objects and variables are plotted according to factor 1 (horizontal axis, explains 72.6% of the variability) and factor 2 (vertical axis, explains 20.1% of the

variability). Factor 1 reflects the opposition between cattle (64.3% of factor's inertia) and caprinae herding (24.6% of factor's inertia). Factor 2 reflects the contrast between pig husbandry (73% of factor's inertia) and cattle herding (25.5% of factor's inertia). All assemblages from the middle Araxes river area are very well clustered due to the importance of sheep and goat herding in their subsistence economy. This specialisation could be an adaptation to dry summers and severe winters. The almost exclusive herding of sheep (and, as shown above, some goats) allows more mobility between summer and winter pastures. The other assemblages are split into three groups 1) Damtsvari Gora, Shulaveri, Alikemek Tepesi and Baba-Dervish have more cattle, and less pig and caprinae than the other assemblages 2) Arukhlo I, Gargalar Tepesi, Toyre Tepe and Kamiltepe have more pigs and caprinae than the first group and 3) Shomu Tepe and Mentesh Tepe where sheep and goat herding is the main subsistence strategy, are closer to the middle Araxes river area assemblages. It is therefore not possible to recognise any strong and homogeneous regional pattern for the sites situated in the middle Kura river area, northern highlands or the Eastern steppes. It has been argued that the importance of cattle at Shulaveri could be related to the early date of the settlement [Chataigner, 1995: 216]. Such a pattern of animal resources exploitation seems to reappear in the Chalcolithic periods as evidenced at Damtsvari Gora and Alikemek Tepesi. The relative heterogeneity of faunal assemblages related to the Shulaveri-Shomu Tepe culture could also be due to peculiar socio-economic choices at each settlement or to differences in the status and function of the sites.

Diachronic studies

As stated above, intensive cattle breeding could be characteristic of early Neolithic and then Chalcolithic settlements in the middle Kura river area, northern highlands and Eastern steppes. It has, however, to be confirmed by future analyses of assemblages from such periods. Besides, no other clear diachronic shift could be evidenced from the correspondence analyses. At the scale of the middle Araxes river area, patterns of animal exploitation remain unchanged from the early-6th to the early-4th millennium B.C. In the same way, assemblages from the aceramic Neolithic and Chalcolithic layers at Darkveti are not statically different (χ^2=3.5, df=4, p=0.47).

Some intra-site analyses evidence, however, slight diachronic evolutions. At Arukhlo I, a decrease of sheep and goat to the benefit of pig have been noted from the earlier to the later layers [Vekua, 1984: 94, tab. 18]. In this respect, it can be pointed out that recently published data about Arukhlo I [Lyonnet et al. 2012: 154-5] fit better with the earlier levels.

Other examples of diachronic evolution come from the middle Araxes river area. At both Aratashen and Aknashen-Khatunarkh, hunting increases from the earlier phase (Aratashen layer II and Aknashen-Khatunarkh layers IV-V) to the later phase (Aratashen layer I and Aknashen-Khatunarkh layers II-III). In the same time the importance of sheep and goat slightly decrease to the benefit of cattle [Bălăşescu et al. 2010: 36, fig. 17]. Both sites experienced the same evolution although it is slightly more visible at Aknashen-Khatunarkh. The relative representation of each

taxa in the early and later phases seems to be close, however there is a significant difference (at Aratashen χ^2=44.7, df=4, p=4.56E^{-9} and at Aknashen-Khatunarkh χ^2=105.9, df=4, p=5.44E^{-22}). At Ovçular Tepesi, phase I (*ca*. 4350-4250 B.C.) and phase II (*ca*. 4250-3950 B.C.) assemblages are significantly different (χ^2=66.8, df=3, p=2.08E^{-14}) the later showing a decrease of sheep and goat to the benefit of cattle (Fig. III). In these three cases, the evolution of the relative representation of the different taxa from one phase to another could show a change in the socio-economic organisation, subsistence strategies, status and function of the settlement, but they are still located within the rather narrow regional pattern of the middle Araxes river area.

New directions for zooarchaeology in the South Caucasus

Zooarchaeology has already provided important evidence for the socio-economic characterisation of Neolithic and Chalcolithic cultures in South Caucasus. However, many questions remain. Major points of the research agenda and methods that will be employed are sketched here.

Neolithisation and domestication

As mentioned above, the earliest remains of domestic species identified so far seem to belong to animals already morphologically very different from their wild ancestors. It is unknown where these populations were domesticated, when and how they spread in South Caucasus. This question is partly linked with the advances of archaeology in the region, as there is still a lack of assemblages situated in this critical chronological period between the Mesolithic and the early-6th millennium B.C. So far, only a few palaeogenetic studies have included remains from South Caucasus [Geörg, 2011; Ottoni et al. 2012; Scheu, 2011] but it is likely that in the future this method will provide more information on the relations between South Caucasus and different domestication centres. The neolithisation process is characterised not only by domestic animals but also by commensal ones (in particular rodents and shrews). The latter developed the ability to live inside human settlements where they found food and shelter. One of the most emblematic commensal rodents is the house mouse (*Mus musculus* ssp.) which started to live in human communities in a few areas considered as "centres of commensalism" during the early Neolithic and then spread toward adjacent regions thanks to the movement of humans and goods [Cucchi et al. 2012]. Using geometric morphometrics it has been demonstrated that house mice that lived during the Chalcolithic period at Ovçular Tepesi originated from a centre of commensalism located in North Levant [Cucchi et al. 2013]. Hopefully, the development of sieving and flotation techniques during archaeological excavations will allow the study of further commensal mammals assemblages in order to investigate the relationship between South Caucasus and putative centres of commensalism.

Horse is another species for which South Caucasus could have played a role. Unlike any other early settlement of the region, Alikemek Tepesi contained a significant amount of equid bones that have been claimed as belonging to domestic horse [Narimanov, 1977]. This discovery could either reflect a local management or an early spread of domestic horses from West Central Eurasia, which is the region where the domestication origin of this species is currently the best supported [Warmuth et al. 2012]. A reassessment of the taxonomical status and dating of the equid remains from Alikemek Tepesi would considerably fuel the debate on this question.

