

4.9 Dog and Human Sepultures at *Peltuinum* (L'Aquila, Italy)

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Abstract

Peltuinum is a Roman town in the central Apennines founded in the mid-1st century BC and abandoned in the 5th century AD when struck by violent earthquakes. The archaeological campaigns led to the discovery of three atypical funerary contexts in abandoned theatre structures (five shafts and a sewer) and of the city walls (a tower). All three sites show a strong association of human, dog, and other faunal remains. Still, they differ by the modality of deposition, the age at death profile of the human individuals, the number of associated dogs, and the presence/proportion of other domestic fauna, suggesting different interpretative scenarios. In this paper we describe the cases focusing on the dogs' remains in relation to their symbolic role. The analysis focused mostly on the dog remains from the shafts to understand whether there was a choice in the type of dog to be sacrificed based on certain characteristics such as sex, size and age.

Keywords: Central Italy, theatre, human and dog depositions, breeds, dogs sacrifice.

1 Introduction

The excavations conducted in the ancient city of *Peltuinum* concentrated on the area of the ancient theatre, whose construction history and layout have been clarified. The building, like the entire city, was abandoned in the second half of the 5th century AD due to a series of violent earthquakes. In the following centuries it was mostly used as a place to obtain building material. However, the entire northern sector of the theatre, which took advantage of the hillside, was covered by building drains, while, between the 11th and the 12th centuries, during the period of encastellation in the Abruzzi, the southern radial compartments of the theatre were incorporated into a fort. At some later time, the end of the 13th–beginning of the 14th centuries, the area between these units was stripped to be occupied by a 'workers' district, i.e., a series of small rooms used for reworking material in order to rebuild a nearby church (Tulipani 1996, Migliorati, 2014, 2015; Migliorati, *et al.* 2021). The excavations brought to light three atypical funerary contexts which are five shafts and a sewer in the disused theatre structures and a tower of the city walls. The three contexts show a strong association between humans and dogs. In the complex and diversified phenomenon of associated burials of

dogs and humans across time and space, the site of *Peltuinum* provides three relevant funerary contexts (Fiore *et al.* 2018, Figure 1).

2 Methods

The animal remains were determined using the animal osteological collection of the Bioarchaeology Service of the Museo delle Civiltà, in Rome and by consulting the atlases of Schmid (1972) and Barone (1981). For the scientific nomenclature of domestic animals, the reference was Gentry, Clutton-Brock and Groves (2004). Age-at-death diagnosis was based on stages of teeth formation, eruption and wear according to Payne (1973) and Bull and Payne (1982) and on the fusion of the articular epiphyses of the long bones (Silver 1969, Bullock and Rackham 1982, Bull and Payne 1982). The minimum number of individuals (MNI) was calculated according to Bökönyi (1970), Chaplin (1971) and Cruz Uribe and Klein (1984). Osteometric data were collected according to the methodology of von den Driesch (1976).

The bones of canids recovered from the shafts were studied in detail. The material was analysed from an osteological, taphonomic and biometric point of view. The age-at-death was estimated according to Barone

(1981, 1995). The withers height was calculated following Koudelka (1884) and Harcourt (1974). Sex assessment, besides the presence or absence of *os penis*, was hypothesised on the morphological characteristics of the skull proposed by Colline Brassard, Cecile Callou (2020, Fig. 1). The taphonomic analysis was carried out macroscopically using a magnifying lens 10x, and microscopically using a stereomicroscope (Nikon SMZ 1000, 8x80). Statistical analyses were performed through the PAST (PALaeontological STATistics) 3.20 software version (Hammer *et al.* 2001).

3 The shafts

The archaeological excavation of the theatre led to the discovery of seven shafts (85 x 55 cm and 400 cm average depth) located at the foot of the *pulpitum* wall and used in ancient times to house the poles of the *aulaeum* (Figures 1–2).

Shaft I (counting from north) was emptied during previous excavations and therefore no data are available on its filling, while shaft V was not investigated because of the ‘workers’ district superposition (13th - beginning of the 14th centuries). Shafts II–III–IV were brought to light below an accumulation of building materials, which can be dated, through the discovery of catacomb lamps, to the 5th cent. AD.

The excavation of the fill, which took place between 2011 and 2013, yielded, from the crest throughout the depth of the shafts, countless osteological finds related to human fetuses and newborns. Moreover, these findings were associated with dogs and some individual horses and other fauna, mixed with building material from the collapse of the *scaenae frons*.

On the other hand, the sixth shaft had partially been emptied already between the 13th and 14th centuries, to a depth of about 2.50 m, and the bone remains, found at the bottom, appeared to be sealed with a thick

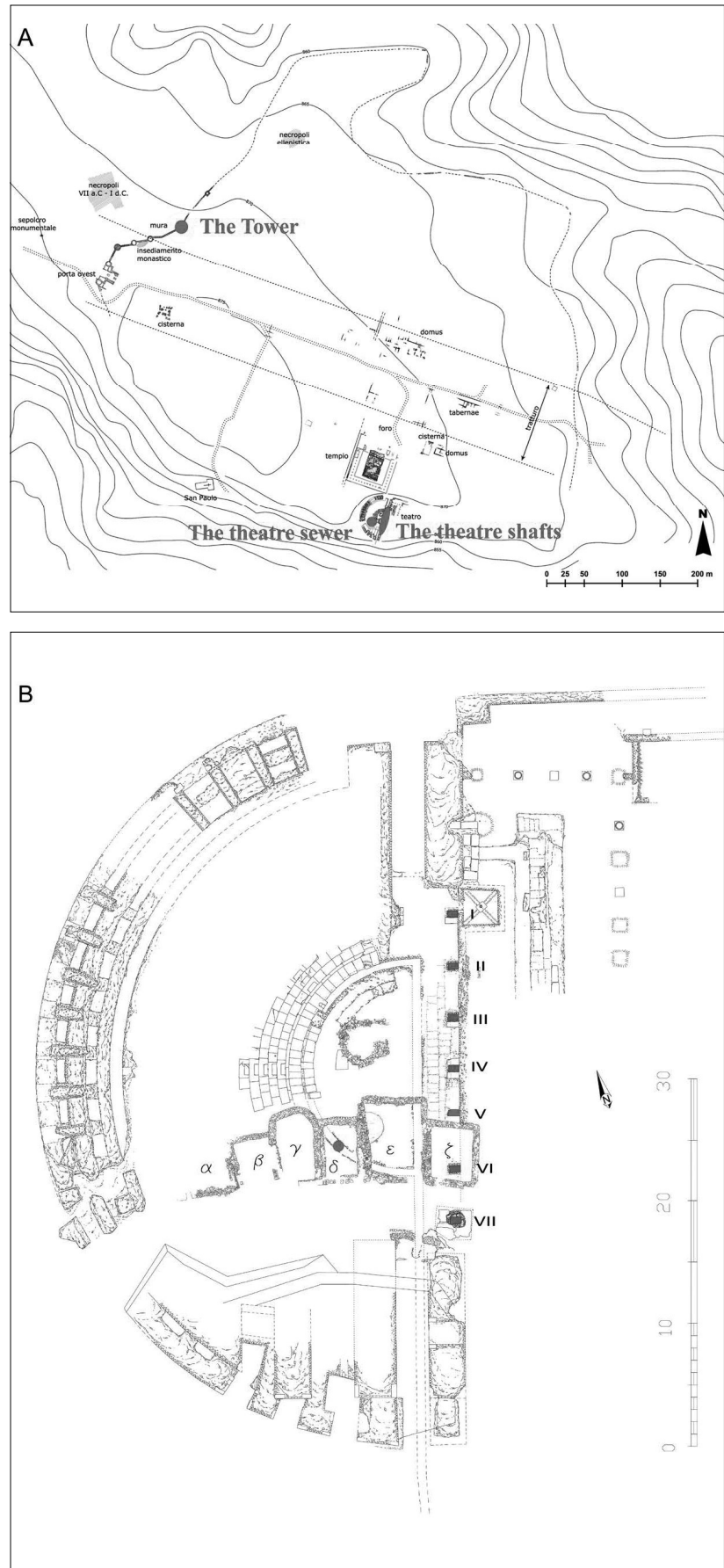


Figure 1. Plan with the location of the three contexts (a) and detail of the theatre with the shafts and sewer in room δ (b) (Migliorati *et al.* 2018).

layer of the local silty soil. The shaft was then backfilled with building waste mixed with earth and finally obliterated by the floor of a room of the 'workers complex'.

