Extensive rescue excavations preceded the construction of a shopping mall in the satellite settlement of Ménfőcsanak, southwest of the city of Győr in northwestern Hungary. Work directed by Andrea Vaday of the Archaeological Institute of the Hungarian Academy of Sciences brought light graves from a Migration Period cemetery. Many of these burials were disturbed either by contemporaneous or subsequent robbing, something also reflected in some of the animal remains. The animal bone assemblage recovered during rescue excavations from the cemetery at this site, Ménfőcsanak–Bevásárlóközpont, was attributed to Germanic Langobards (also known as Langobardi or Lombards) who originated in the area of northern Silesia and formed part of the tribal confederation of Suevi. The Langobards played no mentionable role in bringing down the Roman Empire. Migrating south as late as the sixth century, they filled a power vacuum in the Carpathian Basin left by the Hunnic Empire prior to their settlement in Northern Italy after AD 568. In the absence of large, permanent settlements, information concerning animal keeping by the Langobards of the Migration Period and Early Middle Ages largely originates from sacrificial animals and meat offerings recovered from burials.¹

Only a few features contained animal remains in verified stratigraphic positions, including a total of six graves. These structured deposits were considered burials based on the presence of human skeletons, within this context the finds may have a ritual character. Complete animals interred into graves as part of the mortuary ritual are not only important due to the relative paucity of relevant biometric data from settlements. When burials contain complete animal skeletons, they are well suited for detailed morphometric and pathological studies.² In addition to providing biological context (age, sex, phenotype), well-preserved skeletons contribute complementary information to the taphonomic history of a cemetery.

Material

Sporadically occurring mammalian bones were found in heavily disturbed Graves 219 (a female burial), 236, and 254. Since they originate from robbed graves and other mixed contexts, their chronological position cannot be verified. Animal remains relevant to the culture historical interpretation of the cemetery came to light from the following features:

Grave 227:
This inhumation burial of an adult man contained what looked like “two small bone spirals” of 7–8 mm in diameter (fig. 1) at the time of excavation. These peculiar artefacts could be identified as fragments of an ossified cartilaginous avian trachea, possibly originating from goose (Anser sp.).³ Such remains sometimes found in excavated materials belong to the syrinx (or tracheal bulla) of birds in the order of Anseriform birds. The “bulba ossea” at the

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¹ Bökönyi 1974, 77.
² Bartosiewicz 2002.
³ Erika Gál, personal communication.
lower part of the male syrinx is peculiar in being swollen serving as a resonating voicebox. The complete organ is shown in fig. 2 with ossified tracheal rings in place. The bulla itself, however, is unlikely to survive in archaeological deposits due to its poorly ossified thin wall. These curious bird remains are difficult to interpret in the absence of pertinent bones (skull base or cervical vertebrae. But they certainly did not end up in the burial by accident.

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4 Garrod 1875.
Grave 251:
This southernmost inhumation grave in the cemetery belonged to a young adult (19-20 years old) woman. In addition to the disarticulated long bones from a young domestic hen (Gallus domesticus L. 1758) fragments of egg shell were found in the chest area of the deceased. A small fragment of an ossified cartilaginous avian trachea possibly belonged to a larger species. While the bird remains could not be analyzed in taxonomic detail, the presence of eggshell is unambiguous proof of a spring funeral.

Grave 262:
The extended skeleton of an adult (40-50 years old) woman lay in this grave with her right leg slightly contracted. The burial yielded the complete skeletons of two mature dogs (Canis familiaris L. 1758). Dog A was found above the corpse, thrown on its back facing east in a disfigured position (fig. 3). The carcass of dog B was placed on a bank on one side of the grave, above the woman’s right shoulder.

Grave 272:
This inhumation of an adult (30-40 years old) female contained several parts of a pike (Esox lucius L. 1758) skeleton (supraoccipital, vomer, two fragments of a right dentale, angulare,
quadratum fragment, four precaudal and two caudal vertebrae; fig. 4), as well as several small, non-identifiable fragments from the cranium and the zonoskeleton. They were put left of the woman’s feet, some 10 cm above the feature’s bottom. The near complete recovery of this pike skeleton is the result of meticulous hand-collection, since fish bones of lamellar structure are extremely sensitive to size-related taphonomic loss. Some of the missing fragments may have been eroded by the sandy soil.

