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A Monumental Horse Burial in the Armenian Highlands

Here we report on the unprecedented discovery of the complete skeleton of a ritually interred adult stallion with a bronze ring in its mouth. The horse was buried in a unique 15-meters diameter monumental stone-built tomb excavated in the Aghavnatun necropolis located on the southern slopes of Mt. Aragats, in the northern fringes of the Ararat Depression, Republic of Armenia. The tumulus was roughly circular; the horse's remains were found in situ, in an inner oval-shaped structure. Our methodological procedure included a detailed description of the burial, a taphonomic study of the bones, and meticulous morphometric observations and measurements, and thus we could provide a taxonomic definition and an age estimate. Direct radiometric dating of the horse's skeleton provided a date of 2130±20 BP. The morphological characteristics of the horse, with its tall stature and slender feet, suggest that it was a large individual, similar to the extinct breed of Nisean horse previously known mainly from textual and iconographical sources. The metal ring found in the mouth of the horse suggests that it likely served as a breeding stallion. This discovery presents a unique combination of zooarchaeological evidence for the importance of the horse in the Parthian-Hellenistic worlds, and advances our understanding of the broad social significance of the past breeding of equids in the Armenian Highlands.

Keywords: *Armenia, horse burial, Classical archaeology, Nisean horse, Ararat Depression.*

Introduction

The Armenian Highlands were well-known in the Achaemenid and Hellenistic worlds as the breeding land for large numbers of high-quality horses, which were in continuous demand for cavalry forces. The natural conditions of the country were very suitable for livestock-raising, and herding was one of the main economical components. Strabo (a 1st century BC Greek historian and geographer) explicitly stated that horses were among the main herding domesticates in the Armenian Highlands ("Armenia is an exceptionally good horse-pasturing country"; Strabo, VI. 13. 7). He further emphasized that Armenian horse-breeding relied on raising the well-known and nowadays extinct breed of the Nisean horse. This horse was greatly valued for military purposes by the Parthian kings, "because they were the best and the largest" (Ibid., 14. 9). For example, the king of Great Armenia (Armenia Mayor) Tigranes I of the Artashesid Dynasty (123–95 BC) is said to have had, in addition to his cavalry, six thousand horses in full armor as a reserve for his cavalry power (Ibid.).

The Nisean horse was one of the most valuable breeds of horses in the ancient world. Its first occurrence is in the early 6th century BC, when it becomes the imperial horse of Persia. Historical accounts indicate that it was a large breed, higher than any other horse of its time, with distinctive characteristics, such as a ram-headed skull with two bumps on its forehead, a strong neck, and a long mane. Some of these typical features were also documented in depictions and reliefs, showing mainly its large size. The horse's color was mainly chestnut. The rare occurrences of black and white colors were considered to be a representation of the horse-god in the Achaemenid Empire. They were prestige horses also in Hellenistic times. Following the conquest of Persia, Alexander the Great demanded a tribute of thousands of Nisean horses from the captured cities. Those horses were also seen later by Strabo, who describes them as the most elegant riding horses. Later written descriptions of this breed report on its dispersion by various rulers across Eurasia. It is believed that the Nisean horse became extinct in the Late Hellenistic period; most probably owing to hybridization and crossbreeding with the Arab horse (Davis, 2007).

Despite its certain historic and pictorial descriptions, the Nisean horse has been hardly documented zooarchaeologically. This is due primarily to significant overlap of phenotype between most horse breeds, which complicates its identification. Of special interest are those landrace horse breeds that were selected and bred within a limited geographic region. Therefore, the most likely area to find the Nisean horse is the highlands of Armenia, where it was supposedly bred.

The lack of direct evidence that the Armenian Highlands were the breeding grounds for the Nisean horse also stems from the seeming absence of archaeological installations to support the vast scale and extensive horse-breeding as described in the historical records. The recent discoveries of numerous large curvilinear stone-built enclosures that are scattered across the Armenian Highlands provide important information regarding the traditional husbandry system, which involved livestock-keeping through gathering of free-ranging animals from the pasture into corrals where they could be separated, bred, and selected (Malkinson et al., 2018). These large Armenian enclosures, also generally termed desert kites, were made to capture and tame in semi-free conditions the desired animals. Some of the enclosures have funnel-shaped features that lead to isolated pens or cells where animals can be separated and manipulated by the herders. These enclosures provide an excellent means for the taming of large herds of the highly-valued and constantly demanded Armenian horses as suggested by the historical sources. The construction of each of the large enclosures necessitated a pre-planned and controlled investment of at least 150 work days, likely reflecting a central organization for such endeavors (Ibid.).