The most southern shaft, VII, was destroyed to a depth of approximately 3.00 m and completely emptied. It plausibly happened due to the construction of the fortress.

3.1 Faunal bone remains from the shafts

All the shafts contain faunal bone remains that can be attributed to a total of 89 individuals, predominantly dogs, the other domestic animals being represented by rare remains of horse, cattle, pig, sheep/goat.

(Fiore and Salvadei 2014, Migliorati *et al.* 2018, Sperduti *et al.* 2018). The remains of horse, cat and sheep/goat refer to whole skeletons or large portions (Tables 1–4). The shafts included different amounts of animal bone remains, three of them contained more than 1000 finds, III only 663. This is also reflected by the estimation of the Minimum Number of individuals, ranging from 30 (shaft II) to 12 (shaft III). Due to post-depositional



Figure 2. The shaft VII in the excavation phase (Photo by G. Calandra).

phenomena the dog elements were not found in anatomical connection, except in rare cases, and it has become difficult to reassociate the elements to individuals.

Shaft VII, the last one investigated, had been emptied in antiquity and filled with building material; bone remains are rare and the largest ones were found near the walls, where patches of the previous filling were preserved. Careful sifting enabled the recovery of several small fragments of human and dog bone remains. The dog remains refer to limb bones of an

Table 1. NR and NMI of individual animals present in the different shafts.

Taxa	Shaft II	Shaft III	Shaft IV	Shaft VI	Shaft VII	TOTAL
<i>Equus</i> sp.	4	4	60	35		103
<i>Bos taurus</i>	11	6	7	12	1	37
<i>Sus domesticus</i>	3			2	1	6
<i>Ovis/Capra</i>			2	15		17
<i>Canis familiaris</i>	1192	614	1100	1200	8	4114
<i>Felis catus</i>	3			21		24
Indet.	121	39	80	65	58	363
Total Remains	1334	663	1249	1350	68	4664
<i>Equus</i> sp.	2	2	3	2		9
<i>Bos taurus</i>	2	1	2	2	1	8
<i>Sus domesticus</i>	1			2	1	4
<i>Ovis/Capra</i>			1	1		2
<i>Canis familiaris</i>	24	9	18	15	2	68
<i>Felis catus</i>	1			1		2
Total MNI	30	12	24	23	4	93

Table 2. NR and NMI of individual animals present in various contexts.

<i>Taxa</i>	TOTAL SHAFTS		SEWER - US 1263		TOWER		TOTAL	
	NR	MNI	NR	MNI	NR	MNI	NR	MNI
<i>Equus</i> sp.	103	9	1	1	25	4	129	14
<i>Bos taurus</i>	37	8	2	1	56	6	95	15
<i>Sus domesticus</i>	6	4	2	1	43	7	51	12
<i>Ovis/Capra</i>	17	2			71	9	88	11
<i>Canis familiaris</i>	4114	68	34	1	102	13	4250	82
<i>Felis catus</i>	24	2			3	1	27	3
<i>Canis lupus</i>					4	1	4	1
Aves			15		2		17	
Indet.	363		163		150		981	
Total NR	4664	93	217	4	456	41	5537	138

Table 3. Percentages of NR and NMI of individual animals present in various contexts.

<i>Taxa</i>	TOTAL SHAFTS	SEWER - US 1263	TOWER	TOTAL
<i>Equus</i> sp.	9.7	25.0	10.0	10.1
<i>Bos taurus</i>	8.6	25.0	15.0	10.8
<i>Sus domesticus</i>	4.3	25.0	17.5	18.7
<i>Ovis/Capra</i>	2.2		22.5	8.0
<i>Canis familiaris</i>	73.1	25.0	30.0	59.4
<i>Felis catus</i>	2.2		2.5	2.2
<i>Canis lupus</i>			2.5	0.8
Total MNI	93	4	41	138

Table 4. NMI and age of dogs present in various contexts.

Dog	Foetus/ New Born	Young	Adult	MNI
Shaft II	7	3	14	24
Shaft III	1	3	5	9
Shaft IV	9	1	8	18
Shaft VI	9	1	5	15
Shaft VII	1		1	2
Sewer US 1263			1	1
Tower	3	5	5	13
Total MNI	30	13	39	82

adult individual and those of a puppy. Cattle (fragment of ulna), pig (third phalanx) and probable *Ovis/Capra* (diaphysis of long bone) are rare.

In the VII shaft bone remains are rare, further careful excavation operations have collected evidence that this shaft was also used for the deposition of children and dogs, even though the original sediments were removed in ancient times.

In overall, the remains of 68 dogs were found from the shafts, mostly adults or aged 0–1 month (newborns/fetuses). It was discovered that young dog remains (aged 2–12 months) are rare and older individuals are absent (Table 4).

On the evidence of several *os penis* and fetuses we recognised the presence of both males and females.

The height at withers shows that small to medium-sized dogs predominate.

3.2 Human bone remains from the shaft

Nearly 2,500 human skeletal elements from 87 individuals were found in the shaft, unfortunately post-depositional processes altered the original positions, and it was not possible to recognise and isolate individual skeletal features (Sperduti *et al.* 2018).

Infants in the shafts are predominantly individuals who died at birth, including cases of miscarriage and premature birth. The age includes individuals from 22 fetal weeks to three years of age with a predominance of individuals of perinatal age (38–40 weeks of gestation). The human skeletal sample from *Peltuinum* seems to represent a particular case of collective burial of infants outside the formal burial ground of the community.

3.3 Methods of deposition

The reconstruction of the deposition patterns of the finds reveals the complexity of the use of the shafts. Shaft IV contained two complete foals and one leg end of *Ovis/Capra*, all very young, and the right leg of an adult horse from the femur to hoof. In addition to these skeletons complete or large portions in anatomic connection there were 18 dogs of different ages. The animal remains of shaft IV were found only 70 cm thick from the top. They consisted of two whole foals, a whole leg of an adult horse, 9 puppies, 1 juvenile and 8 adult dogs and 17 infants. Based on the size of the shafts and the estimated footprint of the carcasses, we calculated that if they had been laid at the same time, they would have reached at least 2 m thick. This fact supports the hypothesis that the carcasses were probably placed at different times.

There are other elements, in addition to the constant presence of human infants and fetuses always associated with dogs, that make the *Peltuinum* shafts an accumulation to be read in ritual function (Migliorati *et al.* 2018). Dogs and horses were laid whole; dogs are in considerable quantity and among them there are also puppies and pregnant female dogs, some show traces of voluntary killing, finally a dog was laid at the closure of one of the shafts.

4 The sewer

Archaeological investigations in room δ , carried out in 2016, have brought to light a section of the semi-annular sewer channel for the disposal of rainwater from the theatre (Figure 1, B). A wall separating two different fills was identified inside the canal. The wall appears to be built against the ground with the curtain facing the north-west sector. From the excavation data and from the analysis of the structures of the workers' quarter, it can be deduced that the canal was excavated for the sector that could have presented problems for the support of a series of walls that were connected just above the canal; the fill soil would not have been sufficiently compact and consistent to support the structures. This sector was therefore emptied of earth and material from the collapse of the theatre (which occurred in the 5th century due to more than one strong earthquake) and filled with silt and limestone chips of various sizes to make the soil inside the canal compact and solid. The fill is dated by fragments of archaic faience. Since it was not useful to excavate the entire sector of the canal inside the room δ , the south-eastern part was not touched and the excavation did in fact reveal the materials from the collapse of the theatre and the sewer's parapets: architectural elements, curved tiles, roof tiles and limestone elements. Within this sector, particularly in contact with the upstream part of the sewer partition wall, several human bone

fragments belonging to two individuals were found (Fiore *et al.* 2018, Migliorati *et al.* 2021).