Grave 282:
This burial was located in the south of the cemetery, in the proximity of the grave labelled Feature 251. Remains of a pond tortoise (*Emys orbicularis* L. 1758) found in this burial came to light from right above the skull in this inhumation. Although carapace fragments of the tortoise shell are the most obvious remains of this animal, thanks to the extremely careful hand-collection several smaller parts of the skeleton were recovered, including the skull (with the right mandible), the pairs of scapulae, humeri, the pelvis and the right tibia, indicative of a complete animal.

Grave 946:
The inhumation grave of this male contained the fragment of a pig (*Sus domesticus* Erxle. 1777) humerus. The robust distal half of the bone survived.

**Discussion**

The variety of animals represented in this cemetery bear different types of zoological and culture historical information. Dog remains offer the most complex picture of Langobard attitudes toward animals. Eggshell fragments and pike remains embody possible seasonal aspects of the burial rite. Other animal remains carry little information beyond their sheer

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5 Takács 1988.
6 Bartosiewicz 1983.
presence. Archaeozoological finds from the Ménfőcsanak–Bevásárlóközpont cemetery will be discussed in the decreasing order of information content.

Dog typology
Although by the Roman Period there seems to be an emergence of dog breeding within the empire, it is not entirely appropriate to speak of bona fide dog breeds in Migration Period cultures whose dog keeping practices are largely undocumented. Never-the-less, the typological character of the two complete dog skeletons found is worth discussing.

The skulls of both dogs recovered from Grave 262 were rather gracile (Appendix, Table 1). Their extremity bones are also indicative of long-legged, but relatively lightly built animals (Appendix, Table 2). Dog A was a healthy, large, adult male. Dog B, a smaller female of the same type, shows signs of several healed fractures. Its broken left nasal bone healed in an oblique position, and the left front leg was deformed by a small but poorly healed trauma to be discussed separately.

In fig. 5, cranial measurements (see Appendix, Table 1 for detail) from five dogs from Germanic contexts in Hungary were plotted within the range of ± standard deviations around the standardized mean value of a sample of 15 to 22 Sarmatian rural dogs.8 Skull measurements are sorted by the average of cranial measurements (standard score = 0) taken on Sarmatian rural dogs. Most measurements of the Germanic dogs exceeded the Sarmatian mean value in the graph, i.e. they are larger on average: the occipital region of the Ménfőcsanak specimens, shown on the top of the list in Figure 5), is particularly well-developed especially in the case of the male (A). While, however, the principal cranial widths in the Hegykő and Keszthely specimens are near or above the Sarmatian average, the facial skulls of the two Langobard dogs from Ménfőcsanak under discussion here look distinctly narrower even than the average of Sarmatian dogs (bottom of the graph in Figure 5).

8 Numbers very depending on the preservation of measurements, but Sarmatian dogs seemed closest both chronologically and in the sense that they represented pastoral communities, comparable to those of the Migration Period; Bartosiewicz 2000.

![Diagram of cranial dimensions](image-url)
Since long bones are completely preserved in many animal burials, withers heights can be estimated on the basis of several skeletal elements using coefficients calculated from the skeletal proportions of modern individuals of known withers heights. The greatest lengths of all long bones in Dog A resulted in withers height estimates between 620.8–651.2 mm (mean= 641.0 mm). The withers height of Dog B was estimated to between 534.8–600.2 mm (mean=567.9 mm), on the basis of intact long bones (Appendix, Table 2).

In fig. 6, the mean withers height estimates of the two Langobard dogs from Ménfőcsanak and the three Keszthely individuals published by Vörös were plotted against two major Roman Period assemblages. One of these was the values estimated for Sarmatian dogs from the Barbaricum (southeastern Hungary), the other originated from the Pannonian urban settlement of Tác–Gorsium. The histogram confirms the remarkably broad size distribution, well known from other Roman provinces. Extremely small dogs are absent at the Sarmatian rural settlement of Gyoma 133. Migration Period dogs in Figure 6 that include individuals A and B from the Ménfőcsanak cemetery and those from Keszthely are large medium size and large by these standards. The dogs found in the Ménfőcsanak and Keszthely burials are indubitably taller than average. Although somewhat smaller, the error margins of the estimated withers height of Dog A from Ménfőcsanak are similar to the range of six males Prummel studied from the horse burial in Oosterbreintum. Withers height estimates from this latter site ranged between 620–690 mm, exceeding the stature range of modern-day day Alsatians (600–650 mm). This rather large size made Prummel conclude that such dogs may have been used as fighting hounds of some sort. While confronting dogs of this size can

