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Castra Terrae Culmensis – the daily life of knights of the Teutonic Order in the light of recent research.

Keywords
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Abstract

This article presents the results of a long-term archaeological and environmental studies research conducted by the Institute of Archaeology at the Nicolaus Copernicus University in Toruń in 2005–2018 on castles in Papowo Biskupie, Radzyń Chełmiński, Kowalewo Pomorskie, Unisław, Starogród, Lipienek, Bierzgłowo, Wąbrzeźno and Grudziądz. The research was interdisciplinary and included also non-invasive, geoarchaeological, HGIS, archaeobotanical and archaeozoological studies. Their results were used not only to discuss the chronology of the origins of building activity and the model of the development of defensive architecture, but also to reconstruct selected elements of daily life. The daily life of the inhabitants of the Teutonic Order's castles was conditioned by many elements related primarily to their monastic rule. However, the daily existence of the knights was also strongly influenced by the natural conditions affecting the location and position of the castles, as well as the external environment, including the architecture of the space in which the daily elements of life took place. In addition to the Rule and monastic statutes, archaeological findings uncovered in the course of the archaeological research provide interesting clues that also speak about the conditions of life, work, prayer and duties of members of the Order.

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Introduction

The Crusades were one of the most important forms of military mobilization in the medieval period. Crusader expeditions had important implications for the formation of new state structures. Increased political stability and increased development linked to urbanization, growing trade and capital accumulation soon led to the emergence of the foundations of modern states. From this perspective, the study of the origins of fortifications in Poland by the Teutonic Knights is an important component of the broader study of the issues of the formation of their crusader state in Europe.

This article is the result of research conducted since 2005, when the Institute of Archaeology at Nicolaus Copernicus University in Toruń (Instytut Archeologii Uniwersytetu Mikołaja Kopernika w Toruniu) carried out the first series of archaeological research: in Papowo Biskupie (formerly Germ. Papau), Radzyń Chełmiński (formerly Germ. Rheden), Kowalewo Pomorskie (formerly Germ. Schönsee), Wąbrzeźno (formerly Germ. Briesen), and Grudziądz (formerly Germ. Graudenz).[1] In 2016, we also began a project, funded by the National

[1] Bogusz Wasik and Marcin Wiewióra, "Próba rekonstrukcji układu przestrzennego zamku wysokiego (domu konwentu) w Kowalewie Pomorskim na podstawie źródeł historycznych i najnowszych wyników badań archeologiczno-architektonicznych," *Wiadomości Konserwatorskie* 45 (2016): 53–65; Bogusz Wasik and Marcin Wiewióra, "Zamek w Kowalewie Pomorskim. Dzieje warowni w świetle wyników badań archeologiczno-architektonicznych," *Acta Universitatis Nicolai Copernici*, *Archeologia* 35 (2017): 129–158; Marcin Wiewióra, "Badania archeologiczno-architektoniczne średniowiecznego zamku w Papowie Biskupim w ziemi chełmińskiej," *Archaeologia Historica Polona* 17 (2007): 293–305; id., "Sprawozdanie z badań archeologiczno-architektonicznych zamku w Papowie Biskupim w 2008 r." (Ms. Instytut Archeologii, Uniwersytet Mikołaja Kopernika w Toruniu, 2009); id., "Stratygrafia kulturowa Góry Zamkowej. Synchronizacja warstw i analiza obiektów kulturowych," in *Zamek krzyżacki w Grudziądzu w świetle badań archeologiczno-architektonicznych. Studia i materiały*, ed. Marcin Wiewióra (Toruń: Wydawnictwo Naukowe Uniwersytetu Mikołaja Kopernika, 2012), 73–125; id., "Wyniki badań archeologiczno-architektonicznych zamku krzyżackiego w Papowie Biskupim w latach 2006–2008," in *XVII Sesja Pomorzoznawcza*, vol. 2, *Od późnego średniowiecza do czasów nowożytnych*, ed. Henryk Paner and Mirosław Fudziński (Gdańsk: Muzeum Archeologiczne, 2013), 113–124; id., "Zamek biskupów w Wąbrzeźnie w świetle wyników badań archeologiczno-architektonicznych," in *XVIII Sesja Pomorzoznawcza*, vol. 2, *Od późnego średniowiecza do czasów nowożytnych. Materiały z konferencji 16–18 listopada 2011*, ed. Ewa Fudzińska (Malbork: Muzeum Zamkowe, 2013), 77–86; id., "Badania archeologiczno-architektoniczne zamku głównego w Radzyniu Chełmińskim w latach 2008–2009," in *XVII Sesja Pomorzoznawcza*, vol. 2, ed. Paner and Fudziński, 169–178; id., "Nowe źródła do dziejów zamku w Grudziądzu," in *XVIII Sesja Pomorzoznawcza*, vol. 2, ed. Fudzińska, 87–104; id., "*Studia nad średniowiecznym warsztatem budowlanym zamku krzyżackiego w Papowie Biskupim*,"

