The Animal Bones from Excavations in Meshoko Cave in the Northern Caucasus

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Introduction: The Site and the Excavations

This report is concerned with the analysis of the faunal remains recovered from the excavations of Meshoko Cave in the North Caucasus region of south-western Russia. The five seasons of excavations from 2011 to 2015 were directed by Evgenii Cherlenok of the State University of Saint Petersburg. To date, material from six stratigraphic layers from excavations near the entrance of the cave has been collected. Layers 5-6 belong to the late Eneolithic (Chalcolithic) period, with radiocarbon dates centring around 3700 cal. BC. Layer 3 has produced Maikop cultural materials dating to the early Bronze Age. Layer 1 contains a very mixed material culture assemblage and therefore the bones could belong to a wide range of dates. Layer 2 belongs to the Bronze Age. Layer 4 is thin layer and it may not represent a cultural phase.

In all seasons, animal bones collected by hand were assigned where possible to a location point, which will in due course provide the opportunity to examine intra-site distributions in detail. In addition, all the spoil from the 2015 excavations was sieved, which has enabled an assessment to be made of the efficiency of recovery of faunal remains by normal excavation methods.

Methods of Animal Bone Analysis

All the animal bones and teeth recovered by normal excavation from the 2011-2015 seasons were recorded individually onto a relational database (Microsoft Access), which forms part of the site archive. All fragments, including loose teeth, limb bone shaft fragments, rib heads and vertebral centra were recorded to species level where possible. If this was not possible, the specimen was assigned to one of various size categories: large mammal (cattle; red deer; horse); medium-sized mammal (pig; sheep/goat; dog; cat; roe deer etc); small mammal (mainly rodents); and large, medium-sized and small birds. In cases where it was not possible to assign a size category, the specimen was recorded as an unidentified mammal or bird Identifications were occasionally facilitated by reference to identification manuals and/or consultation with some of our colleagues. Most of the sheep/goat bones could not be assigned to either species, but it was possible to identify some elements specifically as sheep or goat following the guidelines of Boessneck (1969), Payne (1985), Prummel and Frisch (1986) and Zeder and Lapham (2010). Some of the largest bones of pig, bovid, and sheep/goat could have been from wild animals but the majority were from smaller domestic stock. Because of the lack of an available skeleton reference collection and/or because of very similar morphologies, it was not possible to assign most of the bird and small mammal bones to a particular species. All the bird bones have been assigned to size categories and provisional identifications are discussed in this report. Worked bone artefacts housed at the Heritage Museum were examined for the purposes of species and element identification. All the sieved material from the 2015 excavations was scanned, but only identifiable specimens were counted.

Assemblage (context) summaries were created for each layer for each year of excavation (e.g 2013 Layer 2; 2015 Layer 5 etc.). In addition, assemblages recovered from discrete pits were treated separately (e.g. 2013 Layer 3 Pit 71). In the main database table the following information was recorded where appropriate for each specimen: year of excavation; stratigraphic layer; feature; location point; species/taxon; anatomical element; zones of bone present; approximate percentage of bone present; evidence for any taphonomic processes (e.g. gnawing damage; erosion; weathering; charring; calcification; concretions); epiphyseal fusion data; other comments including observations of pathology. Some bones had modern or occasionally ancient breaks, which could be refitted. Such specimens were recorded as a single element but the refitting was noted.

Separate tables linked to the main table by an individual identification number were created for metrical, butchery and tooth ageing data. Tooth eruption and wear descriptions for cattle, sheep/goat and pig follow the method of Grant (1982). Where possible, age ranges were assigned to these specimens based on Silver (1969); Payne (1973); Hambleton (1999); Jones (2006; 2012a; 2012b); and Matschke (1967). The state of epiphyseal fusion was recorded for selected post-cranial elements and, where possible, ages assigned following Silver (1969) and Reitz and Wing (1999:76). Most measurements followed those described by von den Driesch (1976).

Assemblage Size and Preservation

A total of 3,455 animal bone fragments were recovered by hand from the 2011-2015 excavations, of which 1,548 have been identified to species, or nearest taxa (Table 1). A further 249 fragments were recorded from samples retrieved mainly from the 2015 excavations (unidentified mammal fragments were not recorded in sieved samples).

The assemblages from Layers 2, 4 and 6 are small, each providing fewer than 50 identified elements. Layer 1 produced nearly 200 identified specimens, but this assemblage must be treated with caution because of dating issues. Therefore the largest and most reliable samples come from Layers 3 and 5. Layer 3 (Maikop) produced over 800 fragments from hand excavation, of which nearly 400 have been identified. Layer 5 (Eneolithic) provided over 2,000 fragments from hand excavation including over 1,100 identified specimens. The counts from Layers 3 and 5 were supplemented by identifications of material from the sieved residues (Table 1). Therefore most of the discussion related to possible chronological variations in the faunal assemblage will be focused on comparisons between Layers 3 and 5. A total of 112 separate assemblage groups were created. These included assemblages from 78 pit contexts. Nearly all of the remaining assemblage came from the general layers excavated in different years. Most of the pit assemblages were very small, often producing less than 10 bone fragments. Preliminary assessment indicated that were no significant differences between the assemblages from the pits and layers.

The surface preservation of most of the bones recovered was good. Hardly any of the identified elements were eroded and only around 6% showed signs of weathering. This is not surprising given that the bones were deposited in the sheltered cave. 6% of the identified bones had an ivoried appearance. The causes of these surface modifications are complex but high percentages of ivoried bones usually indicate good surface preservation (Table 2).

However, there are other indications that the faunal assemblage has been severely damaged. Evidence of gnawing was observed on 15% of the surviving identified elements (excluding loose teeth). Most of the gnawing marks are characteristic of those inflicted by canids and it can be assumed that dogs kept by the inhabitants of the cave had regular access to the bones deposited there. A total of six specimens (2 from Layer 3; 4 from Layer 5) have evidence of acid erosion, indicating that they have been digested. These all consist of phalanges and small portions of metapodials of the major mammal species (3 pig; 2 sheep/goat; 1 bovid). Although humans sometimes consume bones, it is much more likely that these discarded poor quality meat bones were eaten by dogs and subsequently redeposited in their faeces. The relatively high incidence of dog gnawing on surviving bones also implies that many more would have been completely destroyed by this agency. The more fragile bones of younger and smaller animals would have been more susceptible to total destruction.

At least 12 identified bones (2 from Layer 3; 10 from Layer 5) have been damaged by rodent gnawing. There is no evidence to suggest that this rodent activity postdated the human occupation of the cave and it is therefore likely that humans shared the cave with rodents, some of whose bones were also discovered during the excavations (see Table 1 and discussion below).

