Archaeofauna 25 (2016): 107-126

The dogs of Roman Vindolanda, Part II: Time-stratigraphic occurrence, ethnographic comparisons, and biotype reconstruction

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(Received *8 September 2015*; Revised *29 November 2015*; Accepted *11 December 2015*)

ABSTRACT: The Roman fort-village complex at Vindolanda in northern England has yielded extensive well-preserved remains of domestic dogs, *Canis familiaris*. Herein, we pose the questions—did the Romans breed for distinctive dog morphotypes, or were dogs breeding panmictically; and if dogs were bred, was it for functionality. We address these questions utilizing remains that are correlated to age and context; morphometric analysis; dental wear stage; bone pathology; pawprints impressed in tiles, and contemporary written records and artwork. All age classes of dogs are represented. There is no evidence that dogs were butchered for food; survivorship curves suggest the typical U-shaped distribution found in populations at equilibrium. Small, medium-sized, and large dogs are represented with frequency changing over time and corresponding to change in the region of origin of the resident military cohort. Husbandry is confirmed on an individual with healed wounds and with the discovery of a beehive-shaped wattle doghouse. Dogs were used extensively in hunting wild game and bred for that activity. By integrating many diverse kinds of data we are able reconstruct biotypes of Roman dogs, greatly facilitating the interpretation of their functionality.

KEYWORDS: ANCIENT DOG HUSBANDRY, BIOTYPE RECONSTRUCTION, *CANIS FAMILIARIS*, DOMESTIC DOG, ROMANO–BRITISH, ROMAN DOG ETHNOGRAPHY, SURVIVORSHIP, VINDOLANDA

RESUMEN: El fuerte-poblado romano de Vindolanda en el norte de Inglaterra fue ocupado desde el 50 al 415 A.D. y ha proporcionado una importante colección de restos bien conservados de perro, *Canis familiaris*. En este trabajo se contesta a las preguntas acerca de si los romanos criaron perros con el propósito de obtener morfotipos específicos o si aquellos perros se cruzaron libremente y de modo aleatorio (panmixis). También, si los perros fueron criados, si tal cría repondía a razones funcionales. Utilizando restos caninos bien contextualizados, respondemos estas preguntas incorporando análisis morfométricos, estadíos de desgaste dentario, patologías óseas, huellas impresas en cerámica (tejas) y registros documentales e iconográficos. Todas las cohortes de perro se encontraban aquí documentadas y no existen evidencias de que los perros fuesen consumidos. Las curvas de supervivencia son las clásicas con forma de U constatadas en poblaciones en equilibrio. Se constatan asímismo perros pequeños, medianos y grandes cuyas frecuencias variaron según el lugar de origen de las guarniciones que se sucedieron en el asentamiento. El cuidado de los canes lo confirma una perrera con forma de colmena y un individuo con heridas cicatrizadas. Los perros fueron usados para la caza y criados con tal fin. Integrando

todas las fuentes de datos se han podido reconstruir los biotipos caninos de los romanos, infiriendo con ello su funcionalidad.

PALABRAS CLAVE: CRIA CANINA ANTIGUA, RECONSTRUCCIÓN DE BIOTIPOS, *CANIS FAMILIARIS*, PERRO, ROMANO–BRITÁNICO, ETNOGRAFÍA DE PERROS ROMANOS, SUPERVIVENCIA, VINDOLANDA

INTRODUCTION

The Vindolanda fort and village complex situated 3 km south of Hadrian's Wall in northern England sits near the edge of the ancient Roman Empire, yet has yielded a large and diverse collection of Roman-era dogs. This paper represents Part II in a series on the dogs of Roman Vindolanda; for detailed site information and collection techniques, see Part I (Bennett *et al*., 2016).

Herein, we ask the question -did the Roman- era inhabitants of this remote garrison have distinctive morphotypes of dogs or were their dogs all of the "village dog" or dingo-like morphotype which likely represents panmictic breeding? If there are dogs of different sizes and shapes, do they resemble modern morphotypes? Much contemporary Roman artwork suggests that dogs resembling modern breeds were already in existence nearly 2,000 years ago. To evaluate potentially distinctive Roman-era dogs and determine whether they were bred for different purposes, we utilize morphometrics (Bennett *et al*., Part I of this series, 2016); dental wear stage; bone pathology; pawprints impressed in tile (Bennett, 2012); written records and contemporary artwork; and site geography, ecology, stratigraphy, and architecture. We present biotype reconstructions of the range of Roman dogs known from Vindolanda, created through integration of all these kinds of data in an effort to facilitate our understanding of the uses to which the dogs may have been put.

MATERIALS AND METHODS

For basic excavation techniques and site location map, please see Part I of this series (Bennett *et al*., 2016). Determination of context at Vindolanda has developed over fifty years of excavation at the site, which contains a complex succession of nine forts built one on top of the other over the whole period of its occupation (Birley, 2003; Birley & Blake, 2005, 2007; Birley, 2009; Blake, 2014). Associated with the forts through the earlier periods was an adjacent *vicus* or officially-recognized village, so that the total range of Vindolanda contexts encompasses both formal military and informal military or possibly civilian areas (Birley, 2003; Blake, 2003; Birley & Blake, 2007; Blake, 2014). Military areas include infrastructure such as the fort walls, defensive ditches, and roadways, as well as numerous types of buildings including the commandant's residence (*praetorium*), the administrative center (*principia*), barracks, hospital, granary, warehouse, stables, bath-houses, and latrines. Civilian areas include residences, workshops (butchery, tannery, tilery, jeweler, cobbler, tentmaker, bowmaker, armorer, wainwright, carpenter, blacksmith, bakery, brewery), market areas and shops, an inn, temples, mausolea, and a public spring and aqueduct system (Birley, 2003, 2013; Birley, 2009; Blake, 2014). Bones, including those of dogs, are found from every context and from every time period (Figure 1).

The succession of Vindolanda forts has given rise to a system of relative dating in which Vindolanda finds are grouped by period (Figures 2–4) (Birley, 2003). Absolute chronology by year (Figure 3) has been established through cross-comparison of coins (Brickstock, 2003, 2005, 2007, 2013, 2014) and pottery-makers' stamps (Marlière, 2003, 2007; Marlière & Torres Costa, 2005; Birley, 2007; Sheehan-Finn, 2013, 2014).

RESULTS

Frequency of Skeletal Elements; Juveniles

A total of 520 bones pertaining to domestic dogs have been recovered from excavations carried out

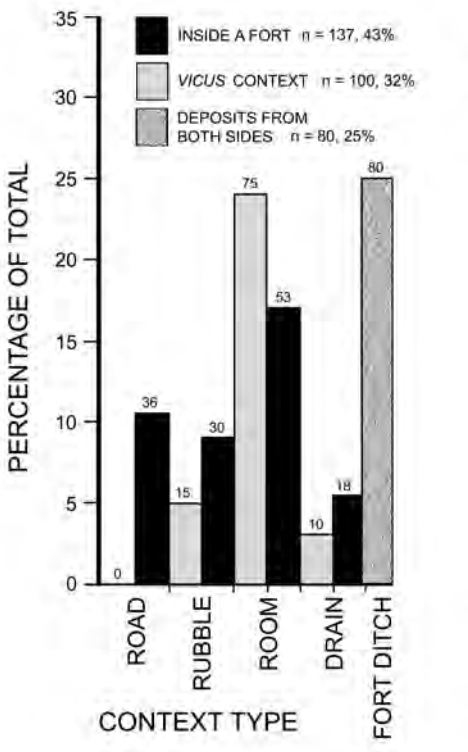

FIGURE 1

Dog bone finds by major context type. Percentages are of the maximum number of individuals (n = 317), with associated material counted as "1". Numbers at tops of columns are actual number of items recovered.

between 1960 and 2014 (Figure 1). Dog remains comprise about 2.6% of the total Vindolanda collection. For purposes of this study, limb bones are considered "juvenile" if any major epiphyses are unfused, or if the central vertebral physis is detached. Maxillae or jaw rami are considered juvenile if deciduous teeth are present, or if the carnassial, premolar, or canine teeth are not fully erupted; or in jaws, if the horizontal ramus is swollen indicating the presence of unerupted teeth (Silver, 1970). Even by these rather broad criteria, only 67 of 520 elements whose maturity could be assessed, representing 12.9% of all dog bones, came from juveniles (Figure 5).