In recent years, there has been growing archaeological evidence to support the notion of the sharply increased demand for horses during the Armenia-Achaemenid satrapy, and the idea that the region was a major source of horses for the empire. The majestic tombs of elite nobles in the Armenian Highlands, with assorted horse-gear and chariots, further support these accounts (Mnatsakanyan, 1960, 1961; Devejyan, 2006; Badalyan, Avetisyan, 2007: 51–54; Simonyan, Manaseryan, 2013; Badalyan, Smith, 2017; Castelluccia, 2017). Furthermore, scenes focusing on horses are commonly portrayed on pottery, monarchic crowns, scepters, and various jewelry items, which indicates that horses were among the most highly valued possessions (Bocchieriyan, 2016: 15, 53, 83).

Here we report of a unique ritual horse burial in a monumental structure found adjacent to ancient herding enclosures in the area of Aghavnatun, western Armenia (Fig. 1). This discovery enables us for the first time to connect between the enclosures and the horse burial, and provide new evidence regarding horse-breeding in the Armenian Highlands. The apparent geographical association of the ritual burial with the many nearby corralling pens further demonstrates the economic importance of the horse and reflects on the ways the landscape was traditionally used.

The Aghavnatun equid burial (tumulus AGH72)

The Aghavnatun archaeological complex is situated west of the modern village of Aghavnatun, at the fringe of the Ararat Depression, in Armavir Region (western Armenia). It covers an area of >100 ha, on the slopes of Mount Aragats, 900–1300 m above sea level. The local landscape is characterized by slopes that are currently almost entirely barren, covered by basalt outcrops and boulders, with annual grass. The lower parts of the slopes, just above the arable land of the valley below, are abundant with a variety of archaeological sites, of which the most visible and common are several large graveyards, massive stone-built cultic structures and towers, settlements, corrals and enclosure pens, as well as rocks with petroglyphs. This rich and varied cultural landscape has been only partially studied, and the dating and associating of different archaeological sites are yet to be established (Gasparyan et al., 2013; Barge et al., 2015; Nadel et al., 2015). The nearest stone-built enclosures (reported in (Malkinson et al., 2018)) are located less than 500 meters away.

Here we focus on the Aghavnatun burial (tumulus AGH72), which was excavated in 2008 in the necropolis