Herd mobility, seasonality and nomadic pastoralism

The question of mobility is of high interest in South Caucasus due to the geographic and climatic conditions. Dry summers in the plains and the severe winters in the mountains could have led to the use of seasonal settlements. Such a hypothesis is supported by architectural features in some sites that are in favour of seasonal or at least temporary occupations [Marro et al. 2011]. Herd mobility is, however, not necessarily accompanied by the mobility of the entire human community. Sheep and goat could have been led to the pastures even if the majority of the people stayed in the settlement. The relative representation of different taxa in the assemblages from the middle Araxes river area settlements and from Mentesh Tepe, with mostly sheep and goat and a lack of pigs, is a good clue for the use of mobility in the herding system. Isotopic analyses will certainly provide important answers in the coming years. It has been widely demonstrated that the ratios of oxygen, carbon and strontium isotopes are excellent indicators of seasonal mobility between various geological regions and vegetation backgrounds [Balasse, 2002; Mashkour, 2003; Mashkour et al. 2005; Mashkour et al. 2003].

Socio-economic adaptation to peculiar environmental settings

The mosaic of geographic, environmental and climatic conditions in South Caucasus led to a form of a cultural regionalism that is, to a certain extent, visible in the exploitation of animal resources. In order to fully understand these adaptations to peculiar environmental settings, one may hope that assemblages from underrepresented areas (especially the highlands but also the Back Sea shores) will be available to zooarchaeologists in the near future. Differences in settlement-types are also a problem for regional comparisons. For instance, it is not currently possible to decide if the specific pattern evidenced in Imeretian cave sites assemblages is due solely to local adaption to a peculiar environmental setting (i.e. humid forests) or is specific to cave or rock shelter occupations. The best way for the investigation of regional peculiarities would be statistical analyses of meta-data. These, however, will be possible only after a significant increase of zooarchaeological analyses.

Conclusions

Like other disciplines related to archaeology, zooarchaeology benefits from the recent growth of excavations and researches that started in South Caucasus in the late 1990's. Zooarchaeologists are involved in almost every field project in the region and the amount of available data is constantly increasing. Recent works are completing our knowledge of subsistence strategies among the Neolithic and Chalcolithic cultures. It has been previously (i.e. before the 1990's) recognized that the earliest Neolithic assemblages, with the exception of Imeretian sites, consist mainly of domestic animals. Recent zooarchaeological studies and radiocarbon evidence from Aratashen, Aknashen-Khatunarkh, Kamiltepe, Mentesh Tepe and Arukhlo I firmly date the appearance of such subsistence strategies in the very beginning of the 6^{th} millennium B.C. at the latest. New information is also being provided on the structure of the herds and exploitation strategies (i.e. slaughtering age profiles). The peculiarity of Imeretian assemblages, which mainly contain game mammals although domestic mammals are present from the aceramic Neolithic period, is also known since the 1970's. Recent studies confirm the presence of other regional patterns such as in the middle Araxes river area (where the animal economy is specifically focused on the exploitation of sheep and goats) during both the Neolithic and Chalcolithic periods. On the contrary, faunal spectra from other areas, in particular along the Kura River, display increased variability. New techniques that appeared recently in the field of zooarchaeology, such as palaeogenetic, isotopic and geometric morphometric analyses, are now employed to analyse animal remains from South Caucasus. They aim to investigate a large range of questions including the origin of domestic and commensal animal populations as well as patterns of herd mobility. One can expect that the role of South Caucasus cultures in the development of these intensive forms of interaction between animals and human societies will be re-evaluated in the near future.

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BIBLIOGRAPHY:

Badalyan R., Harutyunyan A. A., Chataigner C., Le Mort F., Chabot J., Brochier J. E., Bălăşescu A., Radu V. & Hovsepyan R.
2010 The Settlement of Aknashen-Khatunarkh, a Neolithic Site in the Ararat Plain (Armenia): Excavation Results 2004-2009.
TÜBA-AR, vol.13, pp. 185-218.

Badalyan R., Lombard P., Avetisyan P., Chataigner C., Chabot J., Vila E., Hovsepyan R., Willcox G. & Pessin H.
2007 New data on the Late Prehistory of the Southern Caucasus. The Excavations at Aratashen (Armenia): Preliminary report.
In: *B. Lyonnet. (ed). Les cultures du Caucase (VI-III^{ème} millénaires av. n. è.). Leur relations avec le Proche-Orient. Actes de la Table Ronde de Saint Pétersbourg, Février 2004. pp. 37-62*. Paris.

Badalyan R., Lombard P., Chataigner C. & Avetisyan P.
2004 The Neolithic and Chalcolithic Phases in the Ararat Plain (Armenia): The View from Aratashen.
In: *A. Sagona* (*ed). A View from the Highlands. Archaeological Studies in Honour of Charles Burney, pp. 399-420*. Leuven.

Bălăşescu A., Vila E., Radu V., Badalyan R. & Chataigner C.
2010 Production animale et économie de subsistence au Néolithique dans la Plaine de l'Ararat (Arménie).
Annales d'Université "Valahia" Târgovişte - Section d'Archéologie et d'Histoire,Vol. 12, No. 1, pp. 25-38.

Balasse M., Ambrose S. H., Smith A. B. & Price T. D.
2002 The Seasonal Mobility Model for Prehistoric Herders in the South-western Cape of South Africa Assessed by Isotopic Analysis of Sheep Tooth Enamel.
Journal of Archaeological Science, vol. 29, No.9, pp. 917-932.

Bar-Yosef O., Belfer-Cohen A., Meshveliani T., Jakeli N., Bar-Oz G., Boaretto E., Goldberg P., Kvavadze E. & Matskevich Z.
2011 Dzudzuana: An Upper Palaeolithic Cave Site in the Caucasus Foothills (Georgia). *Antiquity, vol. 85, pp. 331-349*.

Bendukidze O. G.
1979 Holocene Vertebrate Fauna of Georgia. Tbilisi. (In Russian).
Golocenovaja fauna pozvonochnyh Gruzii.