Size and Completeness of Skeletons

Study of pawprints impressed in ceramic building materials (Higgs, 2001: 51; Bennett, 2012; and see Cram, 2000) document that dogs of different sizes existed at Vindolanda. Our morphometric study of 27 relatively complete skulls, 61 jaws and 92 measurable limb bones confirm the presence of dogs ranging in "shoulder" or "withers" height from about 27 cm to 70 cm. While some Vindolanda dogs show phenotype similar to modern "village dogs" or Australian dingoes, the majority are morphologically different and the range of size and

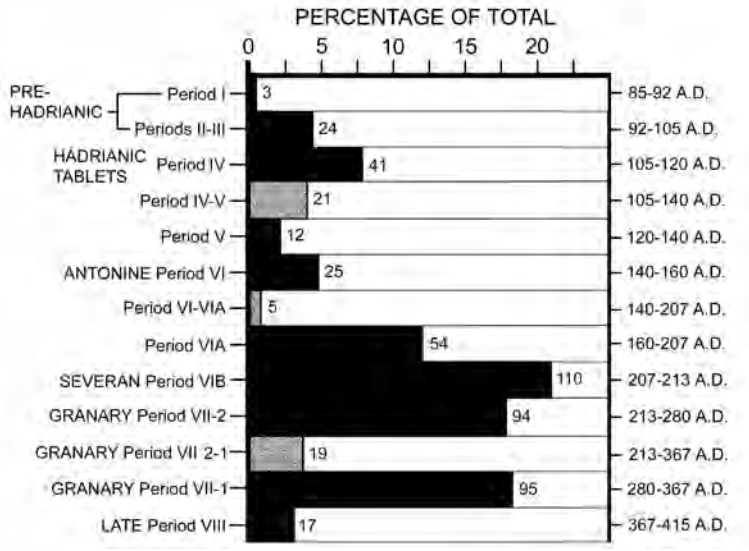

FIGURE 2

Bone counts by Vindolanda period and calendar year. Numbers to right of columns represent actual number of bones recovered. Dark gray bars are specimens with "fuzzy" dates which could be assigned to time periods either earlier or later. Total sample n = 520.

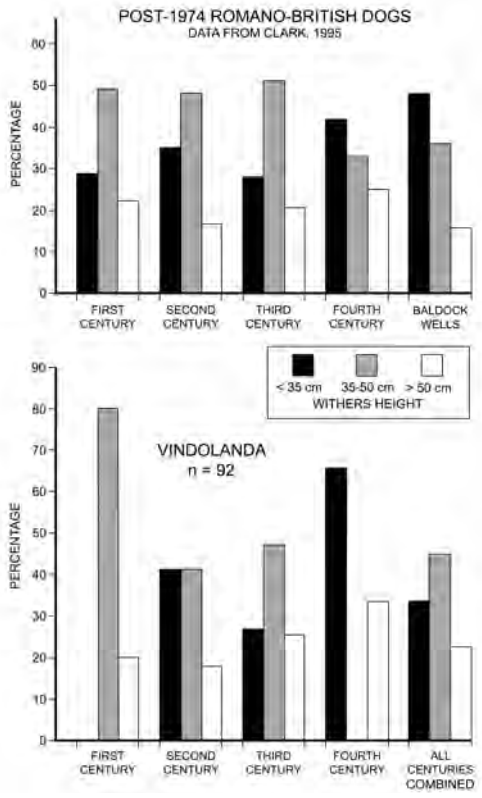

FIGURE 3

Frequency of large, medium, and small dogs by century. Vindolanda numbers (below) are compared with data from Clark Baldock Wells locality (1995, her Figure 14). Withers heights calculated by application of Harcourt's (1974) factors. Vindolanda n = 130, representing the total number of limb bones complete enough to permit calculation of withers height.

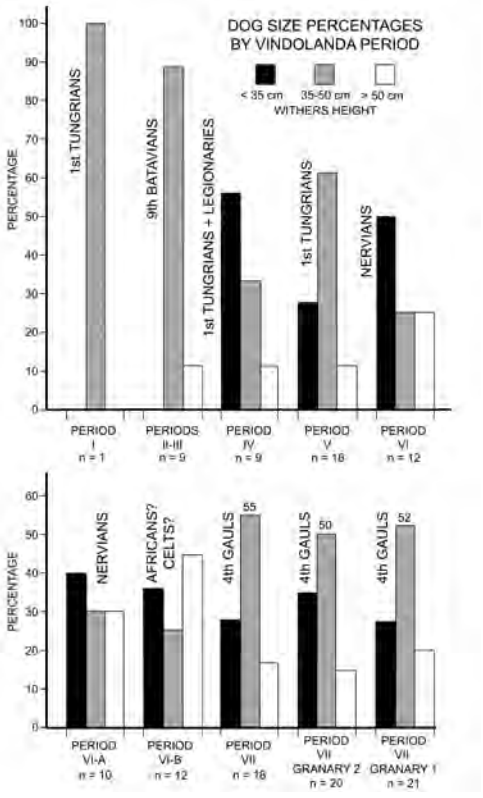

FIGURE 4

Frequency of large, medium, and small dogs by Vindolanda period. The cohort name or nationality thought to have been in residence at Vindolanda in any given period is shown. "Granary level 2" dates 213–280 A.D.; "Granary level 1" dates 280–400 A.D. Only bones complete enough to permit reasonably accurate estimation of withers height are represented, with n = 130.

phenotype is far greater than either dingoes or British dogs of the Neolithic (Bennett *et al*., 2016).

Of 39 dog skulls or partial skulls recovered to date from Vindolanda, five have been recovered in association with a significant portion of the postcranial skeleton. The bones were not interred but instead were recovered scattered on a surface or in a ditch with skeletal elements in proximity but for the most part not in normal anatomical position. Association has been assumed because of proximity, congruence among the bones as to size and maturity, and the absence of other dog bones from the same immediate area. The associated dogs include a juvenile excavated in 1993 from the floor of a room in a *vicus* building; an adult from the Severan Fort Ditch excavation of 2002 (Hambleton, 2003); an adult from a drainway ditch excavated in 2012; and an adult excavated in 2014 from the floor of a room in a fort. All these dogs are of medium to small size. The fifth dog was recovered in 1997 from a hypocaust channel under a heated room in the third-century (Period VII) *praetorium*; this adult dog is of large size. Unassociated dog bones have been recovered from most Vindolanda contexts, but as with the associated material, none had been interred, deposited in a well, or buried in association with a building cornerstone.

The maximum number of individual dogs indicated by bony remains is 317, an estimate based on the assumption that all dog bones not otherwise believed to be associated belong to different individuals. Minimum number of individuals was not calculated because material was usually excavated from widely separated contexts, so that all unassociated bones probably represent different dogs.