Evidence for burning was recorded on 65 identified bone elements (Table 2). The degree of burning varied from slight evidence of scorching through to the complete charring (blackening) of the bone. In addition, 119 unidentified fragments recovered by hand collection were also charred and four were calcined (white). There is no evidence for areas of high concentrations of burnt bones, apart from Layer 2, in which 16% of the fragments were charred, including slight scorching on two of the ribs and a thoracic vertebra of the neonatal calf partial skeleton. It is likely that these and other bones in this layer were damaged by fire after deposition.

Another common occurrence was the presence of concretions adhering to the bones, particularly in Layers 4 and 5 (Table 2). Although the concretions did not damage the bones themselves, in the more severe cases they prevented identification and would have obscured any evidence of butchery.

The assemblage was generally highly fragmented. Many of the fragments consisted of very small portions of the complete bones rendering many of them unidentifiable. Over half of the hand-collected material was unidentified, with only the assemblage from Layer 1 containing more identified fragments than unidentified ones (Table 2). An indication of the generally highly fragmented state of even the identified bones can be seen in the fragmentation evidence of the major limb bones, mandibles, scapulae and pelves of all the identified species (Table 3). These bones were divided into five size categories ranging from ≤10% to 100% of the complete bone. 69% of the bones fell into the smallest size category and only nine out of 694 bones were complete. Overall, the approximate mean size of these identified elements was 19%. There were insignificant differences between the two largest samples from Layers 3 and 5. The average size of the identified bones recovered from Layer 1 was slightly larger (24%). The less fragmented nature of this assemblage would partially account for the higher percentage of identified elements recorded in this layer (Table 2). Unsurprisingly, fragmentation was particularly marked in the bovid assemblage where 134 of the 150 major bones with recorded fragmentation consisted of ≤10% of the complete bone and the approximate mean size was only 12%. The major bones of the smaller species are less likely to break into as many identifiable fragments. Nevertheless pig fragmentation levels were high (mean = 17%). The sheep/goat assemblage was a little less fragmented (mean = 22%).

Fragmentation of bones can be caused by a multitude of factors including carcass division, cooking, gnawing, erosion and weathering. In this case the most likely additional cause of fragmentation is trampling. In this respect it is probably significant that the assemblages from the pits were generally slightly less fragmented (24%) than those from the layers (18%), indicating the pits gave some protection to the bones. Many of the bones in the pits, however, were incorporated only after they had been subjected to trampling and other causes of fragmentation.

Another indicator of the general standard of bone preservation is the number of loose teeth recovered. Loose teeth usually indicate that the mandibles and maxillae in which they were set have been destroyed or severely fragmented. Therefore high levels of loose teeth often indicate poor survival, although their abundance can also be affected by different retrieval standards. Given the high fragmentation levels of this assemblage along with the careful excavation methods, high levels of loose teeth should be expected and this is indeed the case, with loose teeth providing 17% of the overall assemblage (Table 2). Loose teeth provide significantly higher percentages of the assemblages from Layers 1-3 than in Layers 4-5, indicating that the assemblages from the later levels are less well preserved than those from the Eneolithic period.

Species Present

A fairly wide range of species were identified from among the hand-recovered and sieved assemblages, including domestic and wild large mammals (in order of abundance pig, sheep/goat, bovid, red deer, dog, roe deer, beaver, wildcat, hare and otter), and wild small creatures, including hamster, mole, hedgehog, squirrel, frog and lizard, and numerous unidentified small mammal (rodents) of mouse size and rat size, including two fragments of unidentified small carnivore (mustelidae). Birds were also present (identifications are discussed in a later section).

Species Representation in Hand-recovered Assemblage:

Remains were recovered from all stratigraphic layers 1-6 during 2011-2015 (Table 1). The largest animal bone assemblages came from the eneolithic Layer 5 (2030 fragments) and the Maikop Layer 3 (808 fragments). Layers 1, 2, 4 and 6 produced far fewer bones. Overall, the assemblage is dominated by pig, sheep and bovid, which together make up over 93% of all identified specimens. Red deer were present in small numbers in all layers. Dogs were present in very low numbers, and no dog bones were recovered from Layers 4 and 6. It is worthy of note that no horse remains were recovered from any layers at Meshoko Cave.

The relative importance of the five main mammal species varies between stratigraphic layers (Table 4), although only assemblages from Layers 1, 3 and 5 are large enough to provide reliable comparisons. Bovid are consistently the third most abundant species in Layers 1, 3 and 5, but the relative importance of sheep and pig differs between these layers. In Layer 1 sheep/goat (48%) are more abundant than pig (27%). In Layer 3 this is reversed and pig (45%) are more abundant than sheep/goat (28%). The situation is different again in Layer 5 where sheep/goat (37%) and pig (36%) are of almost equal abundance.

Some variations in species abundance are apparent within each layer when comparing assemblages from different excavation years (Table 5). Where assemblage sizes are large enough to reliably compare results, in Layer 3 the 2013 and 2015 assemblages display broadly similar patterns of species abundance. However, in Layer 5 the assemblage compositions are more variable between different excavation years. For example, in 2011 Layer 5, bovid are more abundant than pig and sheep/goat, while in 2012 pigs are most abundant followed by bovid then sheep/goat. In particular, there is a significant difference in the 2013 assemblage from Layer 5 compared to other years. 2013 Layer 5 has a much greater abundance of sheep/goat (72%) and a scarcity of bovid (1%) compared to other years assemblages from the same layer. The 2013 sample may account for much of the apparent differences between Layers 3 and 5 overall. The differences between years may at least partly be an artefact of the quite small sample sized involved, although genuine spatial intra-site variation in animal bone deposition and/or subtle differences in horizons within stratigraphic layers may also account for these differences.

Pig

A total of 596 fragments of pig bones and teeth (including 42 fragments from the sieved material) were recovered, representing an MNI (Minimum Number of Individuals) of 18 pigs.

Pig Body Part Representation

Full details of the elements represented of all species are stored in archive tables. The elements represented in the two largest pig assemblages can be compared in Figure 1. These have been divided into six broader categories for the purpose of this discussion: cranial elements; loose teeth; upper forelimb (including scapula); upper hindlimb (including pelvis); lower limbs; trunk (ribs and vertebrae). It should be noted that the numbers of elements incorporated into these zones are not equal. For example, the upper forelimb category consists of only four elements whereas the lower limb category potentially incorporates more than 30 bones in pigs. This bias is to an extent offset by the fact that many of the foot bones are very small and often do not survive or are overlooked during excavation. In addition, the cranial elements and upper limb bones tend to be much more fragmented than the foot bones and potentially one bone could produce several different specimens that have been counted.

Results for pig are shown in Table 6. Cranial elements are well represented throughout the deposits providing 22% of the overall pig NISP counts. These include a large number of small fragments from skulls, although mandibles are also well represented (Figure 1). Employing minimum number of element counts (MNE), a minimum of 18 different skulls and 13 mandibles are represented in the hand-collected assemblage. Cranial elements often form substantial portions of pig assemblages from archaeological sites and the results from Meshoko Cave are not unusual in this respect.

