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Three Dogs from the Late Iron Age Boat Grave Cemetery at Gamla Uppsala Prästgården, Sweden

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*Excavations at the vicarage yard (*prästgården*) at the famous Late Iron Age magnate centre of Gamla Uppsala, Sweden, have yielded six Viking Age (*c. *AD 750–1100) boat burials, several containing the remains of domestic dogs. The present study is an osteological examination of the remains of three of these dogs, one each from three boat graves, with a primary goal of morphological reconstruction and a secondary focus on identifying sex, age, and pathology. Two dogs were large, slender sight hounds, while the third was somewhat smaller and of indeterminate type. The preference for sight hounds in high-status graves is consistent with previous results from the contemporaneous nearby boat cemeteries of Vendel and Valsgärde, adding weight to the hypothesis of a shared funerary culture between these sites in the Late Iron Age.*

Keywords: Viking Age, Scandinavia, dogs, zooarchaeology, funerary archaeology, morphological reconstruction

Introduction

Gamla Uppsala is one of the preeminent archaeological sites of Late Iron Age Sweden (Figure 1). Though it is most famous for the colossal mound burials that dominate the site to this day, more recent research has shed light on Gamla Uppsala's function not simply as a burial or ritual ground, but as a magnate complex that wielded significant regional power (Hedeager, 2008; Ljungkvist & Frölund, 2015). In the sixth century AD, Gamla Uppsala rapidly developed into a monumental site, and during the Vendel period (*c.* AD 550–750) came to function as a combined royal, ritual, and economic settlement and burial centre. In the Viking Age (*c.* AD 750–1100) it became a symbol of a legendary past and remained a pre-Christian cultic centre until the final decades of the Viking Age. Thereafter, a bishopric was established at the site, so that Gamla Uppsala remained a ritual centre (albeit transformed) into the Middle Ages, ultimately emerging as the archdiocese of Sweden (Rahmqvist, 1986; Ljungkvist, 2000).

In addition to the royal mounds, evidence of substantial local settlement and funerary practice abounds, though Gamla Uppsala never reached urban status, or what could be defined as a 'town' (Ljungkvist, 2000; Klevnäs, 2007). The

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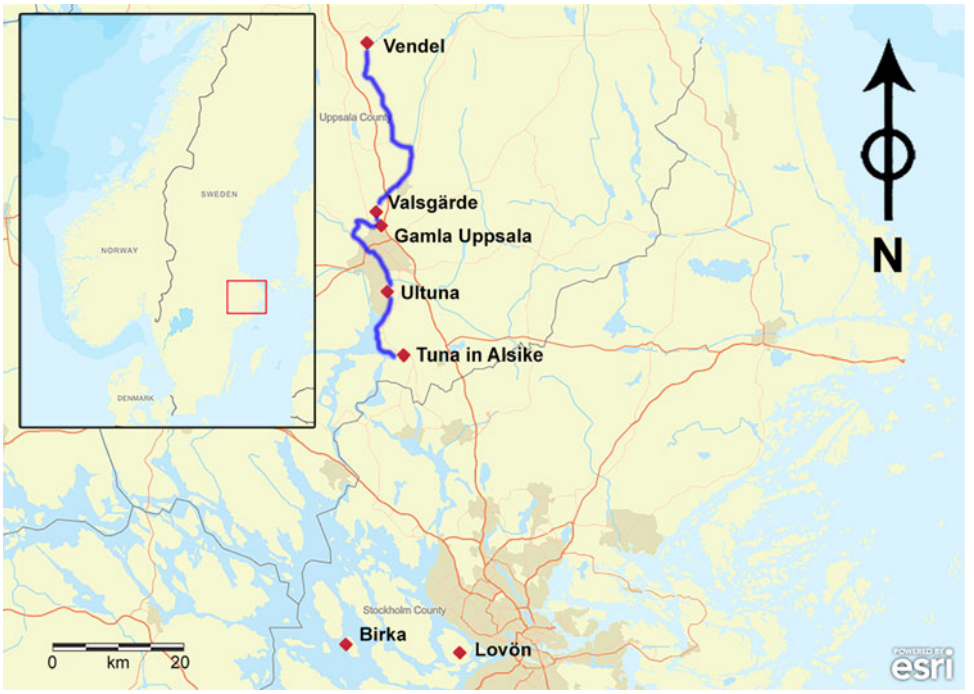

Figure 1. *Map of southern and central Sweden, showing the location of Gamla Uppsala and other sites discussed. The waterway linking the sites is highlighted in dark blue.* Map generated using ArcGIS. Basemap ('Streets/Rues') generated by Esri, HERE, Garmin, Foursquare, FAO, METI/NASA, USGS.

focus of this study is a small Late Iron Age cemetery located in the vicarage yard (*prästgården*) on a terrace slightly northwest of the mounds, which has thus far produced six boat inhumations and five cremation graves (Nordahl & Malmius, 2001; Klevnäs, 2007; Strehlau, 2018; Arkeologerna, 2023). These graves yielded human remains and artefacts, as well as the bones of animals. Human graves accompanied by animals were a widespread phenomenon in Late Iron Age Scandinavia, with the greatest number of graves containing animals located in what is now Sweden (Prummel, 1992). Overall, the domestic dog (*Canis familiaris*) is the most common species represented, persisting through the Vendel period and Viking Age and associated with people of variable status, age, and sex, and a variety of burial forms (Sten & Vretemark, 1988; Gräslund, 2004; Jennbert, 2011; Strehlau, 2018: 30–33).

