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Late-Medieval Horse Remains at Cēsis Castle, Latvia, and the Teutonic Order's Equestrian Resources in Livonia

By ALEKS PLUSKOWSKI¹, KRISH SEETAH²,
MARK MALTBY³, ROWENA BANAJEA⁴, STUART BLACK⁵ and
GUNDARS KALNIŅŠ⁶

EXCAVATIONS AT the castle complex of Cēsis, Latvia, uncovered an unusual find of large quantities of horse bones, some of which were partially articulated, along with equestrian equipment. These were associated with a destroyed building at the edge of the southern outer bailey. The horses included large males, most probably stallions, and pathology on several of the recovered vertebrae suggests these individuals had been used for riding. The size of the horses was within the range for medieval war horses, and the associated tack also pointed to prestigious riding animals. Radiocarbon dating of the bones placed them firmly within the Teutonic Order's period of rule. We conclude here that these horses fulfilled a military role in the final decades of the Teutonic Order's rule in Livonia in the late 15th/early 16th century and that the well-known equestrian culture of late-medieval Prussia was comparable in character, if not in scale, to that in Livonia.

Over the course of the 13th century, the tribal territories of the eastern Baltic were conquered by crusading armies and re-organised as the Christian polities of Livonia and Prussia. With the exception of the Danish Duchy of Estonia, these were governed by militarised theocracies — the Teutonic Order, bishops and their cathedral chapters. In the case of Livonia, power was split between four episcopates, cities — particularly Riga (now in Latvia) — and the Teutonic Order, which in AD 1237 had absorbed the remnants of the locally established military order, the Sword Brothers, who had been vassals of the archbishops of Riga. The Teutonic Order's Livonian estates were overseen by a provincial master, with individual territories governed by commanders (German *Komtur*) and advocates (*Vogt*). These officials were based in castles, the largest of which were effectively fortified convents, and their principal roles concerned the maintenance of

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order, the management of resources and the provision of security. The Teutonic Order promoted itself as the defender of Latin Christendom in north-eastern Europe against pagan Lithuania and Eastern Orthodox Russian principalities, particularly Novgorod.⁷ Compared to Prussia, the surviving written sources for Livonia are extremely limited and fragmentary,⁸ but they indicate that by the 15th century, and almost certainly earlier, the Teutonic Order had mobilised substantial military resources at its castles.⁹

One of the most important elements of these was horses. The war horse, along with the crossbow, has been considered pivotal to the military successes of crusading armies in the eastern Baltic¹⁰ and came to define the power of the new regime. Horses consistently feature in the visitation records of the Teutonic Order's castles in both Prussia (where they are far better documented) and Livonia. Each castle had ownership of its own equine stock, but could also procure cavalry or pack horses from its vassals through *corvée* — the tenurial obligations imposed on both the conquered population and incoming colonists following the Crusades. Our knowledge of the Order's equine resources is largely based on Prussian sources, and until recently there has been little comparative data from Livonia. However, a zooarchaeological survey of horses across the eastern Baltic before and after the Crusades has provided a baseline for assessing finds of equine remains from Livonian sites.¹¹ Horse remains are typically found at the Teutonic Order's castles during excavations, but they are usually disarticulated and highly fragmented. Excavations at the castle complex at Cēsis in Vidzeme, central Latvia (German Wenden), uncovered a rare find. The remains of both articulated and disarticulated horses were exposed, along with equestrian equipment, in stratigraphic horizons associated with a destroyed building at the edge of the southern outer bailey. This provided a new opportunity to contextualise the equestrian resources utilised by the Livonian branch of the Teutonic Order within the broader context of the eastern Baltic.

EXCAVATIONS AT CĒSIS CASTLE

The castle complex had been the focus of over three decades of excavations (1974–2008), directed by Zigrīda Apala.¹² Much of the area within the castle was excavated during this time, including the remains of the Western Range which was detonated by the castle inhabitants on 6 September 1577 during the Russian siege. In 2010, surveys of the southern outer bailey and moat were conducted with a gradiometer and ground penetrating radar, within the context of 'The Ecology of Crusading' project.¹³ The aim was to identify areas with undisturbed cultural deposits and to recover a range of environmental data. This was followed by targeted excavations in 2011 and 2012, consisting of a 2 m × 5 m trench (N) in the moat, a 2 m × 10 m trench (M) in the southern outer bailey, and three small trenches within the western part of the castle targeting

⁷ Selart 2015.

⁸ Kreem 2002; see also chapters on Livonia in Pluskowski forthcoming 2018.

⁹ Benninghoven 1963.

¹⁰ Ekdahl 1991; 1998.

¹¹ Maltby et al forthcoming 2018 for Livonia and Makowiecki  2018 for Prussia. See also Bliujienė 2009 for a long-term Baltic overview of horses.

¹² Apala 2007; 2010a–c.

¹³ The geophysics within the castle grounds were conducted by David Thornley (University of Reading).

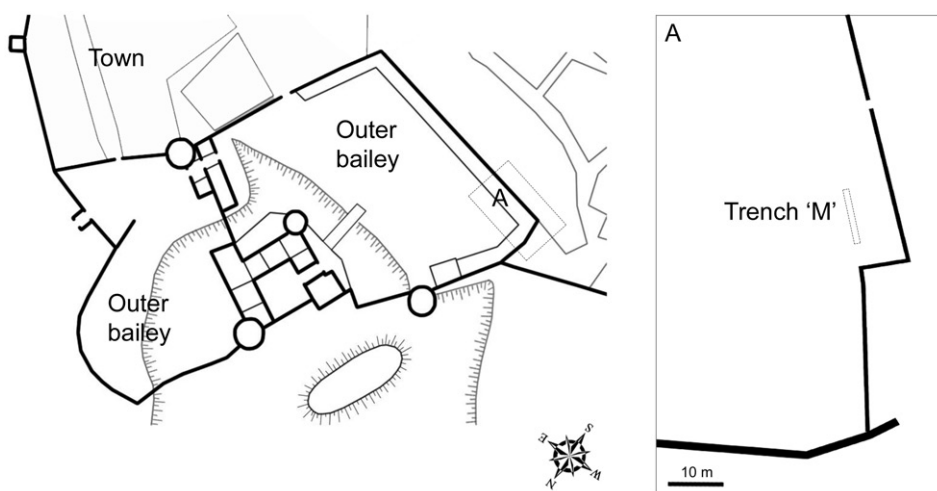


FIG 1

Simplified plan of Cēsis Castle showing the location of trench M in the south-western corner of the southern outer bailey.

discrete sedimentary deposits. A diverse range of ecofacts and artefacts were recovered during these excavations. The earliest phases could be dated by the dendrochronology of associated timber structures and linked to the expansion of the castle in the later 14th century. These were small-scale excavations largely aimed at recovering a suite of environmental data. The horse bones were found in trench M.

Trench M, opened in the south-western corner of the southern outer bailey (Fig 1), was excavated over the course of two seasons. Initially, a 2 m × 8 m trench was opened in 2011, and this was extended to the east by two metres in 2012 to determine whether an uncovered wall was internal or external. The excavation area was opened along a raised platform of soil, the edge of which corresponded to the outer wall of a range represented on later maps of the castle.¹⁴ Traces of several phases of construction, destruction and rebuilding were uncovered. The soil was waterlogged at a depth of c 2.8 m (Fig 2), where a substantial timber, probably a sill plate, lay directly on top of the natural geology (Fig 3). This was dated by dendrochronology to c AD 1374/5 and its use may have been secondary, or it may have derived from a timber-framed building constructed in situ. The chronology of the main destruction layer is discussed in further detail below, but the sequence of activities in this part of the castle's precinct appears to begin no earlier than the mid-14th century. The structure appears to have been subsequently rebuilt (as represented by a horizon of brick rubble) and then used until the end of the 15th/start of the 16th century (see section on dating below), at which point it was destroyed by fire. This destruction horizon consisted of a dark soil layer (044/063) with unevenly distributed charcoal and ash, c 1.75–1.85 m deep and with an average thickness of 10 cm across the profile.¹⁵ Embedded within this were a series of charred timbers most of which lay on an S/N axis (see Fig 4), as well as a small lens of

¹⁴ Caune 2007.