4.1 Human bone remains from the sewer

The human bone remains consisted of small cranial fragments and a mid-proximal tibia; two zygomatic fragments allowed the identification of 2 male individuals over 30 years of age.

4.2 Animal bone remains from the sewer

The bone remains recovered in this site (US 1236) include 34 fragments of dogs attributable to a single adult individual (Tables 2–3). Rare remains referring to domestic ungulates were also recovered: cattle (a fragment of radius and semilunar of an adult individual), pig (two fragments of teeth of a very young individual), a phalanx of an adult equid and one of an adult sheep/goat. Lagomorphs remains (tibiae, metapodial and maxilla) were found in this unit, rare bird and amphibian remains are also present.

The fragmentary dog remains refer to the different portions of the carcass.

The skull is documented by fragments of the mandible and lower teeth. The forelimb is represented by fragments of radius and ulna. The hind limb is represented by a fragment of the tibia, fibula, and tarsus bone. The axial skeleton consists of several thoracic, lumbar, and caudal vertebrae and several fragments of ribs. The extremities of the limbs consist of some metapodials and phalanges.

Half of the remains were found in a restricted area and at an altitude between 100 and 120 cm; radius and ulna, several vertebrae and the ribs were slightly misplaced.

In summary, the representation of all the anatomical parts of the 34 elements (all referable to one adult individual) suggests the presence of a complete dog body that was subsequently disrupted.

5 The Tower

Surveys and excavations have shown the city walls were bound to the shape of the plateau and, moreover, the northwestern side was protected by a few towers. The recent excavation of the northern section of the walls brought to light a new tower. The filling of the inside, below the plowed soil, consisted of a layer about 1.30 m thick, characterised by the presence of numerous animal and human bone remains, numerous squared blocks of medium and large dimensions and various ceramic fragments, falling within a very broad chronology (4th/3rd cent. BC - 4th cent. AD) (Migliorati *et al.* 2018).

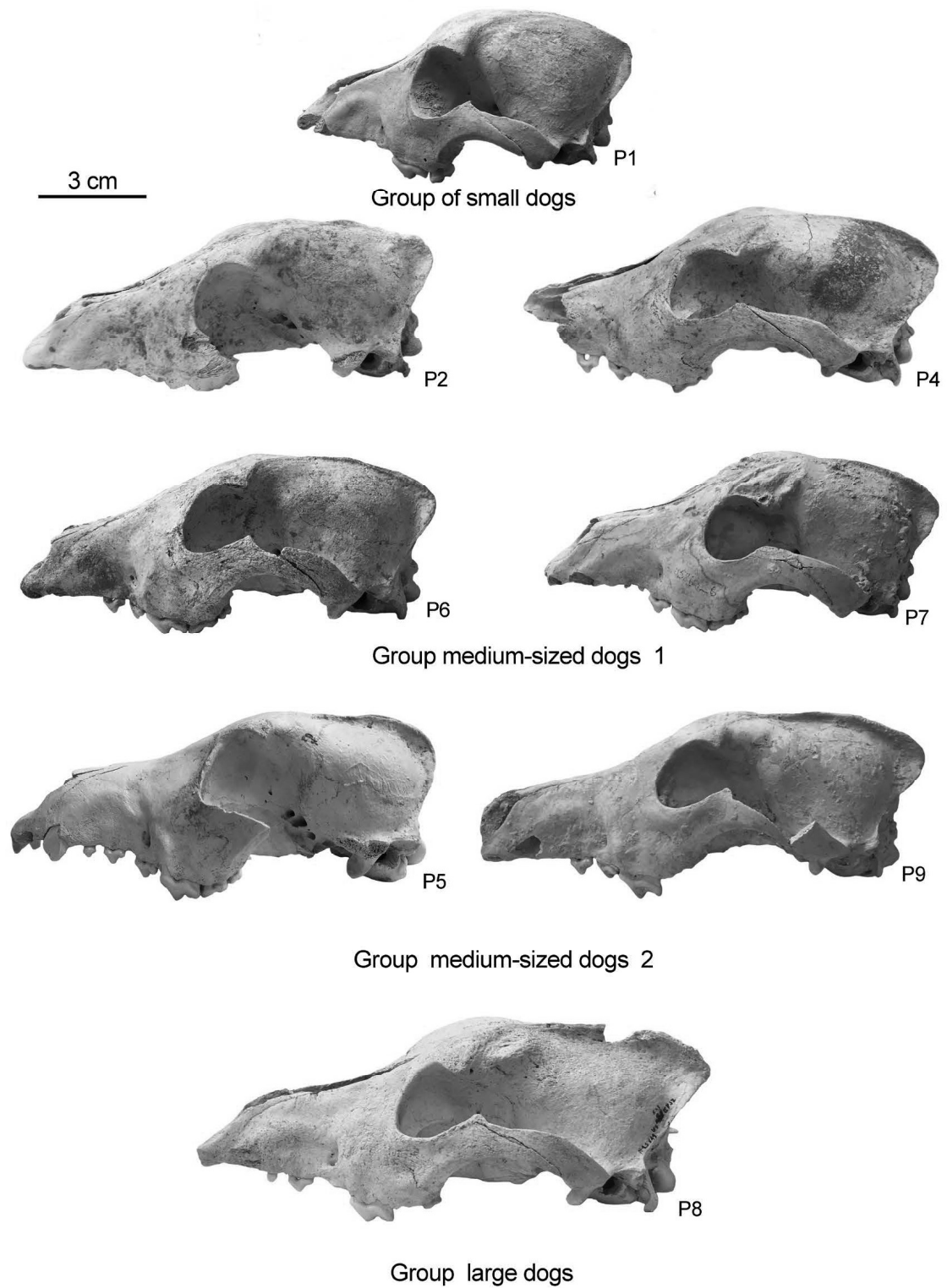


Figure 3. Skulls dog in lateral view, for descriptions and details, see paragraph 6.1 for description and details.
(Photo by I. Fiore).

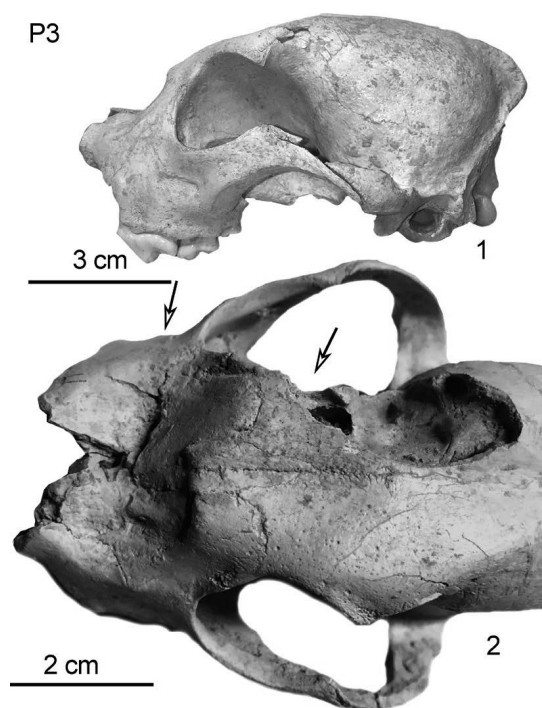


Figure 4. Skull dog (P3) in lateral view and details the blows, see paragraph 6.1 for description and details (Photo by I. Fiore).

Commingled disarticulated human material corresponds to dozens of individuals, both adults and subadults, associated with the remains of domestic animal species including at least two dogs in partial anatomical connection.