Within Sweden, this phenomenon is archaeologically best attested in the Mälaren region of central-eastern Sweden (that is, the region identified as the historical *Svíþjóð* or Svealand, the realm of the *Svíar* or Svear; Brink, 2008; Lindkvist, 2008), especially in high-status graves of the Vendel period. Elite graves in this context, both free-standing and as part of cemeteries, often contain copious quantities of animal remains from a wide variety of species, mostly domesticates (Öhman, 1983; Sten & Vretemark, 1988; Strehlau, 2018; Nichols, 2021). Conversely, in the Viking Age, while more graves containing animals have been archaeologically identified overall, the animal assemblages of elite graves in the Mälaren region are generally smaller, often containing only a single

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horse and/or dog (Prummel, 1992; Strehlau, 2018). This pattern is clearly visible at the famous Vendel and Valsgärde cemeteries, which feature boat graves from both the Vendel period and Viking Age (Öhman, 1983; Nichols, 2021).

The differential treatment of animals in graves constitutes another line of evidence. Certain species, such as cattle, sheep, and pig, tend to be disarticulated and are often represented solely by bones from the 'meaty' parts of the body; conversely, animals such as dogs, horses, and raptors are far more likely to have been buried or burned intact (Sten & Vretemark, 1988; Strehlau, 2018). The most plausible interpretation is that the former were slaughtered and butchered in conjunction with a funerary feast, while the latter were killed specifically as a sacrifice to the person being laid to rest, to serve as companions in the afterlife (Jennbert, 2011: 69, 163). In a recent study of fourteen burial grounds featuring animal remains throughout the Mälaren region, seventy-six per cent of all dogs identified were determined to have been placed intact in the grave (Strehlau, 2018: 36).

The osteological examination of dog remains from three of the boat graves from the Gamla Uppsala Prästgården cemetery (Prästgården hereafter) is presented here. The remains of three dogs are the subject of morphological reconstruction, as well as demographic (sex and age) and pathological analysis. The morphological reconstruction is the primary goal of this article, given that it allows for most comparison with contemporaneous sites (see below), and gives a clearer picture of the overall state of dog husbandry in the cultural context of the Vendel Period and Viking Age. However, data on sex, age, and pathology are still included for the reference of future research.

The results are then compared with the dog remains from the contemporaneous grave cemeteries of Vendel and Valsgärde in Uppland, Sweden; these cemeteries provide excellent opportunities for comparison not only because of their cultural, geographical, and temporal proximity to Prästgården, but because they also contained unburned boat graves with dog remains that have been subjected to osteological analysis (Öhman, 1983; Nichols, 2021). A comparison of these results allows for speculation on the role of canine companionship in the funerary customs of the Late Iron Age Svear elite more broadly.

Materials and Methods

Of the six boat graves at Prästgården, four (designated Prästgården 36, 1, 2, and 3) were found during excavations in the 1970s, and the contents of these graves are currently housed at the Museum Gustavianum in Uppsala. Prästgården 1, 2, and 3 showed clear evidence of having been opened and robbed in the past, while only Prästgården 36 remained undisturbed (Klevnäs, 2007). In 2019, archaeological investigations uncovered two additional boat graves, which are currently under study by archaeologists and osteologists at the archaeological company Arkeologerna (2023) and await full publication. Thus, the present article deals only with the graves excavated in the 1970s.

Three dogs were identified in these graves: one each in Prästgården 36, 1, and 3. The dogs in Graves 36 and 1 were very well preserved, with the vast majority of the skeleton present. In Prästgården 3, on the other hand, all skeletal material was badly damaged; the canine remains are thus of only limited use in morphological reconstruction.

After identification, a minimum number of individuals (MNI; here referring exclusively to dogs unless otherwise noted) was determined for each grave, with each dog given a designation noting the grave and its number within that grave (e.g. Prästgården 36 contained a single dog, designated 36a; additional dogs

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would have been designated 36b, 36c, etc.). All skeletal elements were recorded in a database and measured following von den Driesch (1976). Morphological reconstruction proceeded from these measurements using the methods detailed below.

Post-cranial reconstruction

Long bones were measured for three primary dimensions: greatest length (GL), narrowest diaphyseal breadth (SD), and distal epiphyseal breadth (Bd). Metapodials (bones of the feet) and vertebrae were measured only for greatest length.

The withers height—the height of the dog at the shoulders when standing—is estimated via regression formulae applied to the greatest length of the humerus, radius, ulna, femur, tibia, and metapodials (Harcourt, 1974; Clark, 1995). A height estimate is obtained from each relevant complete bone in an assemblage, and the final result reported is the average of all these results. Based on withers height, dogs are classified into one of seven categories (following Belhaoues, 2011): dwarf (<25 cm); very small (25–29 cm); small (30–39 cm); medium (40–49 cm); medium-large (50–59 cm); large (60–69 cm); and very large (≥70 cm).

Limb slenderness index (*SI*) is the ratio of greatest length to narrowest diaphyseal breadth of the humerus, radius, femur, and tibia, represented by the formula $SI = SD \times 100/GL$ (De Grossi Mazzorin & Tagliacozzo, 2000). This is used to gauge the general 'build' of the dog and aid in type classification (see below). The final result reported is the average of all results obtained from a single individual's complete long bones. Building on the work of De Grossi Mazzorin & Tagliacozzo (2000), I propose three categories for slenderness index: slender (6–7.9); medium (8–9.9); and robust (10–11.9).