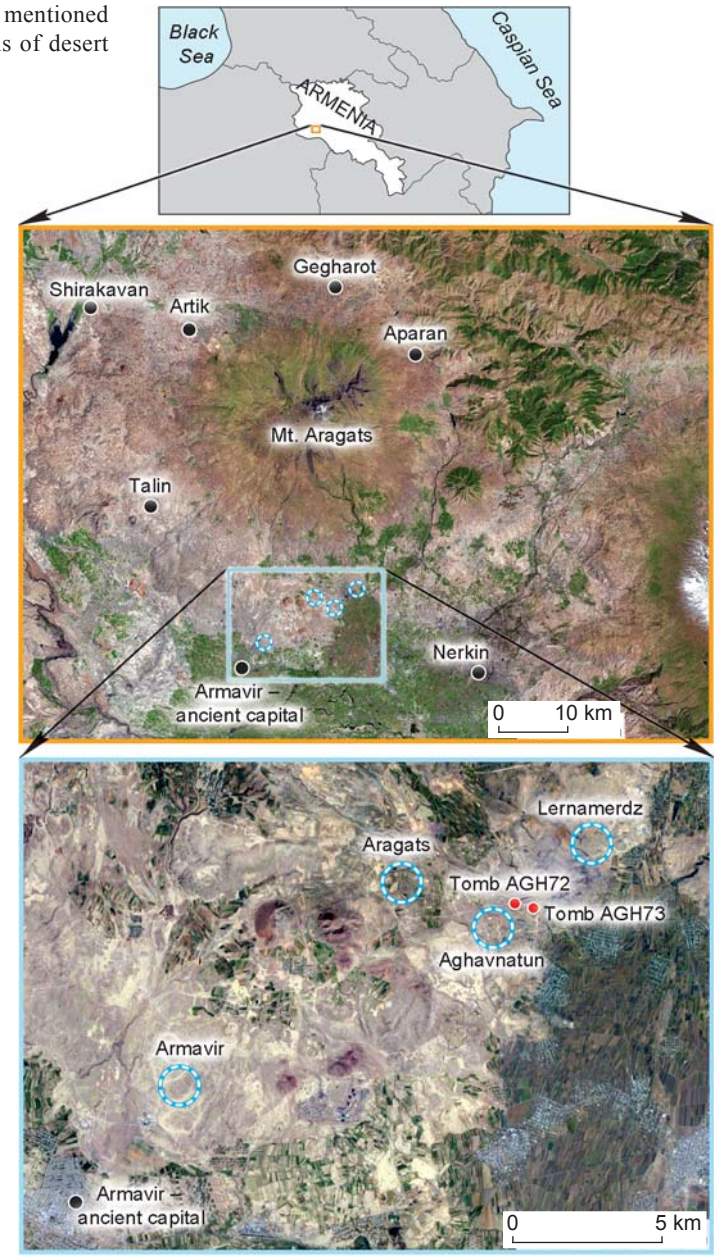

Fig. 1. Map of location of the study area and other sites mentioned in the text. Light blue circles represent concentrations of desert kites.

of the same name by archaeologists L. Petrosyan and F. Muradyan under the direction of B. Gasparyan, exposing a ritual burial of an equid (Fig. 2). The tumulus is roughly circular and symmetrical (14 m in diameter and at least 1 m high). The perimeter and inner walls were constructed from large undressed basalt stones, while the fillings were made of stones of various sizes. The center of the tumulus is divided by a ca 0.65 m wide corridor, with possibly two entrances. The northern entrance was sealed, while the southern part was not preserved. The equid was found *in situ*, in an inner oval-shaped structure, measuring ~1.60 × 2.20 m (Fig. 3).

The animal was placed complete in the center of a specially constructed chamber. It was found in articulation, with its forelegs flexed below the lower part of the skull and its hind limbs flexed under its chest. The horse was buried with a metal ring in its mouth (Fig. 4, 5). The ring was placed in the diastema between the incisors and the molar teeth of the mandible. Other grave goods were entirely missing. A handful of non-indicative pottery sherds and a ventilation pipe, together with three obsidian implements, were discovered during the cleaning of the cover or the shield of the burial (Fig. 6, *a*). The obsidian artifacts are most probably a random addition entering the grave with the sediment used for the construction and cover.

Direct radiometric dating of the horse's skeleton (first phalanx, Lab. No. IAA171298, Institution of Accelerator Analysis, Japan) provided a date of 2130 ± 20 BP, calibrated to 349–96 BC (± 2σ). Thus, the obtained date falls with 95 % confidence within the range of the 4th–1st centuries BC.

Adjacent to the equid burial, another small tumulus was also excavated (AGH73), which was possibly a ritual addition to the above burial. The structure was composed of a pile of undressed stones, with no inner walls or chambers, and poor in material remains. The most important among the finds was a fragment of a ceramic bowl with a painted ornament, which may tentatively be used to date the structure to the 4th century BC (Fig. 6, *b*). Thus, the dates of both tumuli fall within the same time period, when the Armenian Highlands were ruled by the Orontid (Yervandid) dynasties, which were independent kingdoms and allies of the Achaemenid Empire.

Research methods

The bones of the excavated equid were fragile and badly preserved. Most of the long bones, the pelvis, vertebrae, and the skull were heavily crumbled and broken *in situ*. The maxillary teeth were collected as isolated specimens, while most of the mandible was retrieved intact.

Following excavation, the bones were kept at the Institute of Zoology, National Academy of Sciences of the Republic of Armenia, in Yerevan. Our inspection of the bones was carried out in 2017. Each of the equid bones was examined under a magnifying lens (×5) for bone

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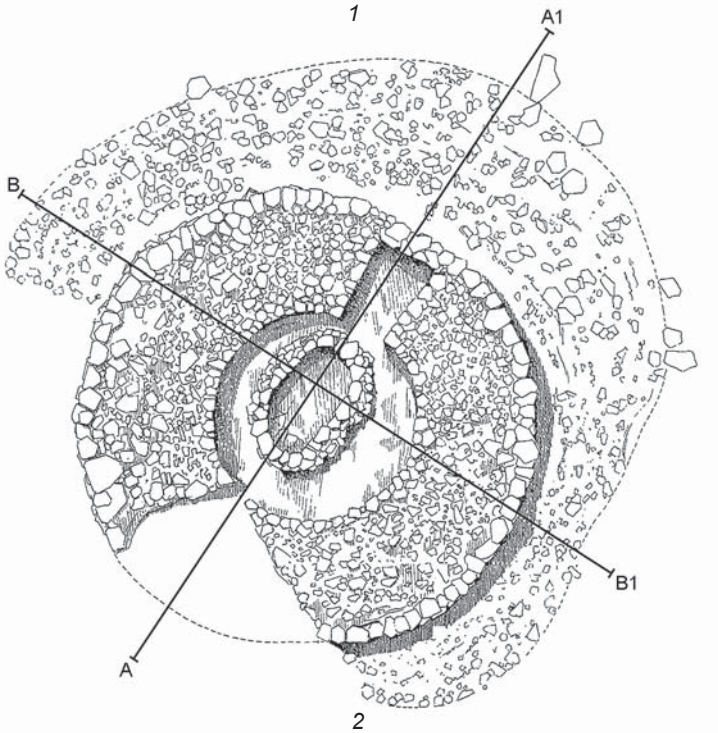