Program for the Development of the Humanities (Narodowy Program Rozwoju Humanistyki), entitled. "Castra Terrae Culmensis – at the edges of the Christian world." It conducted interdisciplinary research of five Teutonic Order castles over three years: Unisław (formerly Germ. Wenzlau), Starogród (formerly Germ. Althaus), Bierzgłowo (formerly Germ. Birglau), Lipienek (formerly Germ. Leipe) and Papowo Biskupie.[2]

The results were used not only to discuss the chronology of the beginnings of building activity and the model for the development of defensive architecture, but also to reconstruct select elements of daily life of the inhabitants of the castles. The use of modern research methods provided completely new data on the natural conditions of the location, topography, the economic basis of the first castles and the daily life of their inhabitants between the 13th and 15th centuries. Daily life at the Order's castles was conditioned by many elements related mostly to the organization's monastic rule. However, the daily existence of castle communities was also heavily influenced by the natural conditions affecting the location and position of the castles, as well as by the external environment including the architecture of the spaces which provided the settings for daily life. The natural environment limited access to food sources, drinking water supplies and transportation routes that determined the basis of the inhabitants' livelihoods. The special relationship between the military and monastic aspects of daily life for members of the Teutonic Order is also reflected in topography and architecture. As the seat of the knights, the castle had, in addition to defensive elements such as curtain walls, towers and fortified gates, elements characteristic of monasteries, such as chapels, refectories and dormitories. The rules and statutes of the monastic order, as well as the archaeological finds associated with them, are interesting clues that also speak to the conditions of life, work, prayer and duties of the members of the Order.[3]

Ochrona Zabytków 1–4 (2013): 179–198; id., "Wstępne sprawozdanie z badań archeologicznych prowadzonych na zamku w Grudziądzu w 2009 roku," in *XVII Sesja Pomorzoznawcza*, vol. 2, ed. Paner and Fudziński, 155–168.

[2] *Castra Terrae Culmensis – na rubieży chrześcijańskiego świata. interdyscyplinarne badania nad warownym budownictwem zakonu krzyżackiego w świetle źródeł archeologiczno-architektonicznych, historycznych i przyrodniczych*, ed. Marcin Wiewióra, vol. 1 (Toruń: Wydawnictwo UMK, 2020).

[3] Adrian Boas, *Archaeology of the Military Orders. A Survey of the Urban Centres, Rural Settlements and Castles of the Military Orders in the Latin East (c. 1120–1291)* (Abingdon–New York: Routledge, 2006).

Methods

The research was interdisciplinary and included archaeological, non-invasive, geoarchaeological, HGIS, archaeobotanical and archaeozoological research. The archaeological research was extensive and involved systematic archaeological field surveys and sondage excavation. The layout and shape of buildings were determined using non-invasive and architectural research. At the same time, the existing hypotheses on the construction and architectural transformations were tested based on architectural features that had previously been invisible (footings, foundations, foundation negatives, construction layers, etc.). An extensive reconnaissance was performed using magnetic measurements. Electrical resistivity prospection was conducted in selected locations within the area. The castles were also analysed and visualised in 3D using terrestrial laser scanning. The non-invasive tests also included the drawing up of orthophotomaps, digital terrain models (DTMs) and digital surface models (DSMs).[4] Geo-geomorphological analyses involved attempts to recreate the original topography of the castle sites and surroundings, which had been changed by natural and anthropogenic processes. Detailed studies of the vicinities of the castles covered an area within a radius of 2 km, i.e. about 12.6 km^2 each. It was assumed that this would encompass the area of relevance to their creation, in accordance with the "principle of least effort", i.e. the cost-benefit ratio for exploiting a given space. In accordance with palaeogeographic research methodology, the starting point for reconstructing the environmental context of the sites and surroundings of the Teutonic Order's strongholds was a comprehensive analysis of the modern-day geographic environment of the castles, being the result of changes that it has undergone since they were built.[5] Issues of the provisioning of raw materials of animal origin to the residents of individual castles were addressed using archaeozoological analyses. As a result, numerical data on zoological groups, species, anatomical composition, individual age (at death), sex, and marks of anthropogenic origin on bones were obtained. Specimens showing traces of processing or pathology were also characterised. Macroscopic plant

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[4] Marcin Wiewióra, Bogusz Wasik, Paweł Molewski Krzysztof Misiewicz, Wiesław Małkowski, and Miron Bogacki, "New historical data on the Teutonic Order crusades in Prussia: geophysical and archaeological research into an earth-and-timber stronghold and city of the 1230s at Starogród, northern-central Poland," *Archaeological Prospection* 27, no. 2 (2020): 135–152.