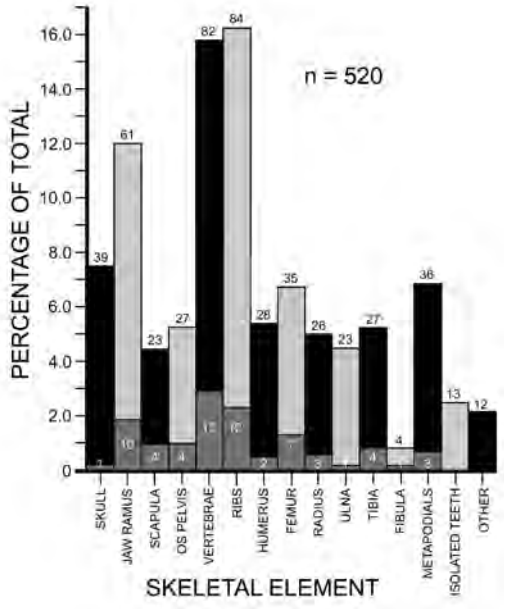

FIGURE 5

Comparative frequency of different skeletal elements of Vindolanda dogs. Juveniles are shown in dark gray at the base of each category in which they occur. Juveniles number 67 of 520 elements or 12.9% of the total. Black numbers at tops of columns are the total recovered, representing adults plus juveniles; white numbers at column bases are juveniles only.

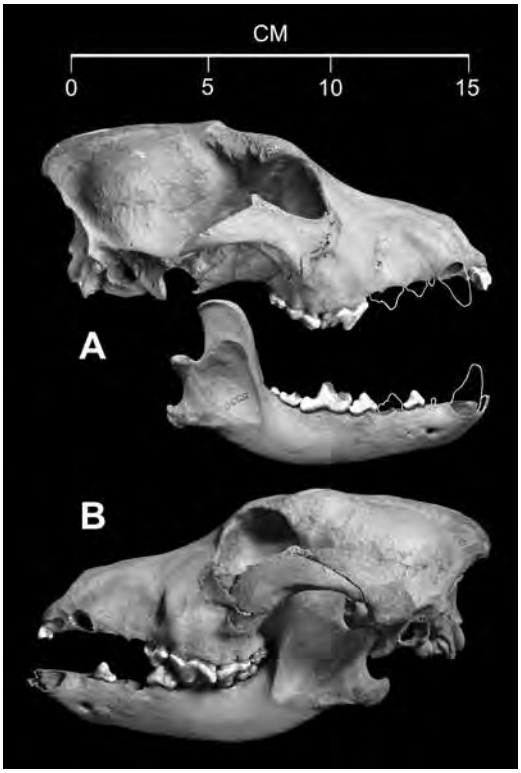

FIGURE 6

Vindolanda specimen CI-VI 10152 (SF 5530), right and left lateral views of the skull and associated mandible of an aged dog from a *vicus* ditch of the Antonine Period VI, 140–160 A.D. Note in this figure and following the bulldog-like stout build, with deep mandible, wide face, and slightly short muzzle. Profiles of missing teeth restored with white lines. Pathology due to blunt impact is evident on the right frontal, while the left frontal shows the healed wound from a boar's tusk.

Evidence for Butchery, Skinning, and Gnawing; Pathologies

Butchery marks, which usually manifest as V-shaped chop marks, chattering cuts, the ends of bones cloven cleanly away, or shattering and splintering, are very common on bones of "food species" from Vindolanda, including cattle (*Bos taurus*), goat (*Capra hircus*), sheep (*Ovis aries*), and pig (*Sus scrofa*). Bennett (2005) reported butchery marks on horse vertebrae at Vindolanda. However, butchery marks are extremely rare on dog bones there, with only one instance observed (Figure 15). Cut-marks, usually interpreted as an indication of skinning, were found on one juvenile dog metapodial and one humerus, representing less than one-half of one percent of all dog bones recovered.

Evidence of gnawing or digestion is rare also (Table 1); two geriatric inferior premolars from beneath the East Granary (Bennett & Timm, 2013) appear to have been partially digested. An associated radius and ulna from the 2013 roundhouse context (discussed below) were thoroughly gnawed (Figure 16), but they plus a partial proximal ulna collected in 2009 are the only gnawed dog bones in the collection. By contrast, pathologies are fairly common on Vindolanda dog bones, with more than 20 found (about 5% of all dog bones recovered). Herein, we highlight pathologies on the skull of an aged dog, presumed to be a boarhound (Figures 6–8).

Survivorship Based on Tooth Wear Scores

We used the tooth-wear scoring system of Horard-Herbin (2000) to compare Vindolanda dogs with wild-killed Australian dingoes and with wolves from the late Pleistocene Natural Trap Cave in Wyoming. Survivorship curves for these three pop-

FIGURE 7

Vindolanda specimen CI-VI 10152 (SF 5530), dorsal view showing details of healed tusk-wound to left orbit and frontal, and cudgel wound which partially crushed the right frontal sinus.

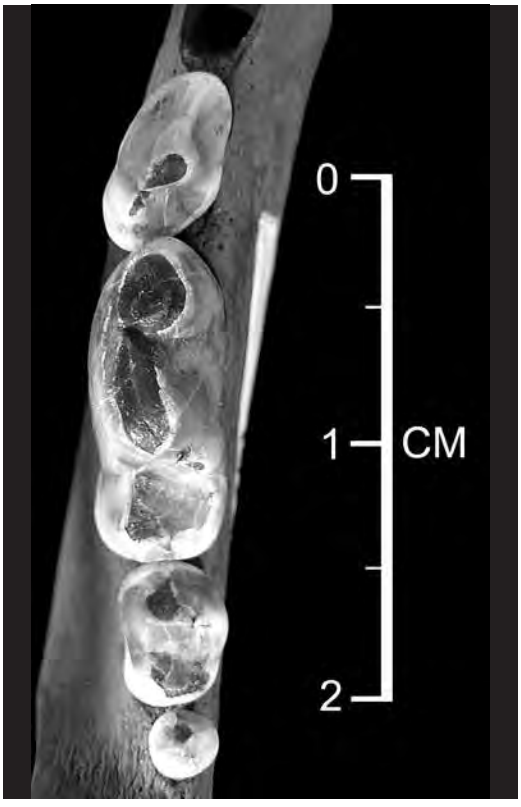

FIGURE 8

Vindolanda specimen CI-VI 10152 (SF 5530), closeup view of the right mandible to show the heavily worn teeth (Stage F of Horard-Herbin, 2000).

FIGURE 9

Reconstructed life appearance of Vindolanda specimen CI-VI 10152, after healing of wounds.

ulations are in sharp contrast and thus instructive. Australian government programs currently mandate the systematic removal of dingoes found outside the "dingo fence" (Corbett, 1995). Removal is either by trapping or hunting, and it is evident from the survivorship curve (Figure 10) that the naïve and curious young dingo is the most frequent casualty.

The survivorship curve for Pleistocene wolves from Natural Trap Cave is exactly the opposite. Aptly named, this cave is a flask-shaped, cathedral-sized hollow developed in limestone bedrock. It has a blind, funnel-shaped entrance at the top with a 25-m deadfall to a rocky floor below, with no egress. The smell of the rotting carcasses of entrapped animals probably attracted many geriatric carnivores; wolves, especially older individuals, are especially well represented. Hungry and with diminished ability to hunt (MacNulty *et al.*, 2009), they either fell or jumped into the cave in quest of an easy meal, but were subsequently unable to get out (Martin & Gilbert, 1978).