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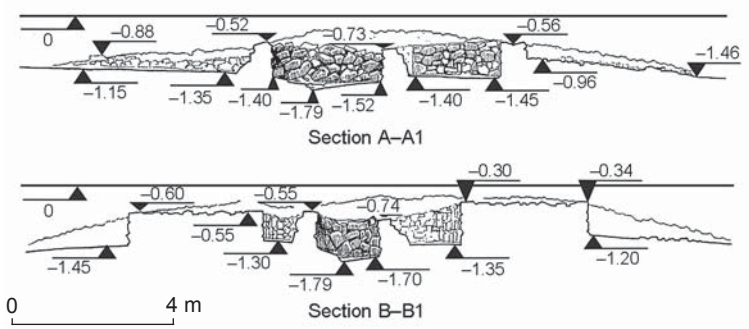

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Fig. 2. Tumulus AGH72.
1 – field photo, *2* – plan, *3* – side view.

surface modifications (butchery, burning, carnivore puncture, scoring, and digestion) and pathological bone alteration.

Identification of the excavated skeleton of the equid was based on the enamel patterns of cheek teeth, and size and proportions of limb bones (Johnstone, 2004). Bone measurements followed the method developed by von den Driesch (1976). The age of the specimen was determined according to tooth wear (Levine, 1982).

Results

The retrieved bone assemblage of the equid from tumulus AGH72 is heavily fragmented. Complete long bones are entirely absent, and the remains belong to a single equid individual (NISP = 80, MNI = 1). The assemblage includes isolated teeth, bone epiphyses, limb-bone shaft fragments of varying lengths, and most of the carpal, tarsal, and phalanx bones, which were retrieved complete. In addition, most of the axial skeleton was encountered.

A detailed examination of bone surface modification of each of the retrieved bones revealed no evidence of butchering. Similarly, we found no evidence of burning nor any type of percussion marks, including pits, micro-striations and conchoidal notches that could indicate any sort of bone processing, butchery, or consumption of the carcass prior to its deposition. In addition, tooth marks of carnivores are entirely absent, indicating that the carcass was protected from post-depositional and post-burial destruction.

The Aghavnatun horse bones from tumulus AGH72 lack any evidence for pathological modification. Absence of pathology in the lower legs suggests that the equid was not exploited as a draft animal. The low preservation of the axial skeleton does not allow a similar inspection, and we could not search for skeletal abnormality that could have been caused by intense riding. In addition, the absence of excessive wear on the lower and upper premolar and molar teeth suggests that the horse was not ridden with a bit. This tentatively supports the