[5] Paweł Molewski, "Próba rekonstrukcji stanu środowiska geograficznego miejsc położenia i otoczenia zamków w czasie ich budowy w XIII–XIV wieku," in *Castra Terrae Culmensis*, vol. 2, ed. Wiewióra, 7–28.

remain analysis was performed on samples from three castles: Starogród, Papowo Biskupie and Unisław.[6]

Reconstruction of the geographical environment and the surroundings of the castles

The contemporary geographic environment of the western part of Chełmno Land (Germ. Kulmerland) differs significantly in condition from the 13th–14th centuries. It has undergone multiple transformations. The most significant transformations were in the original vegetation cover, mainly manifesting as a significant expansion in agricultural land at the expense of woodland beginning in the 13th century. Natural hydrological conditions were also changed by regulatory, land-development and hydraulic engineering works, which intensified from the end of the 18th century onwards. The topography and soils then underwent lesser modifications. In Western Europe and partly in Central Europe, the so-called Medieval Warm Period is postulated to have lasted from AD *c.* 1200 to 1350.[7] The climate in the 13th and 14th centuries was generally mild, which favoured the colonisation of Chełmno Land. Palynological studies were used to determine the settlement phase, which correlates with the period from the Teutonic Order entering Chełmno Land until early modern times. It was characterised by progressive deforestation, which, as pollen diagrams indicate, was particularly intense near Teutonic Order centres (strongholds). It is assumed that the deforestation of Chełmno Land ended in the late 13th or early 14th century. The pollen diagrams show that arable lands dominated in deforested areas, with a high prevalence of cereals and a smaller share of vegetation representing meadows and pastures.[8]

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[6] Daniel Makowiecki, Grażyna Makowiecka, and Martyna Wiejacka, "Kości zwierzęce," in *Castra Terrae Culmensis*, vol 2, ed. Wiewióra, 199–220; Karolina Maciejewska, Monika Badura, and Marek Merdalski, "Materiały karpologiczne," in *Castra Terrae Culmensis*, vol. 2, ed. Wiewióra, 221–223.

[7] Marcin Wiewióra, Paweł Molewski, Daniel Makowiecki, Dorota Bienias, and Monika Badura, "Castles and towns of the Teutonic Order in Chelmno Land: Environment, animals and plant subsistence. A new archaeological and geo-archaeological study," *Journal of Archaeological Science: Reports* 46 (2022): 218, https://doi.org/10.1016/j.jasrep.2022.103681; Paweł Molewski, "Próba rekonstrukcji", 7–28; Rajmund Przybylak, "Zmiany klimatu Polski i Europy w ostatnich stuleciach," *Kosmos, Problemy Nauk Biologicznych* 57, no. 3–4 (2008): 195–208.

[8] Alex Brown, Rowena Banerjea, Wynne Dawn, Amanda, Stivrins Normunds, Marc Jarzebowski, Lisa-Marie Shillito, and Aleks Pluskowski, "The ecological impact of conquest and coloniza-

Samples obtained from buildings and ramparts of Teutonic Order and Slavic strongholds indicate that oak and pine were used as the principal building materials. They also indicate that the use of pine increases in younger periods. This also applies to sites whose surroundings are not favorable habitat for pine forests. This is illustrated by materials from Lipienek, a castle located deep in the upland, in which remains of oak, birch and common hornbeam were recorded. These are trees that form subcontinental oak-hornbeam forests, for which the most favorable habitat is defined by fertile soils. Such lime-oak-hornbeam forests are considered the main climax community in the Chełmno Land. The older layers at the Lipienek site are correlated with the remains of deciduous trees, and the youngest levels are dominated by Scots pine. In light of the palynological analysis, since the mid-13th century, the role of Scots pine in the composition of forests, which remained in areas unsuitable for agriculture, has been increasing in the Chełmno Land.[9]

Around the main Teutonic Order seats, such as Starogród, anthropogenic pressure is marked with greater intensity. The results obtained from the xylological analysis suggest a close connection with the local raw material base, which exploited various surrounding woodlands for construction as well as fuel extraction. Timber was exploited from both upland and valley areas. The presence of tree taxa typical of valley areas: ash, elm and willow were recorded only in materials from Unisław and Starogród.[10]

The Vistula valley below these sites is a region of habitats favorable for riparian forests, such as ash-elm woodlands formed by the afore-mentioned taxa. Although the site in Bierzgłowo Castle is also located at the edge of the Vistula valley, "riparian" taxa did not appear in the samples, but a significant presence of Scots pine was noted, among others. This is probably explained by the fact that the valley regions below Bierzgłowo Castle is a zone still covered by pine forests in areas of sandy, steeply drained pre-valley terraces.

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tion on a medieval frontier landscape: combined palynological and geochemical analysis of lake sediments from Radzyń Chełmiński, northern Poland," *Geoarchaeology* 30 no. 6 (2015): 511–527, https://doi.org/10.1002/gea.21525; Alex Brown, Anneli Poska, and Aleks Pluskowski, "The environmental impact of cultural change: palynological and quantitative land cover reconstructions for the last two millennia in northern Poland," *Quaternary International* 522 (2019): 38–54, https://doi.org/10.1016/j.quaint.2019.05.014.