5.1 Human bone remains from the Tower

The human remains recovered from Tower number 984 relate to 35 individuals of different ages, mostly adults. No anatomically connected remains were recognised, and the bones are fragmented. Surface modifications and fractures suggest that the remains are in secondary deposition.

5.2 Animal bone remains from the Tower

A total of 456 animal bone remains from the tower were recovered and analysed, of which 304 have been specifically determined. The sample almost exclusively consists of domestic animals; the dog prevails both in the number of remains and in the MNI of individuals, followed in order by sheep/goat, ox, pig, and equids, with the presence of cats being sporadic (Tables 2–3).

The bone remains of ungulates are generally fragmentary and only in rare cases whole; they refer

to cranial elements and limb ends, while long bones are less represented. Some remains show traces of cuts or cleft fractures from slaughter. Mortality profiles fall into those reflecting meat exploitation activities, with animals slaughtered at young adult/adult age (pigs, oxen, sheep/goats) and working and breeding activities, with animals kept alive until productive activity was exhausted (oxen, equids, and sheep/goats of adult/senile age).

The dog is represented by all parts of the body and in some cases, it is possible to reconstruct entire portions of the same individual. Anatomical elements are generally whole except for the ribs and skull, which are more susceptible to post-depositional fracture. All age groups from newborn to adult are represented. Some elements, two humeri and a radius of considerable size would testify to the presence of an adult wolf in the tower.

5.3 Mode of deposition

The bone remains show in some cases different degrees of preservation, perhaps due to longer exposure times before complete burial.

Bone remains of ungulates can be traced back to meal scraps or slaughter activity; the dogs, showing no traces of anthropogenic modifications, could be dead animals ‘thrown inside the tower’. Therefore, an activity may be part of the cleaning of the area from carrion and slaughter waste. This interpretation may be plausible also considering that animal bones are associated with hundreds of human remains no longer in connection, and in secondary deposition and ceramic material covering a chronological span from the 4th BC to the 4th AD (Migliorati *et al.* 2018). Actually, near the tower, a monastery was built in the 7th cent. AD, remaining in use until the 17th cent. (Tulipani 1996). Archival documents testify that an agricultural area was associated with the monastery, in accordance with customary usage. In consequence, the tower may indeed be a ‘deposit’ of heterogeneous material, coming from a sort of reclamation of the area used centuries earlier as a necropolis and designated by the monastery for agricultural use.

6 Analysis of dogs from the shafts

The discovery of eight complete and of one almost complete (P3) dog skulls allows to analyse their morphology and to reconstruct the variety of dogs introduced into the shafts and in some cases also to trace the cause of death and the state of health of the animals (Figures 3–4).

Below is the description of the nine skulls that were discovered.

6.1 Skulls

P1 - Skull almost complete, missing the left incisor area and some teeth. Head of small size (GL 138.5), short and wide, compared to the other skulls, but it is still within the dolichocephalic forms (Cephalic Index (CI) 68.8). The teeth are slightly worn; cranial sutures are evident. The teeth are in line, but very close together. Sagittal crest is not very evident. The foramen magnum has a keyhole shape. The sex is uncertain, probably female due to of the morphological features of the skull (POP, SC, BO = post-orbital process; sagittal crest; basioccipital) (Colline Brassard, Cecile Callou 2020, Fig. 1).

P2 - Skull almost complete, missing the left zygomatic and some teeth. Head of medium size (GL 172.6), slightly elongated and falling within dolichocephalic forms (CI 54.8). Teeth little worn and cranial sutures are evident. The teeth are in line, but very close together. Sagittal crest present. Shape of the *foramen magnum* nearly a keyhole. The sex is uncertain, probably female because of the morphological features of the skull (POP, SC, BO). Frontal depression and on right orbit possibly from blow or healed wound.

P3 - Incomplete skull, missing a large fragment of the maxillae. Head small in size (estimated GL about 155/160 mm), slightly elongated head falling within dolichocephalic forms (CI 54.0). Teeth are slightly worn and cranial sutures are not very evident. Sagittal crest is not very evident. Shape of the *foramen magnum* is nearly a keyhole. The sex is uncertain, probably female because of the morphological features of the skull (POP, SC, BO). There are blows at the level of the left orbit with breakage of the skull and around the snout evidence for crushing from blows.

P4 - Incomplete skull, missing a small fragment of the maxillae. Head of medium size (estimated GL about 190 mm), slightly elongated head falling within dolichocephalic forms (CI 40 ca.). The teeth are little worn and the cranial sutures evident. The teeth are in line, but very close together. Sagittal crest is present. Shape of the *foramen magnum* is nearly a keyhole. The sex is uncertain, probably cf. female because of the morphological features of the skull (POP, SC, BO). It shows blows at the level of the left orbit with a break in the skull.

P5 - Incomplete skull, missing the zygomatics and some teeth. Head of medium size (GL 188.7 mm), slightly elongated head which falls within the dolichocephalic forms (CI 54). The teeth are little worn and the cranial sutures evident. The teeth are in line, but very close together. Sagittal crest is very pronounced. Shape of the *foramen magnum* is almost oval. The sex is uncertain, probably cf. female because of the morphological

features of the skull (POP, SC, BO). The canines are very wide compared to the other individuals. The left canine is broken at the waist and shows around the alveoli a halo of osteolysis on a reactive basis. The animal has probably suffered from an infection.

P6 - Incomplete skull, missing zygomatics and some teeth. Head of medium size (GL 169.0 mm), slightly elongated head falling within dolichocephalic forms (CI 55). Teeth are little worn and cranial sutures are moderately evident. Teeth are not in line, P4 is transverse. Sagittal crest present. Shape of the *foramen magnum* oval. The sex is uncertain, probably male because of the morphological features of the skull (POP, SC, BO).

P7 - Complete skull missing some teeth. Head of medium size (GL 168.4 mm), head not very elongated and falling within the dolichocephalic forms (CI 65). The teeth are little worn, and the cranial sutures are not evident. Sagittal crest is present. Shape of the *foramen magnum* is a keyhole. The sex is uncertain, probably male because of the morphological features of the skull (POP, SC, BO). The teeth are in line, but very close together. It shows irregularities in the contour of the upper margin of the right orbit, compatible with a previously healed fracture.

P8 - Incomplete skull missing the left zygomatic, nasal bones and some teeth. Head large (GL 221.3 mm), elongated head falling within dolichocephalic forms (CI 50). Teeth are worn, incisors and some premolars have been lost in life and alveoli have been or are being resorbed. Teeth are in line, but very close together. There is a very pronounced sagittal crest. Shape of the *foramen magnum* is almost oval. The sex is uncertain, probably male because of the morphological features of the skull (POP, SC, BO). It shows osteolysis on a reactive basis on the frontal, the animal has probably suffered from an infection.

P9 - Skull complete, missing some teeth. Head of medium size (GL 187.8 mm), elongated head falling within dolichocephalic forms (CI 45.5). The teeth are little worn, and the cranial sutures are not evident. The teeth are in line, but very close together. Sagittal crest is very pronounced. Shape of the *foramen magnum* is almost oval. The sex is uncertain, probably male because of the morphological features of the skull (POP, SC, BO).

6.1.1 Dogs. Morphology, breeds, sex, age, health and death

The nine skulls came from shafts II and IV. The morphometric data show skulls of varied sizes ranging from 138.5 mm to 221.3 mm with a mean of 175.1 mm and a high standard deviation of 22.8 (Table 5). In terms of size morphology, the dogs in shaft II show more

Table 5. Skull indices and ratios of dogs of *Peltuinum*.
SI=Skull index, MI=Muzzle index, MWI=Muzzle width index.