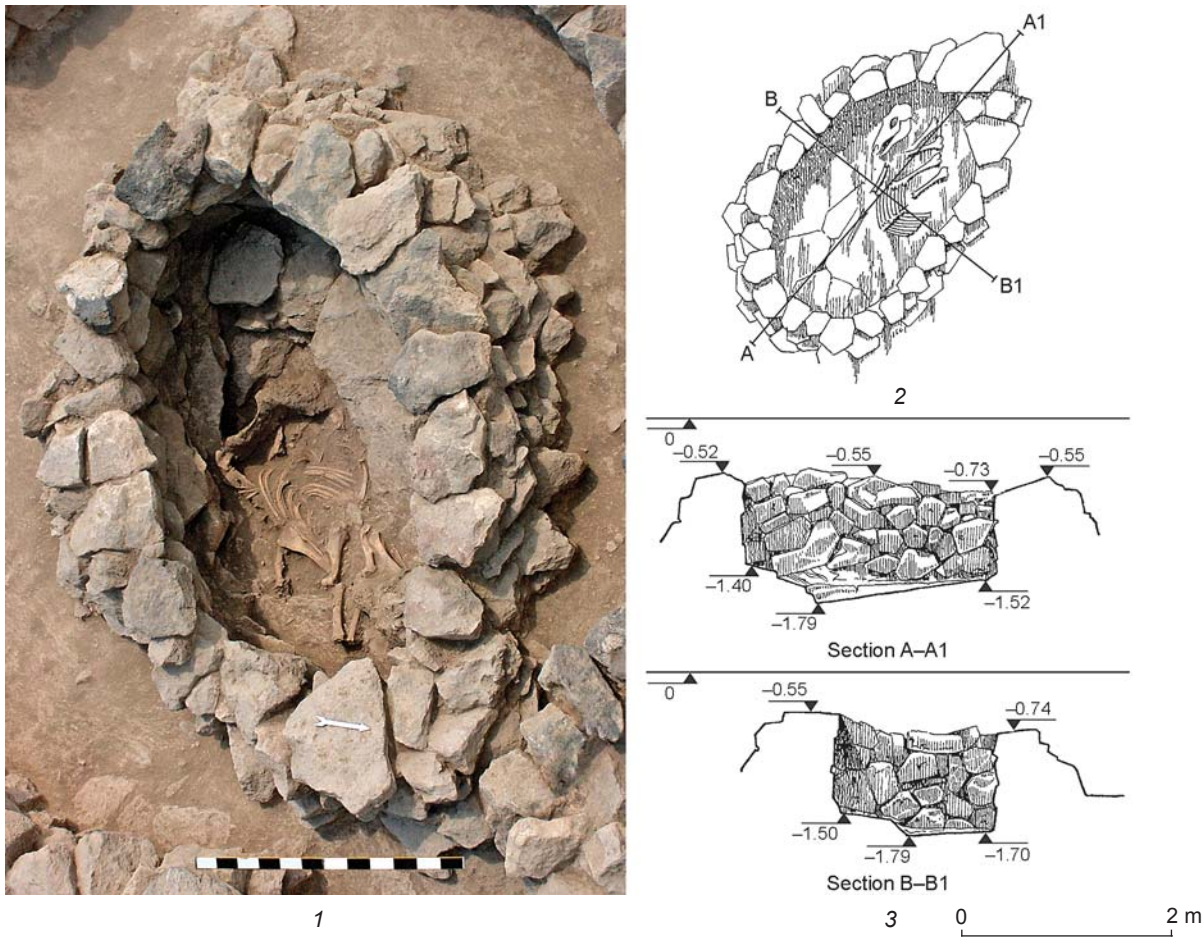

Fig. 3. The horse interment inside the oval installation.
1 – field photo, *2* – plan, *3* – side view.

Fig. 4. The horse's skeleton *in situ* with the ring in its mouth.

Fig. 5. The ring found in the horse's mouth.