The final post-cranial result involves minimum body length, here determined simply as the sum of the lengths of all preserved cervical, thoracic, lumbar, and sacral vertebrae (i.e. C1–7; T1–12; L1–5; S1–3). Minimum total length can be obtained by adding to this length the basal length of the skull and the combined length of all preserved caudal vertebrae. This will by necessity be an underestimate, as it does not factor in intervertebral discs, but given an average intervertebral disc width of *c.* 5 mm in medium-large dogs (de Decker et al., 2012), this is only likely to underestimate the length by less than 1.5 cm, which should not significantly affect the result.

Cranial reconstruction

The fragmentary nature of the dog skulls at Prästgården has made cranial index, and therefore basic cranial shape, impossible to ascertain. Consequently, cranial morphology is reported based on the minimum length of the skull, as well as the following three indices (following Hourani, 2018): snout index (*SI* = muzzle breadth / snout length); palatal index (*PI* = palatal breadth / median palatal length); and mandibular slenderness index (*SIm* = height of corpus / total length).

Additionally, where post-cranial remains are in an insufficient state of preservation to allow for reliable size reconstruction, the length of the maxillary cheek-tooth row (total length from P^1–M^2), the length of the maxillary carnassial tooth (P^4; largest upper premolar), and the length of the mandible can provide reliable, if less precise, alternatives (De Grossi Mazzorin & Tagliacozzo, 2000) (Table 1). Abbreviations for the teeth are noted in the following manner: maxillary incisors: $I^{1–3}$; maxillary canine: C^1; maxillary premolars: $P^{1–4}$; maxillary

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Table 1. *Dog size categories in mm, based on craniomandibular measurements (following von den Driesch, 1976; size categories and numerical values follow De Grossi Mazzorin & Tagliacozzo, 2000).*

Size category	Mandible length	P^1–M^2 length	P^4 length
Small	<113	<55	<16
Medium-small	113–124	-	-
Medium	125–135	55–67	16–20
Medium-large	136–146	-	-
Large	≥147	>67	>20

molars: $M^{1–2}$; mandibular incisors: $I_{1–3}$; mandibular canine: C_1; mandibular premolars: $P_{1–4;}$ mandibular molars: $M_{1–3}$.

In sum, post-cranial morphology is based on four primary factors: withers height, limb slenderness index, body length (C1–S3), and total length (tip of snout to tip of tail). Cranial morphology is also based on four factors: minimum condylobasal length, palatal index, snout width index, and mandibular slenderness index.

Type classification

All these factors, plus certain observable characteristics such as severity of the nasal stop (the curved section on the top of the skull where the snout transitions into the forehead), spacing of the teeth, and relative proportions of the limbs, are combined to categorize each dog into one of four morphotypes:

- Spitz: generally wolf-like dogs in a wide variety of sizes (to which all modern Nordic breeds belong). A modern example is the Norwegian Elkhound.
- Sight hound: gracile dogs with long necks and dolichocephalic heads (including lurchers, being crossbreeds between a sight hound and a dog of another type). A modern example is the Borzoi.
- Molosser/mastiff: powerfully built dogs often with foreshortened snouts. A modern example is the Rottweiler.
- Lap dog: any dog small enough to lie in a human's lap. A modern example is the Pomeranian.

Dogs of these four types have existed in Europe since antiquity (von Mosczinsky, 2001; Gräslund, 2004), but they are not synonymous with modern breeds, which are defined by clear standards, most of which did not exist until the modern period. For obvious reasons, morphotype categorization becomes more reliable the more of the skeleton is preserved. This is rarely completely definitive, for several reasons. First, a significant amount of skeletal similarity can often be seen between types, as well as morphological diversity within types. Second, in an age with no evidence for standardized pedigree breeding, we cannot account for exactly how much hybridization took place between dogs of different type. It is conceivable that dogs bred for specialized tasks, or dog types with prestige value attached, were more commonly paired with dogs of a similar type, but this is as yet entirely speculative.

Lap dogs may be determined by size alone; they have been noted at the Late Iron Age cemeteries of Tuna in Badelunda, Västmanland (Gräslund, 2004), Lovön (Petré, 2000), and Birka in Uppland (where they represent the majority, rather than the exception; Prummel, 1992). Sight hounds are arguably the next most recognizable, often featuring an almost flat nasal stop and radii and tibiae that are longer, respectively, than the humeri and femora (von Mosczinsky, 2001).

Age and sex represented

Sex can only be conclusively determined by the presence of a baculum (penis bone)

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indicating a male individual. Where not present, Ruscillo's (2002) 'table test' is applied, in which the humerus is placed on its anteroventral surface and observed for movement: if it remains stable, female is suggested with sixty-nine per cent confidence; if it tips over, male is suggested with eighty-five per cent confidence. Here, the test is run ten times on both humeri to ensure the integrity of the result.

Minimum age is assessed primarily by the ossification of different elements of the skeleton, with the sciatic tuberosities of the os coxae being the last to fuse at *c.* two years old (Silver, 1969: 251–53). Dogs with this feature can be considered fully adult. A high degree of dental wear can potentially be assessed as a marker of advanced age, but this is problematic given the dogs' variable diets and their tendency to chew hard objects from a young age (Silver, 1969: 256–65).

Pathology and taphonomy

Any visible pathological changes to the skeleton were noted. Appropriate osteological methods were used to determine whether changes were caused by disease or injury during life, whether any healing had taken place before death, and whether any preliminary diagnosis could be made (Waldron, 2009; Bartosiewicz, 2013).

The Dogs in the Burials

Each grave under study contained a minimum of one dog. Earlier osteological accounting of Grave 1 concluded an MNI of two dogs (Nordahl & Malmius, 2001; Strehlau, 2018, a discrepancy owed to the probable misidentification of numerous sheep bones as dog bones) but the present analysis revealed no duplicate canid skeletal elements, therefore the MNI is one. Given the sheer ubiquity of dog remains in human graves in this cultural context, they can reliably be considered intentional depositions, especially in Graves 36 and 1 where the dogs show signs of having been carefully placed. All graves examined in the present study contained several other species in addition to the dog remains, but these are beyond the scope of this article (see Nordahl & Malmius, 2001 and Strehlau, 2018 for more information).