The Vindolanda dog survivorship curve contrasts with both of the above examples (Figure 10) representing the typical U-shaped distribution found in populations at equilibrium (Keeton, 1972). Death rate is high for puppies and young dogs, falls steadily to a low point during the prime of life (for dogs, this equates to about 1 ½ to 2 ½ years of age), and then rises again as the teeth become senescent (putatively, at age 4 years old or greater) (Figures

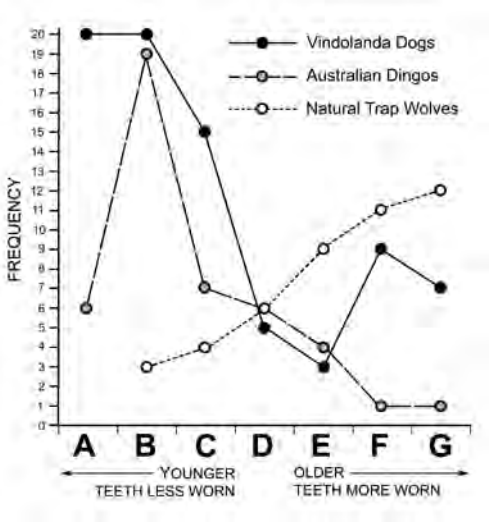

FIGURE 10

Survivorship curves determined by application of the tooth-wear scoring system of Horard-Herbin (2000) to a sample of jaws from Vindolanda, Australian dingoes, and late Pleistocene wolves from Natural Trap Cave, Wyoming. A–G represent tooth-wear categories.

6–8). In agreement with the above-noted lack of cutmarks or butchery marks, the Vindolanda survivorship curve indicates that dogs were neither raised nor utilized at this site to provide meat or hides as is documented elsewhere in the Iron Age (Méniel, 1992; Horard-Herbin, 2000).

Time-Stratigraphic Distribution and Cultural Association

Dog bones in the Vindolanda collection come from every period, from "pre-Hadrianic" levels dating to circa A.D. 85, to the twilight years of the Roman Empire in the early 5th century (Figures 3–5; Birley, 2009; Blake, 2014). Thanks to tight stratigraphic control achieved through careful excavation and cross-comparison of amphora stamps and coins (Marlière, 2003, 2007; Marlière & Torres Costa, 2005; Birley, 2007; Sheehan-Finn, 2013, 2014), we are able to track changes in the Vindolanda dog population through time.

With associated material counted as 1 individual, the maximum number of individuals is 307. Highest totals occurred in the Severan and Granary periods, VI-B and VII respectively, but totals are moderately high from the Hadrianic Period IV onward (Birley & Blake, 2005, 2007; Blake, 2003, 2014). Clark (1995) examined dog material from Romano–British sites excavated since Harcourt's survey (1974). Comparison with Clark's results (Figure 4) indicates that in most centuries, Vindolanda produces more dogs of both small and large size, though small dogs do not appear at Vindolanda until the second century.

Dog remains are broken out by "Vindolanda period" in Figure 5, a technique which relates the occurrence of dogs directly to the resident military cohort (Blake, 2014). Cohort change often coincides with cultural changes, because cohorts were drawn from disparate areas of the empire including Spain, North Africa, Belgium, France, and Italy (Birley, 2002). It is reasonable to believe that people of different cultures would have varying preferences for dog type. The native Celtic population also had an ongoing influence, for many soldiers were recruited locally (Birley & Blake, 2005, 2007). Dogs from Vindolanda periods I through III are almost all of middle size. Small dogs suddenly appear in the "tablet era," Period IV, and thereafter persist as a significant percentage of the total dog population. Large dogs seem to have been most popular during the Severan anomaly, period VI-B, but were first kept in significant numbers during the earlier Antonine era, period VI.

Occurrences by Context

Context association allows determination of the physical settings that most commonly produce dog remains at Vindolanda. Vindolanda dogs have not been found in wells, graves, near or under altars, or incorporated into building foundations, and it is thus unlikely that any so far recovered were ritually slaughtered or interred as has been observed at other sites (see Yvinec, 1987; Méniel, 1992; Davis, 1995; Murphy & Ó Baoill, 2000; Dunand & Lichtenberg, 2005; Smith, 2006; Snyder & Moore, 2006; Wilkens, 2006).

A higher percentage of Vindolanda dogs (43%) come from contexts within or directly associated with a fort, than from any *vicus* context (32%). Of *vicus* remains, the majority come from the floors of rooms or from the yards just outside those rooms (Figure 2). A significant fraction (25%) of dog material was recovered from the fort ditches,

which were defenses ringing the forts. They had a V-shaped cross-section and averaged about 2–3 m wide at the top and about 1–2 m deep with an "ankle breaker" or cleanout slot cut into the bottom (Birley, 2003; Blake, 2014). Although constructed as part of the fort, the ditches were actually more accessible to people who worked and resided outside the fort walls and a large fraction of the artifacts of all classes recovered from the ditches were probably deposited from the *vicus* side (Andrew Birley, *pers. comm.*).

Evidence for Dog Husbandry and Use at Vindolanda

Direct evidence for the use of dogs in hunting comes from a skull with associated mandible (Figures 6–8) recovered from a ditch in the Antonine-era *vicus* (R. Birley, *pers. comm.*). Measuring 151.55 mm (basal length) by 107.14 mm (zygomatic width), the skull is slightly larger than the median size for Vindolanda dogs and of robust build. The teeth are stout and heavily worn. With a broad, relatively short face it is similar to a British Iron Age Shar-Pei analog reported by Baxter & Nussbaumer (2009).

Two pathologies are evident upon the anterior frontal bones. Upon the left side is a 5.5 cm grooved scar of 2–5 mm depth, whose width and flat-bottomed shape makes it most likely to have been made by the inferior tusk of a boar. The lesion skims the center of the superior rim of the left orbit, and there are changes in bone thickness and texture in the immediate area consistent with a healed abscess. There is also scarring on the inferior orbital rim which involves the eminence for the postorbital ligament. It seems from this that the boar probably did not take the dog's eyeball but left him with the distinctively scarred face of an old campaigner (Figure 9).

A second pathology also appears upon the head of the same dog: crushing of the right frontal bone, due to downward impact from a blunt object, probably a wooden cudgel (Figures 6, 7). Damage is located primarily behind the right orbit, although there is bony proliferation upon the right postorbital process. Roman boar hunts often included a "master of hounds"—a servant or slave whose duties were to manage leashed dogs, to release them at the appropriate moment, and to call the dogs off the boar so that the hunter, rather than the dogs, would be credited for the kill. Once dogs engage prey, however, it can be difficult to get their attention—thus the master of hounds typically carried a cudgel, so that the dogs, which wore heavy leather collars as well as leather body armor, could be pulled out of the fight (Figure 14).

Since all the rather serious wounds upon this dog's head healed completely, and the condition of its dentition shows that it lived to be at least four years old (probably longer), it is reasonable to conclude that boarhounds were valued at Vindolanda and that they received veterinary attention when injured (see MacKinnon & Belanger, 2002, and the Vindolanda tablets which mention an officer who functioned as a veterinarian; Bowman & Thomas, 1994, 2003; Birley, 2002; Birley, 2009). If "Scarface" was a bitch, she might have been valued as a breeder even if no longer able to hunt; the same might also have been true if the dog were male. From the find context it is probable that this dog did not die afield.

Still more about dog husbandry at Vindolanda is revealed by the unusual and interesting "roundhouse complex" excavated during 2012–2013. This consists of an oval structure associated with a rectangular structure immediately to the south (Figure 11; Blake, 2014). Both buildings were made of wattle, constructed by weaving thin, flexible sticks between upright poles which had been driven into the ground. Evidence from coin dating, amphora stamps, and ceramic analysis indicates that the complex may originally have been built as early as the very beginning of the 2nd century in Vindolanda period III (ca. AD 100–105). The complex continued in use into period IV and was demolished and remodeled between ca. AD 105–120 before being abandoned with the fort. A subsequent fort's western defensive ditch (period V, ca. AD 120–130) cut out part of the complex of buildings and covered the rest below a meter of "boulder clay" which made up the ditch's western berm. Throughout its history, the complex was located outside the western (period III) and northern (period IV) ditches of the Vindolanda forts (Blake, 2014).