Berthon R., Decaix A., Kovács Z. E., Van Neer W., Tengberg M., Willcox G. & Cucchi T.
2013 A Bioarchaeological Investigation of Three Chalcolithic Pits at Ovçular Tepesi (Nakhchivan, Azerbaijan).
Environmental Archaeology, online preview.

Chataigner C.
1995 La Transcaucasie au Néolithique et au Chalcolithique. Oxford.
Conolly J., Colledge S., Dobney K., Vigne J.-D., Peters J., Stopp B., Manning K., Shennan S.
2011 Meta-analysis of Zooarchaeological Data from SW Asia and SE Europe Provides Insight into the Origins and Spread of Animal Husbandry.
Journal of Archaeological Science, vol. 38, No. 3, pp. 538-545.
Cucchi T., Auffray J.-C. & Vigne J.-D.
2012 On the Origin of the House Mouse Synanthropy and Dispersal in the Near East and Europe: Zooarchaeological Review and Perspectives.
In: *M. Macholán, Baird S. J. E., Munclinger P. & Piálek J. Cambridge (eds). Evolution of the House Mouse. pp. 65-93.*
Cucchi T., Kovács Z. E., Berthon R., Orth A., Bonhomme F., Evin A., Siahsarvie R., Darvish J., Bakhshaliyev V. & Marro C.
2013 On the Trail of Neolithic Mice and Men towards Transcaucasia: Zooarchaeological Clues from Nakhchivan (Azerbaijan).
Biological Journal of the Linnean Society, vol. 108, pp. 917-928.
Geörg C.
2011 Paläopopulationsgenetik von Schwein und Schaf in Südosteuropa und Transkaukasien. Mainz.
Hamon C.
2008 From Neolithic to Chalcolithic in the Southern Caucasus: Economy and Macrolithic Implements from Shulaveri-Shomu Sites of Kwemo-Kartli (Georgia).
Paléorient, vol. 34, No. 2, pp. 85-135.
Helmer D., Gourichon L. & Vila E.
2007 The Development of the Exploitation of Products from *Capra* and *Ovis* (Meat, Milk and Fleece) from the PPNB to the Early Bronze in the Northern Near East (8700 to 2000 BC cal.). *Anthropozoologica, vol. 42, No. 2, pp. 41-69.*
Kiguradze T. & Menabde M.
2004 The Neolithic of Georgia.
In: *A. Sagona (ed). A View from the Highlands, Archaeological Studies in Honour of Charles Burney, pp. 245-298*. Leuven.
Kovács Z. E., Berthon R., Van Neer W. & Cucchi T.
2013 What is Inside the Pits ? Micro-and Macrofaunal Investigations at Chalcolithic and Early Bronze Age Ovçular Tepesi (Nakhchivan, Azerbaijan).
In: *B. De Cupere, V. Linseele & S. Hamilton-Dyer (eds). Archaeozoology of the Near East X. Proceedings of the Tenth International Symposium on the Archaeozoology of Southwestern Asia and Adjacent Areas, pp. 163-171*. Leuven.

Kushnareva K. K.
1997 The Southern Caucasus in Prehistory. Stages of Cultural and Socioeconomic Development from the Eighth to the Second Millennium BC. Philadelphia.
Lawrence B.
1973 Problems in Intersite Comparison of Faunal Remains.
In: *J. Matolcsi (ed). Domestikationsforschung und Geschichte der Haustiere, pp. 397-402*. Budapest
Lombard P. & Chataigner C.
2005 Le Néolithique et le Chalcolithique en Transcaucasie: l'exemPle des bassins de la Kura et de l'Araxe.
In: *J. Guilaine (ed). .Aux marges des grands foyers du Néolithique. Périphéries débitrices ou créatrices? pp. 63-84.* Paris
Lyonnet, B. & Guliyev F.
2010 Recent Discoveries on the Neolithic and Chalcolithic of Western Azerbaijan.
TÜBA-AR, vol. 13, pp. 219-228.
Lyonnet B., Guliyev F., Helwing B., Aliyev T., Hansen S. & Mirtskhulava G.
2012 Ancient Kura 2010-2011: The First Two Seasons of Joint Field Work in the Southern Caucasus.
Archäologische Mitteilungen aus Iran und Turan, vol. *44, pp. 1-190*.
Marro C., Bakhshaliyev V. & Ashurov S. G.
2009 Excavations at Ovçular Tepesi (Nakhchivan, Azerbaijan). First Preliminary Report: The 2006-2008 Seasons.
Anatolia Antiqua, vol. *17, pp. 31-87.*
Marro C., Bakhshaliyev V. & Ashurov S. G.
2011 Excavations at Ovçular Tepesi (Nakhchivan, Azerbaijan). Second Preliminary Report: The 2009-2010 Seasons.
Anatolia Antiqua, vol. *19, pp. 53-100*.
Mashkour M.
2003 Tracing Ancient "Nomads": Isotopic Research on the Origins of Vertical 'Transhumance' in the Zagros Region.
Nomadic Peoples, vol. *7, No. 2, pp. 36-47.*
Mashkour M., Bocherens H. & Moussa I.
2005 Long Distance Movement of Sheep and Goat of Bakhtiari Nomads Tracked with Intra-Tooth Variations of Stable Isotopes (^{13}C and ^{18}O).
In: *J. Davies, Fabiš M., Mainland I., Richards M. & Thomas R. (eds). Diet and Health in Past Animal Populations. Current Research and Future Directions. pp. 113-124.* Oxford.