Loose teeth provide 23% of the pig NISP counts and were the most common elements retrieved from sieving (Table 6). They also form over half of the pig elements in Layer 1 and nearly a third of those from Layer 3. In contrast they only form 13% of the assemblage from Layer 5, reflecting the broader trends in loose teeth abundance discussed above, and indicating that the pig assemblage was better preserved in Layer 5.

The upper limb bones of both the forelimb and hindlimb are both quite well represented. They should be present in roughly equal numbers and this is the case overall (12% and 14% of the NISP counts respectively). However, this picture disguises some variations between layers. Whereas upper forelimb elements outnumber those of the hindlimb in Layer 3, the opposite is true in Layers 1 and 5. In the latter case, this is partially the result of an increased percentage of pelvis fragments in some areas of the cave (Figure 1). Amongst the forelimb elements, humerus fragments are much better represented than the others, partially reflecting its greater robusticity. This is also reflected in the MNE counts, in which at least 18 humeri were represented in hand-collected material compared with only nine scapulae, eight ulnae and four pelves. With regard to the hindlimb elements, roughly equal numbers of tibiae and femora fragments are represented throughout, whereas as noted above pelves are much better represented in Layer 5 than in Layer 3 (Figure 1). The ageing evidence of the pelves from Level 5 is discussed below. The, smaller, more fragile, fibula is less well represented and the only pig patella was recovered in a sieved sample. Overall MNE counts see pelves (14) outnumbering both tibia (13) and femur (11), with at least ten pelves represented in Layer 5 compared with just five femora and tibiae.

Lower limb bones provided around 14% of the pig assemblage collected by hand. As noted above, theoretically these should outnumber the numbers of upper limb bones because there are so many more bones in the pig's foot. It is possible that the feet of some pigs were removed prior to the carcasses being brought into the cave. However, because of retrieval and survival biases pig foot bones are rarely well represented in archaeological assemblages and it should be noted that lower limb bones form 31% of the pig elements recovered from sieving, showing that these were more likely to be overlooked during normal excavation (Table 6). Lower limb bones were generally better represented in Layer 5 than in Layer 3 (Figure 1). MNE estimates also reflect the relatively poor representation of pig foot bones. The highest MNE (for the metatarsals) was only 5.

Ribs and vertebrae (trunk) were relatively well represented (10%) particularly in Layer 5 (14% - Table 6). Their relative abundance in Layer 5 again probably mainly reflects better survival conditions, although the possibility that some meat-bearing parts of the body were introduced into the cave after initial butchery elsewhere should also be considered, particularly as rib shafts of unidentified medium-sized mammals are quite well represented, again particularly in Layer 5 (Table 7).

Pig Butchery Evidence

The body part analysis discussed above indicates that all parts of pig carcasses were quite well represented and although it is feasible that the assemblage includes some joints of meat prepared outside the cave itself, it is likely that many pigs were butchered within the cave. Butchery marks were observed on a total of 29 pig elements from Layers 3 and 5 (Table 8). This is quite a low incidence of butchery but the highly fragmented nature of the assemblage can partially explain this.

An unusually complete pig skull from Layer 5 (Point 12.4024) has possible evidence for pole-axing, as it displays several sharp chop marks on the frontal/parietal region on the top of the skull (Figure 2). If so, this indicates that the pig was slaughtered inside or in the vicinity of the cave. Similar marks were found towards the back of another pig skull from Layer 5. Finer cuts located near the upper orbit of a third skull are more likely to have been the result of skinning and cleaning the skull and a fine cut on the lateral aspect of a maxilla from Layer 3 is likely to have been made during the removal of cheek meat.

Fine incisions were observed on various parts of five pig mandibles, four of which were from Layer 3. In two cases the location of the cuts towards the back of the mandible (ramus) is indicative of the separation of the lower jaw from the skull. The other cuts were located on the inside (lingual) or underside (ventral) aspects of the jaws and are more likely to have been made during extraction of the tongue. Two scapulae and a humerus from Layer 5 have cut marks probably made during filleting of meat from the upper forelimb. No marks were observed on any of the other forelimb elements.

Despite their abundance, butchery marks were observed on only one pig pelvis. This consisted of a cut on the outside of the ilium of one of the largest pig specimens, which could have been a wild boar. A tibia of a juvenile pig from Layer 3 has cuts near the distal end indicating that this piglet carcass had been dismembered. Another tibia from this layer bore several knife cuts on its shaft indicative of filleting. A corresponding cut was observed on a fibula.

Cuts on an astragalus, centroquartal and the proximal end of a metacarpal bear evidence for the removal of the feet from the upper limbs. Butchery marks were observed on a total of seven vertebrae from Layer 5. These all consisted of fine incisions. Those observed on thoracic and lumbar vertebrae were all associated with the removal of the flanks of the animal from the vertebral column. Corresponding marks were observed on three rib heads. Transverse cut marks on cervical vertebrae indicated where the skull had been separated from the neck.

Pig butchery was therefore carried out with the aid of fine blades and the only evidence for the use of a heavier implement was on the skulls which show possible evidence of pole-axing. Dismemberment of carcasses with fine knives often does not leave cut marks on bones, as the focus is on cutting through ligaments rather than the bones themselves. Many of the bones were probably also broken open to extract marrow and for pot-boiling. Unfortunately subsequent trampling, gnawing and other taphonomic factors have destroyed much of this evidence.

Pig Age at Death

Estimation of age at death was possible for 22 mandibles or loose teeth, the majority of which (17 specimens) were from individuals younger than 27 months at death. Among these young pigs there was a high proportion of individuals (12 specimens) that died as juveniles (<14months) and were most probably killed in the latter half of their first year. The teeth provide very little evidence for exploitation of very young pig, with only one mandible belonging to a neonate/infant <6 months. There were three specimens of young adults (c.2-3 years old at death) and only two older specimens (>3years at death), of which one was from a very mature adult. The sample is too small to enable detailed reconstruction any analysis of mortality and survivorship profiles, nevertheless, the small sample from Layer 3 (15 specimens) and the even smaller sample from Layer 5 (5 specimens) both show similar emphasis on juveniles, with very few adults.

The epiphyseal fusion dataset is mainly comprised of remains from Layer 5, with other layers making no significant contribution. A preference for the consumption of juvenile pigs is evident from the epiphyseal fusion data: amongst the 30 surviving elements known to fuse by c.12 months, exactly half remain unfused, suggesting a high proportion of pigs were killed in their first year. Among the elements known to fuse at 2-2 ½ years, the majority from the cave were unfused and only one third were fused at death, supporting the observation from the dental ageing that most pigs were killed before the age of c.2 ½ years. Among the later fusing elements (known to fuse by c.3-3 ½ years) only 10% were found to be fused, further supporting the conclusion that mature adults were only rarely killed and consumed by the inhabitants of Meshoko Cave.