[9] Dorota Bienias, "Materiały antrakologiczne," in *Castra Terrae Culmensis*, vol 2, ed. Wiewióra, 224–229,

[10] Bienias, "Materiały," 227.

Hydrological conditions and the locations of the castles were important issues during their construction. In the case of the strongholds in Starogród, Unisław and Bierzgłowo, located at the edge of the upland high above the Vistula proglacial valley, including within its quasi-island portions , the moats surrounding them were dry for obvious reasons. As indicated by archaeological research, the deepest of them, in Lipienek, separating the bailey, was periodically filled with shallow water during the high-water level of Castle Lake. The moats in Papowo Biskupie, at least periodically filled with water, separated the castle complex from the slopes of the subglacial trough in which it is located, as well as the two bailey areas. They connected Lake Papowo, located to the west of the castle, with a small reservoir, located to the east of it. It is possible that in order to fill the moats, the waters of Lake Papowo were artificially dammed. In addition to supplying the moats, the surface waters in the vicinity of the castles in Lipienek and Papowo may have had transport (timber floating) and economic (fishing) functions, including as a source of reeds, one of the building materials of the time.[11]

Castle location and topography

The locations of all the studied fortresses have obvious natural defensive qualities. Previous research in the Chełmno Land indicates that castles were built in places of strategic importance and/or nodes of land and water communication routes of the time. Their strict location was undoubtedly determined by the physiography of the area. Since the location of Teutonic Order's castles quite commonly refers to the locations of early medieval strongholds, the typology of their locations can be applied to the Teutonic Order castles analyzed here. Four of the studied sites – Lipienek, Starogród, Unisław and Bierzgłowo – are located at the edge of the upland, at its contact with terrain depressions of different origin, from which they are separated by a high and steep slope. The height and steepness of this slope determined the inaccessibility of the location of the castle, and its length limited access to it often only from one side, thus facilitating defense. Many times, choosing a naturally inaccessible site reduced the need for artificial barriers, such as ramparts and moats, around the perimeter of the stronghold.[12]

In these sites , the ratio of the perimeter of the castle area protected naturally to that requiring the construction of artificial obstacles varies. Additional natural

[11] Molewski, "Próba rekonstrukcji", 22–28.

[12] Ibid., 13–22

barriers to access to these strongholds were either surrounded by lake waters (Lakes in Lipienek, Papowo Biskupie) or wetlands (Starogród, Unisław, Bierzgłowo).[13]

An analysis of ten potential lines of observation between the fortresses showed that practical mutual visibility between them could only exist in the case of the castles in Starogrod and Unisław or Lipienek and Papowo Biskupie. In the former, it was mainly due to the location of both sites on the concave curve of the Vistula valley edge and the several dozen-meter depression separating them – in a straight line – from the area in the valley floor (Unisław Basin). In the second case, i.e. the visibility between Lipienek and Papowo Biskupie, which are separated in a straight line by only 6 km, and the minimum clearance is 13.4 m, it would be possible, assuming that there was no high forest between the strongholds on the observation line. In the other cases of mutual visibility of , the clearance between the line of observation and the ground surface was rather too small (maximum 7.1 m) or non-existent, which excluded the mutual visibility of castles, regardless of the forested terrain.[14]

Castle architecture

Brick Teutonic Order castles are one of the most characteristic features of the landscape of Chełmno Land. They include well-preserved objects (Bierzgłowo), while some have survived to the present day as ruins (Papowo Biskupie, Lipienek) and others have been completely destroyed (Kowalewo, Wąbrzeźno, Grudziądz, Unisław, Starogród). The results of recent archaeological and architectural studies have provided many new data showing, among other things, that strongholds differed in architectural form, but also in construction technique and the course of the construction process.[15] For many years there has been discussion on the pattern according to which the construction of Teutonic Order strongholds developed. Based on historical records and archaeological findings to date, it has been assumed that most of the masonry-wall Teutonic Order castles were erected at the

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[13] Wiewióra, Molewski, Makowiecki, Bienias, and Badura, "Castles," 6–7.

[14] Molewski, "Próba rekonstrukcji," 17.