Mashkour M. & Vila E.
2003 Archaeometrical approaches for tracking ancient Bedouins; a pilot project in northern Mesopotamia from IVth to Ist Millennia BC.
Mitteilungen des SFB "Differenz und Integration, vol. *4, No. 1, pp. 1-20*.
Narimanov I. G.
1977 On the History of Early Cattle Breeding in Transcaucasia.
Reports of Academy of Science of Azerbaijan SSR, vol. 33, No. 10, pp. 56-59.
K istorii drevnejshego sktovodstva Zakavka'ja.
Doklady Akademii Nauk Azerbajdzhanskoj SSR. (In Russian).
Nebieridze L. D.
1978 The Darkveti Multilayer Shelter. Tbilisi.
Darkvetis Mravalpeniani Ekhi. (In Georgian).
Ottoni C., Girdland Flink L., Evin A., Geörg C., De Cupere B., Van Neer W., Bartosiewicz L., Linderholm A., Barnett R., Peters J., Decorte R., Waelkens M., Vanderheyden N., Ricaut F.-X., Çakırlar C., Çevik Ö., Hoelzel A. R., Mashkour M., Mohaseb Karimlu A. F., Sheiki Seno S., Daujat J., Brock F., Pinhasi R., Hongo H., Perez-Enciso M., Rasmussen M., Frantz L., Megens H.-J., Crooijmans R., Groenen M., Arbuckle B. S., Benecke N., Strand Vidarsdottir U., Burger J., Cucchi T., Dobney K. & Larson G.
2012 Pig Domestication and Human-Mediated Dispersal in Western Eurasia Revealed through Ancient DNA and Geometric Morphometrics.
Molecular Biology and Evolution, Advance Access publication.
Scheu A.
2011 Palaeogenetische Studien zur Populationsgeschichte von Rind und Ziege mit einem Schwerpunkt auf dem Neolithikum in Südosteuropa. Mainz.
Smith A. T., Badalyan R. S. & Avetisyan P.
2009 The Archaeology and Geography of Ancient Transcaucasian Societies, Volume I, The Foundations of Research and Regional Survey in the Tsaghkahovit Plain, Armenia. Chicago.
Tsitsishvili A. L.
1969 Animal Bone Remains from Shulaveri.
Archaeological Expeditions of Georgian State Museum, vol. 1, pp. 27-34.
Kostjanye ostatki zhivotnyh iz Shulaveri.
Arheologicheskie jekspedicii Gosudarstvennogo muzeja Gruzii.. (In Russian).
Varazashvili V. V.
1992 The Early Agricultural Culture of the Iori-Alazani Basin. Tbilisi. (In Russian).
Rannezemledel'cheskaja kul'tura Ioro-Alazanskogo bassejna.

Vekua A. K.
1984 Animal World of Eneolithic Eastern Georgia based on the Materials from the Settlements of Arukhlo I (6^{th}-4^{th} Millennia BC*).*
Materials for Georgian and Caucasian Archaeology. vol. *9, pp. 91-119.*
Zhivotnyj mir Vostochnoj Gruzii v jepohu jeneolita po materialam poselenija Aruhlo I (VI-IV tys.do n. je.).
Materialy po arheologii Gruzii i Kavkaza. (In Russian).
Vereshchagin N. K.
1967 The Mammals of the Caucasus. A History of the Evolution of the Fauna. Jerusalem.
Vigne J.-D.
2011 The Origins of Animal Domestication and Husbandry: A Major Change in the History of Humanity and the Biosphere.
Comptes Rendus Biologies, vol. 334, No. 3, pp. 171-181.
Vigne J.-D. & Helmer D.
2007 Was Milk a "Secondary Product" in the Old World Neolithisation Process? Its Role in the Domestication of Cattle, Sheep and Goats.
Anthropozoologica, vol. *42, No. 2, pp. 9-40.*
Warmuth V., Eriksson A., Bower M. A., Barker G., Barret E., Hanks B. K., Li S., Lomitashvili D., Ochir-Goryaeva M., Sizonov G. V., Soyonov V. & Manica A.
2012 Reconstructing the Origin and Spread of Horse Domestication in the Eurasian Steppe.
Proceedings of the National Academy of Sciences, vol. 109, No. 21, pp. 8202-8206.
Wilkinson K. N., Gasparian B., Pinhasi R., Avetisyan P., Hovsepyan R., Zardaryan D., Areshian G. E., Bar-Oz G. & Smith A.
2012 Areni-1 Cave, Armenia: A Chalcolithic-Early Bronze Age Settlement and Ritual Site in the Southern Caucasus.
Journal of Field Archaeology, vol. *37, No. 1, pp. 20-33.*

Table I. List of the assemblages mentioned in the text.

Number on map	Site name	Region	Relative chronology	Absolute chronology range (cal. BC)
1	Darkveti (layer IV)	West	Aceramic Neolithic	
	Darkveti (layers II-III)	West	Chalcolithic	
2	Dzudzuana	West	Chalcolithic	*ca*. 4500-4300 [Bar-Yosef et al. 2011: 336, tab. 2]
3	Sagvarjhile	West	Chalcolithic	
4	Samele Klde (layer I-III)	West	Chalcolithic	
5	Shulaveri	Middle Kura	Neolithic	
6	Arukhlo I	Middle Kura	Neolithic	*ca*. 5800-5300 [Lyonnet et al. 2012: 85]
7	Shomu Tepe	Middle Kura	Neolithic	
8	Toyre Tepe	Middle Kura	Neolithic	
9	Baba-Dervish	Middle Kura	Neolithic	
10	Gargalar Tepesi	Middle Kura	Neolithic	
11	Mentesh Tepe	Middle Kura	Neolithic	*ca*. 5900-5600 [Lyonnet et al. 2012: 88, fig. 130]
12	Damtsvari Gora	Northern highlands	Chalcolithic	
13	Kamiltepe	South-East	Neolithic	*ca*. 6000-5400 [Lyonnet et al. 2012: 3]
14	Alikemek Tepesi	South-East	Chalcolithic	*ca*. 5300-4900 [Lyonnet et al. 2010: 225]
15	Aratashen (layer II)	Middle Araxes	Neolithic	*ca*. 5900-5500 [Badalyan et al. 2007]
16	Aknashen-Khatunarkh (layers IV-V)	Middle Araxes	Neolithic	*ca*. 6000-5500 [Badalyan et al. 2010: 210, tab. 1]
	Aratashen (layer I)	Middle Araxes	Neolithic	
	Aknashen-Khatunarkh (layers II-III)	Middle Araxes	Neolithic	