In its first phase, the roundhouse averaged 4.67 m in diameter, yielding about 17 m^2 of interior floor space. The second phase was smaller, with an average diameter of 3.87 m and an interior area of about 12 m^2. The range of material culture found on the floor in each building, along with hearths and storage pits, suggest that they were used as a domestic dwelling (Blake, 2014).

FIGURE 11

Aerial photograph of the "roundhouse complex" excavated at Vindolanda in 2012 and 2013 (scale units in meters). Superstructures of both the rectangular and the round structures were made of wattle. White dots mark the tops of structural poles driven into the natural clay substrate. The circular "footprint" of the beehive-shaped doghouse within the larger elliptical structure can clearly be seen. Photo by Adam Stanford, courtesy The Vindolanda Trust.

Within the later oval building there is also a smaller, circular wattle feature measuring 98.2 cm (about one yard) in diameter (Figure 11). While the percentage of dog bones recovered from this complex is not, on average, different from other Vindolanda contexts that produce dog bone, the percentage of juvenile dog bones from the roundhouse context is about twice as high (9.5%) as the average for other Vindolanda contexts (Figure 18). Two thoroughly gnawed adult dog bones (Figure 16), along with high percentages of gnawed bones of goats, cattle, and pigs, also come from this complex. The punctate form of the toothmarks and their presence over virtually the entire surface of many of the bones confirm that they were chewed by dogs -probably puppies- and not pigs (Greenfield, 1988; Domínguez-Solera & Domínguez-Rodrigo, 2009). The fourth-century "Dominus Julius" floor mosaic from near ancient Carthage (Dunbain, 1978; Ben-Abed Ben-Khader *et al*., 1987; Blanchard-Lemee & Ennaifer, 1996; Bardo National Museum, 2014) (Figure 12) presents the image of a similar-sized beehive-shaped wattle doghouse in context of the daily routine of a prosperous Roman country estate. The evidence suggests that the small round structure was in fact a doghouse of this type, perhaps used to shelter bitches nursing puppies (Figure 17).

The Range of Dog Morphotypes at Vindolanda

Space limitations prevent us from presenting more than a few of the hundreds of dogs depicted in Roman painting, pottery, sculpture, and mosaics (see Figures 13, 14). Survey of artwork (Schefold, 1972; Dunbain, 1978; Joyce, 1981; Ben-Abed Ben-Khader *et al*., 1987; Guillaud & Guillaud, 1990; Blanchard-Lemee & Ennaifer, 1996; Wilson, 2005; Witts, 2005; Yućel, 2010; Bardo National Museum, 2014; Pompeii and Herculaneum mosaics and paintings, 2014; Sullivan, 2014) corroborates our osteological and tile-track studies in finding a broad size range, from toys shown sitting in peoples' laps up through long-legged coursers standing as high as a man's hips or a horse's elbow.

FIGURE 12

A brindle-coated, bat-eared harrier wearing a collar, tied by a rope to a T-shaped stake in front of a beehive-shaped wattle dog-house. Detail from the Dominus Julius mosaic, dating to about 375 A.D. (Bardo Museum, Tunis (14cm)).

While a metric scale is obviously not provided in Roman artwork, there can be no question that the intention was to represent different sizes and phenotypes. In terms of apparent shoulder height and build, we classify these as follows:

1. Small dogs:

(a) Toys (analogous to modern Maltese, Chihuahua, or Pomeranian).

(b) Miniatures (somewhat larger than toys; analogous to Miniature Poodle, small Spitz, Miniature Schnauzer).

(c) Dwarfs (analogous to "old fashioned" Dachshunds or to many modern terriers such as the Scottish or Patterdale).

2. Medium-sized dogs:

(a) Harriers (analogous to the Ibizan or I'Siqha Hounds or the so-called "Pharaoh hound").

(b) "Pack hounds" (dogs with body size and type similar to living pariahs, village dogs, and dingoes).

(c) Boarhounds (analogous to the Cane Corso, Chow-Chow, or Shar-Pei).

3. Large dogs:

(a) Coursers (analogous to the Scottish Deerhound or Irish Wolfhound)

(b) Mastiffs (analogous to the Turkish Kuvash or several European and American mastiff breeds).

Each of these morphotypes is represented by bony remains in the Vindolanda collection, and on the basis of standard manual forensic reconstruction techniques (Crockford & Pye, 1997) we provide a "biotype reconstruction" (Valadez *et al*., 2006) of the living appearance of each (Figure 19). It is important to note that reconstructions of head shape and body proportions are based strictly upon bony remains, and were made by the lead author prior to our survey of Roman artwork. The final reconstructions presented here convey typical stance, ear shape and carriage, tail carriage, and pelage length and thickness as suggested by contemporary Roman artwork. The reconstructions are labeled by category, with shoulder height calculated using Harcourt's (1974) factors.

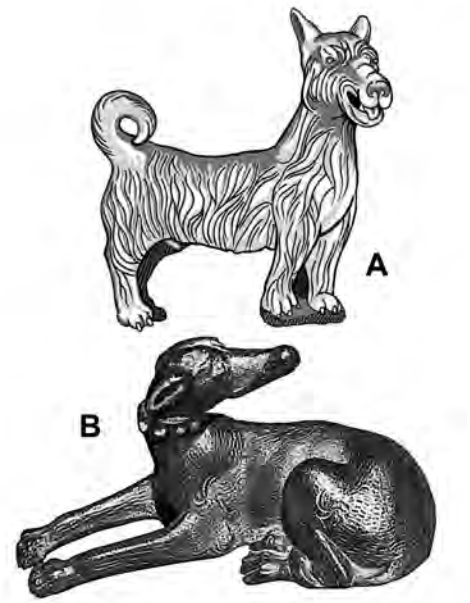

FIGURE 13

Facsimile drawings of two well-known Roman dog statuettes from Britain; approximate maximum dimension of dog image in (cm). A, a shaggy-haired dog with "dwarf" conformation, possibly representing the *Agassaean* breed as known to the Romans. From Coventina's Well situated less than 1.6 km (1 mi) from Vindolanda (4.8cm). B, a smooth-haired dog with long snout and long-legged, gracile conformation, from Lydney Park in Gloucestershire. As scale is impossible to determine, this statuette could represent either a harrier or a courser. It may represent the type of dog called *Vertragus* by the Romans (9.2cm).

The dwarf, harrier, and courser were reconstructed from complete or nearly complete associated material. They are clearly the products of selective breeding, as are the toy and miniature, the boarhound and mastiff. The pack hound/village dog represents a medium-sized eumorphic type,