The available ageing data is not sufficiently well refined to determine season of death, and it is not possible to say whether occupation of the cave was all year round or seasonal. Neonatal pigs are present in the assemblage from Meshoko Cave, but only in very small numbers. Only nine very porous bones (indicative of neonates) were recovered, including five from Layer 5 and two from Layer 3. This suggests pigs were present in the vicinity of the cave during birthing season (spring). In addition, the early fusion sample includes ten unfused pelves from Layer 5, all of which were similar in size and shared the same level of development, perhaps indicating a group of individuals, several months old but less than one year, all killed at the same age and time of year.

The ageing evidence from the pig remains points strongly towards an emphasis on the exploitation of young pigs, with a particular preference for juvenile pigs killed in their first year. Very few individuals were kept beyond 3 years. This is a pattern typical of domestic pig exploitation. The one or two older animals present probably represent preferred breeding stock, or possibly the occasional acquisition of wild pig.

Pig Metrical Data

The highly fragmented condition of most of the bones prevented the recording of measurements for all species. In addition the prevalence of immature animals severely limited the number of fully fused bones of pig that could be measured and some of those that were measured may not have grown to full size. Measurements of teeth were also restricted by the fact that many of them were incomplete. The metrical data are presented in Table 9. Only five specimens from Layer 3 were measured, the remaining 14 coming from Layer 5. The metrical data support the impressions gained during recording that there was a wide range in the size of the pig bones indicating that both domestic pigs and wild boar were represented in the sample. Some of the measurements clearly fall into the size ranges of domestic boar. For example, a lower third molar from Layer 5 has a greatest length of 45.3mm, which falls into the size range of modern wild boar from the Caucasus (Albarella et al. 2009, 110). By contrast another third molar from the same layer measured 32.3mm, well within the domestic pig range. Similarly, two distal tibiae from Layer 3 and a proximal radius from Layer 5 fall comfortably within the domestic pig range, whereas an astragalus from Layer 5 has a lateral length more likely to place it within the wild category. However, many of the other measurements fall into the areas of size overlap between large domestic pigs and small wild boar. For example, the two distal humeri from Layer 5 have articular breadth measurements comparable to wild boar found in various parts of Europe (Albarella et al. 2009, 116) but also fall into the range of domestic pigs found, for example, in Roman Britain (Maltby 2010). Tooth measurement of modern Caucasian wild boar suggest that they are large compared with wild boar populations elsewhere in Europe but unfortunately there are very few measurements of the post-cranial skeleton available to make comparisons (Albarella et al. 2009). Given these problems, all that can be said at the moment is that the pigs from Meshoko Cave came from both domestic and wild animals. Given the presence of bones of perinatal mortalities and the general mortality patterns which indicate a high kill-off of young animals, it seems likely that the majority of the pigs were domestic but some wild boar were also captured.

Sheep/Goat

A total of 562 fragments of sheep and goat (22 from sieved material) were recovered. These represent an MNI of 18 sheep/goats.

It was possible to distinguish between sheep and goat on a small proportion of specimens. A total of 20 fragments of bone and teeth were identified as sheep (*Ovis aries*), and a further 19 specimens confirmed as goat (*Capra hircus*). The presence of sheep is confirmed in Layer 1 (6 fragments), Layer 3 (3 fragments), Layer 4 (1 fragment) and Layer 5 (10 fragments). By contrast, all 19 firm identifications of goat came from Layer 5. However, goats are almost certainly present in Layer 3 (at least two adult teeth from Layer 3 have been provisionally identified as goat). Although a small sample, these results are interesting as they suggests that exploitation of goat may have been more common during the early periods of occupation at the cave (Layer 5) than in the later period of occupation (Layer 3). Differentiation of sheep and goat is difficult, especially when remains are fragmentary, so the vast majority of sheep/goat remains in our sample were not further differentiated. Hereafter sheep and goat are discussed together as sheep/goat.

Sheep/Goat Body Part Representation

A summary of sheep/goat body part data is shown in Table 10 and percentages of the different elements in Layers 3 and 5 are provided in Figure 3. Full details are stored in the site archive tables.

There is quite an even representation of body parts throughout the deposits although there are some minor differences visible on closer inspection. Cranial elements form around 18% of the assemblage throughout the deposits Table 10. At least 18 different mandibles are represented overall. Loose teeth were the most commonly recorded indicating the highly fragmented nature of the assemblage. However, they formed only 5% of the Layer 5 assemblage compared with 26% in Layer 3, indicating that the sheep/goat assemblage was better preserved in the earlier layer, which is indicated by the corresponding higher percentages of limb and trunk bones in Layer 5. Upper forelimb bones are slightly less well represented than their hindlimb counterparts. The radius was the most commonly recorded of these, outnumbering the humerus, scapula and ulna in both Layers 3 and 5 (Figure 3). The radius remained the most common of these bones in the overall MNE counts (16), followed by scapula (13), humerus (11) and ulna (10).

The tibia was the most commonly recorded hindlimb element, and it was the most common sheep/goat element in Layer 5, although it was not as prominent in the Layer 3 assemblage (Figure 3). Although the pelvis was comfortably outnumbered by tibia in the NISP counts, it produced a slightly higher MNE estimate (12) than either tibia (11) or femur (10).

The lower limb bones were dominated by metatarsal and metacarpal fragments. The relatively high numbers of metapodials fragments that could not be more closely identified is another indication of the highly fragmented nature of the assemblage. Metacarpal fragments tended to be slightly more common than metatarsals in the upper layers whereas the reverse is the case in the earlier deposits, but the differences are not extreme. Overall, at least 14 metatarsals and 13 metacarpals are represented. Phalanges, carpals and tarsals were much less frequently retrieved, although at least nine astragali and six calcanea are represented.

Sheep/Goat ribs and vertebrae, as in the case of pig, were significantly better represented in Layer 5 than in Layer 3 and provided around 10% of the sheep/goat assemblage overall. Many of the unidentified mammal rib fragments would also have belonged to sheep/goat (Table 7). The higher incidence probably reflects better preservation.

The sheep/goat assemblage is formed of a relatively evenly balanced distribution of bones from all parts of the body. Variations can mainly be attributed to differential preservation and recovery. Most sheep/goat assemblages are dominated by the densest elements such as loose teeth, mandibles and the shafts of radius, tibia and metapodials. This is also the case at Meshoko Cave. The under-representation of carpals, tarsals and phalanges is likely to be the result of retrieval bias and these elements were indeed relatively more common encountered in the sieved assemblage (Table 10). Therefore, it seems likely that most of the sheep/goat represented in the cave were animals that were brought there for slaughter.