[15] Marcin Wiewióra, "Najstarsze fazy osadnictwa krzyżackiego," in *Castra Terrae Culmensis*, vol. 2, ed. Wiewióra, 29–41; Bogusz Wasik, "Zamki krzyżackie w okresie późnośredniowiecznym i nowożytnym. Analiza źródeł architektonicznych," in ibid., 29–41; id., "Architektura i technika budowy zamków murowanych w Starogrodzie, Bierzgłowie, Lipienku, Papowie Biskupim i Unisławiu w kontekście budownictwa zamkowego Prus," in ibid., 248–252.

site of earlier fortifications (of Slavic or Old-Prussian tribes). As a rule, the oldest Teutonic Order defensive structures were made of earth and timber; they were successively replaced with brick and stone structures. We can draw such conclusions primarily thanks to the 14th-century chronicle of Peter of Dusburg, which contained descriptions relating to fortifications from the period in which the monastic state was being formed. In analysing this problem reference is very often made to an interesting historical source that describes the condition of Chełmno Land before the arrival of the Teutonic Knights and is known as the document of *Lonyz*. It lists over 20 towns, which include former fortified settlements (*quondam castra*). To date, it has been possible in only a few cases to confirm which Teutonic Order structures were erected at the sites of earlier gord-type settlements (which we refer to herein simply as earth-and timber fortified settlements).[16]

Archaeological excavations showed that the regular castles were not usually built at the site of a former earth-and-timber stronghold. At the same time, the construction of older, irregular brick castles continued (e.g. Toruń (formerly Germ. Thorn), Grudziądz, Starogród, Bierzgłowo) to layouts with several wings in imitation of regular castles. In the Chełmno Land, smaller castles were also built as the headquarters of lower-ranking officials. These castles may have been in the form of a reduced regular castle, a residential tower or a tower house (*Festes Haus*).[17]

One of the most interesting issues relating to the development of defensive architecture is the first set of regular castles. In Chełmno Land, the oldest such buildings are those in Papowo Biskupie and Lipienek. Archaeological research has shown that in Lipienek, under the ruins of the brick castle from the late 13th and early 14th century, there were remains of an earth and- timber rampart. It has also been evidenced that the rampart was first built in the 11th century and rebuilt in the 13th. The radiocarbon dates of samples taken from the lower part of an exposed fragment of the rampart and homogeneous collections of pottery fragments date the older phase of the fortifications to the 10th–11th centuries. Traces of early medieval settlement in this place were recorded as early as the 1990s, but only in the course of recent research was it confirmed that there had been an early medieval

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[16] Wiewióra, "Najstarsze fazy," 29–41.

[17] Marcin Wiewióra, "Gród i zamek w państwie krzyżackim – miejsce tradycji czy tradycja miejsca?" *Archaeologia Historica Polona* 24 (2016): 195–231; Marcin Wiewióra, Bogusz Wasik, Paweł Molewski, Monika Badura, Karolina Maciejewska, Daniel Makowiecki, Paweł Moszczyński, Krzysztof Misiewicz, Wiesław Małkowski, Miron Bogacki, and Sebastian Tyszkowski, "The Teutonic crusade in Prussia: reconstruction of a medieval fortified settlement complex at Unisław," *Antiquity* 93, no. 369 (2019): 752–771.

stronghold that was adapted by the Teutonic Knights. At the same time, it is the second known example (after Gdańsk (formerly Germ. Danzig)) of a castle belonging to the younger, so-called regular group of brick strongholds erected from the late 13th century that, unlike other complexes of this type, was built on the site of former Slavic and Teutonic Order's strongholds.[18] The castle in Papowo Biskupie, unlike the Lipienek stronghold, was not built on the site of an older building, but on a specially prepared site. As part of the recently completed project, however, we were primarily interested in the posited second bailey, which was thought to have occupied a specially prepared quasi-peninsula that projected into the west side of the castle lake; this bailey would have run adjacent to the east bailey that lay to its east, from which it was separated by a road. Several surveys managed to confirm the economic importance of the bailey in the 14th and 15th centuries, where, among other things, grain was stored. This was confirmed by archaeobotanical analyses of the remains of spikelets, cereals, and weed diasporas discovered within the second bailey in Papowo Biskupie. Rye was most likely stored as a food product for inhabitants or an ingredient of animal fodder.[19]

Food preferences

Vegetable consumption was among the staples on the daily menu for the Order's castle communities. Simple vegetables predominated, namely parsley roots, rutabagas, less frequently carrots, cabbage and peas. Garlic was used as a condiment, and poppy seed oil was used in large quantities in the Teutonic Order's cuisine. On the tables of senior officials there was no shortage of such exotic spices as pepper, saffron, ginger, cloves and cinnamon. In rare instances the Teutonic Order's inventories also mention cherries and pears, and juices made from cherries and raspberries. The inventories also mention sizable supplies of almonds, raisins or dates.[20]

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[18] Bogusz Wasik, "The beginnings of castles in the Teutonic Knights' state in Prussia," *Castellologica Bohemica* 18 (2018): 167–190.

[19] Badura, Maciejewska, and Merdalski, "Materiały karpologiczne," 221–223; Marcin Wiewióra, "Stratygrafia warstw kulturowych i charakterystyka poziomów osadniczych," in *Castra Terrae Culmensis*, vol 1, ed. Wiewióra, 59–100.

[20] Andrzej Radzimiński, "Przy stole rycerzy i duchownych zakonu krzyżackiego w Prusach," in *Życie codzienne w regionie kujawsko-pomorskim*, ed. Waldemar Rozynkowski and Małgorzata Strzelecka (Toruń: Urząd Marszałkowski Województwa Kujawsko-Pomorskiego, 2011), 10–19.