Prästgården 36

Prästgården 36, dated to the ninth century AD, belonged to a female descendent at least forty-five years old at death (Nordahl & Malmius, 2001; Klevnäs, 2007). The boat itself was of dugout type, pointed at both the bow and stern with a gunwale nailed on (evidenced by the presence of nails outlining the perimeter of the boat but no rivets indicating a constructed hull). Grave goods included bronze and silver personal ornamentation, as well as an iron handle from what was likely a wooden bucket. The dog (36a) was placed to stern, on the aft-most section of the portside gunwale; in addition, the grave also contained the remains of a chicken and a sheep (Strehlau, 2018).

Dog 36a is in an excellent state of preservation, with most of the cranial and postcranial skeleton in good condition. Pertinent to this study, all long bones were present (all but the left femur and tibia were complete), as were seventeen of twenty metapodials. Only the base of the braincase was preserved but the snout is mostly intact, including a full set of teeth (with the sole exception of the right M_3). The majority of the spinal column was also present, including fourteen caudal vertebrae. Vertebrae T2–6 were, however, missing. Explaining the loss of T2–6 requires further consideration. That the ribs which would have been attached to these

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vertebrae were preserved indicates that these vertebrae were still present when the dog was inhumed; given the otherwise excellent state of the remains, it is difficult to ascribe the loss of these vertebrae to decomposition. It is more likely that these bones were crushed during or after burial, an explanation further supported by the post-mortem damage to the surrounding vertebrae T1 and T7. I therefore conclude that the dog was buried intact.

A clue may come from the position of the dog in the grave. After the grave was backfilled, it was marked above ground with a stone setting that traced the shape of the boat (Klevnäs, 2007). The dog, placed along the gunwale of the boat, would have lain directly beneath the outline of this monument, and it is possible that a heavy stone placed directly over its thorax could have crushed these vertebrae. Alternatively, it is possible that the crushing episode occurred later, when the soft contents of the thoracic cavity had fully or partially decayed, resulting in a sizeable void in the ground beneath the stone: the stone could thus have sunk and crushed the vertebrae beneath it. The fact that the skull, which was also along the gunwale, was not fully crushed does not negate this scenario: it is possible that the stone over the skull was wider, or simply placed more carefully, than that over the thorax.

Prästgården 1

Prästgården 1 dates to approximately AD 900 and belonged to a male occupant aged between thirty-five and forty-five at death (Nordahl & Malmius, 2001; Klevnäs, 2007). Unlike Grave 36, but like the majority of Viking Age vessels, the boat in Grave 1 was clinker-built. The dog (1a) was located on the starboard side of the boat, near the human remains. The archaeological assemblage of this grave contained a dog's leash, placed on the starboard side in close proximity to the dog itself, possibly indicating the dog was leashed when placed in the grave. Other grave goods included a knife, strike-a-light, bone gaming pieces, pieces of burnt clay, and a Thor's hammer ring. The remains of horse, sheep, pig, cattle, bird, fish, and bear (represented solely by claws, evidencing a bearskin blanket) were also present (Strehlau, 2018).

Dog 1a is also almost entirely preserved, and the bones themselves are in good condition. All long bones (except the right tibia) are present, as well as sixteen of twenty metapodials. The skull is mostly complete, including both mandibles and most teeth. Perhaps most remarkably, given their small size and delicate nature, the basihyoid and left stylohyoid have survived. The presence of nearly all cranial, axial, and appendicular elements (including a full vertebral column with fourteen caudal vertebrae), as well as small elements such as hyoid fragments and phalanges, confirms beyond reasonable doubt that the dog was buried intact.

Prästgården 3

Prästgården 3, which was severely plundered, retained very few human remains and can only be broadly dated to the Viking Age (Klevnäs, 2007). The boat was evidently clinker-built. The grave contained a minimum of one dog (3a). Its mandible was located roughly amidships, with the rest of the bones distributed throughout the robber fill layer; other species represented included horse, pig, and cattle. It has been speculated that the animal remains in this grave were associated with a nearby, much later, single horse burial, or else that they were deposited by the robbers of the grave to 'appease' the grave's occupant (Nordahl & Malmius, 2001; Klevnäs, 2007). A simpler explanation would be that these

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animals were interred during the original burial, disturbed when robbers broke in, and then hastily reinterred when the grave was backfilled.

Most of the dog's skeleton has been lost. Enough elements from the mandible, fore- and hindlimbs, and a single vertebra (C6) remain to indicate that this dog was buried intact; however, these remains are in extremely poor condition.

Results

Post-cranial morphology

The measurements of the long bones and metapodials used in size reconstruction of all three individuals are found in Tables 2–4.

In 36a and 1a, the near completeness of the skeletons meant that post-cranial morphology could be reconstructed with a high degree of accuracy (Table 5). In post-cranial terms, the two dogs are extremely similar, with nearly identical withers height (placing them both in the large category) and slenderness index. Proportionate to withers height, the slenderness index of both dogs indicates individuals of above-average slenderness, of a build roughly similar to a modern Dobermann (De Grossi Mazzorin & Tagliacozzo, 2000). Unfortunately, body/total length cannot be reliably compared, as the five missing thoracic vertebrae of 36a mean its results are severe underestimates.