Sheep/Goat Butchery Evidence

Butchery marks were observed on 30 sheep/goat elements, mainly from Layer 5 (Table 8). Most were located on bones that could not be further identified but two of the butchered bones definitely belonged to sheep. Although no butchery was recorded on any of the identified goat bones, it is very likely that goat meat was also eaten. Many of the types of butchery marks observed on sheep/goat elements were similar to those encountered in the pig assemblage. Most of the marks consisted of fine incisions but deeper marks were encountered on several bones. For example, a humerus from Layer 5 had been chopped through the distal articular surface in order to separate it from the radius and ulna. A metacarpal from Layer 3 had similarly been sliced through near the proximal end when it was detached from the radius. Chop marks were also observed on two vertebrae. More typical were fine incisions observed on five shaft fragment or distal ends of radii, associated with dismemberment and possibly skinning, and the cuts near the dorsal ends of six ribs, made during the removal of the flanks from the vertebral column.

Sheep/Goat Age at Death

Estimation of age at death was possible for a total of 22 mandibles or loose teeth from Layers 1, 3 and 5. No very young individuals (<6 months) were represented. Sheep/Goats of all ages from juvenile to adult are represented, with approximately half belonging to younger individuals (c.6 months – 2 years) and the rest belonging to adults, including young adults (c.2-4 years) and adults (c.4-6 years), as well as some very mature adults (>6 years). Some of the young individuals with deciduous teeth present could be reliably differentiated to sheep and goat. Positive identifications of both young sheep (2 specimens) and young goat (1 specimen) were made from Layer 5. Layers 1 and 3 each yielded one young sheep. Adult teeth are more difficult to differentiate, but tentative identifications of goat were made for one adult specimen from Layer 5 and two adults from Layer 3. In addition, Layer 5 produced two heavily worn deciduous 4^{th} premolar teeth with roots almost fully resorbed. These are most likely teeth that were cast as the adult dentition erupted, and are a good indication that some sheep/goat were housed inside the cave.

The epiphyseal fusion dataset is mainly comprised of remains from Layer 5, with other layers making only a small contribution. Amongst the 59 surviving epiphyses known to fuse by c.10 months, only 20% were unfused, indicating that most sheep/goat were kept beyond their first year. Although three fragments of very porous (neonatal) bones were recovered from Layer 5. Of the middle-fusing group of epiphyses, only seven (33%) were fused, supporting the observation from the dentition that a high proportion of sheep/goat were killed before 2-2 ½ years old. A similar proportion of the later fusing epiphyses were fused, suggesting the majority of sheep/goat were killed before the end of their fourth year.

There is no emphasis on any one age cohort and the available ageing data suggest young sheep in their first, second and third years were exploited for meat. Adults were kept to a range of different ages, having probably contributed secondary products before being killed and consumed.

Sheep/Goat Metrical Data

As with the other major species represented, the high levels of fragmentation severely limited the number of sheep/goat bones that could be measured. In addition, as discussed in relation to ageing data, it has not always been possible to determine whether the measured bones belonged definitely to sheep or to goat. Eight of the 24 measured bones were positively identified as goat, five were classified as definite or probable sheep, and the remainder as sheep/goat (Table 11). Unfortunately only three of the measured bones were from Layer 3 (the others are from Layer 5), so it is not possible to compare possible changes in sizes of sheep and goat between the late Eneolithic and Maikop periods.

Two complete goat metacarpals had greatest lengths of 98.1mm and 113.6mm, indicating that there was a wide range in the sizes of goats present. The five goat radii from Layer 5 had a mean proximal breadth of 30.1mm (sd 1.9), which lie comfortably within the range of domestic goat bones recorded elsewhere. However, the presence of wild ovicaprines within this assemblage cannot be entirely ruled out, as a few specimens were noted as being of large size. For example the length of a maxillary third molar from Layer 5 measured 22.8mm. This may have belonged to a large domestic goat but, if so, it is an exceptionally large specimen. However, unfortunately it has not been possible as yet to compare the morphology and size of this tooth with other specimens.

Bovid

A total of 355 fragments of bovid bones and teeth (6 from sieved material) were recovered from the cave, representing a MNI of 10 cattle.

Bovid Body Part Representation

A summary of bovid body part evidence is shown in Table 12 and percentages of the different elements in Layers 3 and 5 are provided in Figure 4. Full details are stored in the site archive tables.

The evidence again show that all parts of the body were fairly evenly represented, suggesting that cattle were brought to the area of the cave for slaughter and subsequent consumption. Comparison between the assemblages from Layers 3 and 5 shows that cranial elements and loose teeth were better represented in Layer 3. Their increase was associated with lower values of all the other body part areas (Table 12).

Skull fragments outnumbered mandible fragments in the NISP counts (Figure 4) and provided a higher MNE estimate (10) overall compared with mandible (7). Only one small separate fragment of a horncore was recorded from Layer 1, although the base of another was found still attached to a skull fragment of a large bovid in Layer 3. Horns may have been regarded as raw material for working and removed elsewhere. Loose teeth were again well represented throughout the deposits, particularly in the upper layers.

Upper forelimb elements were consistently outnumbered by those of the hindlimb, although the difference was not large (Table 12). The NISP counts of the various upper forelimb elements were fairly similar (Figure 4) with the radius providing the highest MNE count (8), followed by scapula (6) and humerus (5). Similar MNE counts were obtained for the principal hindlimb elements headed by tibia (7), femur (6) and pelvis (5). NISP counts of these elements were also very similar (Figure 4). Metatarsals were the most commonly recorded of the lower limb elements but first phalanges and carpals were better represented than in the assemblages of pig and sheep/goat, probably reflecting their larger size, which gave them a better chance of retrieval. At least seven metatarsals and four metacarpals are represented.

Ribs and vertebrae fragments formed around 15% of the hand-collected assemblage. Both are also quite well represented in the unidentified large mammal assemblage (Table 13). The vast majority of the elements in this category are likely to have belonged to cattle.

As in the case of sheep/goat and pig, it seems very likely that most, if not all, of the domestic cattle bones represented on the site belonged to animals that were brought to the vicinity of the cave for slaughter, subsequent carcass processing and consumption.

Bovid Butchery Evidence

Butchery marks were observed on 27 bovid elements, 20 of which were from Layer 5 (Table 8). As in the case of pig and sheep/goat, most of these marks consisted of fine knife cuts. However, there was occasional evidence that a heavier implement was used. For example, a cattle ramus from Layer 5 bore a fairly deep blade mark inflicted during its separation from the skull. A pelvis and a scapula, both from Layer 3, had been chopped through the acetabulum and glenoid respectively during dismemberment. Chop marks were also observed on two cervical vertebrae from Layer 5.