Archaeobotanical studies of plant remains make it possible to recognize plant species used by human communities at a certain time, but also to learn about the nature of the inhabitants' diet reflecting their social and economic status.[21] Biological analyses, including archaeobotanical ones, have been used only in the context of some castles and Teutonic Order towns (Elbing (today Elbląg), Danzig).[22] This is mainly due to the conditions of locating castles on dry elevations and slopes, which are generally not conducive to the preservation of plant remains.

The analyzed set of botanical traces obtained during the research makes it possible to describe primarily the use of cereals and, to a lesser extent, legumes. The richest data on this subject comes from Papowo Biskupie. An accumulation of grains of common rye (*Secale cereale*) (more than 1,600 specimens) was found in a 14th–15th century site located within the pre-castle. It is possible that these are traces of stored supplies that were burned down along with the building (house?) in which they were stored. In the medieval period, the cultivation of rye in Poland was very widespread and its grains were used to make flour. A small proportion of segetal weeds was found in rye samples, mainly those that relate to the rye fruit by structure and the weight of their diaspores (tares, knapweed, cornflower). In addition to rye, the castles certainly received wheat, but the proportion of grains of this grain in the materials is negligible. One burnt grain was preserved in a sample from Starogród (13th century). Millet (*Panicum miliaceum*), which was widespread in the Middle Ages, was also preserved in the form of a single grain in materials from Unisław. The context of the latter find – the castle kitchen – indicates a remnant of a product intended for consumption. Burnt oat (*Avena sp.*) grains were noted in

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[21] Monika Badura and Beata Możejko, "The plant element in the diet of the inhabitants of Danzig (Gdańsk), Elbing (Elbląg), and Marienburg (Malbork) during the rule of the Teutonic Order: historical and archaeobotanical perspectives," in *Ecologies of crusading, colonization and religious conversion in the medieval Baltic. Terra Sacra II*, ed. Aleks Pluskowski (Turnhout: Brepols, 2019), 95–110.

[22] Alexander Brown and Monika Badura, "Cēsu pils aizsarggrāvī un pirmajā priekšpilī atrasto augu makroatlieku un putekšņu analīze: liecības par apkārtējās vides apstākļiem un augu izmantošanu," in *Cēsu pils raksti*, vol. 1, *Cēsis: Cēsu pils saglabāšanas fonds*, ed. Gaundars Kalniņš (Cēsis: Cēsu pils saglabāšanas fonds, 2017), 101–113; Rovena Banerjea and Monika Badura, "Settlement life in Livonia and the impact on its territories: the geoarchaeological and archaeobotanical evidence," in *Environment, colonization and the Baltic Crusader states. Terra Sacra I*, ed. Aleks Pluskowski (Turnhout: Brepols, 2019), 175–205; Rovena Banerjea, Monika Badura, Alexander Brown, Lionello Morandi, Mirosław Marcinkowski, Heiki Valk, and Alexander Pluskowski, "Feeding the Crusades: archaeobotany, animal husbandry and livestock alimentation on the Baltic Frontier," *Environmental Archaeology* 25 (2019): 135–150; Aleksander Pluskowski, Monika Badura, and Marc Jarzembowski, "Exploiting plants: macrobotanical remains from Prussia," in *Environment, colonization*, ed. Pluskowski, 377–403.

samples from Papowo Biskupie (14th–15th centuries). It is known from archaeobotanical data and historical sources that oats were used as food, both for humans and animals. In the medieval food model, vegetables from the legume group (so-called legumes) had an important place. In the materials under discussion, pea seeds were preserved only within the Unisław castle kitchen.[23]

Among the foodstuffs present in the menus of grand masters and Teutonic Knights, various types of meat dominated. Analysis of written sources indicates that corned beef, and pork in the form of ham or sausages, dominated the food supplies stored at the Order's castles. Lamb, both fresh and salted, was also consumed. The food eaten by grand masters differed from that eaten in conventual castles or within the residences of lower officials. Knights consumed a relatively large amount of both pork, beef and mutton, but such dishes as veal, lamb and piglet were very rare. Information from written sources shows that bird meatmade up an important part of the diet, both domesticated and wild. Ducks, geese, chickens, as well as starlings, wild ducks and partridges were the dominant traditional table fare. The castle larders also contained supplies of meat from deer, wild pigs, hares, and aurochs. It should also be remembered that brother-knights, subordinating their daily life to the monastic rule, also adapted their menus to feast days and the fasts associated with them.[24] Therefore, fish, mainly cod, eel, salmon, pike, lamprey, or bream and sturgeon, took the place of meat on these days.[25]

During years of research of the Teutonic Order's castles in Chełmno Land, tens of thousands of animal bone fragments were discovered and analyzed. This provided an authoritative set of data that made it possible to reconstruct the food pattern of the inhabitants of the castles. The main element of the food of the castle communities were domestic mammals. They dominated the faunal assemblage of each site, although their composition varied. The results indicate that the Teutonic Knights, like the early medieval Slavs, preferred the consumption of pork. While the culinary importance of pork in the Teutonic Order period in the castles is indicated by the predominance of pig remains over cattle, the opposite was true for the region's cities. Here cattle breeding provided the principal source of meat and most likely animal by-products such as hides, bones and horn . Hence, in the

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[23] Badura, Maciejewska, and Merdalski, "Materiały karpologiczne," 221–223.