Dog skulls	ID	SI	MI	MWI	skull Length
P 1 - US 859 II Shaft	P1	62.8	39.1	38.8	138.5
P 8 - US 859 II Shaft	P8	50.5	35.6	38.8	221.3
P 9 - US 859 II Shaft	P9	45.5	40.0	38.5	187.8
P 5 - US 881 II Shaft	P5		44.3	34.5	188.7
P 3 - US 881 II Shaft	P3	54.7			160.0
P 6 - US 840 IV Shaft	P6	53.8	40.8	38.1	169.0
P 4 - US 860 IV Shaft	P4	54.3			170.0
P 2 - US 860 IV Shaft	P2		43.2	34.0	172.6
P 7 - US 860 IV Shaft	P7	55.9	40.7	39.3	168.4

	SI	MI	MWI	Skull Length
N	7	7	7	9
Min	50.5	35.6	34.0	138.5
Max	62.8	44.3	39.3	221.3
Mean	55.3	40.5	37.4	175.1
Dev	4.1	2.8	2.2	22.8

variability, in fact in this shaft, there is both the smallest and the largest dog skull with high standard deviation values (length 138.5–221.3; mean 187.8 and dev.St 31). The dogs in shaft IV illustrate less variability, falling within the range of medium-sized dogs, the length of the skulls is similar, in fact, the standard deviation is 1.9 (length 168.4–172.6; mean 170 and dev.St 1.9).

Cranial sutures are very evident in the skulls (P1, P2, P4, P5), moderately visible in P3, P6 and P8, and not visible in P7 and P9.

Overall, the teeth are a little worn, indicating that there are adult individuals of different ages, however not senile. The teeth are close together and only in one case, there is one 'out of line' with overcrowding and rotation of a premolar.

The morphological traits evaluated for sex determination (BO: basioccipital; POP: post-orbital process; SC: sagittal crest; Colline Brassard, Cecile Callou 2020, Fig. 1) do not always provide certain data, we have however assigned the sex when two or three characteristics are present. Since there is no exact correlation, we have preferred to record the data as

probable. There are five dogs, probably females (P1, P2, P3, P4, P5) and four males (P6, P7, P8, P9).

The sagittal crest in the individuals P1, P3 is not very evident; it is very marked in P5, P8, P9 these are probably three male dogs defined also by other morphological traits (BO, POP, SC); the crest is present, nevertheless not very marked in the remaining skulls.

The shape of the occipital hole is oval in four cases (P5, P6, P8, P9), in two cases it is keyhole shaped (P1, P7), in three other cases it is close to keyhole shape (P2, P3, P4). The smallest skull has the *foramen magnum* in the shape of a key-hole, indeed it is a characteristic of 'Toy' dogs. Although the size of the *Peltuinum* skull is not so small, in fact from the height at withers of the long bones there are no individuals smaller than 25 cm. If one refers to the explanation given by Evans (2013) in his analysis of modern dogs, it could indicate that the other four (P2, P3, P4, P7) which have a key-hole notch, being of medium to large size are not purebred dogs, but mongrels.

The evaluation of the profile (nose-frontal jump or stop) was carried out considering the angle between the line of the frontal bones and the upper line of the muzzle. None of the skulls has a very marked stop, the angle measurement was carried out digitally on photos of the profile of the skulls, showing angle values between 148°–168° ca. The numbers fall within the ultra-long linear values; therefore, it is seen with a not very marked stop. In two cases, P1, the smallest skull, and P8 have the narrowest angle values (150° ca), indicating a relatively more marked stop than the others, while in the cases of P2 and P6 the profile is continuous without a stop, and in the remaining cases, the values are between 158°–168°. These differences suggest that there are at least four different morphologies or types of dogs as morphometric analysis verified.

Breeds were defined based on skull morphology and morphometrics compared to those of current dog breeds (Phillips *et al.* 2009, Knoest 2015), pending genetic analysis. Nine skulls were whole or could be measured for morphometric analysis (Table 5, Figures 5–6). The data confirm those obtained from height at withers, there is a predominance of medium-sized dogs with two exceptions: one particularly small and one large. The analysed record is predominantly composed of two slightly diverse groups of medium-sized dogs P2-P4-P6-P7 and P3-P5-P9 with P3 being quite close to the first set, while P1, which is particularly small, and P8, which is particularly large, diverge from the two groups and from each other. The skulls in the first group all come from the IV shaft, this could suggest a choice of animals of a particular breed or size.

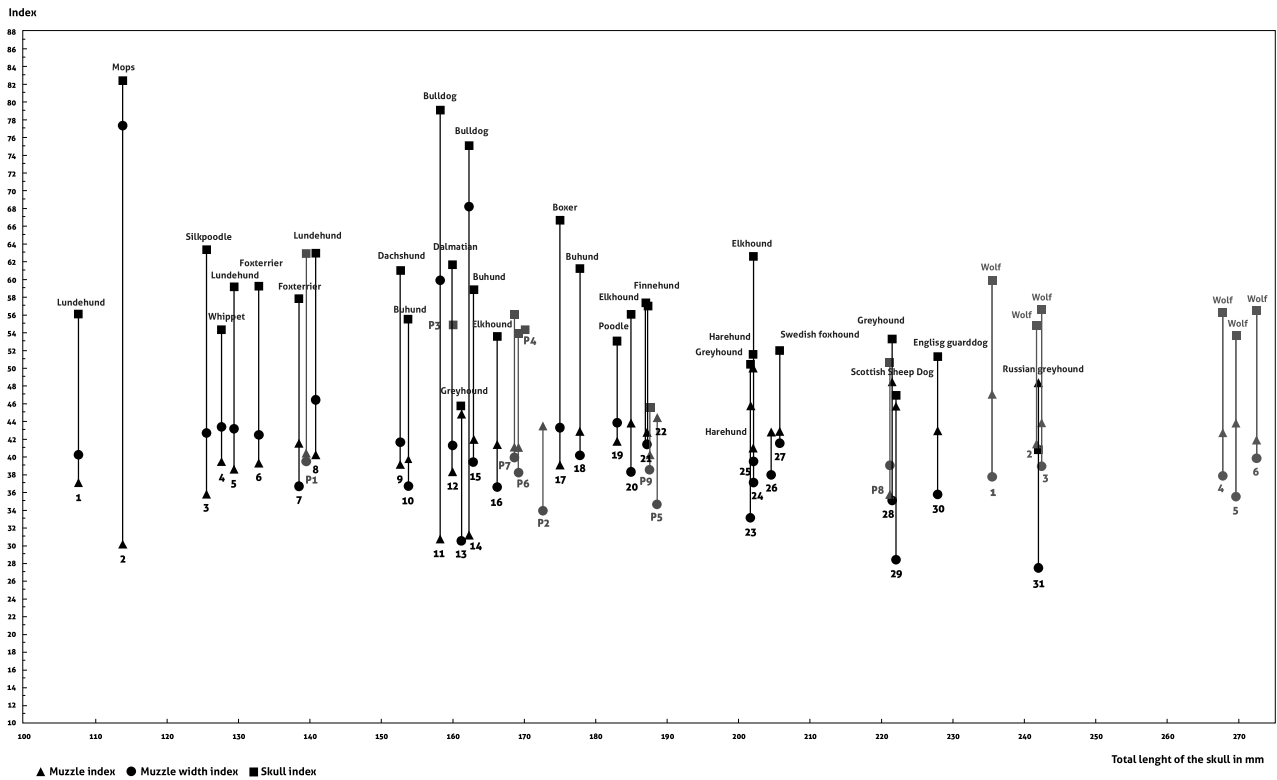


Figure 5. The skull, muzzle length and muzzle width indices for the 9 skulls of the *Peltuinium* dogs (red), the 31 skulls from modern dogs (black) and 6 skulls from modern wolf (blue), (Modified after Knoest 2015: 36).