The fragmentary nature of dog 3a rendered it unsuitable for calculation of withers height, slenderness index, or body/total length. Consequentially, morphological comparison with the other two

Table 2. *Measurements of long bones of Dog 36a. All measurements (in mm) follow von den Driesch (1976).*

Dog 36a Bone	Greatest length (GL)	Narrowest breadth (SD)
Humerus (right)	185	14.4
Humerus (left)	185.5	14.4
Radius (right)	184	14.2
Radius (left)	184.5	14.5
Ulna (right)	218	-
Ulna (left)	219	-
Femur (right)	200.5	14.4
Femur (left)	>188	14.4
Tibia (right)	215	14.4
Tibia (left)	>208.5	14.7

Table 3. *Measurements of long bones of Dog 1a. All measurements (in mm) follow von den Driesch (1976).*

Dog 1a Bone	Greatest length (GL)	Narrowest breadth (SD)
Humerus (right)	189.8	14.4
Humerus (left)	188	14.3
Radius (right)	193	14.7
Radius (left)	>190	14.3
Ulna (right)	223	-
Ulna (left)	224	-
Femur (right)	203.2	<15.3
Femur (left)	>200	<15.3
Tibia (right)	-	-
Tibia (left)	>75	-

Table 4. *Measurements of long bones of Dog 3a. All measurements (in mm) follow von den Driesch (1976).*

Dog 3a Bone	Greatest length (GL)	Narrowest breadth (SD)
Humerus (right)	-	
Humerus (left)	>55.7	13.6
Radius (right)	>61.2	12.9
Radius (left)	-	
Ulna (right)	-	-
Ulna (left)	>32	-
Femur (right)	>59	-
Femur (left)	-	-
Tibia (right)	>84	-
Tibia (left)	-	-

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Table 5. *Comparison of post-cranial morphological reconstruction of dogs 1a and 36a.*

Dog	Withers height (cm)	Limb SI	Body length (cm)	Total length (cm)
36a	60	7.5	>63	>112
1a	61	7.6	110	124

specimens can only be made on the basis of the mandibular length (see below).

Cranial morphology

The fragmentary nature of the craniomandibular remains made it impossible to determine the cranial index for any individual. Dog 3a was represented solely by an incomplete left mandible, not long enough to compare it in terms of absolute size to 36a or 1a; 3a's mandibular carnassial (M1) is similar in length to those of 36a and 1a, but the mandibular carnassial is not a reliable indicator of dog size (following De Grossi Mazzorin & Tagliacozzo, 2000). A side-by-side comparison of the three mandibles shows that the teeth of 3a were more closely packed than those of 36a and 1a (Figure 2A). This may indicate a different morphotype with a less elongated jaw, or alternatively, it may be a consequence of the dog's smaller size overall. The minimum mandibular length of >121 mm indicates a dog of at least medium-small size, but this is an underestimate of at least 10 mm. Accounting for this missing length would place the dog in the medium category.

Like the post-cranial results, the cranial results indicate dogs of very similar size; the largest discrepancy is in the mandible length, with 36a exceeding 1a by only 5.5 mm (roughly four per cent). Notwithstanding the general metric similarities between dogs 36a and 1a, however, naked-eye observation of the crania nevertheless suggests dogs of different skull shape (Figure 2B).

In 1a, it can easily be observed in the craniofacial region that the dog had a gracile snout with little to no nasal stop. The profile of the mandible is also relatively flat, with $M_{2–3}$ not turning upwards at an angle. These features are strongly suggestive of a sight hound. This conclusion is further supported by the dog's height, and the fact that its lower limbs are longer than its upper limbs (von Mosczinsky, 2001).

In 36a, the nasal stop is more pronounced, and the snout and mandible are generally more robust overall. Additionally, the mandible has a more curved profile, with $M_{2–3}$ curving upwards at an angle. These features are generally more reminiscent of a spitz, though they can also be seen in certain, robust modern breeds of sight hound (e.g. the much larger Irish Wolfhound). In post-cranial terms, however, the fact that the length of the lower limbs exceeds that of the upper limbs, and by the general post-cranial resemblance to 1a, rather suggests a sight hound. This apparent blending of traits may simply reflect either the morphological variability of the sight hound category, or that 36a was a lurcher, a highly likely possibility in an age before pedigree breeding.

Not enough of the skeleton of 3a remains to reliably assess morphotype. The gracility of the long bones and the length of the mandible rule out a molosser or lap dog. The remaining options are a gracile spitz, or a smaller sight hound with consequently a shorter jaw, causing crowding of the teeth.

Age and sex

The fusion of the sciatic tuberosity indicates that 36a and 1a were individuals at