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9 Koudelka 1884.
10 Vörös 1999 126.
11 Bartosiewicz 2009.
12 Bartosiewicz 1996.
14 Peters 1997 517, Abb. 2.
15 Prummel 1989 85. With its estimated withers height of 621-651 mm, Dog 1 at Ménfőcsanak fell within the overlap between these two.
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Indeed be a risky enterprise, there are numerous ways of incorporating these animals into particular cultures, including considerations of self-representation and status. Finally, the “stoutness” of forearm bones (radius specifically) was compared to those of dogs known from Tác–Gorsium and Roman Period Germania in fig. 7. The resulting graph does not reveal any remarkable feature of the two Ménfőcsanak Langobard dogs, they occupy a firm position as being of average robusticity expected on the basis of their withers height. They do not deviate at all from the main trend indicated on the basis of known modern breeds and wolves, showing no extreme morphometric modifications such as short-legged or otherwise robust breeds. Even in comparison with settlement assemblages, a size and shape difference between Roman Period urban vs. rural dogs was also observed by Joris Peters in Roman Period Germany.17

Pathology

Although the two dogs had most probably been killed simultaneously for the purposes of the ritual, no symptoms of perimortem trauma could be identified on the bones, although the position of Dog A, the large male found on top of the burial (c.f. Figure 3) is conspicuous. On the other hand, the skeleton of Dog B (the female found on the bank in Grave 262 in a primary position) showed healed fractures. Head injuries in dogs, such as the broken and healed left nasal bone of this bitch, occur commonly and may be regarded a sign of mistreatment in animals living in close proximity to humans. Facial fractures have been described at the Roman provincial town of Tác–Gorsium and numerous other sites from a variety of archaeological periods.18 The occurrence of such healed injuries on the left side of

![Diagram of dog breeds](image)

**fig. 7.** Front leg proportions of Langobard (Ménfőcsanak) and Roman Period dogs relative to modern dog breeds

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17 Peters 1997 517, Abb. 2.
18 S. Bőkőnyi 1984 111; Bartosiewicz 2013 76, Fig. 54.
the head (as in the case of the Ménfőcsanak B dog) is consistent with the hypothesis of blows being delivered by right-handed by humans confronting the animal face-to-face.

Aside from the head injury, a minor but heavily infected fracture distorted the left elbow joint in the same animal (B). First, the diaphysis of the left ulna had been snapped in the proximal (upper) third in a relatively minor accident. In modern veterinary medicine such small fractures have a good prognosis\textsuperscript{19}, as the stronger radius acts as a natural splint if not involved in the injury itself.\textsuperscript{20} In the Ménfőcsanak dog massive symptoms of a compound fracture\textsuperscript{21} developed being indicative of complications resulting from an infection. The healed ulna had formed a massive callus that fused involving the diaphysis of the radius. In a proximal direction, the entire elbow joint became chronically inflamed: both forearm bones, as well as the distal end of the humerus were been deformed by exostoses (fig. 8).

In addition to this primary locus of chronic inflammation, a fusion developed between the 2nd and 3rd metacarpal bones in the same front leg. While the surfaces of these latter bones look smooth and healthy, they show what is known as Sudeck’s Atrophy (Reflex Sympathetic Dystrophy Syndrome) in human medicine. This may occur following long bone fractures or joint sprains and is thought to be caused by a dysfunction of the sympathetic nervous system, which is involved in the regulation of blood supply to the affected part. Due to chronic pain

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\textsuperscript{19} Tamás 1987 301.
\textsuperscript{20} Bartosiewicz 2013 48, Fig. 31.
\textsuperscript{21} sensu Baker – Brothwell 1980 85.