¹⁵ Numbers in (-) refer to archaeological contexts and numbers in <-> refer to individual finds.

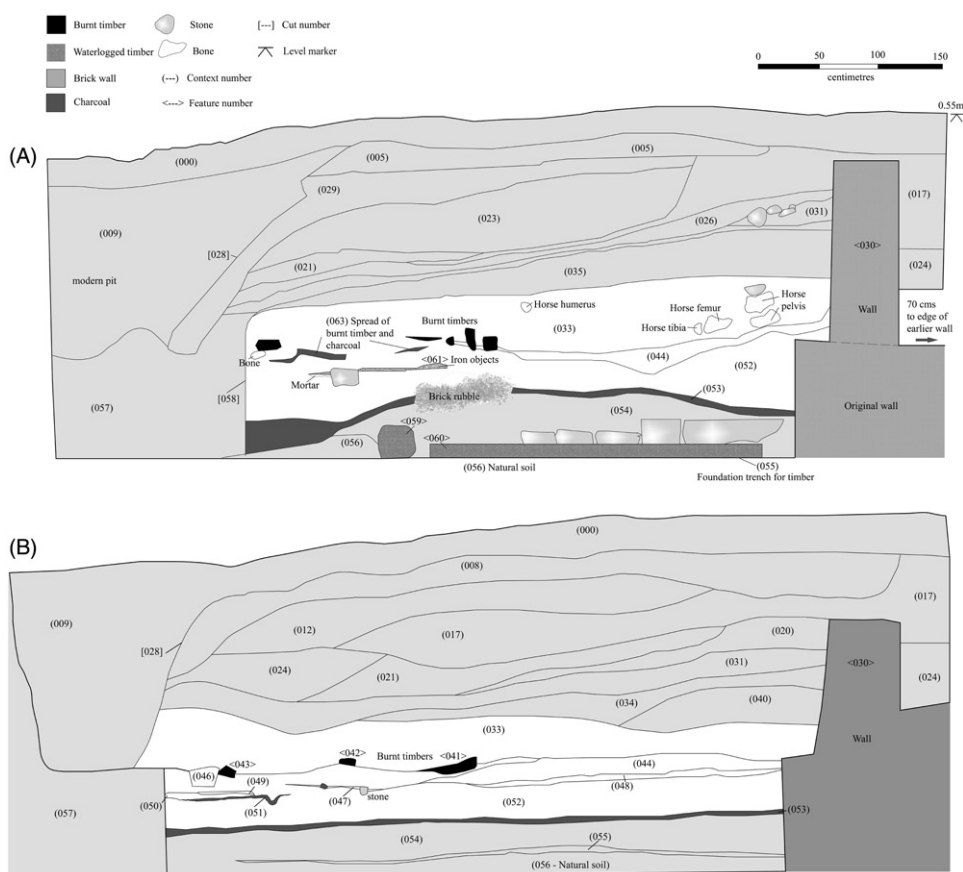


FIG 2

South-facing section of trench M (A) and north-facing section of trench M (B), with the layers associated with the horse remains highlighted in white and the horse tack indicated by <061> in the south-facing section.

mortar. The horse remains, which were recovered above and between these timbers, were situated within a layer (033) covering the charred timbers, with an average thickness of 50 cm. The structure was then rebuilt with the addition of a stove and the roof was retiled; remnants of stove and roof tiles were found throughout the upper horizons. This structure was subsequently demolished and rubbish pits were dug into the ground, truncating the occupation deposits in the western area of the trench. Geochemical and macrobotanical analyses indicated the area contained middens in both its earlier and later phases.¹⁶ Fragments of bone from cattle (*Bos taurus*), sheep/goat (*Ovis aries/ Capra hircus*), pig (*Sus scrofa*), dog (*Canis lupus familiaris*), chicken (*Gallus gallus domesticus*) and hare (*Lepus* sp.) were also found throughout the section.

¹⁶ Banerjea and Badura forthcoming 2018.

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FIG 3
The timber at the base of trench M, view facing north.

THE HORSE REMAINS FROM THE OUTER BAILEY

A total of 1719 fragments of animal bone were recovered from trench M, of which 843 (49%) were identifiable at species level. Of these identifiable fragments, 369 were associated with contexts dating to the period of the Teutonic Order's rule. The majority of these, 251 fragments, were identified as belonging to a minimum number (MNI) of four horses (*Equus caballus*), calculated using the most frequently occurring zone of the tibia (Tab 1).¹⁷ The horse bones were all recovered from the phase of destruction c 175–185 cm below the surface. One hundred and thirty-four fragments were defined as an 'Associated Bone Group' (ABG1) in situ, representing 65% of an entire individual (a horse typically has 205 bones). The horse lay curled on its left side on top of the destruction layer with the head facing towards the south-east, and its bones showed no signs of burning. The skull and atlas (first cervical vertebra) were heavily fragmented when the stove was subsequently constructed on the levelled surface (Fig 5). Some of the ribs had also been pushed to the west. One side of the mandible was complete, with intact cheek teeth (P2, P3, P4, M1, M2, M3) all showing signs of wear. Measurements of the crown heights of the third premolar indicated the articulated individual was aged 17–18 years.¹⁸ Visible portions of a femur and tibia, alongside the fragmented pelvis, were embedded within the S-facing profile, but the latter was successfully recovered (Fig 6). The other three individuals were represented by an associated set of 18 thoracic

¹⁷ The MNI is calculated from the MNE (minimum number of elements) by summing the zones of each element to find the most abundant, then taking the number for the most abundant element to represent the MNI for the species overall (see Hambleton 1999).

¹⁸ Levine 1982.

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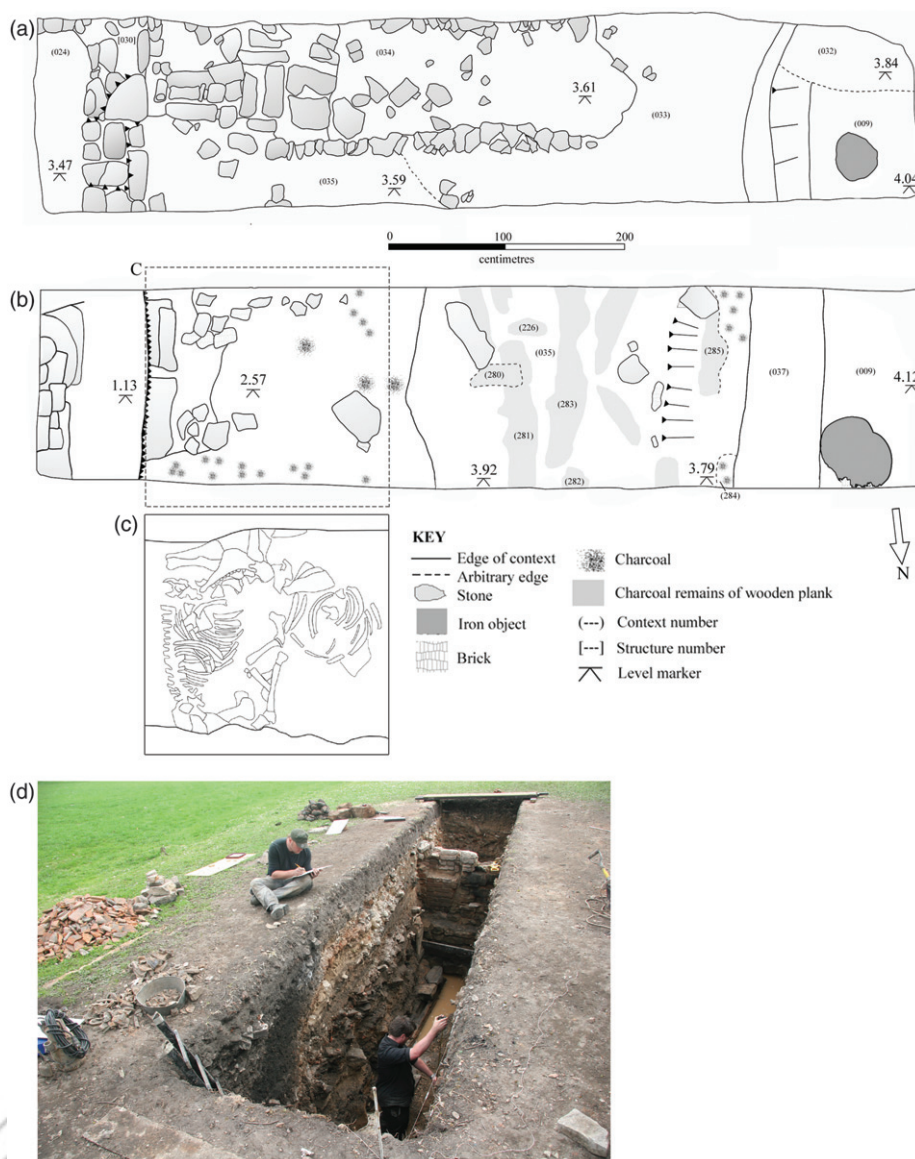