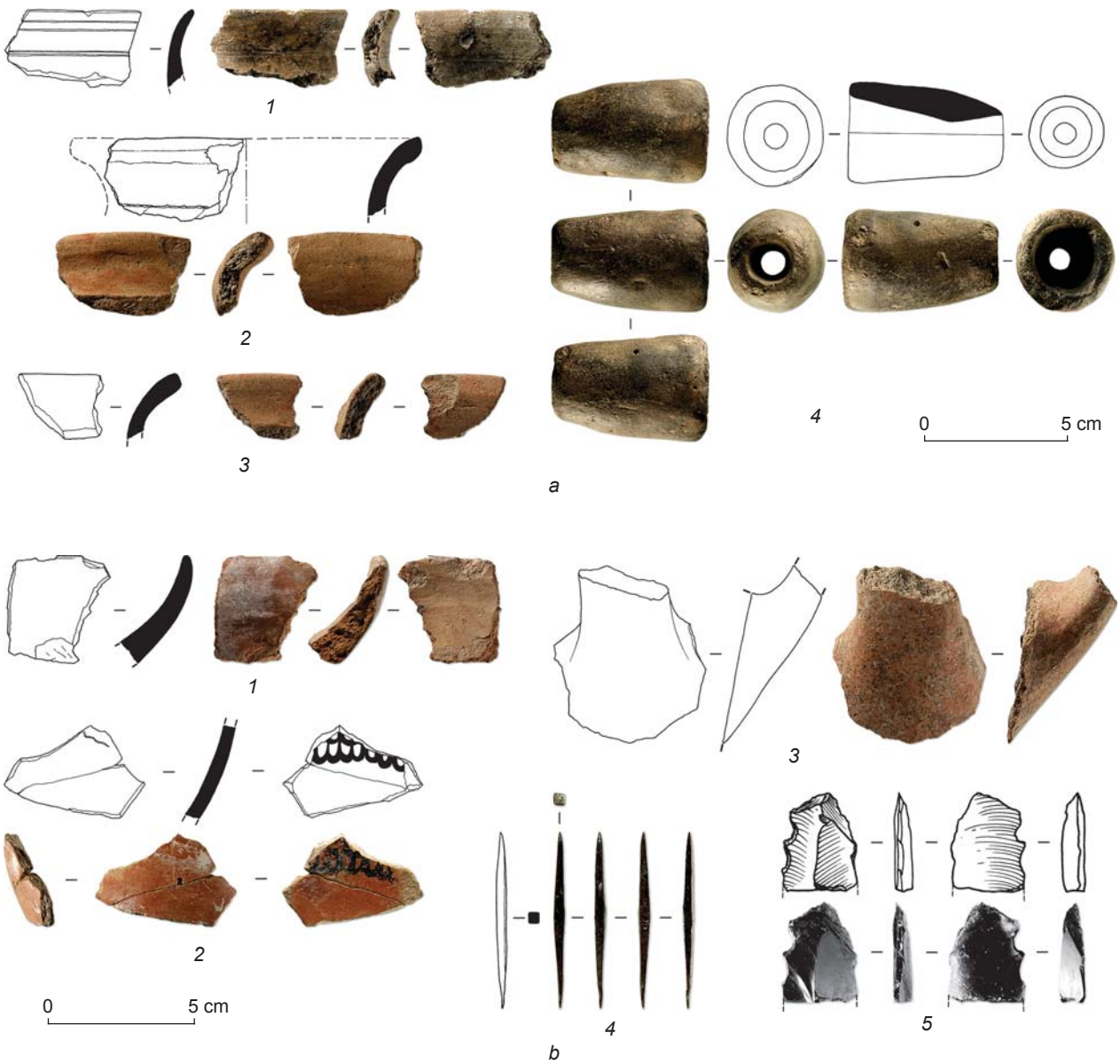

Fig. 6. Finds from tumulus AGH72 (*a*) and AGH73 (*b*).
a: *1–3* – pottery sherds; *4* – ventilation pipe.
b: *1–3* – pottery sherds; *4* – metal needle; *5* – obsidian artifacts.

hypothesis that it was not exploited for riding during its lifetime (Bendrey, 2007).

The taxonomy of the equid is based on several morphological and metrical criteria of bone and teeth. The morphological characteristics of the first phalanges, with their low slenderness, and position of palmar muscle scars (Johnstone, 2004: Fig. 4.13) identify the specimen as a horse (*Equus caballus*). The average measurements of the greatest length of the first phalanges (n = 4; GL = 89.4 mm) versus the shaft diameter (SD = 35.8 mm) tentatively support this observation. The large size of the phalanx falls within the cluster of the horse and is somewhat larger than the mule (Johnstone, 2004: Fig. 4.15). The identification of the specimen as *Equus caballus* is also supported by measurements of the metacarpal (Ibid.: Fig. 4.14). The ratio of the metacarpal's greatest length average (GL = 238.5 mm) to its shaft diameter (SD = 38.92 mm) indicates that it falls within the higher range of measured horses.

The identification of the Aghavnatun equid as a horse is further suggested by applying the log-ratio technique to metacarpal measurements following Johnstone (Ibid.: Fig. 4.18). This comparison reveals that the horse of Aghavnatun is larger than the Prezwalski horse and that it fits the size of a large and tall horse breed (Bökönyi, 1968).

The morphological identification of the horse as *Equus caballus* is also tentatively supported by taxonomic markers of the mandible and maxillary molar teeth (Johnstone, 2004: Fig. 4.2, Tab. 4.1). Given these results it seems plausible to conclude that the combination of the enamel patterns of the mandible and maxillary molar teeth and the size and proportions of the limb-bones suggest that the equid of Aghavnatun can be safely distinguished as a domestic horse (*Equus caballus*) rather than a donkey or a mule. Furthermore, measurements of the long bones and the morphology of the first phalanges indicate that it had long and slender legs.

In order to calculate the shoulder height of the specimen we used the equations based on the length of the long bones. Using the different measurements of complete long bones, we employed the methods of Boessneck and von den Driesch (1974) and Johnstone (2004). The range of the horse's height at the withers is estimated between 149.7 to 159.7 cm, and its average height at the withers is 153 cm (see *Table*). These results indicate that the Aghavnatun horse was a high specimen, especially as compared to other horse breeds known at that time, as usually their height at the withers did not exceed 130 cm (Bökönyi, 1968).

Measurements of the first phalanges suggest that it had slender limbs (calculated slenderness index is 16.3). Slenderness index is calculated as follows: SD × 100/GL, and in AGH72 metacarpal is 38.52 × × 100/239 = 16.3. This observation, together with its tall withers height, tentatively suggest that the Aghavnatun horse had morphological traits similar to those of a Hellenistic horse that was excavated in a Greek sanctuary (the Chora Horse), and identified by Bökönyi (2010) as a Nisean horse.