fig. 8. Elbow joint from Dog B showing exostoses resulting from the compound fracture of the ulna.
Left: lateral aspect, right: fused metacarpals, anterior aspect.
the patient may be reluctant to move the injured part. This leads to muscle wastage and a vicious cycle where stiffness and pain exacerbate each other. If the condition persists there may be adverse changes to the condition of the underlying bone. In the advanced, III stage of this condition, soft tissues in the unused limb become permanently contracted. Meanwhile a thickening of the trabecular system in the affected area may lead to the fusion between bones. This type of atrophy is the consequence of painful inflammation and the concomitant lack of active locomotion in the affected limb. Given the functional significance of the front limbs in carrying approximately two thirds of the animal’s live weight and orienting its gait, the Ménfőcsanak female dog (B) must have had a very noticeable limp.

Cultural implications of dog burials
Multiple dog burials are commonly occur in Germanic ritual contexts. Aside from inhumation graves, horse burials may also contain dog skeletons. Andrea Vaday, the excavator, has provided a detailed review of Migration Period and Early Medieval dog burials from northern and western Europe. From the viewpoint of cultural interpretation, it must be mentioned that, although the Keszthely dogs in Hungary are of great importance in reconstructing the physiognomy of dogs from the Migration Period, they were not found in a context related to humans but horses. These burials, therefore, are more comparable to the horse and dog graves reported from Oosterbeintum in the Netherlands.

Largely contemporaneous dog burials from Transdanubia in western Hungary include the Langobard inhumation grave of a warrior with two dogs placed near his feet in Grave 70 at Hegykő identified by Bökönyi. Although burying dogs along the dead was abandoned with the onset of Christianity across Europe, the arrangement of dogs in this apparently high-status grave is reminiscent of the use of dogs as attributes on Gothic sarcophagi, on which dogs are frequently depicted even if not buried in their physical reality. A widely spread interpretation of dogs in medieval effigy sculptures suggests that they fulfilled an apotropaic function, protecting the deceased. Could they be seen as a Christian re-interpretation of suggested roles for dogs found in pre-Christian funerary contexts? This is a question worth considering in future interpretations.

Aside from the fact that the two largish dogs from Ménfőcsanak–Bevásárló központ were of average skeletal proportions, the fact that they were buried alongside an elderly woman, possibly of 40–50 years of age, makes them a rather unlikely parallel to robust guard dogs, even if we do not know the actual relationship (ownership? attribute? apotropaic sacrifice?) between this person and the dogs buried alongside her.

It may be presumed that the two relatively large dogs were entered with the woman to accompany her on her last, long journey. It is not possible to reconstruct the personal relationship between the dogs and the deceased, but it was possibly less sentimental than one might think in post 19th century “Victorian” terms. On the other hand, although no horse bones were buried in Grave 262, the presence of horse bit fragments in the ruthlessly robbed grave are indicative of a lady of prestigious social standing – whose grave was worth robbing almost overnight after the burial.

The Ménfőcsanak dogs represent the upper size range of “medium size” dogs, they are, thus, similar to the dogs found in the Germanic horse burials at Keszthely.

23 The distal end of the right ulna also displayed a healed fracture in the large dog recovered from Burial 2 at Keszthely. This trauma caused some dislocation and affected the radius as well: Vörös 1999 124.
26 Prummel 1989. A stallion and six large male dogs were buried here.
27 Prummel 1989. A stallion and six large male dogs were buried here.
28 Bökönyi 1974 326.
29 Bartosiewicz 2011.
30 Andrea Vaday personal communication.
31 Bökönyi 1984 66, Group No. 4.
It seems that the role of lap dogs and other small forms as “real” pets was more important in urban contexts, while populations moving with their animals relied largely on the use of medium size dogs. Hence, size in itself is of little help in unambiguously identifying the two Langobard dogs from Ménfőcsanak as pets.

The mythology of pastoral peoples have often involved dogs. Historically, their image has ranged from detested servant to high status companion. In the absence of written records, however, it is difficult to identify the position of individual dog burials within this broad continuum.