FIG 4

Plan of the south-facing profile of trench M showing (A) the layer above associated with the stove (1.45–1.72 m below the surface), the phase of destruction (B), 1.75–1.85 m below the surface, and (C) the location of AGB1. (D) is an oblique photographic view of the south-facing section with destruction layer highlighted.

vertebrae (ABG2), a set of three associated phalanges (ABG3) and a range of incomplete and disarticulated elements (see [Tab 1](#)), although all were recovered close to each other within the area defined by the charred timbers. At least two bones, including an identifiable horse humerus, remained embedded in the S-facing profile. Of these remains, only

TABLE 1
Horse element representation from trench M in Cēsis Castle.

Element	ABG1	Other	Total
Skull fragments	2		2
Mandible	2	1	3
Hyoid	1		1
Loose Teeth	10	3	13
Scapula	2	1	3
Humerus	2		2
Radius	2	1	3
Ulna	2	1	3
Pelvis	2	2	4
Femur	1	1	2
Patella	1		1
Tibia	1	7	8
Fibula	1		1
Carpals	6	1	7
Astragalus	2	1	3
Calcaneus	2		2
Other Tarsals	4		4
Metacarpal 3	2		2
Metatarsal 3	1		1
Peripheral Metapodials		6	6
Phalanx 1	2	3	5
Phalanx 2	2	3	5
Phalanx 3	2	3	5
Sesamoids	4	2	6
Axis (VC2)	1		1
Cervical Vertebrae	5	4	9
Thoracic Vertebrae	18	26	44
Lumbar Vertebrae	5	6	11
Sacral Vertebrae		3	3
Caudal Vertebrae	4		4
Unidentified Vertebrae		1	1
Ribs	36	41	77
Sternebrae	9		9
Total	134	117	251

ABG = Associated Bone Group

Other = Remaining elements (including AGB2 and ABG3)

eight fragments, all from lower limb elements, displayed signs of charring, but no element was completely burnt (Fig 7, Tab 2). All the bones were fully fused, indicating the animals were adults, while three individuals — represented by separate groups of fused vertebrae (ABG1, ABG2 and additional thoracic elements) — were aged to at least five years.¹⁹ Measurements of the crown heights of the third premolar from two individuals within the destruction layer indicated one was aged 17–18 years and the other 10–12 years. The skull of the articulated horse was identified as male due to the presence of canine teeth. Four loose canines were also found among the disarticulated remains.

¹⁹ After Silver 1969.

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FIG 5

Associated Bone Group 1 (ABG1): (a) south-facing; (b) north-facing; (c) and (d) with the later stove positioned over the place where the horse's head lay.

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FIG 6
Parts of the femur, tibia and pelvis *in situ* within the south-facing profile.

The greatest lengths of six of the limb bones were used to estimate withers height based on Vitt (for the list of measurements see Tab 3).²⁰ These estimates ranged from between 135 and 147 cm, averaging 141 cm. These horses are larger than the majority recorded from late-medieval Prussia,²¹ and the prehistoric ranges for Latvia and Estonia.²² The metrical data confirm the documented presence of both small and large horses in Livonia, comparable to that in Prussia. In the latter region, the war horses bred on the Order's estates reached estimated heights of up to 150 cm, while indigenous horses could be as small as 101 cm.²³ In Livonia, the smallest horses stood at an estimated 112 cm.²⁴ In neighbouring Novgorod, where substantial numbers of horse remains have been found, withers heights from 93 complete limb bones from the Troitsky sites averaged around 133 cm with a range of 117–153 cm; from Gorodishche, the average height was 144 cm.²⁵ The most complete ABG from trench M at Cēsis had pathology on ten of the 18 thoracic vertebrae (T8–T18), consisting of overriding dorsal spinous processes, as well as spondylotic spurs of newly formed bone on the ventral and lateral surfaces of the lower vertebral bodies (Fig 8). The same pathology was also visible on the same ten thoracic vertebrae from AGB2, deriving from another individual. Other pathologies from ABG1 included extensive chronic deformation of a single tarsal resembling spavin, and on the medial surface of a right metacarpal, which may have reflected the start of the ossification of the interosseous ligament.²⁶ A small amount of pathological bone growth on a separate rib fragment was also observed.

These are relatively minor pathologies compared to other finds of pathological horse spines from medieval contexts in the eastern Baltic Sea region, where adjacent sets of thoracic and lumbar vertebral bodies and their processes were fully fused.²⁷

²⁰ Vitt 1952.

²¹ Makowiecki et al forthcoming 2018.

²² Maltby et al forthcoming 2018.

²³ Makowiecki et al forthcoming 2018; see also Ekdahl 1998.

²⁴ Maltby et al forthcoming 2018.

²⁵ Maltby et al 2018.

²⁶ Baker and Brothwell 1980, 118–9; Daugnora and Thomas 2005; Levine et al 2005.

²⁷ Eg Daugnora and Thomas 2005; Pluskowski et al 2010; Janeczek et al 2014.

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FIG 7

Detail of charred mid-shaft of a horse tibia fragment from trench M.

TABLE 2
Charred horse bones from trench M in Cēsis Castle.

Element	Number
Phalanx 1	1
Phalanx 2	1
Tarsal	2
Astragalus	1
Tibia	3
Total	8

In Livonian sites, examples of similar pathologies on horse thoracic vertebrae have been found in suburban contexts in Viljandi (German Fellin).²⁸ It is noteworthy that such examples have also been found at other castles associated with the Teutonic Order.²⁹ The causes can reflect a variety of factors, including stresses related to traction, such as pulling carts or ploughs, and as such can manifest in older animals. Indeed, of the three individuals that could be aged by crown height measurements, two were very old. However, given the large size of the horses and their association with luxury riding tack (see below), these pathologies may have developed because of the stresses of being ridden by heavily armoured knights. Barding (armour for horses) became popular for war horses in the 14th and 15th centuries, and by the mid-15th century was defined by a combination of metal plates and leather. However, this type of armour was relatively light; for example, a crinet, protecting the neck of a horse, only weighed around 4–5 kg. On the other hand, the average weight of steel armour was 20–25 kg, and when

²⁸ Rannamäe 2010, app 4, 109.