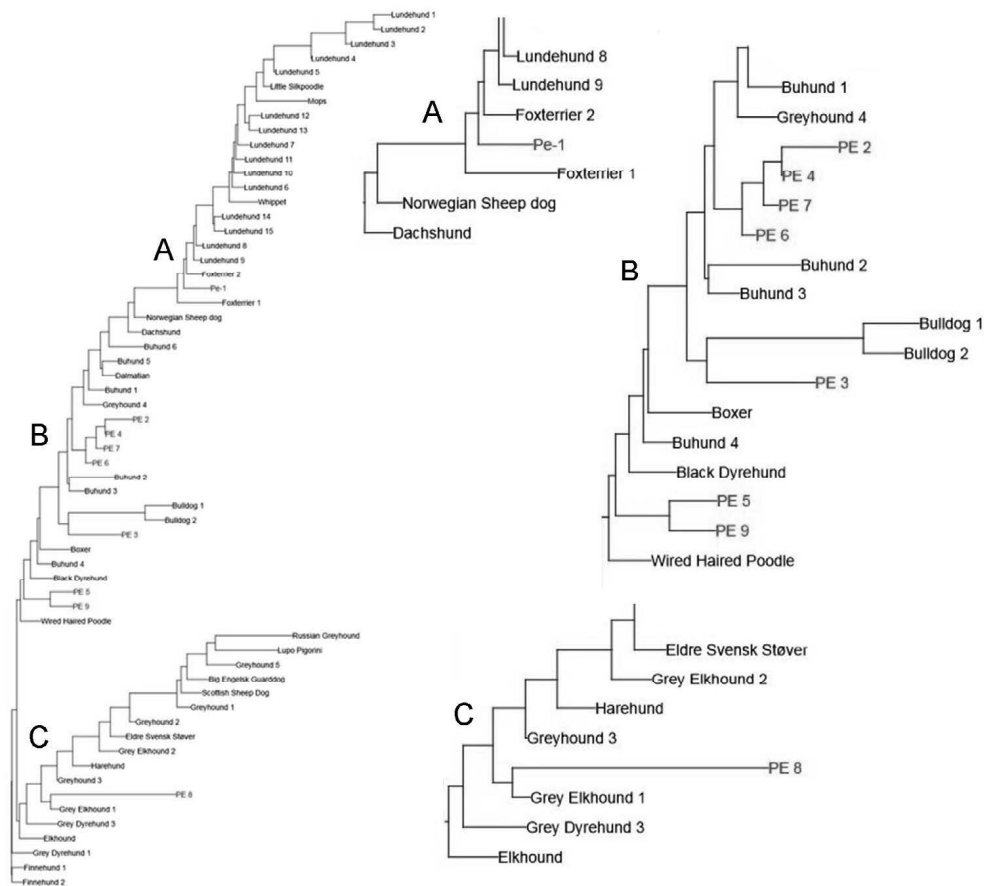


Figure 6. Neighbour joining clustering tree of selected skull measurements of some modern breeds and of the *Peltuinium* dogs. A-C details of the positions of the *Peltuinium* dogs (Data of modern breeds from Knoest 2015).

Although we believe that the comparison with current breeds should be made with prudence, we think it might be useful to have a reference to corroborate the differences found (Knoest 2015). The smaller individual (P1) with a short skull and muzzle is similar to the Terrier group (Federation Cynologique Internationale, Group 3), and resembles the Fox Terrier. The largest dog (P8), with the elongated muzzle, appears similar to the Greyhound group (FCI Group 10), with size and morphology comparable to the Greyhound. Most of the medium-sized skulls are related to the Spitz group (FCI Group 5), with size and morphology comparable to the Nordic Spitz for guarding and herding. Overall, the data seems to indicate the presence in prevalence of utility dogs in the shafts: herding, guarding, and hunting dogs and not companion dogs.

Traumatic and infectious pathologies are present. The analysis of the traces of modifications revealed two individuals with clear traces of blows on the skull (skull P3 and P4). On three skulls there were deformations on the orbits due to healed wounds (P2, P7, P8) probably due to blows in life (Figure 4).

Pathologies of infectious origin were found near the left dental arch of P8 where the left canine is broken and a halo of osteolysis on a reactive basis can be seen around the alveoli. The animal had probably suffered from an infection of dentaria. P5 skull shows rarefaction on the frontal bone possibly due to an unidentified pathology (Figure 3).

6.2 Limb long bones

The femurs are the best preserved of the long limb bones and were used for size analysis of the dogs of *Peltuinum* with some evidence also taken from the other long bones. The bones are well preserved, mostly referable to adult but not senile. Measurements of 25 whole femurs came from theatre shafts, some certainly belonging to the same individual. There is considerable variability in the size of the femurs, ranging from 103–195.5 mm in length with an average of 147 mm (Tables 6–7).

This diversity is reflected in the height at withers which ranges between 31.2–58.8 cm with an average of 44.3 cm according to the Koudelka index (1885); and between 31.3–60.1 cm with an average of 44.9 cm following the Harcourt index (1974). There is no significant variation between the two indices.

The GL length and proximal width Bp of *Peltuinum* femurs were compared with those of 42 femurs belonging to dogs of different breeds analysed by Knoest (2015, p. 70). Comparison with actual breeds should always be considered with special caution, however, it is useful to have a reference of likely size and build. The data

Table 6. Femur measurements and height at withers of *Peltuinum* dogs (measurements: von den Driesch 1976).

Femur of dogs	GL	Bp	SD	Bd	3.01 * GL (Koudelka 1885)	-12.96 + 3.14 * GL K7Z (Harcourt 1974)
N	25	24	25	25	25	25
Min	103.70	23.50	9.00	20.30	312.1	312.7
Max	195.50	39.60	14.80	34.30	588.5	600.9
Mean	147.14	31.87	11.82	26.63	442.9	449.1
Dev	24.66	4.71	1.71	3.76	74.2	77.4

Table 7. Humerus measurements and height at withers of *Peltuinum* dogs (measurements: von den Driesch 1976).

Humerus	GL	Bp	Bd	SD	Bd	Dd	3.37 * GL (Koudelka 1885)	-26.54 + 3.37 * (Harcourt 1974)
N	14	14	14	14	14	14	14	14
Min	98.2	19.0	23.0	8.2	22.3	15.4	320.2	293.6
Max	182.0	33.2	42.9	14.2	35.1	28.0	596.5	570.0
Mean	140.8	26.0	33.7	11.1	28.2	21.6	463.5	437.0
Dev	22.0	3.5	5.1	1.6	3.6	2.9	74.3	74.3

represented in the graph (Figure 7), shows that very small dogs are missing, for the rest, there are animals of different sizes. Although it is a constant that for the same length *Peltuinum* femurs have lower Bp and are therefore less robust.

The graph in Figure 8 basically shows that *Peltuinum* dogs may be distributed in three main groups.

- The first group of dogs, which are the smallest of *Peltuinum*, consists of three subgroups: a) small size 31–33 cm; b) medium-small size 38–40 cm; c) and 44 cm.
- The second comprises the group of medium-sized dogs (46–49 cm), where the largest number of measured elements is concentrated; only one element is located in the group of medium-large dogs with a height of 51–52 cm.