Negative attitudes are reflected by pre-Christian Avar Period finds of putatively dissected dogs as well as a 11th-century human/dog burial from rural Visegrád–Várkert, Hungary. This latter was interpreted as a “witch burial” outside the consecrated Catholic cemetery since it contained the mutilated body of an elderly woman interred in the company of no fewer than six dogs. In Stradów, Poland, a dog burial was found in association with a 12th century child’s grave. In another burial from Grzybów (also Poland), a 14th century human embryo was interred with at least three dogs. All these finds came to light outside consecrated cemeteries, since church law forbade the interment of criminals, unbaptized children as well as animals there. It would be hard to determine, however, whether such dogs are indicative of surviving pre-Christian rituals or a sign of religious excommunication.

A more positive interpretation of the Ménfőcsanak burial is possible, given the careful arrangement of both the human and at least one of the dogs in Feature 262. Even if the woman was not necessarily the owner of these animals, they may have been added to the burial as guardians or symbols of status. In her recent review of dog burials, Anne-Sofie Gräslund also cites the positive symbolism attached to the presence of dogs in early medieval burials.

Food remains
Although some animal remains in this cemetery occur in the form of ordinary grave goods, it must be remembered that, until today, food has also had symbolic meaning. Meals included in the grave may have served as simple media, tools in magic activities or as parts of more complex religious rituals. Food was presumably added to the grave goods in dishes. Some of these may have been made of perishable materials rather than ceramics which makes the interpretation of “solitary” edible animal parts rather difficult.

The meaning of eggshell fragments in burials remains ambiguous. These finds may equally be of dietary and purely symbolic significance. When found along with hen bones, they are more readily interpreted as food remains. The fragments of egg shell and disarticulated long bones from a young domestic hen found in Feature 251 may thus be considered food remains, which does not exclude their possible meaning of eggs as symbols of fertility or accessories of a spring mortuary ritual.

Fish remains tend to be rarely recovered among grave goods even in carefully excavated burials. In the absence of direct zoological parallels, the cultural interpretation of pike remains from Ménfőcsanak is potentially complex. Pike remains in the undisturbed south-southeastern corner of Grave 272 may also be considered part of a meal. Although an intact

32 Juhász 1981 146.
33 Bartosiewicz 1998 65–78, Fig. 1.
34 Bálint 1971.
35 Vörös 1991 184.
36 Rogozinska-Goszczynska 1964 349.
37 Garbacz 1992 218.
38 Zawadzka-Antosik 1973 369.
40 Evidence is available e. g. at Rácalmás, Grave 15, Andrea Vaday personal communication.
41 Sági 1963 77–78.
42 Sági 1963 78.
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dente could have been used for estimating the length of this fish, this possibility is limited in the case of the fragments found at Ménfőcsanak. Given the strong correlations between skeletal measurements in pike and the distance between the teeth of this individual, its length may be visually estimated between 55–60 cm. This impressive carnivorous fish has attained special cognitive value in many cultures. Its strung vertebrae are among the rare worked pieces of fish bone known from Hungary. Pike was also among the most important fish species used in medieval heraldic art. Perhaps it is not an accident that the usually underrepresented class of vertebrates, fish, occurs in the form of a rather large specimen of the powerful pike at Ménfőcsanak, although remains of small Cyprinid fish have been found at the site of Vörs (Grave 30) and Szólád in Hungary. Rarely occurring fish remains were also recovered from Grave 53 at Pottenbrunn and Grave 19 in Großörner.

Taphonomic Considerations

According to Andrea Vaday, Langobard burials were frequently victim of near immediate contemporaneous robbing. From a taphonomic point of view, this must be considered a special form of post-depositional “bioturbation” by Homo sapiens, motivated by socio-economic reasons. In the case of Ménfőcsanak–Bévásárló központ, the disfigured position of Dog A in Grave 262 is indicative of the complete body being tossed aside from the way of the intruders. The fact that the fresh carcass withstood this degree of intrusion offers evidence that the robbers acted prior to the decay of soft tissue that still held the bones together.

The additional taphonomic significance of the two complete dog skeletons in Grave 262 is that, although the grave was robbed, neither of them were directly disturbed. The body of Dog A especially may have been in the way of, but not was not dispersed by the contemporaneous robbers, who must have have been targeting special spots within the inhumation shortly after the funeral had taken place. This may have been the occasion when the right leg of the deceased woman was also twisted into the aforementioned contracted position.