17	Ovçular Tepesi (phase I)	Middle Araxes	Chalcolithic	*ca*. 4350-4250 [Marro et al. 2009: 48, fig. 8; Marro et al. 201: 62, fig. 6]
	Ovçular Tepesi (phase II)	Middle Araxes	Chalcolithic	*ca*. 4250-3950 [Marro et al. 2009: 48, fig. 8; Marro et al. 2011: 62, fig. 6]
18	Areni-1	Middle Araxes	Chalcolithic	*ca*. 4250-3800 [Wilkinson et al. 2012: 23, tab. 1]

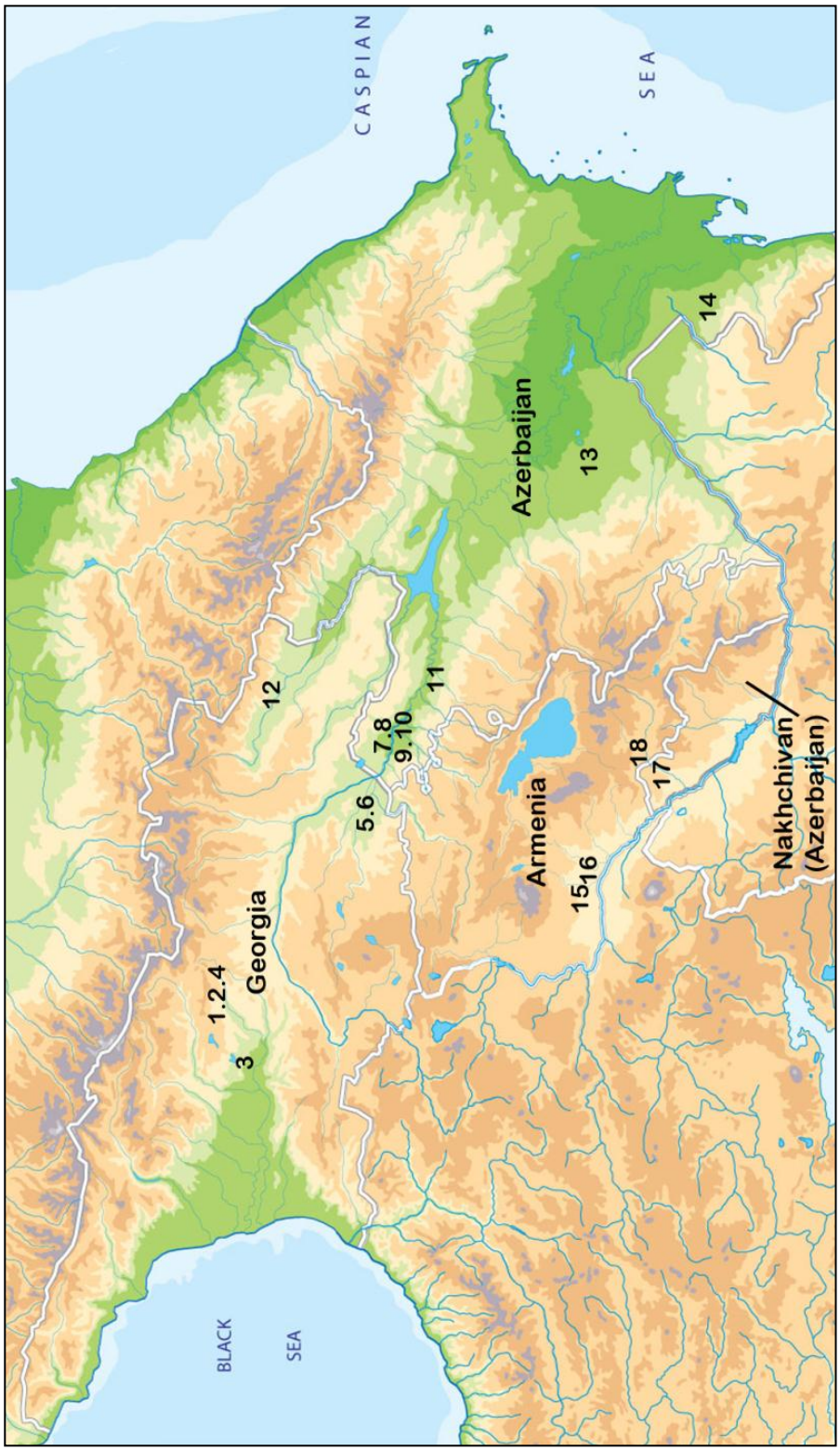
Table II. Quantitative description of the assemblages. NISP = Number of Identified Specimens. The relative representation of sheep and goat, cattle, and pig is calculated in percent of the number of sheep, goat, cattle and pig identified specimens.

Site	NISP Total	NISP Wild	% Wild fauna	NISP Sheep Goat	NISP Cattle	NISP Pig	% Sheep Goat	% Cattle	% Pig	Ratio Sheep: Goat	Reference
Darkveti (layer IV)	412	342	83.0	17	5	47	24.6	7.3	68.1	NA	[Nebieridze, 1978: 91-2, tab. 2]
Darkveti (layers II-III)	307	250	81.4	8	2	46	14.3	3.6	82.1	NA	[Nebieridze, 1978: 91-2, tab. 2]
Dzu-dzuana	128	38	29.7	16	64	10	17.8	71.1	11.1	NA	[Nebieridze, 1978: 92-3, tab. 3]
Sagva-rdzhile	819	519	63.4	0	300	0	0	100	0	NA	[Nebieridze, 1978: 92-3, tab. 3]
Samele Klde (layers I-III)	1129	992	87.9	16	25	95	11.8	18.4	69.8	NA	[Nebieridze, 1978: 92-3, tab. 3]
Shulaveri	870	6	0.7	280	460	124	32.4	53.2	14.4	2.6:1	[Cicishvili, 1969]
Arukhlo I (publ. 2012)	NA	NA	2.0	NA	NA	NA	53.1	32.6	14.3	4 : 1	[Lyonnet et al. 2012: 154-5]
Arukhlo I (publ. 1984)	2414	194	8.0	1002	654	557	45.3	29.5	25.2	62:1	[Vekua, 1984]
Shomu-Tepe	NA	NA	9.5	NA	NA	NA	65.2	28.5	6.3	NA	[Narimanov, 1977]