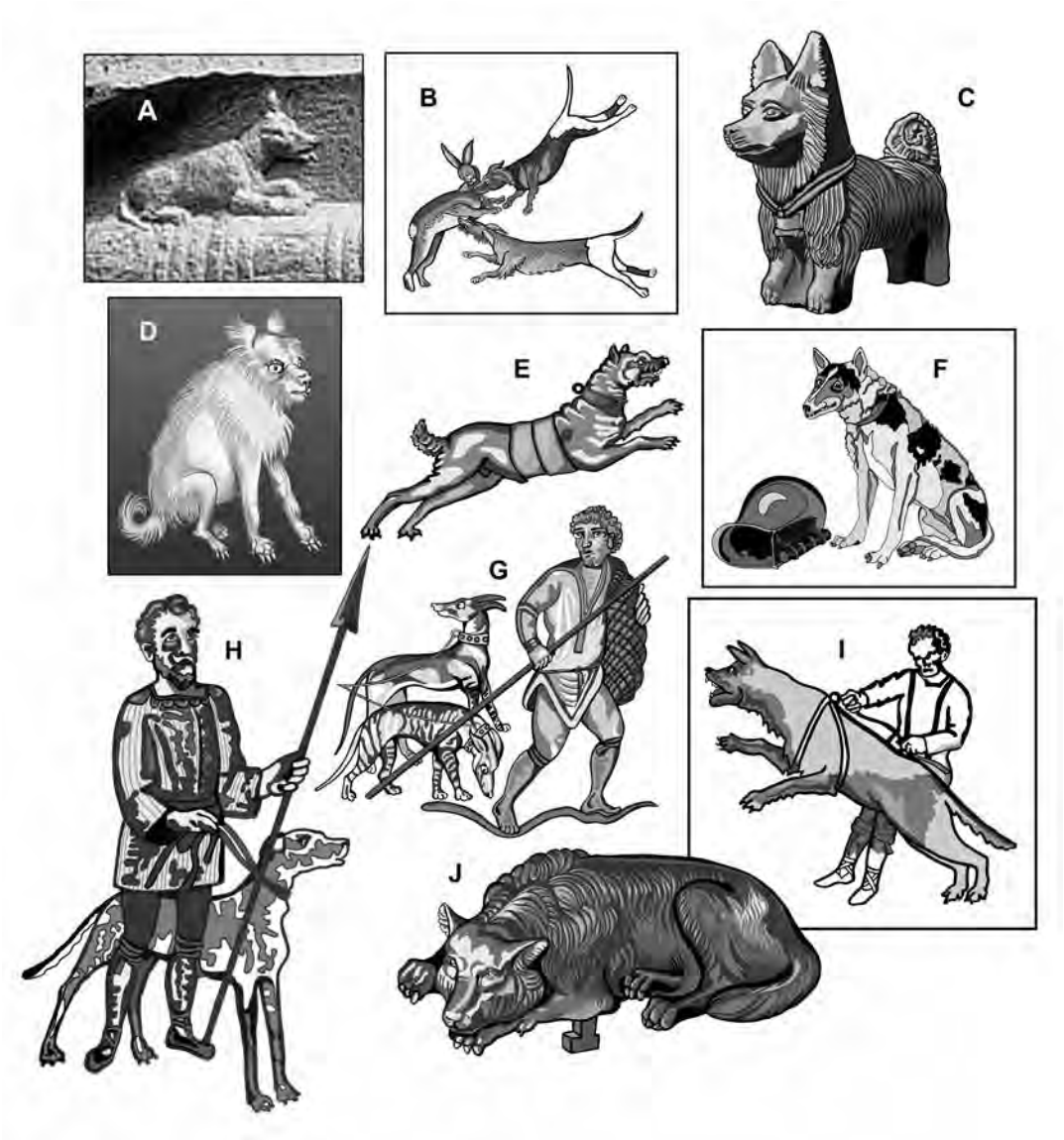

FIGURE 14

A sampling of Roman artwork representing dogs; facsimile drawings; approximate maximum dimension of dog image in (cm). A, a dog of dwarf-hound type riding atop beer barrels loaded upon an oxcart. Many works of art provide a scale by which the size of the dog may be judged (From a 2nd-century sarcophagus (15cm); British Museum). B, a pair of long-bodied, short-legged dwarf-hounds attacking a hare (detail from a floor mosaic in the Palace of Constantine, Alexandria, Egypt (40cm). C, statuette representing a toy dog similar to a Maltese (from Roman Egypt; British Museum (17.3cm). D, a wire-haired and snaggle-toothed toy dog (detail from a Pompeiian wall painting (35cm). E, a boarhound; this image is excerpted from a scene in which several such dogs are shown pursuing a boar. Note the stout build, docked tail and ears, and wrinkled skin. Roman boarhounds are frequently shown wearing armor consisting of a heavy, studded leather collar and leather straps wrapped around the midbody (from an apsidal mosaic in the Bardo Museum, Tunis (62cm). F, a common dog with dingo-like build, exquisitely rendered in microtesserae (from the Royal Palace at Alexandria (72cm). G, a brace of harriers, one brindled and the other fawn-colored. Note the gracile build, long, batlike ears and the height, less than the hunter's knees. Such dogs were used by the Romans to pursue hares, foxes, and birds (detail from the Dominus Julius mosaic, Bardo Museum, Tunis (44cm). H, a courser. Note the soft, flaplike ears and larger size, the dog being taller than the hunter's knees. The "deerhound" or "wolfhound" of Roman times was not as tall as modern dogs of these breeds (from a Gallo–Roman floor mosaic, Lillebonne Museum, Rouen (56cm). I, a mastiff. These massive, woolly dogs, known in antiquity as "Molossians", were used in war, as guard-dogs, and to pursue large or particularly dangerous prey (from a floor mosaic at Le Kef, near Carthage, Bardo Museum (35cm). J, tanged statuette of a mastiff from the lid of a treasure-box that shows the dog's thick, woolly coat (from Roman Syria, British Museum (24cm).

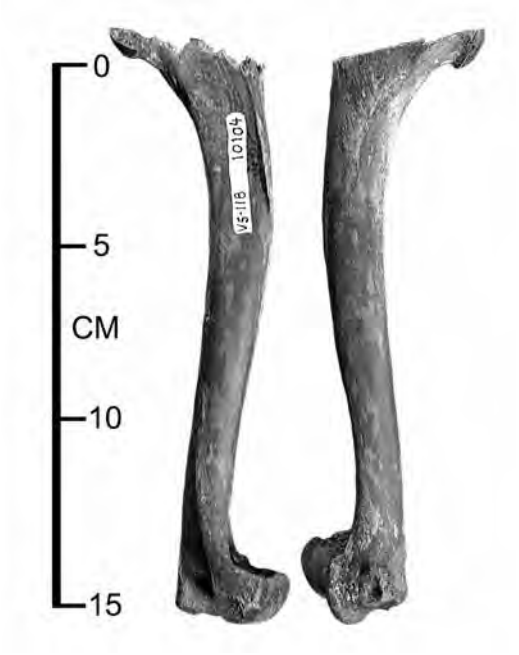

FIGURE 15

Vindolanda specimen VS-118 10104, humerus of a dog with dingo-like build, bearing evidence of butchery. The total length of this bone is estimated to be 170 mm, with a slenderness index (minimum shaft diameter × 100/estimated total length) of about 7.4.

but skulls in this size range are variable with some showing much more breadth of face and more "step" to the forehead than others which probably represent village dogs. While these biotype reconstructions illustrate general characteristics and the overall range of phenotypic variation, subsequent papers will analyze and document in detail the bony remains of each.

DISCUSSION

Ethnographic Evidence for Morphological Diversity in Roman-Era Dogs

Harcourt (1974) argues that "artistic evidence" should not be used in archaeological studies of dogs because "there is no way to know how true to life [artistic representations are] either in conformation or in scale". However, at the same time, he quotes Strabo—and we would add Cato and Varro (Anonymous, 1913); Columella (Forstner & Heffner, 1968); and the Vindolanda tablets themselves (Bowman & Thomas, 1994, 2003; Birley, 2002; Birley, 2009)—all of which attest the existence of various kinds of dog from different geographic areas of the ancient world. The almost fanatical naturalism of Roman artists whose reputation depended upon their ability to render their subjects with fidelity is well known (Figures 13, 14; Toynbee, 1973).

FIGURE 16

Vindolanda specimens V13-26B 23405 and V13-26B 23283, associated radius and ulna of a chondrodystrophic "dwarf" hound found near the roundhouse complex. The bones have been thoroughly gnawed. The ulna measures 111.61 mm, the radius 95.27 mm. The limb slenderness index of the radius is a relatively high 10.03, typical of dwarf dogs.