However, fine incisions were observed much more frequently. These included cuts on two carpals from Layer %, made during detachment from the metacarpal. Cuts associated with the separation of the hind feet were also observed on an astragalus and the proximal end of a metatarsal. Other cuts associated with disarticulation were observed on the proximal end of two femora, a tibia and a first phalanx. Cut marks probably associated with filleting were observed on the shafts of two humeri, the ischial shaft of a pelvis. Several other bones had marks which have not been easy to interpret. As observed for the other species, butchery with knives can often be carried out with minimal damage to the bones. Subsequent breakage of bones for marrow and pot boiling undoubtedly also occurred but this evidence has been compromised by subsequent fragmentation of the bones.

Bovid Age at Death

The sample of teeth and mandibles is too small and fragmentary to provide any clear indication of mortality patterns. Animals of all ages are represented in the assemblage. Layer 1 yielded one young specimen (<6 months) and one extremely old adult. One neonatal mandible from a partial calf skeleton was recovered from Layer 2. Layer 3 had no very young claves present, but juveniles and subadults were represented by at least three specimens. In addition, Layers 3 and 5 each produced a heavily worn deciduous 4th premolar tooth with roots almost fully resorbed. These are most likely teeth that were cast as the adult dentition erupted, and are a good indication that some cattle were housed inside the cave.

The epiphyseal fusion sample for bovids is also small, and is comprised mostly of Layer 5 material. Only one of the 27 early-fusing epiphyses was unfused, indicating that almost all

bovids survived past their first year. Six of the eight mid-fusing epiphyses were fused, indicating most survived beyond 2 years old. Among the 18 surviving epiphyses known to fuse between 3 ½ - 4 years, over 60% of specimens were fused and died as adults.
The limited ageing data suggest a combination of younger bovids of prime meat age (c.2-4years) and older bovids probably utilised as breeding stock and/or for their secondary products, such as milk and traction power, prior to their consumption.

Bovid Metrical Data

The highly fragmented bovid assemblage again restricted the opportunities to extract metrical data. Only 13 bones were measured, all but one from Layer 5 (Table 14). Several of these bones are very large specimens raising the probability that wild bovids (aurochs/bison) as well as domestic cattle are represented in the assemblage. Examples of very large bones include a radius with a greatest proximal breadth of 93.1mm and a metatarsal with a distal breadth of 73.3mm. Indeed, most of the measurements are larger than the means of early and middle Neolithic cattle from central and western Europe (Manning et al 2015). However, a larger sample and further comparisons are required with specimens from eastern Europe and the Near East before more detailed analysis can be made.

Canid

Dog (*Canis familiaris*) is represented by a total of 16 fragments (including 3 fragments from sieving) from Layers 1,2, 3 and 5. A further 9 canid fragments are classified more broadly as dog/fox as they are not clearly distinguishable by size or morphology. Most bones were from adults with fused epiphyses, although a small number of juveniles (three bones with unfused epiphyses) were present, but no very young infants/neonates. Some dogs bones do show evidence of carcass processing; a knife cut on a metatarsal is interpreted as evidence for skinning, while fine knife cuts on a scapula are more typical of butchery for meat. The presence of gnawed bones throughout the assemblage indicates dogs shared occupancy of the cave with people in the role of companion animals, although this role did not exempt them from occasional exploitation for their pelts or meat.

Red Deer

A total of 46 fragments of bones and teeth of red deer were recovered from all layers. This small sample represents only 3% of all hand recovered specimens of the main five identified large mammal species from the site. Red deer remains are slightly more abundant in Layer 3 (5%) compared to Layer 5 (2%), perhaps suggesting a slight increase in importance over time, although Red deer evidently played only a very minor role in the animal economy relative to domestic species in all time periods.

All main areas of the body (head, forelimbs, hind limbs and feet) are represented (Table 15), which suggests whole carcasses were processed and consumed in the immediate vicinity of the cave. It is worth mentioning that more bones of lower limbs were found than for other body areas, which may well be due to these compact and high density bones surviving better than other elements, and because foot bones are more abundant in complete deer skeletons generally. It is also possible that some of these lower limb bones may have been brought into the cave attached to hides. However, the only two observed butchery marks (chops on 1st phalanges that split these bones along their length) are not typical of skinning; and any deliberate selection of foot bones may instead have been for further processing of the carcass for fats or bone working. Red deer post cranial remains are mostly fused, suggesting adults were targeted for hunting, although a small minority of unfused specimens indicate that exploitation of red deer was not exclusively focused on mature individuals.

Roe Deer

Nine roe deer fragments were recovered from Layers 2, 3, 5 and 6. The remains all appear to be from adults. There is clear evidence that this species was exploited by the local community, as one fragment of roe deer radius has been identified among the assemblage of worked bone points.

Wildcat

A total of 9 fragments of wildcat (including 4 from sieving) were recovered from Layers 3 and 5. Classification of felid bones as wild or 'domestic' cat is problematic; the distinctions between the two forms are more behavioural than morphological. However, wildcat tend to be larger on average than house cats, which can assist in classification of zooarchaeological specimens (Kratchovil 1976, O'Connor 2007). All the cat bones from Meshoko Cave appear to be large. Measurements were possible for one complete radius (greatest length 122mm) and one distal humerus (distal breadth 23.6mm), which are near the top end of the size range for wildcat (*Felis sylvestris*) published by Kratchovil, and fall outside the range for domestic cat. Based on their confirmed large size, all the cat remains from the Meshoko Cave are considered to be wildcat. All bones are adult. Although only present in small numbers, this wild species was clearly utilised by the earlier and later occupants of the cave, as fragments from both Layers 5 and 3 displayed evidence of carcass processing in the form of fine knife cuts. One mandible had several cut marks towards the rear of the ramus that were most likely incurred during removal of the head, perhaps during skinning. Other cut marks were found on a proximal radius, distal humerus and sacral vertebra. Butchery marks in these locations are typically associated with carcass dismemberment and processing for meat, suggesting wildcats were exploited for more than just their pelts.

Beaver

A total of eight fragments of beaver (*Castor fiber*), were recovered from Layers 3 and 5. The presence of beaver is compatible with a wooded environment and indicates accessible wetland. Only fused (adult) beaver bones were present. One ulna bone displayed fine knife cuts on the mid shaft, indicative of skinning, suggesting this species was exploited for its fur.

Other Wild Species

Hare (*Lepus* sp.), otter (*Lutra lutra*), squirrel (*Sciurus* sp.), hedgehog (*Erinaceus* sp), mole (*Talpa* sp.) and hamster (family *Cricetidae*) are all present in small numbers in the cave assemblage. Otter is restricted to Layer 1, while squirrel, hedgehog, mole and hamster only occur in Layer 5. Only fused (adult) postcranial remains were observed for hare and otter.
In addition to the identified mammal species listed above, a further 234 fragments of small mammal bones and teeth were recovered. These are mostly the remains of small (mouse-sized) rodents, which have not been further identified, and some larger (rat-sized) rodents, which include remains of probable hamster. Unsurprisingly, the majority of small mammal remains were recovered by sieving (164 fragments), and the only large assemblage of small mammals recovered by hand (62 fragments from Layer 2) are the associated bones from the skeleton of a single individual. Other taxa represented include 1 fragment each of frog, lizard, and fish.