While the dog skeletons in Feature 262 were well preserved in spite of coeval intrusion in the form of robbery, both the remains of domestic hen (Feature 251) and pike (Feature 272) suffered some degree of post-depositional loss that limited their zoological reconstruction.

The Langobard cemetery at Ménfőcsanak, however, also offered an example of potential “taphonomic gain”, that is, animal intrusion that probably had very little to do with contemporary ritual considerations. The case in question is the skeleton of a pond tortoise found in Feature 282. Although there is always a possibility that certain peoples placed tortoises in burials, in the absence of clear cultural modifications such as cut marks or burning, these remains may be considered a natural deposit. This complete skeleton was found above the skull of the deceased. Pond tortoises tend to burrow for hibernation at the beginning of winter, especially in mud or loose soil such as the disturbed area at the head of the robbed Feature 282. Grave pits, when left open even for short times e.g. overnight, may often operate as natural traps. Therefore stratigraphy, animal behaviour and ritual considerations must be carefully weighed in the interpretation of such animal remains.

43 Bartosiewicz 1990.
44 Takács – Bartosiewicz 1989.
45 Khin 1957; Zolnay 1975.
46 Bartosiewicz 1995.
47 Sági 1964; Szólád: preliminary identification by the author.
48 For details see: Andrea Vaday, this volume.
49 Andrea Vaday personal communication.
50 van Wijngaarden-Bakker 1996.
51 The other possibility, tortoises falling into the open grave pit prior to the actual burial and being entered alive along with the deceased, looks less likely in this case.
52 Bartosiewicz – Kovács – Farkas 2013.
Seasonality
Egg remains in Feature 251, as well as the pike remains in Feature 272, offer a seasonal dating as spring burials. There is evidently great probability that hens’ egg laying peaked in the spring during the Migration Period, strongly suggesting a seasonal date.

The seasonality of the pike skeleton is less reliable, since the vertebrae whose growth rings might provide some information on the season of death have been badly eroded. It is worth mentioning, however, that pike is the first fish species to spawn in natural waters in Hungary, during February or March. During this time, these fish move closer to the riverbank in the proximity of Ménfőcsanak, where they are more likely to be caught, than during the rest of the year.\(^{53}\)

These zoological finds suggest therefore spring burials for Features 251 and 252, not surprising in light of the usually greater mortality that follows the winter months of stress and metabolic deprivation in non-industrialized societies in temperate climates.

It is not possible to establish whether the tortoise that ended up in Feature 282 took advantage of the loose soil structure of the original, freshly made grave or of the secondary disturbance by robbers. In any case, the activity that produced optimal circumstances for hibernation for this tortoise must have taken place shortly before the winter. This seasonal estimate, however, cannot be directly linked with the actual burial rite or general mortuary behavior by this particular Langobard group.

Conclusions
Animal remains, found in primary positions in four graves from the Langobard cemetery at Ménfőcsanak in northwestern Hungary, revealed various aspects of the archaeozoological study of grave goods.

Two complete dog skeletons (Feature 262) from rather large, lightly built individuals have lent themselves to detailed analyses of both morphometry and mortuary behavior. These adult dogs, a male and a lame female, accompanied a woman, who may or may not have been their master. Their position, at least, did not suggest an explicitly negative role for these animals in the burial.

Rare fish remains from Feature 272 originated from pike and were interpreted as food remains. Similarly, hen remains and eggshell fragments in Feature 251 may have been part of a meal. Both types of animal remains, however, were briefly reviewed within a ritual context, and have been interpreted as evidence of spring burials.

A tortoise that ended up in Feature 282 was considered irrelevant from a cultural point of view. The preservation of its remains, as well as the taphonomic status of other bones was of help in drafting the cemetery’s history, with special regard to coeval robbing.

While animal remains of the Ménfőcsanak cemetery provided us with only a limited view of animal exploitation by the Langobards, they reflect several important aspects of archaeozoological problems encountered in the reconstruction of mortuary behavior.

Acknowledgements
Thanks are due to Andrea Vaday for her valuable pre-publication discussions on the manuscript as well as to Tibor Kádas who took the photographs. Research presented in this article was supported by Grant T047228 of the Hungarian Scientific Research Fund (OTKA) entitled “Anatomical and pathological investigations on the skeleton of domestic animals: the use of recent observations in the interpretation of archaeological finds”.