FIGURE 17

Vindolanda specimens V13-27B 22942 and V13-27B 23282, associated humerus and radius of a harrier, a dog of medium size with gracile conformation, whose bones were found near the roundhouse complex. The humerus measures 133.56 mm, with an index of 6.63; the radius measures 127.26 mm, with an index of 4.8.

FIGURE 18

Vindolanda specimens V13-2B 23516 (tibia), V13-11B 23170 (radius), associated limb bones of a puppy found in rubble just outside the roundhouse; and Vindolanda specimen V13-15B 26341, femur of a puppy found in a roundhouse drain. The limb bones of juvenile dogs are stouter than they will be at maturity, as circumferential growth somewhat outpaces lengthwise growth during puppyhood. These bones might thus pertain to a pup of boarhound type, but given their small size, they more probably pertain to a dwarf hound. Estimated length of femur 26341 = 100 mm with estimated index of 10.2; estimated length of tibia 23430 (center) = 97 mm with estimated index of 9.0; estimated length of radius 23170 = 81 mm with estimated index of 13.6.

Harcourt discounts a well-crafted statuette from Lydney Park in Gloucestershire (Figure 13B) as representing a Greyhound, saying "although nearly 100 skulls of the Roman period have been examined in the course of this study, not one has been found that bore the slightest resemblance to that of the Greyhound, thus casting further doubt upon the validity of such representations." It is Harcourt himself, we note however, who says that the statuette resembles a Greyhound, and then argues against his own supposition. We consider it unlikely that any artist of Roman Britain would be capable of representing a type of dog that had probably not yet come into existence. We believe rather that the Lydney Park statuette, along with another quality statuette recovered from Coventina's Well less than two miles from Vindolanda (Figure 13A), represent dogs for which we have ample osteological evidence, vis., dogs whose conformation was like that of the Scottish deerhound and the Scottish terrier, respectively (Walsh, 1878; Palmer, 1981; Phillips *et al*., 2009). Ancient names for these dogs are "Vertragus" and "Agassaean," respectively (Birley, 2002).

Morphological similarity does not necessarily equate to affinity with any modern breed. The essential reason for this is that modern dog breeds are often founded upon particular known individuals, and all breeds are defined by physical characteristics and behavioral traits that are rarely or never preserved in the archaeological record (Crowley & Adelman, 1998). Nonetheless, we concur with Phillips *et al*. (2009) in the belief that it is "unreasonable to consider the comparison of archaeological dog remains to modern breeds as too problematic to be of use to zooarchaeological analysis." Clark (1995: 11; italics ours) states, "The increase in variation of size and shape of the domestic dog over time is a phenomenon which is *inextricably bound to human attitudes*, and there is no valid reason why a skeleton cannot be said to derive from a dog of the same size as a particular modern breed, or [to avoid describing a skull] as being of a similar shape to that of a known breed."

Ethnographic data are highly useful when applied with appropriate cautions—especially, that culturally-specific artistic style and iconographic convention are recognized, artistic context is taken into consideration, and over-interpretation is avoided (Toynbee, 1973; Clutton-Brock, 2000; Daróczi-Szabó, 2002; Trantalidou, 2006). In addition to morphological analysis of bones, we follow many other authors in surveying contemporary dog

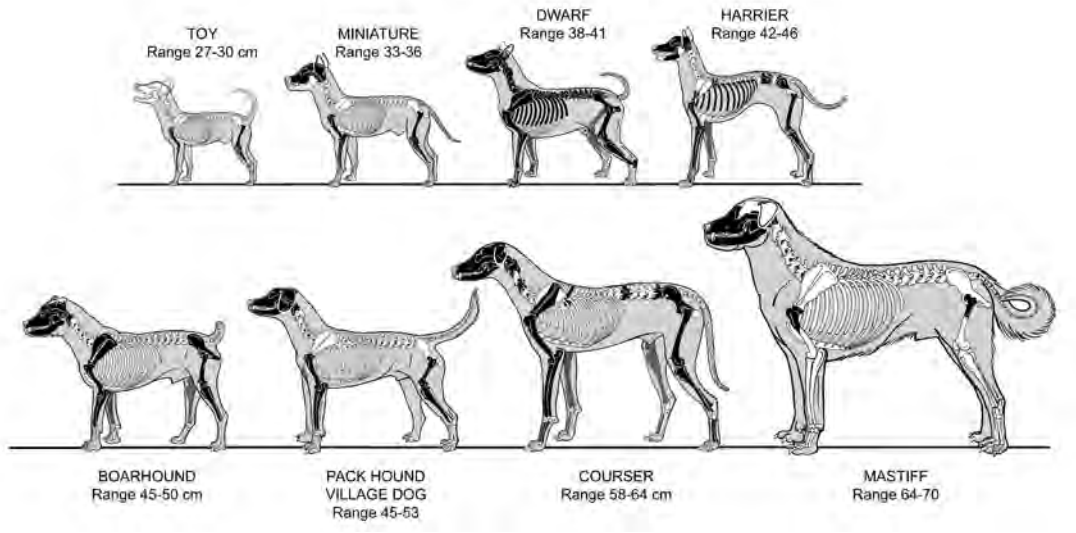

FIGURE 19

Biotype reconstructions of the eight dog morphotypes known from Roman Vindolanda. In characterizing them, we deliberately avoid using the names of modern breeds. Note that each occupies a height range of 3–8 cm, and that some ranges partially overlap; bones pertaining to different morphotypes are distinguished on the basis of slenderness index and anatomical details. Black color delineates bodyparts known from bones. The dwarf hound, harrier, boarhound, and courser are known from extensive associated material, and complete or nearly complete skull material is known from Vindolanda for all but the toy.

artwork (Toynbee, 1973; Manaserian & Antonian, 2000; Schwartz, 2000; Valadez Azúa, 2000; Brewer *et al*., 2001; Daróczi-Szabó, 2002; Trantalidou, 2006). We consider this survey important because the naturalistic representations of Roman artists contain detailed and reliable information on "perishable" physical traits (Daróczi-Szabó, 2002).

Dog Size Distribution

Dogs whose living height ranged from about 27 to 70 cm are present in the Vindolanda collection (Figure 19). Harcourt (1974) reported a similar size range for dogs from British archaeological sites of all periods. Johnstone & Albarella (2002), Grimm (2007), and Baxter & Nussbaumer (2009) document more recent finds that likewise fall within Harcourt's (1974) reported range. Baxter (2010 a, b) and Ayton (2011) reported small dogs, but the total size range of Romano–British dogs, including those from Vindolanda, is less than that from some contemporaneous sites on the European continent: for example Heidelberg-Neuenheim in Germany (Luttschwager, 1965), Tac Gorsium (Bökönyi, 1984; Bartosiewicz, 2000), and Classe (Farello, 1995). A skull from a North African grave-field at Yasmina (MacKinnon & Belanger, 2002) is the smallest Roman-era dog yet reported.

Harcourt (1974) believed that the appearance of small (toy and dwarf) dog morphotypes in Britain coincided with the Roman invasion of the main British island in the last century B.C., but subsequent work by Clark (1995) suggests that they first appeared there somewhat earlier, in the late Iron Age. This implies that the husbandry techniques required for the production and maintenance of phenotypic distinctiveness were not invented by the Romans, but were already known to peoples whom the Romans conquered or with whom they traded.

References in the Vindolanda tablets (Bowman & Thomas, 1994, 2003), along with the wider corpus of Roman writing and record-keeping (Birley, 2002; Birley, 2009), allow us to ascertain something about the people occupying Vindolanda at any given period. So too do the thousands of non-osteological artifacts of every type that have been excavated from the site (Birley, 2003, 2009, 2013; Birley & Blake, 2005, 2007; Blake, 2003, 2014). The succession of soldiers and civilians

who occupied Vindolanda originated in areas far from the site and came there by orders of the Emperor, following their tribal leaders whom the Romans designated as military commanders (Birley, 2002; Birley, 2009).