²⁹ Pluskowski et al 2010.

TABLE 3
Measurements of horse bones from trench M in Cēsis Castle.

Element	Bp	Dp	LG	BG	SLC	DC	Bd	Dd	BT	GL	SD
Calcaneus										114.7	
Femur	114.8					58.1					
Femur	11.8					59.2	90.9	115.9		400	44.7
Humerus	92.6	101.0					83.0	85.0	73.4	292	36.7
Humerus	99.1	109.4					88.4	90.7	77.0	298	40.5
Metacarpal	54.1	34.1					48.9	36.5		224	32.4
Metacarpal	53.4	33.2					49.7	36.8		222	32.6
Metatarsal	50.7	47.4									
Metatarsal	52.9	49.4					49.8	39.2		282	31.5
Radius	82.7	88.8					76.0	41.0		335	37.0
Radius	83.5	45.4									37.3
Radius	87.1	47.8					79.3	41.5		356	41.0
Scapula			62.1	48.6	75.1						
Scapula			58.4	48.6	72.4						
Scapula			59.8	50.5	71.0						
Tibia	96.6	89.3									38.5
Tibia	100.7	99.7					82.4	51.0		372	43.2
Tibia	102.0	96.8									

Bp = Breadth of proximal end

Dp = Depth of proximal end

LG = Length of glenoid cavity

BG = Breadth of glenoid cavity

SLC = Smallest length of collum

DC = Depth of caput

Bd = Breadth of distal end

Dd = Depth of distal end

BT = Breadth of trochlea

GL = Greatest length

SD = Shaft diameter

combined with the weight of a knight, this would have added a load of 70–90 kg.³⁰ Such a weight would result in excessive dorsiflexion, causing the vertebrae to rub against each other. In modern horses, which carry lighter loads, such lesions are typically detected in the saddle-bearing part of the back, between vertebrae T12 and T18, and are commonly referred to as 'kissing spines'.³¹

Previous seasons of excavations at Cēsis Castle have also uncovered partially articulated horse skeletons. In 1927, the skeleton of a horse was found on the stairs leading down to the basement of the Western Range of the castle.³² During excavations of the Western Range in 2005, two partial skeletons were found: one at the north-eastern corner (with a skull but lacking the lower jaw) and the other at the north-western corner (without a skull) of basement room 3. Little information is available on the condition of these remains, and they were not subsequently available for further analysis.

³⁰ Breiding 2005; Pyhrr et al 2005, 32.

³¹ Walmsley et al 2002.

³² This was reported in the newspaper *Pēdējā Brīdī*, 26 September, 1927, in an article with the title "Zelta meklēšana" Cēsu pilsdrupās turpinās (The "h for gold" continues at Cēsis Castle).

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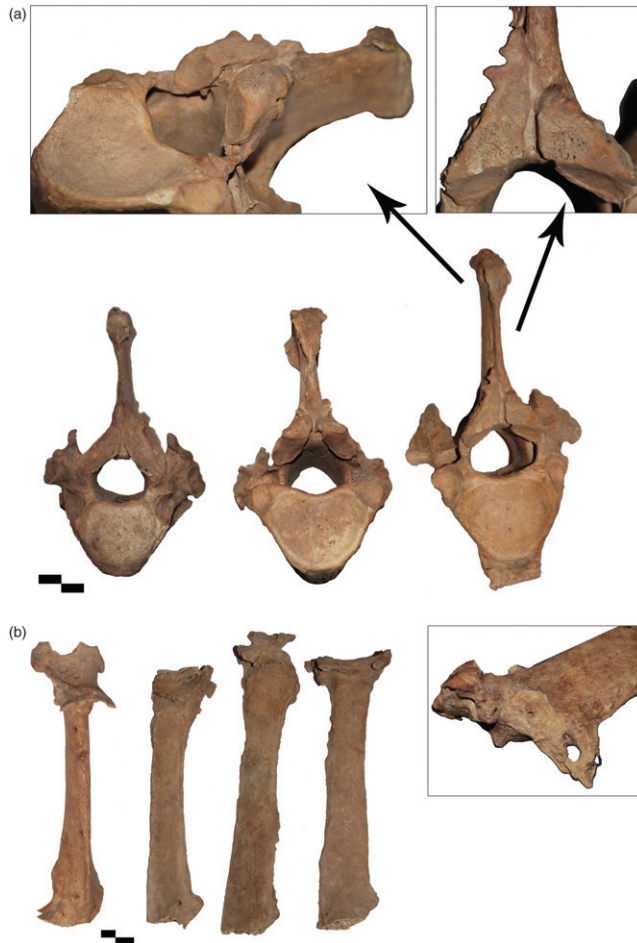


FIG 8

Examples of pathological vertebrae from ABG1: (a) thoracic vertebrae; (b) spinous processes from thoracic vertebrae.

However, it can be tentatively assumed in these cases that the horses were killed by the detonation of the Western Range in 1577.

ISOTOPIC ANALYSIS

Stable isotope analysis was conducted (oxygen, 'O' and hydrogen, 'H') on bone collagen, and trace element analysis (barium, 'Ba' and magnesium, 'Mg') of bone phosphate applied to the excavated Cēsis horse remains. O-H isotopes have been analysed previously on bone collagen for both humans and animals,³³ and the influence of water uptake on the oxygen and hydrogen isotope composition of human and animal

³³ Koon and Tuross 2013 ; Leyden et al 2006; Kirsanow et al 2008.

564 tissues has been well established for decades.³⁴ The isotopic analyses were carried out at
565 the Department of Archaeology at the University of Reading (United Kingdom) using
566 the Chemical Analytical Facility (CAF). Bone collagen was extracted following the
567 method described by Britton, Müldner and Bell.³⁵ Oxygen and hydrogen stable isotope
568 ratios were measured in triplicate on a Thermo-Fisher DeltaV Advantage Isotope Ratio
569 Mass Spectrometer coupled to a Smart TC/Elemental Analyzer. Sample data were
570 taken as averages of triplicate analyses with 2 SD (standard deviation) variations
571 expressed as uncertainty bars. Analytical error was calculated by repeated analyses of
572 internal and international standards and was less $<0.1\text{‰}$ for oxygen and $<2.3\text{‰}$ for
573 hydrogen (2 SD).

574 Linda Reynard and Robert Hedges (2008) established the basis of working with
575 O-H data from collagen following previous work.³⁶ They established the need to
576 calculate the exchangeable hydrogen content of collagen as hydrogen is absorbed
577 from the atmosphere and water being used in the analytical process. In order to
578 correct the data for the effects of hydrogen absorption, a fractionation experiment
579 was conducted whereby six different collagen samples, in triplicate, were exposed to
580 water of different isotopic compositions. Linear correlations were established for each
581 sample plotting water isotope (O and H) against measured O and H isotope ratios in
582 exposed collagen. These data showed a consistent offset between water isotope
583 (O and H) and measured values of between 10 and 19%. The mean of these (11 +/
584 - 3%) was used to correct the measured collagen data for any absorption effects dur-
585 ing analysis.

586 Samples of metapodial, rib, ulnar carpal, ulna and occipital skull bone sections
587 from recovered horse skeletons were analysed for trace elements. The samples
588 were physically cleaned of any altered outer margins using a Dremel drill prior to
589 sub-sampling. The drill head was a burr and sand paper set to remove the surface.
590 Cleaned samples were then washed in UHQ water in an ultrasonic bath to remove any
591 residual soil particles, before being soaked in a 0.1 M HCl solution to remove any
592 deposited carbonates and other soluble materials.³⁷ Once air-dried, the samples were
593 drilled from cross sections of bones to ensure no altered material was selected. Dried
594 bone powder was then dissolved in concentrated HNO₃ until complete digestion was
595 obtained. The dissolved samples were then diluted and a series of internal standards
596 (Rh, In and Re) added to the solutions prior to analysis on a Thermo Fisher iCAPQ
597 ICP-MS which was calibrated with a series of multi-element standards. The instrument
598 was run in KED mode (with the collision/reaction cell on) to prevent polyatomic
599 interferences and to increase sensitivity. Blank deductions were made following
600 procedural blanks and several international standards run alongside the samples.