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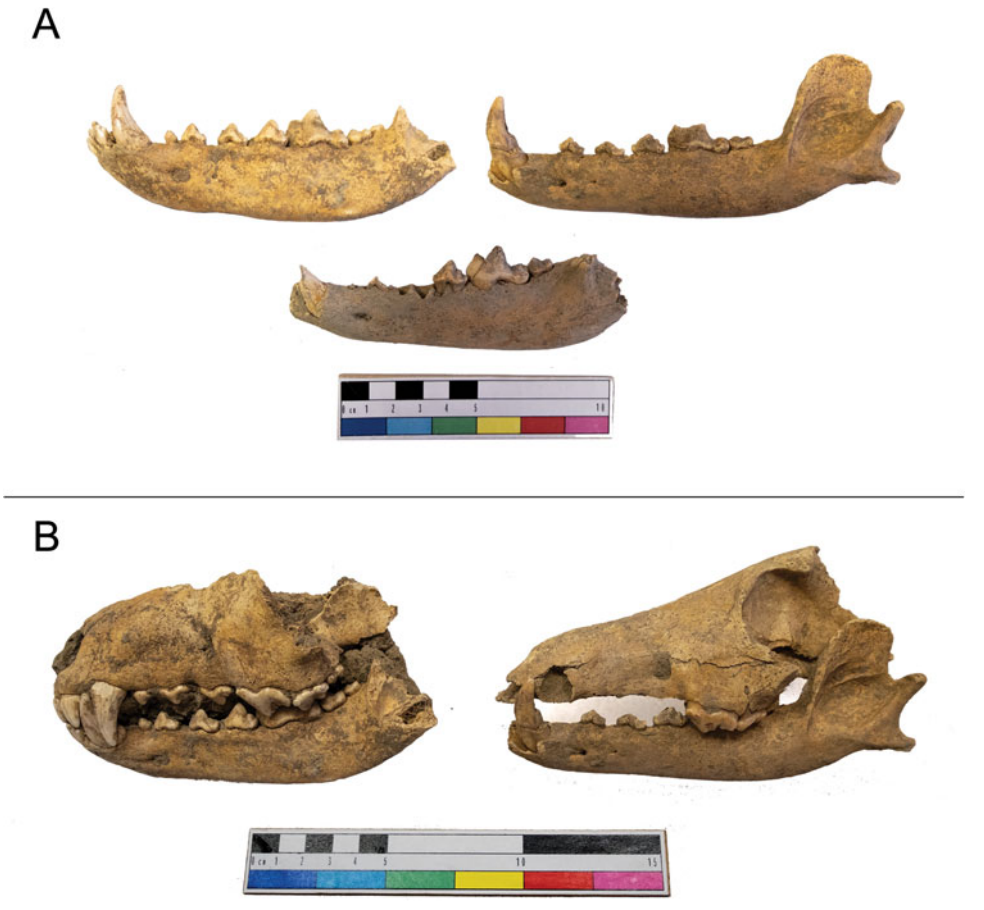

Figure 2. *A: mandible (left) of Dog 36a (top left), Dog 1a (top right), and Dog 3a (bottom); B: cranial remains of Dog 36a (left) and Dog 1a (right).*

least two years old at death; for 3a, the fusion of the distal radial epiphysis indicates a dog at least eleven months old (Silver, 1969: 251–53).

Dog 36a featured a baculum, confirming this individual as male. Dog 1a had no baculum, and given the excellent state of preservation, this alone suggests a female; when the table test was applied, both humeri remained stable in all repetitions, strengthening this conclusion. Dog 3a was not sufficiently preserved to assess sex.

Two tables summarize the information given above, listing cranial data for our three dogs (Table 6) and recapitulating the overall findings (Table 7).

Pathology

Dog 1a was the only dog showing visible pathological changes to the skeleton. Most of the main mesial cusp and distal cusp of the right maxillary carnassial were lost to a massive groove (Figure 3A). The roundness of the groove suggests that after the tooth suffered a fracture, the jagged edges were smoothed out either by natural use wear or by direct human intervention (filing). This would not be the only example of something like 'dentistry' in dogs in this cultural context, as several dogs from the Vendel Period and Viking Age at Valsgärde showed evidence of care

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Table 6. *Cranial information for all dogs. All measurements in mm. * Average of left and right side measurements.*

Dog	Min. CB length	Snout index	Palatal index	P^1-M^2 length	P^4 length	Mandible length	Mandibular SI	M_1 length
36a	>185	-	62.6	73*	19.5*	152.5*	17.5	23.7*
1a	≥192	36.5	61.2	70.5*	18.6*	147*	17.1	22.6*
3a	-	-	-	-	-	>121 (left)	-	23.5 (left)

Table 7. *Summary of information for all dogs.*

Dog	Size	Build	Age	Sex	Morphotype
36a	Large	Slender	≥2 years	Male	Sight hound
1a	Large	Slender	≥2 years	Female	Sight hound
3a	Medium-	?	≥11 months	?	?

given after the loss or extraction of major teeth, preventing infection, and ensuring healing (Nichols, 2018).

There are two symmetrical pathological changes in the mandible. Both first premolars have been lost, with the gomphoses (joints where the roots of the teeth articulate) fully healed without any evidence of remodelling or periodontal disease, and both mandibular canines feature a small patch of wear, resembling caries, on the distal-lingual surface (Figure 3B). Both changes may be due to the dog carrying or tugging heavy objects with its jaws, with the small premolars being steadily eroded from above and the more robust canines being worn down only where they came into repeated friction. Loss of the premolars could also simply be a natural result of tooth loss with age; but the dog shows no evidence of being particularly elderly otherwise, and the symmetrical loss of these specific teeth close to the marks on the canines suggests that these pathologies are related.

Finally, Dog 1a's left calcaneus features a large abscess on the medial surface of the calcaneal process (Figure 3C), likely to be

Figure 3. *Pathologies present in Dog 1a. A: maxilla (left) showing break to P^4; B: mandible showing wear on canines; C: calcaneus (left) showing large abscess.*

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the result of a wound to the ankle becoming infected. The cortical bone on the abscess suggests a degree of remodelling had taken place, but the hollow centre suggests that the wound had not fully healed at the time of the dog's death. No other bones in the region showed signs of damage, suggesting a highly localized injury.