Toyre Tepe	NA	NA	7.2	NA	NA	NA	56.9	27.6	15.5	NA	[Narimanov 1977]
Baba-Dervish	NA	NA	9.5	NA	NA	NA	54.2	40.3	5.5	NA	[Narimanov 1977]
Gargalar Tepesi	NA	NA	2.5	NA	NA	NA	56.2	26.7	17.1	NA	[Narimanov 1977]
Mentesh Tepe	NA	NA	6.0	NA	NA	NA	71.0	28.0	1.0	NA	[Lyonnet et al. 2012: 154-5]
Damtsvari Gora	250	11	4.4	61	168	6	26.0	71.5	2.5	NA	[Varazashvili, 1992: 96-100]
Kamiltepe	NA	NA	2.0	NA	NA	NA	65.3	24.5	10.2	5 : 1	[Lyonnet et al. 2012: 154-5]
Alikemek Tepesi	NA	NA	4.3	NA	NA	NA	42.3	50.6	7.1	NA	[Narimanov, 1977]
Aratashen (layer II)	4121	212	0.1	3530	286	47	91.4	7.4	1.2	3.6:1	[Bălăşescu … 2010]
Aknashen Khatun-arkh (layers IV-V)	3464	184	5.3	2845	410	2	87.3	12.6	0.1	4.6:1	[Bălăşescu et al. 2010]
Arata-shen (layer I)	653	25	3.8	519	94	5	84.0	15.2	0.8	4.6:1	[Bălăşescu …, 2010]
Aknashen -Khatu-narkh (layers II-III)	2097	233	11.1	1488	351	5	80.7	19.0	0.3	3.2:1	[Bălăşescu … 2010]

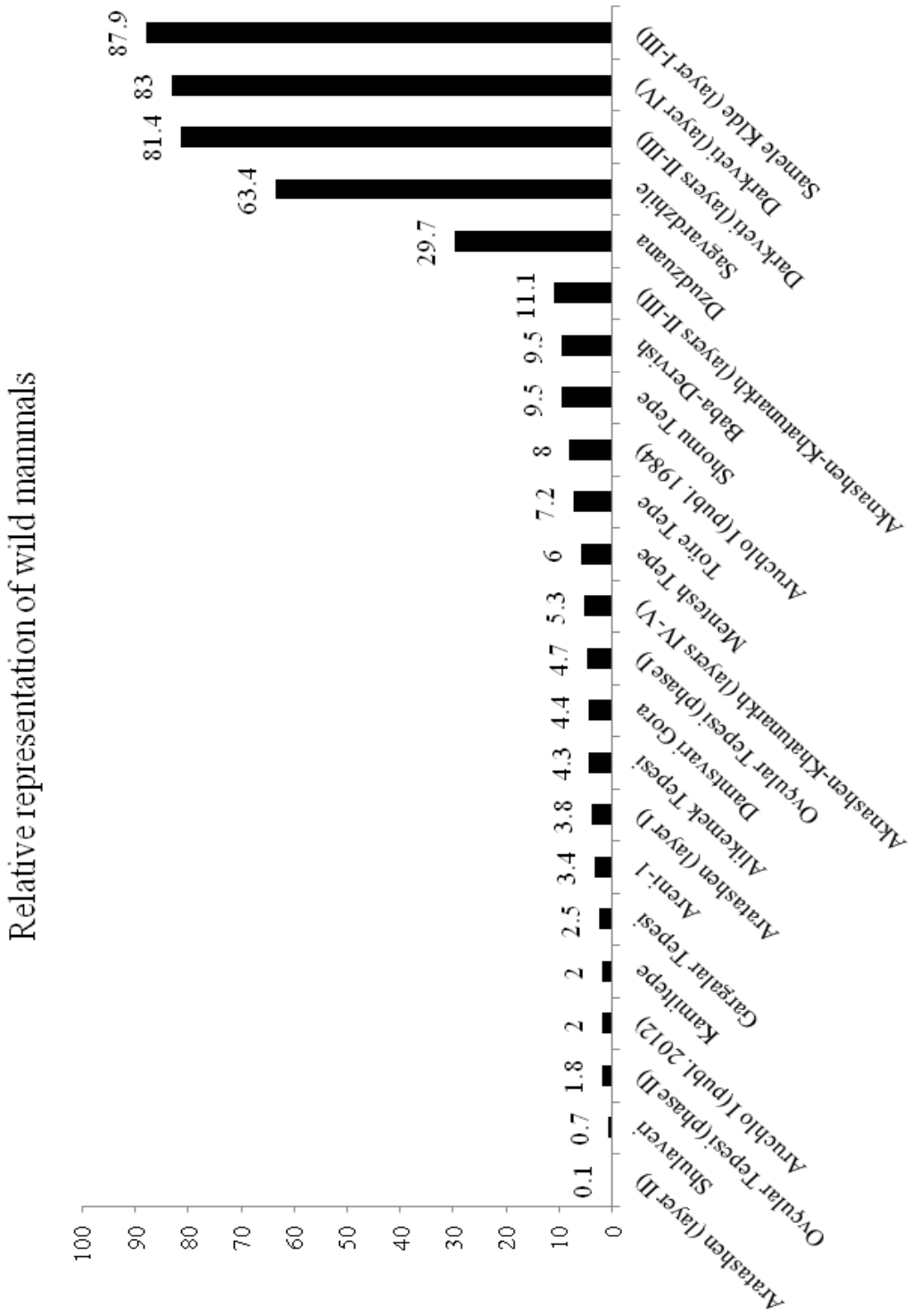
Ovçular Tepesi (phase I)	360	17	4.7	330	7	0	97.9	2.1	0	3.6:1	[Berthon et al. 2013]
Ovçular Tepesi (phase II)	680	12	1.8	534	133	0	80.1	19.9	0	1.6:1	[Kovács…, 2013 ; Berthon, unpublished data]
Areni-1	466	16	3.4	339	98	6	76.5	22.1	1.4	Mostly goat	[Wilkinson et al. 2012: 25, tab. 2]

Fig. I.