601 Trace element concentrations in archaeological bone have been discussed in detail
602 in the literature,³⁸ with studies suggesting that analyses were complicated and dogged by
603 issues of post-burial alteration.³⁹ However, more recent work on trace element uptake
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606 ³⁴ Hobson et al 1999.

607 ³⁵ Britton et al 2008.

608 ³⁶ Reynard and Hedges 2008.

609 ³⁷ UHQ= Ultra-High-Quality water, >18 MOhm, and HCl= Hydrochloric acid.

610 ³⁸ Eg Reiche et al 1999.

³⁹ Turossa et al 1989.

to bone suggests that these data can be useful, and inert elements such as barium and magnesium can be used to interpret *in vivo* concentrations.⁴⁰ While post-mortem burial environments can affect trace element content of bone,⁴¹ and magnesium are relatively immobile in hydrological environments and so we are confident the Cēsis horse trace element data represent *in vivo* values. Barium concentrations in diets of animals can be associated with cereals and other alkaline earth concentrated foodstuffs (eg nuts, cereals, roots, beans, onions).⁴² In addition, magnesium also shows similar traits although noted as being more mobile within the burial environment.⁴³ However, thorough cleaning of bone samples as undertaken in this study and comparison of trace element ratios and immobile elements suggests that the concentrations measured here are close to that *in vivo*. In order to confirm this, trace element ratios were checked to ensure they were in previously reported ranges.⁴⁴ Magnesium, barium, phosphorus, 'P', uranium, 'U' and vanadium, 'V' were monitored in all bone samples in order to assess the level of post-burial alteration. From the U-Series (Uranium Series) dating of the bone samples (see below), it is clear that elements such as uranium are taken up post-burial. However, quantifying the proportion of uptake is possible by comparing elements such as uranium and vanadium that are not readily bioprecipitated into hydroxyapatite bone matrix to bone samples that have not been interred. These elements can be used as useful markers for alteration of bone samples and give a broad indication of the level of post-burial diagenesis.

In the case of vanadium animal tooth enamel, dentine and bone have been shown to have concentrations of 0.1–0.6 mg/kg,⁴⁵ <1.5 mg/kg⁴⁶ and <0.08 mg/kg,⁴⁷ respectively. Similarly, uranium substitution into bone is a good indicator that other elements such as Sr, (strontium), Ba and Mg would have been similarly affected. Concentrations of vanadium in the bone samples from this study are all low <0.5 mg/kg, and most <0.1 mg/kg. Similarly, uranium concentrations are also low (<0.3 mg/kg) indicating that post-burial, diagenetic alteration of bone samples is minimal including elements likely to substitute or ionically exchange into the bone samples post-burial. In addition, elements that are also typically low in bone concentrations *in vivo* (such as REE, some trace metals) are also either below detection limit on similarly low concentrations (see Supplementary Material 1).⁴⁸ In summary, the stable isotope data (Fig 9) show that the Cēsis horses consumed local water and these data are consistent with previously published data.⁴⁹ The trace element data (Fig 10) show that the Cēsis horses consumed high Mg and Ba foods, possibly grain, and compared to other horses analysed within the

⁴⁰ Trueman et al 2008; Hinz and Kohn 2010.

⁴¹ Burton and Price 1990; Kohn et al 2013.

⁴² Eg Spiegel et al 2009; González-Weller et al 2013.

⁴³ Kohn et al 2013.

⁴⁴ Ibid.

⁴⁵ Losee et al 1974.

⁴⁶ Kohn et al 2013.

⁴⁷ Yoshinaga et al 1995.

⁴⁸ REE = Rare Earth Elements as defined by the IUPAC (International Union of Pure and Applied Chemistry) which are the lanthanides with scandium and yttrium.

⁴⁹ Kirsanow et al 2008; Reynard and Hedges 2008.

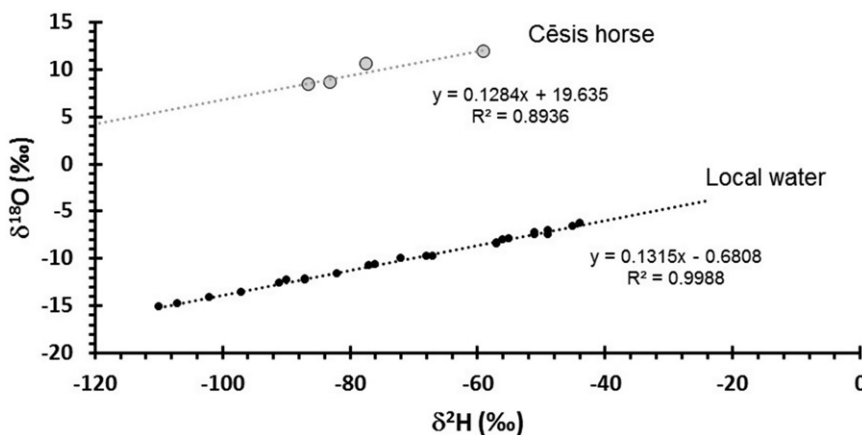


FIG 9

Oxygen-hydrogen isotope plot for the Cēsis horse collagen samples. The correlation in the collagen mirrors the local meteoric water line indicating the O-H balance in the collagen is dominated by local drinking water. The Global Mean Ocean Water trend (GMOW) is produced by natural evaporation of surface waters through the hydrological process. Local meteoric water lines are produced as small deviations from the GMOW as a result of localised conditions in evaporation and/or mixing of different water sources, but are unique to localised areas.

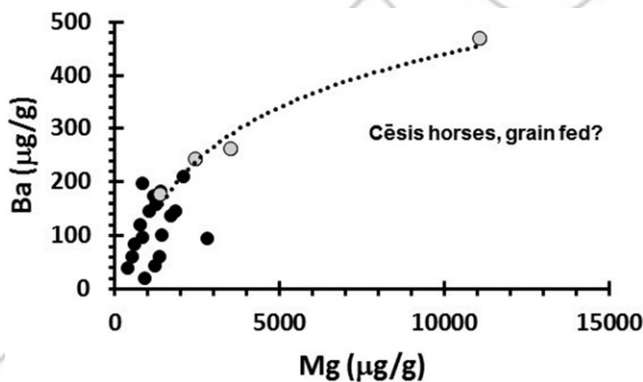


FIG 10

Barium–Magnesium plot for the Cēsis horse samples (Grey) in comparison with other horse samples analysed during the ‘Ecology of Crusading’ project.

framework of the ‘Ecology of Crusading’ project they were being fed differently which supports the zooarchaeological interpretation of these individuals as war horses.⁵⁰

HORSE EQUIPMENT FROM THE OUTER BAILEY

Horse equipment excavated in association with the horse bones was found immediately below the burnt layer with charred timbers. This consisted of elements

⁵⁰ See M. [redacted] et al (forthcoming 2018) for a similar interpretation of a horse bone sample from the Teutonic [redacted]’s castle at Mała Nieszawka (Nessau) with a depleted $\delta^{13}\text{C}$ value relative to other Prussian horses.