[24] *Reguła Zakonu Szpitala Najświętszej Marii Panny Domu Niemieckiego w Jerozolimie*, ed. Janusz Trupinda (Malbork: Muzeum Zamkowe, 2023).

[25] Radzimiński, "Przy stole rycerzy," 12–14.

materials from the site of the original location of Chełmno, one of the collections examined noted a preponderance of cattle remains.[26]

The castles received meat of varying quality, as it derived from individuals of different ages. In the case of cattle, there was both old beef and veal. The meat from animals up to about 1–3 months and half a year old, and therefore very tender, was probably valued. Pigs provided a fairly homogeneous assortment of pork, mostly from adult and fairly old individuals, fattened to at least 2–4 years. Piglets or slightly older animals were also consumed to a small extent. Beef derived from cows, oxen and bulls, pork was also obtained from both sexes. Traces of butchery recorded on the bones indicate the use of sharp tools to facilitate the cutting of the carcass into essential parts and then dividing them into portions for cooking, known as pot portions. Butchering was carried out by skilled workers with appropriate equipment. This is indicated by the marks left by the blades and the flat, very smooth surfaces of the thoroughly cut bones, vertebral bodies, hard shafts of long bones, and especially tarsal bones such as ankle and heel bones. Butcher's axes and cleavers were needed to cut through them, and meat was removed with very sharp knives. On the other hand, a rather peculiar feature recorded for all castles was the low proportion of small ruminants, which in the case of the aforementioned cities are more often recorded in archaeozoological materials than pigs, or their proportion is almost the same. The position of the horse is instead the same. Among wild animals, roe deer, red deer and wild boar accounted for a large part of the faunal remains. Hare was also one of the more important and frequently encountered species. The increasing percentage of roe deer may have been due to more frequent hunting of this species, which, unlike red deer, has adapted well to progressive deforestation. Such a process is also evidenced by the high percentages of remnants of hare, a mammal that preferred open and agricultural areas. During the Teutonic Order period, as in the early Middle Ages, the most commonly raised and eaten species was the chicken (e.g. Lipienek). It was also recorded in materials from Grudziądz Castle in the Chełmno Land, where the presence of chicken was negligible. The same high representation of goose, and the relatively lower importance of chicken, was recorded in faunal materials from the Bishop's castle in Wąbrzeźno, Chełmno Land, dated to the 15th–17th centuries.[27]

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[26] Makowiecki, Makowiecka, Wiejacka, "Kości zwierzęce," 199–220.

[27] Makowiecki, Makowiecka, and Wiejacka, "Kości zwierzęce," 199–220; Grażyna Makowiecka, Daniel Makowiecki, and Mirosława Zabilska, "Wyniki badań zwierzęcych szczątków kostnych," in *Zamek w Grudziądzu*, ed. Wiewióra, 302–351; Marzena Makowiecka, Daniel Makowiecki, and Dorota Bienias, "Analiza źródeł przyrodniczych," in *Zamek biskupów chełmińskich*

Other species – ducks, partridges, or pigeons – were noticeably less frequently consumed. A free-living species, preferring agricultural areas with small groves, bushy thickets and fallow fields, was the partridge. The identification of its remains in both Teutonic Order-period and younger collections can be taken as an archaeozoological indicator of progressive deforestation. On the other hand, the presence of white-tailed eagle remains indicates the existence of forest zones with old-growth trees, preferred by this bird for nesting. Its radial bone fits the pattern in element representation known from other sites, where wing bones were also a major element. The repetition of the occurrence of the aforementioned anatomical syndrome in the Baltic zone became the basis for the conclusion that feathers from the white-tailed eagle's wings were destined for arrow fletching.

The value of these feathers is also evidenced by historical data, according to which birds kept for feathers provided a good income, as they can be sold "to shooters for arrows or usher for horse or shield." Castles also provided suitable habitats for species such as rats and bats. Probably to combat these rodents, cats were kept in the castles, as evidenced by their bones found in Papowo Biskupie, Unisław, Bierzgłowo and the site of the original location of Chełmno.[28]

Building materials, energy resources

The xylological materials obtained during the surveys of several castles and Chełmno town provided interesting information about the exploitation of primarily deciduous trees, mainly oak (*Quercus sp.*), but also pine (*Pinus sylvestris*). The studied material, due to the former function of the sites as well as the sampling locations, shows primarily the use of wood as a building material. Traces of the use of wood as firewood were confirmed only in Unisław. These are the remains of pine wood from the layers of a cooking stove dating to the 14th-15th centuries, and coals of the same species (preserved, among other things, in the form of twigs) with an admixture of oak wood from a site identified as a metallurgical workshop associated with a timber and earth fortress from the early 14th century. Wood,

w Wąbrzeźnie w świetle badań archeologiczno-architektonicznych, studia i materiały, ed. Marcin Wiewióra (Toruń: Wydawnictwo Naukowe Uniwersytetu Mikołaja Kopernika, 2014), 177–205.