It is reasonable to assume that the type of dog most preferred by peoples of different culture and geographic area of origin might differ. Herein we document correlation of dog size with time period. Insofar as dogs of different sizes also tend to be of different phenotype, we can provide the following observations.

The "Vindolanda periods" correspond to changes in the cultural identity of the garrison (Figure 5; Birley, 2002; Birley, 2003). Cohorts drawn from at least five different geographic areas lived at Vindolanda over the more than three centuries during which Roman-allied people maintained it. The Tungrian and Batavian cohorts were recruited from areas in Belgium and the Netherlands not very far apart, and they appear to have been culturally similar (Birley, 2002). The Nervians (if indeed they were the site's occupants during Periods VI and VI-A; Birley, 2002) also came from Belgium. The Gauls, occupants for most of Periods VII and VIII, were from France. During Period VI-B, the Severan "anomaly", there may have been troops from North Africa on site, but also evidently a highly-disciplined elite corps who came directly from Italy, plus, in all likelihood, local Celts occupying the tightly-packed, ordered rows of roundhouses built at Vindolanda (Birley, 2002; Birley, 2003).

The most significant point evident in Figure 5 is the sudden advent of small dogs which occurs at the beginning of Period IV, and the persistent high frequency of small dogs at Vindolanda thereafter. That there were no small dogs on site during Periods I–III, but that the Tungrians kept them at high frequency during Periods IV and V when they returned after an absence of only a few years, argues for the idea that small dogs simply did not become available in the far north of England until the beginning of Period IV.

Large dogs, by contrast, were in Roman time either coursers or guard-dogs, whereas medium-sized dogs were harriers, boarhounds, or else village dogs with dingo-like conformation. Contemporary mosaics show that tall, swift dogs were used to pursue deer with the hunter and the master of hounds following upon horseback, while stout, strong bulldogs and mastiffs were used against wild boar (Toynbee, 1973). There are several references in the Vindolanda writing tablets to hunting activity by commanding officers (Bowman & Thomas, 1994: *Tab Vindol 233*; Bowman & Thomas, 2003: *Tabs Vindol 593*, *594*, *615*). Hunts requiring large dogs were high-status activities reserved for military officers and Legionaries (Alcock, 2001; Birley, 2003). Nonetheless the raising, keeping, training and use of hunting hounds was a complex activity which doubtless involved the efforts of many community members (Birley, 2003).

Nearly all dogs on site during Periods I through III were of medium size. We know from several indications in the Vindolanda Tablets that Flavius Cerialis, probably a Batavian chieftain who served as the Roman commandant of the garrison from about 100 through 105 A.D., was an avid hunter, and so in all likelihood was his predecessor Flavius Genialis (Birley, 2002). It is quite possible that the few large dogs recovered from Periods II–III were, in fact, members of an elite hunting pack belonging to one or both of these men.

Legionaries directly from Rome are thought to have been on site during the Severan Period VI-B (Birley, 2003 and *pers. comm.* 2014), and it is during this period that we find the highest percentage of large dogs. Next highest is associated with the Nervian periods VI and VI-A, but the Gauls who occupied Vindolanda in later periods also kept significant numbers of large dogs.

Ecological conditions in the vicinity of the site changed during the centuries that the Romans occupied it (Birley, 2003). Mature forest originally surrounded the site (Tyres, 2007, 2014), forming a patchwork with fields in late-successional stage (Huntley, 2007, 2014). The plateau upon which most of the Vindolanda forts were built is surrounded on three sides by streams margined by thick undergrowth, and less than one mile away, a reedy tarn lies across low ground in a moist, flowering meadow. To the east, heather-covered slopes stretch upwards to rocky heights. Originally, abundant game populated this richly diverse environmental mosaic, including deer, boar, foxes, hare and comestible wild birds, but the Romans gradually degraded their surroundings over time, and the frequency and diversity of the remains of game species declined (Hodgson, 1977; Bennett, 2005, 2007, 2014; Bennett & Timm, 2013; Birley, 2013). After the end of the Severan Period, however, garrison size as well as the total population

at Vindolanda were less, and the bones of game animals rebound somewhat in frequency. The frequency of large dogs also probably reflects the relative wealth and prosperity of the Gaulish cohort (Alcock, 2001; Birley, 2003).

CONCLUSIONS

The Vindolanda dog collection demonstrates that a range of dog morphotypes was present at this remote garrison during most of its history. While some Vindolanda dogs show phenotype similar to modern village dogs or Australian dingoes, the majority are morphologically different and the range of size and phenotype is far greater than either dingoes or British dogs of the Neolithic. Dental wear documents that dogs of all ages were kept, while the skull of an old dog injured while boar-hunting but subsequently healed shows that "working" dogs were valued. The number of juvenile dogs is relatively low and evidence for skinning, butchering, or gnawing is rare. There is no evidence at Vindolanda that dogs were raised for slaughter, or interred in any ritual context.

Images from contemporary mosaics, as well as the wider Latin literature and specific tablet references, corroborate the idea that large and medium-sized dogs at Vindolanda were used to hunt deer, boar, birds, foxes, and hares. There were also miniature and dwarf dogs small enough to sit on peoples' laps, but which might also have functioned in hunting small game or house mice. Mastiffs functioned as guard-dogs and war-dogs. That dogs were bred and raised at Vindolanda is indicated by the remains of a beehive-shaped wattle dog-house associated with juvenile and gnawed dog bones.

The frequency of large, medium, and small dogs changes with time at Vindolanda, corresponding to change in the region of origin of the resident cohort. Morphometric analysis (Bennett *et al*., 2016) and measurement of dog pawprints impressed in ceramic building materials (Bennett, 2012) provide size data, while documentation of contemporary Roman artwork provides insight regarding perishable characteristics of pelage, coloration, and carriage. Considered together, this evidence allows biotype reconstruction of eight different types of dog that were present at Roman Vindolanda.

The trading reach of the Roman Empire was vast, encompassing much of Eurasia. We demonstrate herein that a range of dog morphotypes were bred at Vindolanda and that they probably served many functions. Dogs were no doubt highly valued and some, perhaps, were obtained from great distances. The striking resemblance of the Trumpington dog reported by Baxter & Nussbaumer (2009) to the modern Chinese Shar-Pei, and of a toy dog reported by MacKinnon & Belanger (2002) to the modern Maltese—to cite only two examples—suggest that some Vindolanda dogs may also have originated far away. However, because dog morphotypology does not have the same basis as the assignment of breed identity, it is not appropriate on the basis of the evidence adduced here to suggest that any ancient dog "belongs to" any modern breed. Future DNA studies may demonstrate ancestor–descendant relationships (Larson *et al*., 2012); until then, the safest course is to understand ancient dogs as functional analogs of the modern dog breeds that they resemble.

ACKNOWLEDGEMENTS

We gratefully acknowledge the financial support of the Vindolanda Trust and its Director, Patricia Birley. Andrew Birley and Justin Blake provided indispensable on-site guidance, and Andrew kindly provided air photos of the "roundhouse complex". Ian Baxter generously provided discussion, measurements, and many photos; he, Andrew Birley, and Anthony Birley read and improved our first drafts. Greg Campbell generously advised us in database design and multivariate analysis. Salvador Gonzales and Wilson Colón provided Spanish-language assistance. Barbara Birley, Louisa Gidney, Jessica Grimm, Geraldine Missig, and Marc Nussbaumer kindly supplied specimen photographs. Sarah Taylor assisted with measurements. Assistance and collection access was provided by David Berman, University of Kansas Natural History Museum.

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