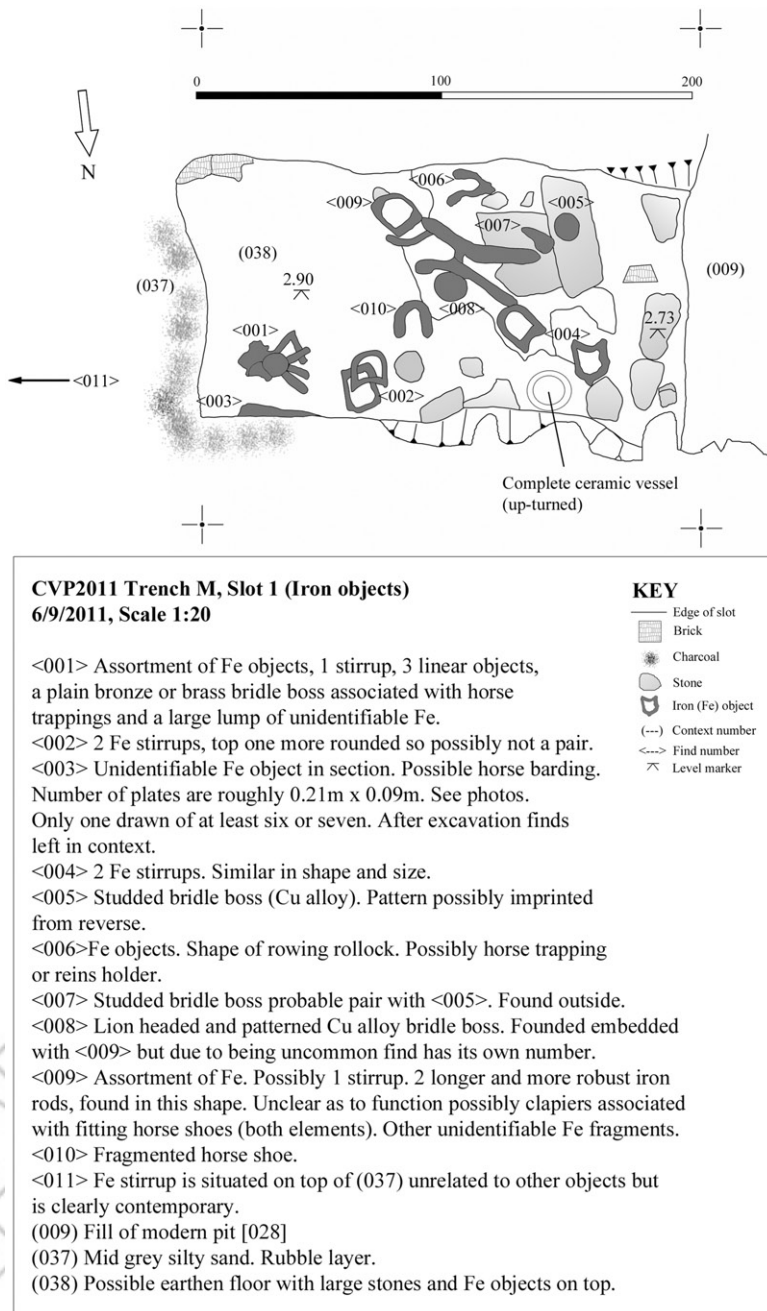


FIG 11

Plan view of the horse tack in trench M. Note that (009) had not been fully excavated at this stage and abuts (038). This context was not clearly defined in the south-facing section and is indicated by <061> on Fig 2a

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FIG 12

The horse tack *in situ*: (a) facing south; (b) facing west and (c) facing north-west.

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from a stirrup, three unidentifiable linear objects and a large lump of unidentifiable iron, four copper-alloy bridle bosses with associated textile/leather fragments, in one case connected to a fragment of curb chain, an iron saddle frame, five (possibly six) additional stirrups and a fragmented iron horseshoe (Figs 11–13). Two of the stirrups recovered on top of each other <002> were different in design, suggesting they did not form a pair, while two lying in close association were identical <004>. A third phalanx from a horse (part of ABG3) uncovered in the south-facing section in 2012 was also directly associated with an iron horseshoe and nails. The artefacts were X-rayed at the Pranas Gudynas Restoration Centre (Vilnius, Lithuania) and at the hospital in Cēsis, revealing details of the bridle attachments (Fig 14).

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811 **FIG 13**
812 **Detail of a boss decorated with a leonine head *in situ*.**

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814 A comprehensive description of the assemblage will be published after the completion
815 of its ongoing conservation.

816 At present, the decorated circular bosses provide the most reliable means of dating
817 the set of equipment — two depict a raised leonine head, one is a studded disc with a
818 dome, and the last has two concentric ridges and is also domed (Figs 15–17). Similar tack
819 is clearly depicted on Pisanello’s ‘Vision of St Eustace’ (c AD 1438–42) and on ‘The
820 Triumphal Procession of Emperor Maximilian I’ by Albrecht Altdorfer and his workshop
821 (c AD 1512–15) (Fig 18). In addition to the identifiable tack, a series of associated, unidenti-
822 fied iron objects resembling small plates were uncovered within the south-facing section in
823 2012; the overall dimensions of this exposed mass were 210 mm×90 mm <061>. Given
824 their fragile state, it was decided to leave them *in situ*, covered by a protective sheet.
825 They may be the remnants of brigandines — small plates sewn into fabric and used as
826 part of horse barding in the 15th century. The closest artistic representation of this type of
827 barding can be found on Pisanello’s tournament fresco in the Palazzo Ducale in Mantua,
828 dating to c AD 1439–42 (Fig 19). The Cēsis horse tack clearly belongs to the European cul-
829 tural sphere in contrast to neighbouring Russia, where the tack was relatively simple until
830 the early 17th century when both ‘horse cultures’ began to converge.⁵¹

831 In summary, the horse equipment associated with the destruction layer and frag-
832 mented horse bones can be broadly dated to the late 15th-/early 16th-century. Although
833 a small element may represent a type of ornamental barding, it largely consists of a form
834 of decorative tack that was popular among the aristocracy in other parts of Europe,
835 including the Holy Roman Empire — the principal source of recruits for the Teutonic
836 Order. Although no plate barding was uncovered in trench M, several pieces of shaffron
837 (horse head armour) have been found during previous excavations at the castle (Fig 20).⁵²

839 **DATING THE HORSE REMAINS**

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841 During the excavation of trench M, the discovery of the horse remains led to the
842 assumption that traces of the Russian siege of the castle in AD 1577 had been uncovered.

844 ⁵¹ Kleimola 2005, 51.

845 ⁵² Tomsons 2017.

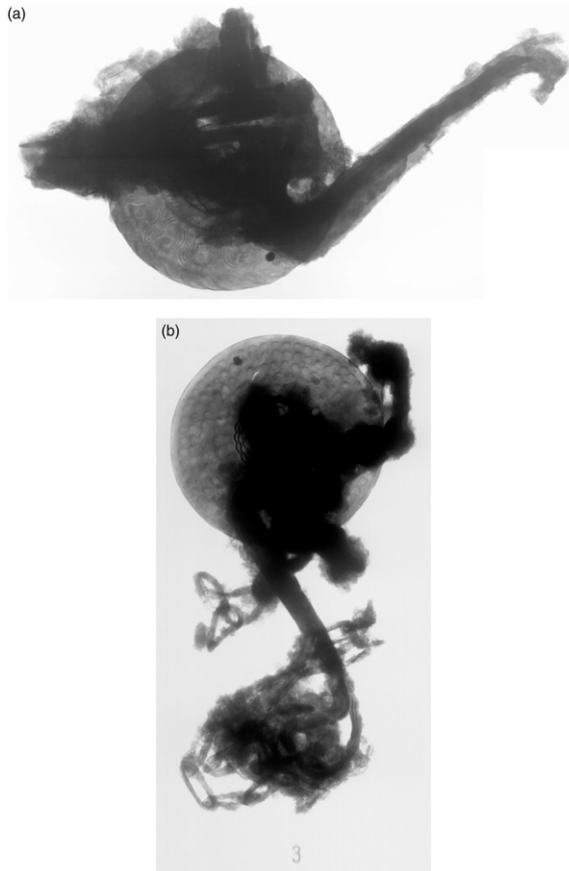


FIG 14

Positive X-rays of (a) a lion head boss and (b) the studded disc boss from trench M showing bit attachments.