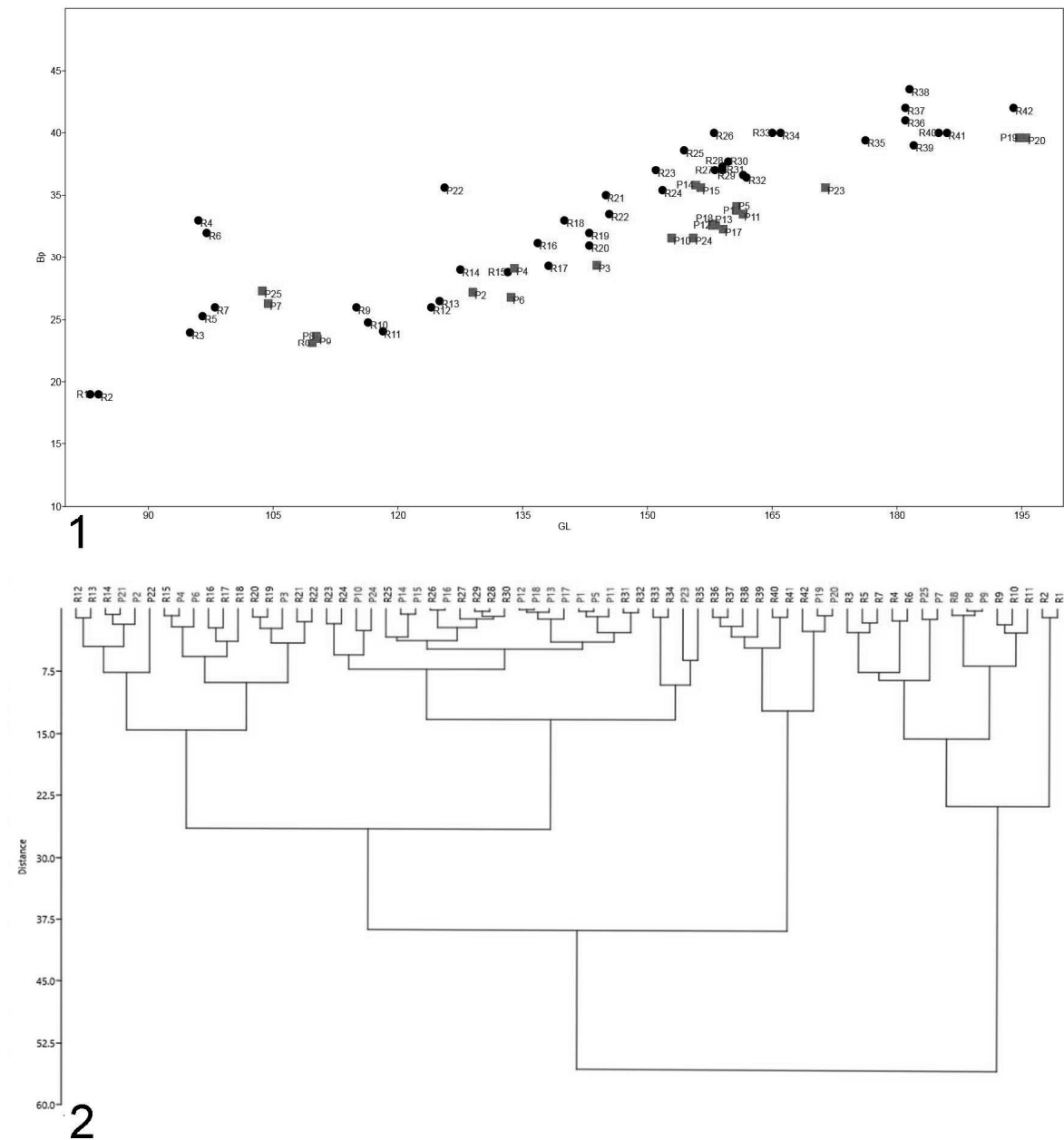


Figure 7. 1, scatterplot of the Bp (Breadth of the proximal end) of the femur against the GL (Greatest Length) of the *Peltuinum* femurs and modern breeds. 2, cluster analysis dendrogram of femurs of *Peltuinum* and of some modern breeds (Data of modern breeds from Knoest 2015).

- The third group consists of large dogs with a height of 59–60 cm.

The comparison with the dimensions of the humeri and ulnae confirms the variability found in the femurs. We note that one individual is smaller with a height at withers of 28.5–30 cm, probably the same as the smallest femur that gave values of about 31 cm. We found variability of 1–2 cm depending on the considered bones and the method of height estimation.

There are differences in the distribution of dogs in the shafts according to size particularly the dogs in shaft II

have a great variability (between 31 and 60 cm), with differences also between US. In shaft II, in effect, small and medium dogs (31–50 cm) are found in the US 881 and small and medium-large dogs (31–58/60 cm) in US 859. The femurs from shaft IV, on the other hand, are more homogenous with minimal variability in height ranging from 45–48/50 cm. This difference was already evident from the analysis of the nine skulls.

6.3 The dogs of *Peltuinum*

Considering only the height at withers estimated from the femurs of *Peltuinum* and comparing it with those of

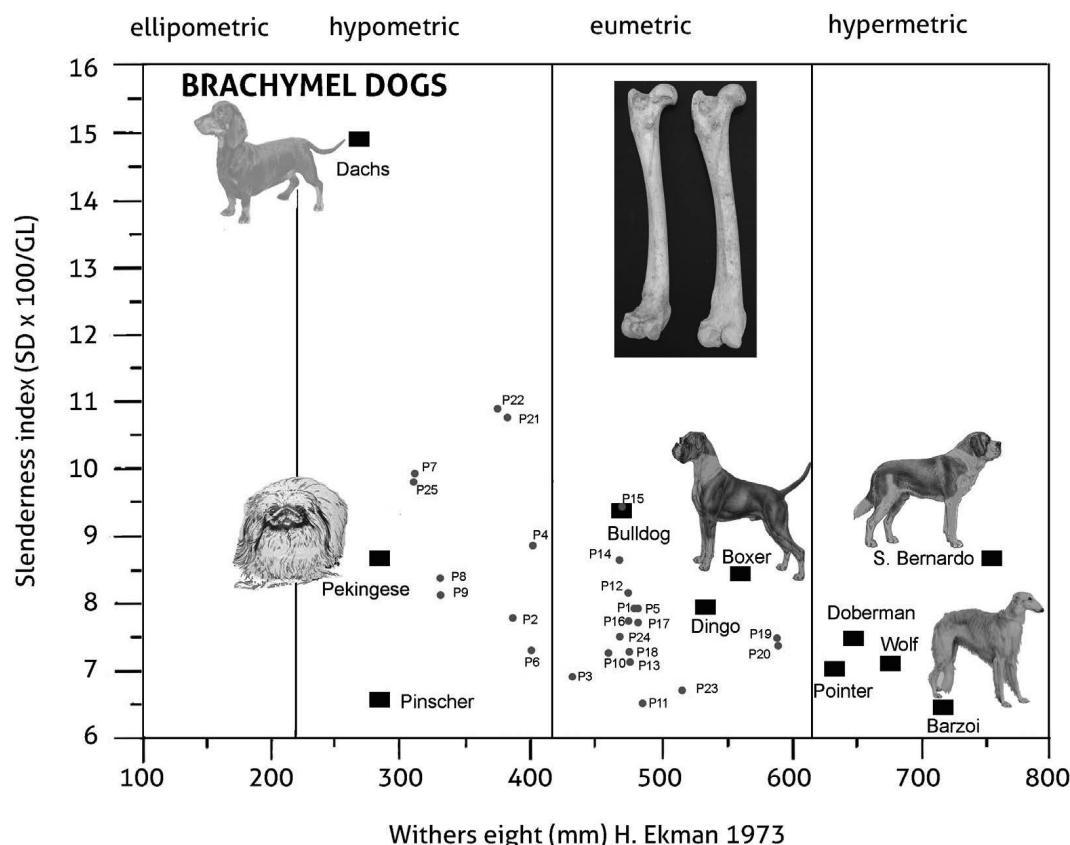


Figure 8. Graph of heights at withers from femurs of *Pelutium* (After De Grossi Mazzorin and Tagliacozzo 2000).

Vindolandia (Bennett and Timm 2016 II, p. 106), if we exclude the absence of very small dogs (under 25/30 cm) and very large dogs (over 70 cm) the remainder fall within the variability of late antique dogs. Similarly, if one considers the data from some Roman Age sites analysed by De Grossi Mazzorin and Tagliacozzo (2000, fig. 10), the withers heights of *Pelutium* fall within the size range of early and late Roman Age dogs, even if the six dogs from *Pelutium* show greater variability. The variability in size observed in the femurs of *Pelutium* may in some specimens reflect gender rather than breed diversity, in fact, both the morphological data of the skulls and the presence of os penis and fetuses (probable insertion of pregnant females) in the shafts show that dogs of both sexes are present.