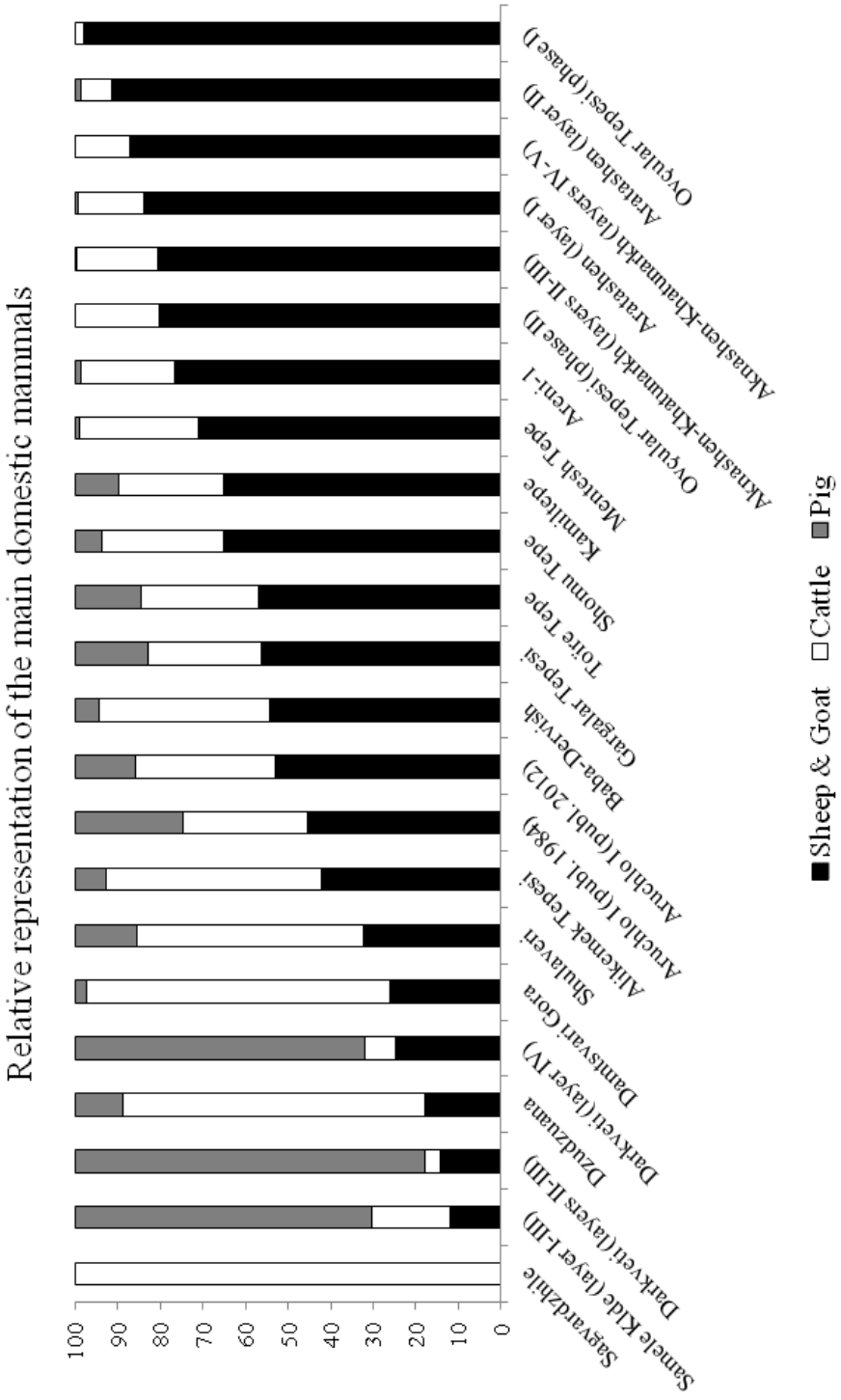
Localisation of the assemblages mentioned in the text. See Table I for the names.

Fig. II.



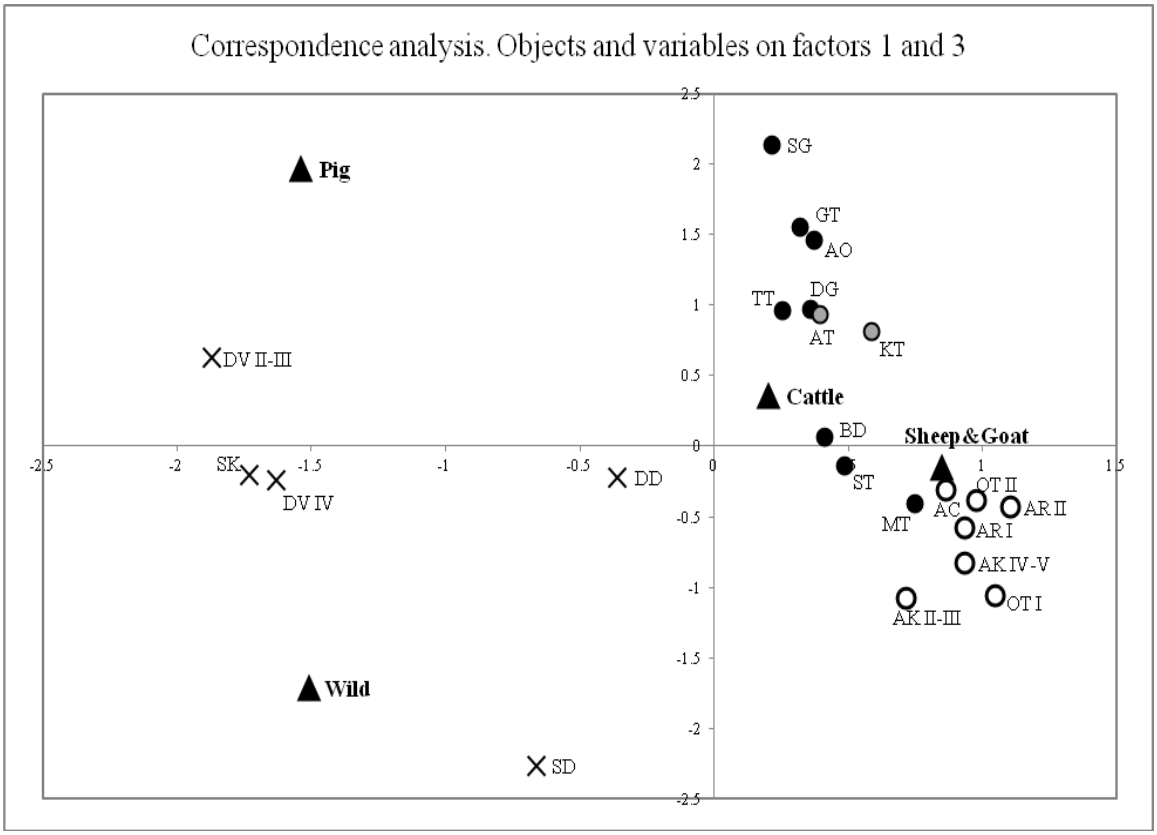
Relative representation of wild mammals in the assemblages, in percent of the total Number of Identified Specimens (NISP). See Table 2 for numbers.