The associated material culture, mostly consisting of smashed roof tiles with additional debris from subsequent demolition layers, including large quantities of largely fragmented stove tiles, was difficult to date precisely — the relative chronological ranges were too broad. Fragments of horse bone were therefore sent for accelerated mass spectrometry (AMS) dating and U-Series dating. The resulting AMS date (SUERC-47219) shows the highest probability range (71.4%) from c AD 1429–1524, while the U-Series date was AD 1503 \pm 35 years (2 sigma), giving a median range of both dates to be c AD 1480–1503 for the most likely range of the horse remains (Fig 21).⁵³ Both dates indicate the horses most likely expired many decades before the siege of AD 1577 (Fig 21). Moreover, the construction of residential quarters on top of the remains and burnt timbers corresponds to the presence of mercenaries at the castle from the mid-16th century. The overall conclusion is that the

⁵³ Black forthcoming 2018.

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935 **FIG 15**

936 The two lionine head bosses from trench M before conservation: (a) front, (b) reverse and (c) one after
937 conservation.
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FIG 16

The studded disc boss from trench M before conservation (a) front (b) reverse and (c) after conservation.

horses are more likely associated with the later phase of the Teutonic Order's rule in Livonia, spanning a period defined by the reigns of six provincial masters.

HORSES AT WENDEN IN THE FINAL PHASE OF THE TEUTONIC ORDER'S RULE

The establishment of the Teutonic Order's theocratic regime in the eastern Baltic is associated with the professionalisation of cavalry. In Livonia, where the written record

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FIG 17

The plain disc boss from trench M before conservation.

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FIG 18

Detail from 'The Ancestors of Emperor Maximilian', in 'The Procession of Emperor Maximilian I' by Albrecht Altdorfer and his workshop, showing the decorative horse tack comparable to the artefacts found in trench M. Albertina, Vienna. Reproduced with permission.

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for the Order's holdings is relatively limited and fragmentary, this is evident from references to horse management in castles and towns, obligations of military service which included the provision of horses — specifically war horses — and castle inventories.⁵⁴ Horse remains found in the castles of the Order and episcopates in Livonia indicate that horses were kept and disposed of within their precincts. As in the case of the Teutonic Order's other large fortified convents, horses were probably distributed across several areas of Wenden Castle, rather than being solely stabled in one building.⁵⁵ There is some tentative evidence that the equine resources of Wenden's commandery improved by the 16th century. In 1451, only 17 horses are listed at the castle,⁵⁶ while

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⁵⁴ Maltby et al forthcoming 2018.

⁵⁵ This depends on the size of the castle; at the extreme end of the spectrum, the central convent of Marienburg in Prussia housed up to an estimated 1000 horses in the mid-15th century in various parts of the complex (Jóźwiak and Trupinda 2012, 440, n 19).

⁵⁶ LUB, 11/160, 126–9.

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FIG 19

Fragment from Pisanello's tournament fresco in the Palazzo Ducale in Mantua, showing horses with brigandine barding, potentially resembling the metal objects discovered in Trench M. Complesso Museale di Palazzo Ducale, Mantua, Italy. *Freely available images.*

by 1551 the commandery could field 300 horses.⁵⁷ This may have been the result of the policies of the most famous Livonian master, Wolter von Plettenberg (c AD 1494–1535), who is known to have employed heavy cavalry in his wars against the Russian principalities, as at the Battle of Siritsa River in 1501.⁵⁸ A document issued by Plettenberg in AD 1526 also referred to the town of Wenden's horse pasture, which was situated in Duppen parish.⁵⁹ By the time of the Livonian War, there were still a large number of horses in Wenden. In February 1578, a famine resulted in 124 horses being killed and eaten, with their entrails given to the poor.⁶⁰ The fragmentary written sources indicate that the Order's wealthier vassals were obligated to provide horses, but animals could also be sourced from further afield, procured during raids on Lithuanian territories, captured in battle or transported across the Order's Baltic estates; the Livonian land marshal sent horses to the grand master in 1463.⁶¹

Medieval war horses were typically 142–152 cm tall at the shoulder,⁶² and while the Cēsis horses average at c 141 cm, the upper estimate (of the overall range of c 135–147 cm) is well within the war horse size category. A slight increase in the size of horses can be observed after the Crusades in both Livonia and Prussia based on the zooarchaeological data analysed to date.⁶³ This almost certainly reflects the breeding of

⁵⁷ Hartmann 2008, 190.

⁵⁸ Dunsdorfs and Spekke 1964, 60.

⁵⁹ LGU, 2, 259–260.

⁶⁰ Russow 1853.

⁶¹ LUB, 12/133, 226.

⁶² Bennett 1995.

⁶³ Maltby et al forthcoming 2018; Makowiecki et al forthcoming 2018.

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FIG 20

Fragments of horse armour recovered from excavations in other areas of Cēsis Castle.

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FIG 21

Summary plot of AMS radiocarbon and U-Series dates for the Cēsis horse samples.

larger horses for heavy cavalry which are noted in written sources as a distinguishing feature of the Order's military assets, while at the same time maintaining and breeding indigenous stock as pack animals and for traction.⁶⁴ Transformations in warfare over the course of the 16th century resulting from the proliferating use of firearms saw the

⁶⁴ Ekdahl 1991; 1998.

1128 gradual abandonment of fully armoured mounted knights in favour of lighter, more
1129 agile cavalry. The Russians had long-used lightly armoured cavalry but shortly before
1130 the Livonian War (1558–1583) the military reforms of Tsar Ivan IV Vasilyevich ('the
1131 Terrible') included making infantry units with firearms a permanent feature of
1132 Muscovite armies. While Polish-Lithuanian cavalry was dominated by heavier armoured
1133 hussars who relied on shock charges during this time, infantry came to play an increas-
1134 ingly dominant role.⁶⁵ In this respect, the Teutonic Order's period of rule in Livonia
1135 bookends two formative periods in eastern Baltic horse culture — the introduction of
1136 heavy European cavalry with the Crusades and its transformation in response to
1137 changing battlefield technology and the experiences of the Livonian War, during which
1138 the Order's Livonian branch was secularised.

1140 CONCLUSION

1142 Articulated and partial horse skeletons are not infrequently found in medieval
1143 archaeological contexts. They represent solutions to the disposal of large carcasses in a
1144 regulated environment,⁶⁶ perhaps the end stage of knackerling,⁶⁷ or animals killed during
1145 a siege (eg Jacob's Ford in 1179, Kingdom of Jerusalem, today Israel)⁶⁸ or in battle
1146 (eg Grunwald in 1410, Prussia, today Poland).⁶⁹ In the pre-Christian eastern Baltic,
1147 horses were also deposited in cemeteries, a practice that seems to have ended following
1148 the Teutonic Order's conquest.⁷⁰ In the Order's Baltic castles, horse remains are
1149 regularly found but they are typically disarticulated and reflect carcass disposal.⁷¹ The
1150 horses uncovered in the outer bailey of Cēsis Castle are unusual insofar as they were
1151 associated with prestigious equestrian equipment. In the late-15th or early 16th century,
1152 the building in the outer bailey of the castle, tentatively interpreted as a stable, was
1153 destroyed by fire. The debris included equestrian equipment, which appears to have
1154 been stored in the building rather than worn by any horses at the time, although at least
1155 one of the animals was shod. The artefacts were found partially resting on some stone
1156 slabs, which may have been part of a floor as 11 stones were uncovered in this area.