The dog populations of the Roman period and *Pelutium* show a great variation in size and many morphotypes and, as considered by various authors, this is found especially in urban contexts (De Grossi and Tagliacozzo, 2000). The variability found at *Pelutium* is confirmed by the data known from ancient sources, in fact, the Romans had and bred a wide variety of dog types. The Romans classified dogs as *pastoricus* (shepherds), *villaticus* (guard dogs) and *venaticus* (hunting dogs); some dogs were also used in warfare. Marcus Terentius Varro (*De Re Rustica*) describes the characteristics of the shepherd

dog as having an intermediate body between the agile hunting dog and the robust guard dog. Hunting dogs were further classified according to their aptitude and morphological characteristics: *seguges* (bloodhounds), with a particularly sensitive sense of smell, for sniffing out game; *celeres* (greyhounds), slender and fast, for chasing game; *pugnaces* (molossoids), strong and robust, for attacking game.

In addition to the dogs owned and used for specific purposes, we cannot exclude the presence of stray dogs that lived in urban areas or in the immediate vicinity where they could easily find food and shelter. Obviously, it is not easy to find exact correlations between the types of dogs found in *Pelutium* and those known from ancient Roman sources. The hypothesis of the presence of dog-breeding in Roman times since morphological and size variability can also be confirmed by the dogs from *Pelutium*.

The analysis of the traces of modifications suggests the cause of death of at least two individuals with clear traces of damage of the skull (skulls P3 and P4). Conversely, three skulls show depression from healed wounds (P2, P7, P8) probably due to blows. These wounds appear to be the result of blows and do not appear to be the result of aggression between dogs or other animals such as

Table 8. Dogs and Humans overview of the three different contexts.

	SHAFTS	TOWER	SEWER - US 1263
DOGS MNI	68	12	1
Complete individuals	yes	yes	No
Human MNI	87	35	2
Fetal/Newborns MNI	84	8	0
Interpretation	Ritual deposition of dogs and newborn	Retrieval and re-deposition from a nearby funerary area	Disturbed deposition

in hunting accidents. The presence of healed wounds could suggest that the animals were cared for by their owners, but another possibility could be that they were village or street dogs and therefore nuisances, badly tolerated, beaten, and driven out of urban areas.

Even if on the other skulls there are no evident traces of killings, it is not excluded that other methods, e.g., strangulation, may have been used, leaving less evident marks.

7 Conclusions

This analysis allowed to better define the characteristics of the adult dogs that were placed in the *Pelutium* shafts to accompany the dead infants on their afterlife journey. They were mainly medium-sized dogs, whose morphological analysis shows that their appearance is akin to that of the Spitz group. There is also a small dog that resembles a Fox Terrier and another resembling a large Greyhound, and the study of the long bones confirms the sizes corresponding to this type of dog (Figures 5–6). The dogs are adults of different ages, but not senile; they include males and possibly pregnant females. Perhaps a choice was made in the type of dog to be included in the shafts: in shaft II there is variability in size and morphology (small, medium, and large), in shaft IV only medium-sized dogs of similar morphology (Figures 7–8).

The morphological analysis and the present comparison seem to indicate the prevalence of utility dogs in the shafts: herding, guarding, and hunting dogs; missing very small dogs (under 25 cm, pet dogs) and very large dogs (over 70 cm).

The traumas on the skulls indicate some dogs may have been maltreated during life; while in two cases there is a clear evidence of intentional killing (Figure 4).

The pathologies found at the skeletal level are rare (except perhaps one case with unidentified pathology and one with inflammation of a broken tooth and

probable osteoarthritis on the long bones of a medium-sized individual), but the traumas found at the cranial level show maltreated dogs. The wounds have healed, which may indicate that perhaps the dogs were cared for and therefore had someone caring for them, however, it is doubtful whether they were street dogs who had been beaten and chased away. Two skulls show clear traces of killing. When it comes to the choice of dog to be sacrificed, the greatest doubt remains as to whether these were animals owned by the relatives of the dead infants or whether they were actually street dogs caught and killed to accompany the infants to the world of the dead.

In antiquity, the dog played various roles: it was regarded as a companion and guide in the afterlife journey, sacrificed in special purification rites to female deities of the chthonic world, buried in a ritual closure of sacred areas, and immolated as a guardian in foundation rites of structures or city-walls; data are attested both in archaeological contexts (Camp 1986; Osanna 1993; Snyder 1999; De Grossi Mazzorin and Minniti 2001, 2006; Chenal-Venarde 2006; Bourbou and Themelis 2010; Fiore and Salvadei 2014; Pedrucci 2014; Fiore 2016; Trantalidou 2016; Migliorati *et al.* 2018; Sperduti *et al.* 2018) and in Literary Sources (Plut., Quaest. Rom. 52, 277¹; Plin., Nat. Hist. XXIX, 58²).

The funerary association of human infants and dogs is documented in Greece in the Agora of Messene in the 3rd cent. BC (Bourbou and Themelis 2010) and in a well from *Kolonos Agoraios* of Athens in levels dated 2nd BC (Liston *et al.* 2018).

The shaft in Athens contained the remains of 450 children, mostly infants or full-term fetuses, and those

¹ Plutarch, Roman Questions by published in Vol. IV of the Loeb Classical Library edition, 1936. https://penelope.uchicago.edu/Thayer/e/roman/texts/plutarch/moralia/roman_questions*/c.html (11.01.2021)

² Pliny the Elder (Translated by H. Rackham, W.H.S. Jones and D. E. Eichholz, 1868–1963). *Natural History*. London: William Heinemann

of at least 150 dogs. There are other similarities between the two contexts:

- remains of other animal species with traces of butchery,
- prevalence of medium-sized dogs,
- some dog skulls retain traces of blows with skull crushing,
- cases of healed infectious and traumatic diseases (predominantly traumatic diseases in *Peltuinum*).

In Athens healed wounds were interpreted as evidence of free-ranging urban dogs. Animals are kept at a distance and therefore not given special consideration in life.

Apart from the different chronology, the main difference is the location of the depositions. In *Peltuinum* infants and animals were laid in the few small rectangular shafts (cm 85 x 55) related to the Roman theatre, while in Athens they were deposited in one single circular sacred well (one m diameter) associated with the sanctuary of Afrodite Urania (Liston *et al.* 2018). This feature shows the intention to put the infants under the protection of the goddess, while in *Peltuinum* there appears to be no such purpose (but the different chronology has to be taken into account). Moreover, in *Peltuinum* there are numerous newborn puppies and fetuses and two whole newborn foals which are not present in the well in Athens.

The dog-infant association has been interpreted as evidence of a purification sacrifice for the premature death of infants (Osanna 1993; Little 1999, De Grossi Mazzorin and Minniti 2006, Migliorati *et al.* 2018). A similar association was also found in the infant necropolis of Lugnano in Teverina, a case closer to *Peltuinum* in relation to time and space than the Kolonos Agoraios in Athens. The 47 infant tombs and the skeletons of 12 puppies under 6 months of age and a single subadult dog (Soren *et al.* 1995, 1999) testify the spread of this type of ritual in central Italy in the 5th century AD, increasingly corroborating the hypothesis of the intentional deposition of dogs and infants. Also in this case, we must underline the differences. Apart from the absence of foals, the Lugnano infants' tombs are single depositions and this feature places the case among the typical depositions of humans associated to dogs.

It is important to point out the presence of various contexts with the human-dogs association at *Peltuinum* (Table 8). Besides the deposition in the shafts, the workers' room δ (sewer) suggest a non-intact burial. The tower, with food waste, ceramics, human bones and abundant dog remains, would suggest the

identification of a dumping area linked to a land reclamation. In the latter case it could have been an ossuary and perhaps at the time of the reburial, rituals involving dogs could have been performed.

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