The age of the Aghavnatun horse was estimated by the crown height of the right and left mandible first molars, as illustrated in Levine (1982: Fig. 2). The obtained crown-height of the measured teeth plotted against teeth of known age gave an estimated age of 17 years for the first right molar (42.1 mm) and 19 years for the first left molar (34.7 mm). Thus, the buried horse was an adult individual in its prime.

Unfortunately, owing to post-excavation deterioration of the skull, which led to the severe disintegration and crumbling of most bones, the canine teeth were not saved and could not be found. Nevertheless, the canine of the mandible can be seen in the excavation photos documenting the exposure of the skeleton (Fig. 4). Therefore, we can safely determine that this specimen was a male stallion.

The metal ring that was found in the horse's mouth is slightly oval (Fig. 5) and has an outer diameter of 11.5 cm and an inner diameter of 9.9 cm. The ring is approximately 8.0 mm thick. The insertion point of the ring is uneven and has a depression in its center, which seems to have been created when the ring's ends were connected. Parts of the ring seem to be eroded, probably as a result of friction. According to the excavator's report, a piece of rope was found tied to the ring. Unfortunately, this piece did not survive for further inspection. The XRF results indicate that the ring is composed of lead and tin bronze alloy.

Discussion

From the end of the 3rd until the 1st millennium BC horses played a significant role in the cultural history of the Armenian Highlands (Mnatsakanyan, 1960, 1961; Devejyan, 2006; Badalyan, Avetisyan, 2007: 51–54; Simonyan, Manaseryan, 2013; Badalyan, Smith, 2017). The resilient human-horse relationship reached its peak in the Van (Urartian) kingdom, whence a wealth of items and archaeological finds of horse related artifacts, including harnessing equipment both for chariot bridling and horseback riding, numerous majestic jewelries with depiction of horses, figurines, metal helmets and shields, gold belts, bowls, and plaques have been discovered (Donaghy, 2014; Samashev, Zhumatayev, 2015; Tumanyan, 2017). Many of these finds were found in royal burials. Horses were occasionally buried in these graves, usually accompanying high-ranking individuals (Khudaverdyan, Khachatryan, Eganyan, 2016). Horse bones are common in the zooarchaeological records of these sites (for NISPs of horses, see (Mizoryan, Manaserian, 2008)). Bridles and bits are commonly associated with the buried horses (Castelluccia, 2017; Jakubiak et al., 2018).

The importance of the Armenian Highlands for large-scale horse-breeding as evidenced in the archaeological

Horse height at the withers, estimated using the method by Johnstone (2004: Tab. 3.3.)

Bone	Measurement, cm	Multiple factor	Height at the withers, cm
Humerus, right	32.8	4.9	159.7
Radius "	34.5	4.3	149.7
Metacarpus "	23.9	6.4	153.1
Metacarpus, left	23.8	6.4	152.6

record is well supported in the broad historical context. The importance of horses in the Achaemenid Empire can be well demonstrated by the god status given by the imperial kings to the Nisean horse (Charles, 2015: 18). In the proceeding Parthian Empire, which was at the time one of the superpowers, there was much emphasis on a well-trained cavalry force (Adalian, 2010: 28). Looking at the scripts of ancient historians, the Armenian region is described as the land of excellent horse-breeding, and of vast meadows dedicated to horse-breeding (Strabo. IV. 9. 14; Polybius. IV. 12. 17–21; Diodorus. VIII. 17. 32–35; Plutarch. VII. 20). The Armenian Highlands are described as one of the biggest sources for horses for the Achaemenid Empire and later also for the Hellenistic and Roman armies. As an Achaemenid satrapy, Armenia was very well known in the Parthian-Hellenistic worlds encompassing wide meadows dedicated for horse-breeding; the Armenians were considered as the best horsemen of the era and the Armenian satrapy offered every year a tribute of 20,000 young male horses to the Achaemenid Empire (Xenophon, IV.V. 34; Strabo. V. 11.14). The quality of the Armenian horses was of the highest. As mentioned above, these historical descriptions are well supported by the large assemblages of horse-related artifacts found in archaeological excavations in the highlands of Armenia.