1157 The area was briefly used for waste disposal as suggested by the macrobotanical
1158 and additional fragmented faunal remains. Therefore, the deposit is generally character-
1159 ised as the abandonment phase of the structure in the outer bailey, where the destroyed
1160 building was reused as a dumping area.⁷² The geochemistry from the mixed rubble
1161 layer (33) does not have the same levels of enrichment as in earlier layers, while the
1162 raised level of calcium could even represent decayed mortar. It is difficult to determine
1163 whether the horses were killed by the collapse or whether their carcasses were deposited
1164 among the debris. The lack of charring on the majority of the bones may suggest that
1165 the horses were suffocated, or killed by falling timbers, roof tiles and other debris. The
1166 fact that horseshoes were still attached to the distal phalanges of at least one animal
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1168 ⁶⁵ Kupisz 2012, 73, 75.

1169 ⁶⁶ Rackham 2004.

1170 ⁶⁷ Eg London, Cowie et al 1998; Windsor, Bourdillon 1993; Witney, Wilson and Edwards 1993.

1171 ⁶⁸ Motro et al forthcoming.

1172 ⁶⁹ Wolski 2008, 75, 79–81.

1173 ⁷⁰ Shiroukhov 2012.

1174 ⁷¹ Pluskowski et al 2010.

⁷² LaMotta and Schiffer 1999.

suggests that their recovery at the time was difficult or, given the nature of the disaster, undesirable. The articulated individual (ABG1) was not associated with any artefacts.

These horses included large male individuals, most probably stallions. The pathology on several of the recovered vertebrae may be connected with the fact that at least two horses present were much older animals, although combined with the size and sex of the individuals, this paper has argued for riding animals as a plausible explanation. The size of the horses is above the average for horse height in medieval Prussia, Livonia and western Russia. The tack found with the horses also points to prestigious riding animals, and while no plated barding was uncovered in the outer bailey, it is likely that such animals would have fulfilled a military rather than an agrarian role. It is therefore entirely plausible that the horse remains in the outer bailey derived from war horses, although the associated tack was largely ceremonial. The destruction of the 'stable' must have been so severe that, instead of searching through the debris and recovering what remained of the tack, a decision was made to cover the remnants, level the rubble and rebuild the structure. The insertion of a stove indicates the new building was intended to have a residential role. A more extensive excavation of this part of the outer bailey would conceivably result in the recovery of more horses and associated material culture, clarifying the scale of the destruction and the number of animals killed. It would be possible to determine whether all the animals were deposited here after the initial destruction of the building. As an archaeological assemblage, they contribute a striking — and otherwise unknown — episode in the story of the final decades of the Teutonic Order's rule in Livonia. They also indicate that the better-known equestrian culture of late-medieval Prussia was comparable in character, if not in scale, in Livonia.

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ABBREVIATIONS

- LUB: Liv-, Est- und Kurländisches Urkundenbuch nebst regesten (Book of Certificates and Register for Livonia, Estonia and Courland) (von Bunge 1853–1857);
 LGU: Livländische Güterurkunden (aus den Jahren 1207 bis 1545) (von Bruiningk 1908);
 SUERC: Scottish Universities Environmental Research Centre

RÉSUMÉ

Des ossements de chevaux de la fin du Moyen-Âge au château de Cēsis, en Lettonie, et les ressources équestres de l'ordre teutonique en Livonie par Aleks Pluskowski, Krish Seetah, Mark Maltby, Rowena Banajca, Stuart Black et Gundars Kalniņš

Les fouilles entreprises dans le complexe du château de Cēsis, en Lettonie, ont mis à jour des vestiges d'un genre inhabituel, à savoir de grandes quantités d'ossements de chevaux, dont certains étaient en partie articulés, ainsi que des équipements équestres. Ces vestiges étaient associés à un bâtiment détruit en bordure du mur d'enceinte extérieur sud. On y retrouve notamment des mâles de grande taille, sans doute des étalons, et la pathologie de plusieurs vertèbres examinées suggère que ces chevaux étaient montés. La taille des chevaux correspond à celle des chevaux

de guerre au Moyen-Âge et la sellerie qui les accompagne laisse également penser qu'il s'agissait de montures prestigieuses. La datation d'indicateurs multiples sur les ossements les fait remonter sans aucun doute à la période de domination de l'ordre teutonique. Nous concluons ici au rôle militaire de ces chevaux dans les dernières décennies de la domination de l'ordre teutonique en Livonie, à la fin du 15^e/début du 16^e siècle, en avançant que la culture équestre mieux connue de la fin du Moyen-Âge en Prusse était de même caractère, sinon de même envergure, qu'en Livonie.

ZUSAMMENFASSUNG

Spätmittelalterliche Pferdefunde in der Burg Cēsis, Lettland, und die Pferdebestände des Deutschritterordens von Aleks Pluskowski, Krish Seetah,

1363 Mark Maltby, Rowena Banajea, Stuart
1364 Black *und* Gundars Kalniņš

1365 Ausgrabungen im Burgkomplex von
1366 Cēsis, Lettland, brachten einen ungewöhnlichen
1367 Fund einer großen Zahl von
1368 Pferdeknöcheln zum Vorschein, von denen
1369 einige noch Gelenke aufwiesen, und zudem
1370 Reitausrustungsteilen. Diese wurden mit
1371 einem zerstörten Gebäude am Rand des
1372 südlichen äußeren Burghofs in Verbindung
1373 gebracht. Zu den Pferdefindungen gehörten
1374 u.a. große männliche Pferde,
1375 höchstwahrscheinlich Hengste, und die
1376 Pathologieuntersuchung bei verschiedenen
1377 gefundenen Wirbeln legt nahe, dass diese
1378 Tiere geritten wurden. Die Größe der
1379 Pferde lag im Größenspektrum mittelalterlicher
1380 Kriegspferde, und die zugehörigen
1381 Zaumzeuge deuten auch darauf hin, dass es
1382 sich um repräsentative Reitpferde handelte.
1383 Multi-Proxy-Datierung der Knochen ergab,
1384 dass sie gesichert aus der Herrschaftszeit
1385 des Deutschritterordens stammen. Wir kommen
1386 hier zu dem Schluss, dass diese Pferde
1387 in den letzten Jahrzehnten der Herrschaft
1388 des Deutschritterordens in Lettland im
1389 späten 15./ frühen 16. Jahrhundert eine
1390 militärische Rolle zu spielen hatten, und
1391 dass die besser bekannte Reitkultur des
1392 spätmittelalterlichen Preußen im Charakter,
1393 wenn auch nicht in der Größenordnung,
1394 mit der von Livland vergleichbar war.
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**Resti equini tardomedievali
presso il castello di Cēsis in Lettonia
e le risorse equestri dell'Ordine
Teutonico nella regione della Livonia**
di Aleks Pluskowski, Krish Seetah, Mark
Maltby, Rowena Banajea, Stuart Black *e*
Gundars Kalniņš

Gli scavi eseguiti nel complesso del castello di Cēsis in Lettonia hanno portato alla luce una insolita quantità di ossa equine, alcune delle quali parzialmente articolate, insieme a finimenti equestri. I reperti erano associati a un edificio distrutto che sorgeva al limite dei bastioni meridionali. Tra i cavalli figuravano grandi esemplari di maschi, probabilmente stalloni, e la patologia di svariate vertebre recuperate indica che questi animali venivano usati per cavalcare. Le dimensioni di questi esemplari corrispondevano a quelle dei cavalli da guerra medievali e anche i finimenti indicavano trattarsi di prestigiose cavalcature. La datazione multi-proxy delle ossa li fa risalire senza alcun dubbio al periodo di dominio dell'Ordine Teutonico. Concludiamo affermando che questi cavalli ricoprirono un ruolo militare negli ultimi decenni di dominio dell'Ordine Teutonico in Livonia tra la fine del XV e gli inizi del XVI secolo e che la meglio nota cultura equestre della Prussia tardomedievale era paragonabile per le caratteristiche, se non per le dimensioni, a quella della Livonia.