All these small terrestrial species are compatible with a woodland environment. There is no direct evidence for the consumption of these wild species, although there is no reason to suggest that they were not eaten. Some, particularly the smaller of these species, may simply represent background fauna occupying the cave or its immediate environment.

Birds

A total of 19 fragments of bird were found in the hand-recovered and sieved assemblages. The majority were recovered from Layer 5, with only 2 fragments from Layer 3, which reflects the better preservation of bones generally in the lower stratigraphic layer. Provisional identifications from among the 12 medium sized birds include members of family *Corvidae* (cf. rook/crow), family *Columbidae* (cf. pigeon/dove) and a partridge (cf. *Perdix* sp.). Provisional identifications among the large birds suggest these are mainly birds of prey, and include buzzard (cf. *Buteo* sp.) and at least one larger species. There is one fine cut mark on the mid-shaft of a bird of prey femur, and another possible cut mark on a large bird scapula. Whether these birds were processed for food or for other materials, such as feathers or bone is unclear (three small beads from among the worked bone artefacts are made from sections of bone shaft that are delicate enough to be from bird, although firm identification was not possible). It appears that birds were among the wild resources exploited by the inhabitants of Meshoko Cave.

Worked Bone

A total of 101 fragments of bones and teeth were recorded as probable worked objects, of which 79 had been previously identified as artefacts by the excavation team and are housed at the Hermitage state museum. The remaining 22 fragments were recovered from among the general animal bone assemblage and mostly comprise small fragments of broken worked bone rather than complete artefacts. Worked remains were recovered from all layers, and as with the overall bone assemblage, the largest collection came from Layer 5 (79 fragments), with rather fewer from Layer 3 (17 fragments).

The most common objects observed (at least 66), were bone points of varying size and shape, some with flat, rounded ends and others fashioned into narrow, sharp points. These points, plus a few similar (blunt-ended) objects, are mainly made from undiagnostic longbone shaft fragments rather than complete skeletal elements, the shaping and polishing of which has further removed any identifying morphological features. Nevertheless, species and element identifications were possible in a few cases and include: 11 points fashioned from sheep/goat metapodials, 3 points fashioned from other sheep/goat long bones, 2 points fashioned from pig fibulae, 2 points fashioned from bovid bones and 1 point fashioned from a roe deer radius. The remaining bone points were mostly fashioned from medium (sheep-sized) mammal long bones, with a much smaller proportion fashioned from large (cow-sized) mammal bones. At least two of the bone points showed signs of having been gnawed by dogs prior to having been worked, suggesting they were selected from accumulated domestic refuse, rather than having been reserved for bone-working at the initial stage of slaughter and butchery. All the bones used to make these objects would have been readily available from among the remains of animals used for food, and choice of bone for making these utilitarian objects was probably governed chiefly by whatever was a suitable size and shape and immediately to hand.

The second most common type of worked bone objects were pendants or beads (at least 15). Ten of these were made from teeth, identified as follows: pig canines (4) dog canines (3), red deer canines (2), all with perforations at the root end. The pig canine pendants were all made from the large curved mandibular tusks of old adult males, and could come from wild boar rather than domestic pigs (domestic pigs could have reached this size, but males are rarely kept to such and advanced age in domestic herds). The dog canine teeth include one small specimen that could possibly belong to a fox, and two canines from much larger dogs (but not large enough to be wolf). The other smaller beads are not identifiable to element or species, but at least three beads are made from short sections of small longbone shafts that are delicate enough to be birds.

The worked sample is small and some of the identifications ambiguous, but it is speculated that the teeth and bones of wild (or at least not the usual domestic herd animals) were selected for personal ornamentation (beads and pendants), while the more utilitarian objects (bone points) were made from the more common domestic /food species.

Discussion

Although the faunal assemblage is relatively small and not exceptionally well preserved, the careful excavation of the deposits and the meticulous collection of all the animal bones has enabled the investigation of animal exploitation by people who occupied the Meshoko Cave over a considerable period. The largest, and therefore most reliable, assemblage belongs to Layer 5 (late Eneolithic) but although the Layer 3 assemblage (Maikop Period) is much smaller, it does allow some comparisons to be made both between the assemblage from Layer 5 and between other Maikop period assemblages. Comparisons can also be made with the bone assemblage from the earlier occupation of the Meshoko settlement (Hambleton and Maltby unpublished).

Layer 5 (Eneolithic) – Exploitation of Pigs, Sheep/Goat and Bovids

This assemblage is dominated by the bones of pigs, sheep/goat and bovids. Although the intra-site analysis has demonstrated that there were significant variations in the abundance of these categories in these deposits, there can be no doubt that the inhabitants of the cave relied very heavily on these species for their meat supply. Pigs and sheep/goat remains were found in roughly equal numbers in Layer 5. Sheep and goats were better represented in this layer (37% of the total of pig, sheep/goat, bovid and red deer counts in the hand-collected sample) in comparison to the earlier deposits at Meshoko settlement (21% - Hambleton and Maltby unpublished). Goat bones outnumber those of sheep in this layer and it is possible that goats were better adapted to the local ecological conditions around the cave and therefore featured more prominently in the diets of the cave’s inhabitants during its early period of occupation. The almost complete absence of bones and teeth of neonatal lambs and kids may partly be the consequence of poor preservation of these fragile and small elements, but it could indicate that sheep and goats were not kept in or near the cave in the Spring. However, that some sheep were kept in the cave during at least some periods of the year is attested by the presence of shed deciduous teeth. The sheep and goats that were eaten in the cave were slaughtered at various ages from six months onwards. However, around half of them were killed before adulthood indicating a focus on the exploitation of sheep and goats for meat, although it should be borne in mind that this slaughter pattern may not be typical of all settlements of this period.

Although pigs also formed a substantial proportion of the Layer 5 assemblage (36% of the total of pig, sheep/goat, bovid and red deer counts in the hand-collected sample), they were less well represented than in the Meshoko settlement, where they formed 48% of the assemblage (Hambleton and Maltby unpublished). The ecology around the cave and indeed throughout the local region would have been well suited both for domestic and wild pigs, both of which would have had ample feeding opportunities in the surrounding woodland. Although no shed deciduous teeth of pigs were found, indicating the presence of live animals within the cave, the presence of some bones of perinatal and neonatal animals indicates that some pigs may have been present during their birthing season, probably in the Spring. The tooth ageing evidence suggests that most of the pigs represented in the cave were more than six months old when they were culled, although the epiphyseal fusion evidence suggests that possibly half of the pigs represented were younger than a year old at death. This could suggest that there was a peak of killing in the autumn, after the pigs had been fattened on the products of the forest. Such a high rate of immature slaughter is much more likely to be encountered in domestic herds, on which greater control can be exercised than in the case of wild populations (Hongo and Meadow 1998).