The horse burial from the Aghavnatun tumulus AGH72 joins the rich archaeological, historical, and iconographic representations and further demonstrates the centrality of the horse and its pivotal economic role in the Armenian Highlands. Thus far, this horse is the only known example in the Caucasus of a ritual burial dedicated only to a horse (for a close example of donkey burial from the southern Levant, see (Bar-Oz et al., 2013)). The location of the tumulus at a short walking distance (~500 m) from several large enclosures and traps and close to the capital of the Hellenistic period Armenian kingdom, Armavir, lead us to suggest that there is a cultural affinity between the nearby enclosures and the horse burial (see Fig. 1). The presence of Bronze Age and Iron Age burials with horses and horse-related artifacts on the fringes of Mount Aragats (e.g., Aparan II, Artik, Gegharot, Nerkin, Naver, Talin, Shirakavan), all of which are spread along the same ecological niche as tumulus AGH72, strikingly manifest the long tradition of horse-breeding in the region (Khachatryan, 1975: 258; 1979; Badalyan, Avetisyan, 2007: 51–54; Simonyan, Manaseryan, 2013; Badalyan, Smith, 2017).

Strabo describes the Armenian Highlands as the land of horses owned by the king; 50,000 Nisean mares were kept here for breeding. These horses were apparently kept in the open meadows, under the king's watch (cf.: (Johnstone, 2004: 53)). The young horses were kept in the open until they reached the age of three years (Donaghy, 2014: 151). A common method of corralling horses in the Asian steppe was by chasing on foot (Rolle, 1989: 106). Such management fits the nearby enclosures that facilitated gathering of horses into the large corral-heads of the kites without stressing them, simply by maneuvering them along the corral guiding walls (Malkinson et al., 2018).

The Aghavnatun tumulus was built to fit a prestigious and respected horse. The morphological characteristics of the skeleton suggest that it was a large male stallion in its prime. No notable injury or any bone trauma were noted. Furthermore, the skeleton was found in articulation and it lacked any evidence of cut-marks on its bones, suggesting that it was not butchered after its death. Its height at the withers indicates that it was a high and robust horse with somewhat slender legs. These characteristics are also found in the Nisean horse. A horse with similar size and morphological traits was reported from the Greek sanctuary Chora Pantanello in southern Italy, and was recognized by Bökönyi (2010) as the Nisean horse.

Noteworthy is the bronze ring that was found in the horse's mouth. Use of a ring as a horse-bit is a well-known practice, first depicted in the standard of Ur, dated to approximately 2450 BC (Clutton-Brock, 1992). However, unlike the Aghavnatun horse burial, in the standard of Ur the rings are located on the upper lip, or on the nasal septum, in the method still commonly used today to control bulls. Such rings are only effective to control the animals when they are used from the front of the animal. The Aghavnatun horse, on the other hand, was found with a bronze ring on its lower jaw. The use of a lower-jaw ring long after the widely common use of mouth-bits in the Armenian region (Castelluccia, 2017; Medvedskaya, 2017) suggests that this particular horse was not ridden but rather led from the front with a rope tied to the ring, which is a common method when leading a stallion to the mare for copulation. Still today, a metal ring on the lower jaw is a preferred bit for stallions while studding rather than any other bit in many breeding farms (Darling, Giffin, 2014).

An interesting mouth ring analogous to that of the Aghavnatun horse was found in the Nabataean site of Umm el-Jimal, Jordan (1st–3rd centuries AD). There too, a metal ring of similar dimensions was found in the mouth of a buried stallion. The size of the Jordanian stallion is nearly the same as that of the Aghavnatun horse (Deckinga, 2013).

Looking carefully at the function of the Armenian enclosures reveals that unlike the hunting installations that are built downhill, to allow driven animals to gain speed until they reach the killing traps and fall into them (Bar-Oz et al., 2011), the Aghavnatun enclosures are built in an opposite, uphill direction (Malkinson et al., 2018: Fig. 1). Clearly, these are not killing traps and it seems that they were operated to catch and corral a herd, and then separate

selected individuals within the large enclosure. The fact that these were built in an uphill setting further supports our reconstruction that the herders meant to cause no injuries to the culled animals.

It is tempting to suggest that this type of enclosure in Armenia, in particular those that are located in the historically acknowledged breeding-grounds of the Armenian horse, were very common in the locations where the breeding of the famous Nisean horses was taking place. The economic importance of Armenian horse-breeding, and the high value of the Nisean horses, could have been the incentive to build large installations serving the industry of high-quality horse-breeding.

To conclude, the unique burial dedicated solely to one adult horse within a monumental structure, as well as the morphological characteristics of the horse and the bronze ring in its mouth, are outstanding within the cultural landscape of the Armenian Highlands. This is also the area where hundreds of large stone-built enclosures are found, many constructed uphill and with sophisticated annexed cells and installations (Ibid.; Nadel et al., 2015). The finds seem to support the historical texts that this is the region where the Nisean horse was bred. We hope that this interpretation will be further reinforced in additional studies and that future research will also address specific genetic traits that will allow the rejuvenation of the ancient and now lost breed of the Nisean horse.

Acknowledgments

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