Fig. III



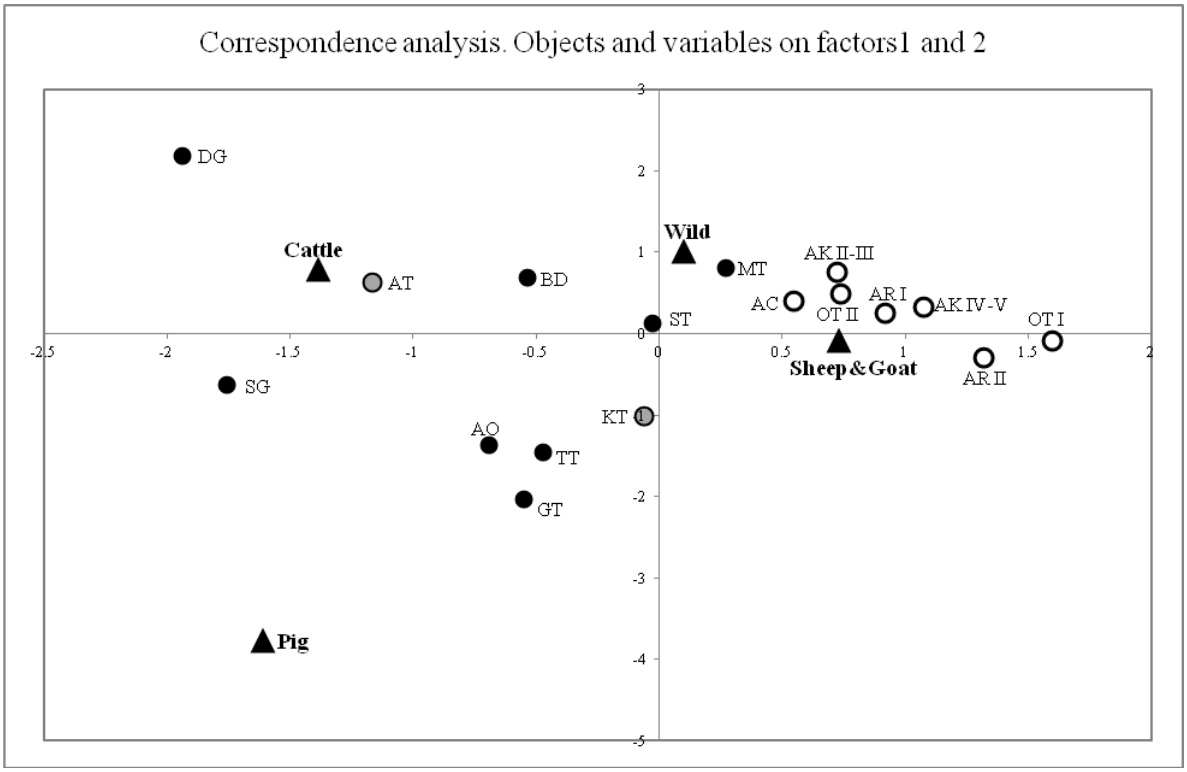
Relative representation of sheep and goat, cattle and pig in percent of the total number of sheep, goat, cattle and pig remains. See Table II for numbers.

Fig. IV



Correspondence analysis with variables (triangle) and objects (crosses and circles) Plotted on the 1st and 3rd factors. Crosses correspond to assemblages from Imereti, black circles to the middle Kura river area and northern highlands, grey circles to the Eastern steppes and white circles to the middle Araxes river area. DV = Darkveti, SK = Samele Klde, SG = Sagvardzhile, DD = Dzudzuana, SG = Shulaveri, DG = Damtsvari Gora, AT = Alikemek Tepesi, AO = Arukhlo I, GT = Gargalar Tepesi , TT = Toyre Tepe, KT = Kamiltepe, BD = Baba-Dervish, ST = Shomu Tepe, MT = Mentesh Tepe, AC = Areni-1, OT = Ovçular Tepesi, AR = Aratashen and AK = Aknashen-Khatunarkh.

Fig. V.



Correspondence analysis with variables (triangle) and objects (circles) Plotted on the 1st and 2nd factors. Black circles correspond to assemblages from the middle Kura river area and northern highlands, grey circles to the Eastern steppes and white circles to the middle Araxes river area. SG = Shulaveri, DG = Damtsvari Gora, AT = Alikemek Tepesi, AO = Arukhlo I, GT = Gargalar Tepesi , TT = Toyre Tepe, KT = Kamiltepe, BD = Baba-Dervish, ST = Shomu Tepe, MT = Mentesh Tepe, AC = Areni-1, OT = Ovçular Tepesi, AR = Aratashen and AK = Aknashen-Khatunarkh.

Prof. Sergi Makalatia

Gori

Historical-Ethnographical Museum

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