Bovid elements formed 24% of the fragments of pig, sheep/goat, bovid and red deer in Layer 5, despite being very poorly represented in the area of the cave excavated in 2013. The equivalent percentage of bovids at the Meshoko settlement was slightly higher (27%). As in the case for sheep and goat, there is little evidence that calving took place on or near the cave, although the discovery of shed deciduous teeth does indicate that some live cattle did enter the cave. Unlike pigs, there is little evidence that bovids were regularly culled prior to their second year, although a substantial proportion of them died before full maturity.
All parts of the bodies of pigs, sheep/goat and bovids were represented and in general the body part distribution suggests that most of these animals were slaughtered in the vicinity of the cave. Indeed, clear evidence of slaughter is witnessed on two pig skulls, which had evidence for pole-axing. Most butchery was carried out with the use of fine blades, although a few bones of bovids and sheep/goat also produced evidence for the use of heavier implements during carcass partitioning.

Layer 3 (Maikop Period) – Exploitation of Pigs, Sheep/Goat and Bovids

Comparisons between the Layer 3 and Layer 5 assemblages are handicapped by the small size of the Layer 3 sample and by the fact that it was less well preserved. There is little that can be added regarding ageing and butchery evidence because of the limitations of the sample size. Currently, there is no convincing evidence that there were significant changes in the exploitation of domestic stock between the two periods. With regards to species representation, this assemblage is also largely composed of the bones of pigs, sheep/goat and bovids but there is an increase in the percentage of pigs (45% of the major species) with a concomitant decrease in percentages of sheep/goat (28%). The percentage of bovids (23%) was similar to that found in Layer 5.

The dominance of pig in this assemblage contrasts with other Maikop period assemblages, which are usually dominated by bones of domestic cattle (Kohl 2009, 78). However, in the case of Meshoko Cave we may be dealing with local adaptations. Pig herding complemented by the hunting of wild boar in the forests in the vicinity of Meshoko seems to have been an important activity since at least the early period of occupation of the fortified settlement and the importance of pigs was also witnessed in the late Eneolithic layers of the cave. It would be natural for the inhabitants of the cave to make full use of the wooded environment, either directly through the collection of the fruits of the forest, as indicated in the discovery of a cache of pears in the cave, or indirectly through the continued and possibly increased exploitation of domestic pigs and, to a lesser extent, wild boar.

Another possible change in the exploitation of animals at Meshoko Cave in this period was the decline in the number of goats compared to sheep, although larger samples are required to confirm this impression. It should also be noted that no bones of horse were recovered from the excavations of the cave, a phenomenon typical of other Maikop settlements (Kohl 2009, 78).

The Role of Wild Animals

Among the species typically classed as domestic (pig, cattle and sheep/goat) there still remains some ambiguity, as several specimens were notable for their large size, suggesting that wild variants of pigs and bovids in particular could be represented in the sample. However, the actual proportion of wild versus domestic is impossible to determine based on size, as many specimens are immature and fragmented, and metrical distinctions require intact adult remains.

Taking the unequivocal wild species (dog/fox counted here as dog), overall 5% of the identified hand-recovered specimens belonged to wild animals. Layer 5 has 4% wild species, and Layer 3 has 7%. Although the percentage of wild remains is marginally greater in Layer 3, there is a more diverse range of species in Layer 5. Differences are slight, but may hint at subtle changes in the use of wild species through time. Certainly, wild species were continuously exploited as a resource throughout the occupation of Meshoko Cave, although their contribution to the diet was minimal. Nevertheless wild species may have had an important cultural significance to communities living in the woodland environment of the region during this time period (see also the discussion of worked bone above).

Assessment of the Sieving Programme

The sieving programme carried out in 2015 involved the collection of all the spoil after the finds from hand excavation had been removed. It therefore served to test the effectiveness of normal excavation methods and to confirm whether species or particular types of elements not recorded in hand-collected assemblages were truly absent.

Although wet-sieving is a laborious and time-consuming task, the results of this exercise were fruitful. In the first place, it confirmed that although standards of recovery from hand excavation were very good, there were some bones of the major species that were more likely to be overlooked, such as the small bones of the feet of pigs and sheep/goat. The results indicated that pigs in particular were probably slightly under-represented in the hand-collected sample. The discovery of bones of perinatal pigs through sieving was also important, as it confirmed that some sows were being kept around the cave during the birthing season.

Sieving also produced evidence for the presence of more bones of wild species, notably the butchered mandible of a wildcat. It also confirmed that fish bones had not been overlooked and that fishing was not an important activity for the cave's inhabitants. Although one or two additional bones of wild birds were retrieved, the sieving programme also confirmed that the exploitation of gamebirds was rarely, if ever, practised.

Normal recovery methods retrieved most of the hamster bones but, apart from the cluster of bones in Layer 2, bones from smaller rodents were generally only recovered in the sieve. Although these and other small species such as frog and lizard almost certainly did not contribute to the human food supply, confirmation of their presence and abundance adds information about the environment both within the cave itself and in it immediate neighbourhood.

Conclusion

On its own, an assemblage of modest size retrieved from a single cave site cannot be expected to provide us with a comprehensive understanding of Eneolithic and early Bronze Age animal exploitation and meat consumption in the northern Caucasus. By its very nature, the cave and the activities of its inhabitants may not have been typical of other settlements in the region. However, the analysis has produced important evidence concerning the exploitation of animals by the inhabitants of that cave and has provided new insights into how the cave was used and how the local environment was exploited. It has shown that not all Maikop period faunal assemblages are dominated by cattle and, in conjunction with the evidence from the earlier Meshoko settlement, the analysis has indicated that the communities around Meshoko may have focused more on pig exploitation over a long period of time than contemporary groups in the broader region.

The excavations have also shown how a carefully considered sieving and sampling programme can enhance the quality of the faunal evidence and improve our understanding of animal exploitation and local environmental conditions. There is further potential for study. We have yet to carry out detailed intra-site analysis of the distribution of animal bones within the cave utilising their location points. Potentially such a study may provide further insights into how the cave was used. Continued excavations of the cave will provide further material to analyse, which will challenge or support some of the preliminary conclusions reached here. In addition, there are assemblages from recent excavations of the earlier Meshoko settlement that have yet to be analysed. Their study will significantly increase the size of the sample of bones obtained from that complex site and allow for a more comprehensive interpretation of animal exploitation and consumption at that complex site. It will also provide us with further information about long-term trends in human-animal relationships in the region, to which the current study of the cave assemblage has already contributed.

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