Discussion

The boat graves at Prästgården are the only ones of their kind at Gamla Uppsala, a landscape otherwise dominated by cremation burials (most of which have not been thoroughly archaeologically investigated) (Klevnäs, 2007). The most obvious points of comparison are instead the boat grave cemeteries of Valsgärde and Vendel, both of which feature dog remains that have been analysed osteologically (Öhman, 1983; Nichols, 2021). While the Viking Age graves there will be of particular interest given the dates of the Prästgården graves, dog burials of the Vendel period and Viking Age at these sites are remarkably similar in most regards. The major discrepancy is in numbers: the mean number of dogs per grave in the Vendel period at both sites is above two, with at least one dog in each grave, whereas only a minority of Viking Age graves at either site contain any dogs at all, and only two graves contain more than one. All graves in the present study—all dated to the Viking Age—contain only a single dog.

All dogs at Prästgården—even the poorly preserved 3a—were buried intact; this conforms to the standard not only at Vendel and Valsgärde, but throughout the Mälar region more broadly during the Late Iron Age (Öhman, 1983; Sten & Vretemark, 1988; Sjöling & Bäckström, 2014; Strehlau, 2018; Nichols, 2021). The two dogs that can be reliably morphologically reconstructed (36a and 1a) appear to be sight hounds of a height at the withers remarkably similar to the majority of dogs deposited at Vendel (mean 60 cm; Öhman, 1983) and Valsgärde (mean 61 cm; Nichols, 2021).

The near uniformity in dog withers height at Vendel and Valsgärde over several centuries and the overrepresentation of sight hounds are among the more significant findings of earlier studies of these sites, and the data from dogs 36a and 1a at Prästgården seem to confirm this further. This is line with a general preference for dogs of medium-large to large stature throughout Sweden (see Ekman, 1973; Boessneck et al., 1979; Sten & Vretemark, 1988; Prummel, 1992; Iregren, 1994; Petré, 2000; Andersson, 2014), with the exception of the Viking Age city of Birka, where small dogs were in the majority (Prummel, 1992), probably owing to a crowded urban environment. However, most sites show a far greater range of variability, with dogs of small, medium, and large stature. Against this, the extremely narrow range of variation seen at Vendel, Valsgärde, and Prästgården represents a distinct phenomenon, probably symptomatic of the general similarity of the burial custom exhibited at the three sites.

This similarity may well be explained geographically, as these three sites are all connected by a major network of waterways. The Fyris river (Fyrisån), which runs directly through modern Uppsala, is likely to have represented a 'highway' in the region, allowing for travel between the magnate centre at Gamla Uppsala and the boat cemeteries in the region. Of these, Valsgärde and Ultuna lie respectively north and south of Gamla Uppsala on Fyrisån itself; Vendel is connected via the adjoining river Vendelån further north, and Tuna in Alsike links in via the northernmost gulf of Lake Mälaren slightly south of modern Uppsala. The dog remains from Ultuna and Tuna in Alsike, several of which have been described as 'large' (Prummel, 1992;

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Sjöling & Bäckström, 2014: 71), have yet to be studied in detail. Precise measurements and morphological reconstruction will be a first step towards testing the geographical limits of what we might call the 'sight hound phenomenon' observed at Prästgården, Valsgärde, and Vendel.

The primary difference between the Prästgården dogs and their contemporaries at Vendel and Valsgärde is their position in the graves. While at these sites most dogs were placed on or near the forward portside railing (although occasional departures from this practice are known), the three graves at Prästgården show no pattern: 36a was placed to port in the stern, 1a to starboard amidship, and 3a is uncertain.

Sight hounds

Sight hounds have been recorded in high-status graves throughout the Mälar region, often in conjunction with raptors such as falcons, hawks, owls, and eagles (Sten & Vretemark, 1988; Gräslund, 2004; Vretemark, 2013; Arkeologerna, 2023). This characteristic combination is generally interpreted as evidence of an elite hunting culture, with mounted hunters using dogs and raptors in a sophisticated partnership to bring down prey such as birds, hares, and even cervids such as deer or elk (Oehrl, 2013; Sten, 2013; Vretemark, 2013; Strehlau, 2018). While it is rarer to find raptors in Viking Age graves comparative to Vendel period graves, rune stones, Old Norse law codes, and Eddic poetry (e.g. *Rígspula*) all attest to the persistence of this venerable activity into the Viking Age (Ljungkvist, 2006; Oehrl, 2013; Dodds, 2014).

If nothing else, the persistence of sight hounds at these sites argues, at least, for the persistence of game coursing with dogs as a pastime of the Svear elite. Moreover, given that the human occupant of Grave 36 was female with a 'feminine' assemblage of bronze and silver prestige items contrasting with the 'masculine' assemblages of weapons and armour of the male occupants at Vendel and Valsgärde, this may indicate that game coursing was not a solely masculine activity.

This particularly aristocratic brand of hunting associates the sight hound with high status, and its sacrifice may have represented a form of conspicuous destruction. Certainly, the elite families conducting the funerals may have intended to impress onlookers, as well as embed their wealth and power in the landscape with elaborate monuments (Klevnäs, 2007). Such an aristocratic dog as part of the funerary assemblage would certainly suit this purpose.

The chthonic dimension

The discussion thus far has focused on the roles of the dogs in life, and their place in the broader Viking Age society. Their participation in the sphere of death introduces a second dimension. It has convincingly been argued elsewhere (Gräslund, 2004; Gräslund & Ljungkvist, 2011; Magnell et al., 2017) that the presence of dogs in these funerary rituals has 'spiritual' dimensions beyond earthly considerations like work, economy, or companionship. This challenges the assumption that a dog's (or any other animal's) function in a grave was solely tied to its 'practical' function while alive.