\(^{53}\) The probabilistic nature of this statement must be emphasized, pike could be caught under the ice as much as in puddles after summer floods; Bartosiewicz – Hertelendi – Figler 1994.
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Bartosiewicz 1998

Bartosiewicz 2000

Bartosiewicz 2002

Bartosiewicz 2009

Bartosiewicz 2011

Bartosiewicz 2013

Bartosiewicz – Hertelendi – Figler 1994

Bartosiewicz – Kovács – Farkas 2013

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Bökönyi 1984

von den Driesch 1976

Garbacz 1992

Garrod 1875

Gräslund 2004
Juhász 1981

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Pike-Tay et al. 2004

Poór 1989

Prummel 1989

Prummel 1992

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Sági 1964

Takács 1988

Takács – Bartosiewicz 1989

Tamás 1987

Vörös 1991

Vörös 1999

van Wijngaarden-Bakker 1996

Zawadzka-Antosik 1973

Zolnay 1975
## APPENDIX

<table>
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<tr>
<th>Measurements</th>
<th>Ménfőcsanak</th>
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<tr>
<td></td>
<td>A, male</td>
</tr>
<tr>
<td>1 Total skull length</td>
<td>207.5</td>
</tr>
<tr>
<td>3 Basal length</td>
<td>187.0</td>
</tr>
<tr>
<td>40 Occipital height</td>
<td>53.5</td>
</tr>
<tr>
<td>- Bassus-Staphylium length</td>
<td>82.0</td>
</tr>
<tr>
<td>13 Median palatine length</td>
<td>108.0</td>
</tr>
<tr>
<td>36 Breadth at canine alveoli</td>
<td>38.5</td>
</tr>
<tr>
<td>30 Zygomatic breadth</td>
<td>111.0</td>
</tr>
<tr>
<td>32 Frontal breadth</td>
<td>51.0</td>
</tr>
<tr>
<td>29 Breadth of the brain case</td>
<td>66.0</td>
</tr>
<tr>
<td>- Breadth of the condylus occipitalis</td>
<td>44.3</td>
</tr>
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**Table 1. Cranial measurements (mm)** of the Ménfőcsanak dogs

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<th>Dog A, male</th>
<th>GL</th>
<th>BP</th>
<th>DP</th>
<th>SD</th>
<th>Sd</th>
<th>BD</th>
<th>DD</th>
<th>WH cm</th>
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<tr>
<td>scapula</td>
<td>158.0</td>
<td>86.5</td>
<td>-</td>
<td>-</td>
<td>28.2</td>
<td>36.4</td>
<td>25.1</td>
<td>-</td>
</tr>
<tr>
<td>humerus</td>
<td>160.2</td>
<td>87.2</td>
<td>-</td>
<td>-</td>
<td>29.5</td>
<td>36.5</td>
<td>24.5</td>
<td>-</td>
</tr>
<tr>
<td>radius</td>
<td>193.3</td>
<td>38.0</td>
<td>46.0</td>
<td>15.5</td>
<td>17.0</td>
<td>8.5</td>
<td>28.0</td>
<td>15.5</td>
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<tr>
<td>ulna</td>
<td>239.9</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>femur</td>
<td>211.4</td>
<td>41.5</td>
<td>27.5</td>
<td>14.0</td>
<td>15.0</td>
<td>38.0</td>
<td>40.5</td>
<td>63.1</td>
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<td>20.0</td>
<td>63.9</td>
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**Mean WH** 63.7

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<th>BP</th>
<th>DP</th>
<th>SD</th>
<th>Sd</th>
<th>BD</th>
<th>DD</th>
<th>WH cm</th>
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<td>-</td>
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<td>31.4</td>
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<tr>
<td>humerus</td>
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<td>ulna</td>
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<td>-</td>
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<tr>
<td>femur</td>
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<td>56.8</td>
</tr>
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</table>

**Mean WH** 56.5

*Estimate–epiphyses deformed by exostoses*

**Table 2. Long bone measurements (mm)** and withers heights (WH, cm) of the Ménfőcsanak dogs

54 Code numbers, terminology and abbreviations after von den Driesch 1976, 42–43.