We should question whether sight hounds, despite being hunting dogs in life, were included in these burials *only* because they were hunting dogs. That such a large range of dog types can be found in burials throughout Scandinavia, associated with nearly every demographic of human society (excepting, perhaps, the enslaved), suggests that the species had at least one chthonic dimension regardless of type or 'function'. Recourse to post-human theory

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further invites us to consider the complex personality of the dog in Old Norse thought beyond functional accessories or livestock. Dogs are among humans' closest and most intelligent animal companions, and their responsiveness to command combined with their inherent tendencies to search, explore, and defend suits them exceptionally well to the role of 'psychopomp': a forward 'scout' on the journey from the present world to the next, opening the way for their human companion, as well as, potentially, acting as an alarm and potential defender against dangers encountered on the way. Taken in this way, the dog transforms from a mere sacrifice in the grave of its 'master' to an essential companion, possibly even a partner, in the journey beyond death.

The fact that the dogs in graves such as the Prästgården graves were often sight hounds (or, elsewhere, spitzes or lap dogs) might have been merely incidental to the more important fact that they were the interred person's closest or most trusted animal accomplices, some of their most reliable partners in their ultimate journey. It is reasonable to suppose that a person buried with a hunting dog anticipated being able to go hunting with that dog in the next world; perhaps in death, as indeed in life, such a dog may also have had the potential to do more.

Conclusion

Of four boat graves investigated at Prästgården in the 1970s, three (Prästgården 36, 1, and 3) contained the positively identifiable remains of a single dog each. The bones of two dogs (36a and 1a) were very well preserved and reconstruction showed them to belong to the sight hound morphotype, both measuring approximately 60 cm at withers. Dog 1a had sustained a severe injury to her right upper premolar, repetitive erosive stress to the lower canines, and an injury to her left ankle. Dog 36a was assessed as male and 1a as female. The third dog (3a) was highly fragmented but appears to have been a medium-sized, lightly built spitz or sight hound. These results broadly conform to the kinds of dogs at the contemporaneous nearby sites of Vendel and Valsgärde, and further confirm the fashion for sight hounds among the Late Iron Age Svear elite.

Overall, the total animal assemblages from Graves 1 and 3 closely resemble those of the boat graves at Vendel and Valsgärde in terms of species represented, suggesting that these graves belonged to the same funerary tradition. While none of the classic martial gear of Vendel or Valsgärde is present in Prästgården 1 or 3, this absence is likely to be the result of looting (Klevnäs, 2007). Prästgården 36, by contrast, finds more parallels with the roughly contemporaneous Årby boat burial (Arbman et al., 1993), and represents a clearly different tradition, possibly related to the female sex of its human occupant.

These results will be important when combined with those from the boat graves excavated in Prästgården in 2019 (Arkeologerna, 2023) to give a fuller picture of the burial practices at Gamla Uppsala during the transition from the Vendel period to the Viking Age. It will also, as briefly mentioned, be vital to conduct comprehensive osteological studies of the dog remains found at other boat grave cemeteries throughout central-eastern Sweden, given their close geographical link to Gamla Uppsala. A systematic comparison of the custom of dog burials at the five major boat cemeteries along the Fyris river (Prästgården, Valsgärde, Vendel, Ultuna, and Tuna in Alsike) will be a major step towards a broader understanding of dog inhumation in human graves throughout the entire Svear region.

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Trois chiens découverts dans les sépultures à bateau de la nécropole de l'âge du Fer récent de Gamla Uppsala-Prästgården en Suède

*Les fouilles du site du jardin du presbytère (*prästgården*) situé dans le célèbre centre de pouvoir de l'âge du Fer récent de Gamla Uppsala en Suède ont révélé six sépultures à bateau de l'époque Viking (environ 750–1100 apr. J.-C.) dont plusieurs contenaient les restes de chiens domestiques. Le but principal de l'examen ostéologique de trois de ces chiens (un par tombe) est de reconstruire leur morphologie, en plus d'une analyse de leur sexe, âge et traces de pathologies. Deux chiens étaient des chiens de chasse grands et minces (lévriers) tandis que le troisième était plus petit et de race indéterminée. La préférence pour les chiens de chasse dans les sépultures prestigieuses est attestée dans les nécropoles contemporaines voisines de Vendel et Valsgärde, ce qui étaye l'hypothèse d'une tradition funéraire commune à l'âge du Fer récent* Translation by Madeleine Hummler

Mots-clés: époque Viking, Scandinavie, chiens, zooarchéologie, archéologie funéraire, reconstruction morphologique

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Drei Hunde aus dem späteisenzeitlichen Bootgräberfeld von Gamla Uppsala-Prästgården in Schweden

*In den Ausgrabungen im Hof der Pfarrei (*prästgården*) des weltbekannten späteisenzeitlichen Machtzentrums von Gamla Uppsala in Schweden wurden sechs wikingerzeitliche (ca. 750–1100 n. Chr.) Bootgräber entdeckt, davon einige mit Überresten von Hunden. Ziel der vorliegenden Studie ist es, die Morphologie von drei Hunden (ein Hund pro Bootgrab) durch die Untersuchung ihrer Knochen zu rekonstruieren sowie das Alter, Geschlecht und Pathologie dieser Tiere zu bestimmen. Zwei Hunde waren große und schlanke Jagdhunde (Windhunde), der dritte war kleiner und von unbestimmter Rasse. Die Vorliebe für Windhunde in hochrangigen Gräbern stimmt mit den benachbarten zeitgenössischen Bootgräberfeldern von Vendel und Valsgärde überein, was die Hypothese einer gemeinsamen Grabsitte in der späten Eisenzeit unterstützt.* Translation by Madeleine Hummler

Stichworte: Wikingerzeit, Skandinavien, Hunde, Zooarchäologie, Archäologie der Grabsitten, morphologische Rekonstruktion

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