[28] Martyna Wiejacka, Daniel Makowiecki, Monika Opelkova, Marcin Wiewióra, and Aleks Pluskowski, "Birds at the Teutonic Order's castles in Prussia (Poland)," *Quaternary International* 626–627 (2022): 133–141.

the use of which for fuel purposes has been confirmed by anthracological analyses, has very good energy properties, for example, pine has the highest calorific value among trees and is characterized by its combustibility. The oldest residential buildings discovered within the first locational town, Chełmno (1st half of the 13th century), were made of oak wood. These were basement houses, one of which exposed a level of pressed polepa with imprints of roundwood and quadrangular logs, probably constituting the walls of the building. Also, the oldest buildings from the Starogród castle (13th century) were made of hardwood – oak, poplar (*Populus sp.*), but a building discovered in the same economic development zone of the high castle dated to the 15th century was built of pine. Remnants of oak and pine wood were found in a residential building from Papowo Biskupie (13th/14th century). Remnants of oak wood were confirmed in another building, dating to the 14th–15th century, from the Papowo bailey area, in which an accumulation of burnt rye grains was discovered. In the layers of the ramparts of the timber-earth strongholds in Lipienek, Unisław and Bierzgłowo (the oldest settlement phases at these sites), remnants of several taxa, primarily deciduous with oak dominance, were recorded. The anthracological materials from Unisław from the bottom of the dike include oak remains dated by the 14C method to 1150±35 BP and wood of the spreading taxa used as stakes formerly forming a wooden stabilizing structure. Poplar remains came from the core of the dike, dated to 1110±30 BP, and oak remains were marked in the preserved ceiling layers. Also in the Lipienek rampart layer, dated to 1165±30 BP, the remains of deciduous wood were confirmed.[29]

Red brick appeared in Poland as early as the end of the 12th century, but became more widely used in the first half of the 13th century, especially with the arrival of colonists from what is today Germany and Silesia. By the end of the 13th century it was already a basic building material. The earliest example of the use of brick in Teutonic Order fortresses is, most likely, a fragment discovered during the excavation of the layers of the oldest timber and earth fortress in Starogród. The Chełmno Highlands and the Vistula proglacial valley/valley abound in clay raw materials that can be used to make bricks, tiles and other building ceramics. These include Pleistocene glacial till, stagnant clays and silts, and Neogene clays (Pstre clays, Poznań clays). Analyses of the sampled bricks carried out during the archaeological survey clearly indicate that no shoal clay was used for their production, primarily because it is a poor-quality raw material. Based on an analysis of geological maps and descriptions of the resources of the clay rocks closest to the individual

[29] Bienias, "Materiały antrakologiczne," 224–229.

castles, located within a radius of about 20 km from each one, it can be concluded that at the surface or under a small overburden of the ground, there are deposits of post-glacial varved clays which are an oily ceramic raw material, lacking major quantities of sand. These are deposits of the most likely raw material, used for the production of ceramic building materials, which were probably derived from readily available sands present in the vicinity of all the analyzed castles. Analyses of written sources indicate that Teutonic Order brickyards were often erected in the vicinity of constructed buildings, and their production was used primarily on site. Clay was also generally sourced in the local vicinity.[30]

Material culture

Analysis of material culture in Teutonic Order castles, was mostly based on historical information about the contents of their utility rooms, related for example to the kitchen and food consumption. Ceramic vessels are the most numerous type of artifacts and still, despite the use of much more accurate dating methods, the main source for dating medieval sites in the Chełmno Land. The earliest phase of settlement found in the castles of the Chełmno Land (Phase I), is related to the technology used in the early Middle Ages. On the territory of the Chełmno Land, pottery of this type, called "traditional" was produced until the late Middle Ages, and is dated from the 11th to the 13th century. These vessels have been a staple in dating fortified settlements for many years, in addition to an extensive program of radiocarbon dates. In many castles, a sequence of settlement layers associated with timber-earth Teutonic Order strongholds lay on top of the early medieval layer. The next stage of settlement is associated with the construction and functioning of first timber-earth and then masonry castles (Phase III). These materials can be related to the final phase of early medieval Chełmno pottery. Considering that these materials occur together with steel-gray vessels fired in a reducing atmosphere, we can assume that we are dealing with a combination of a local, traditional pottery trend with a new trend that can be associated with German colonization. The steel-gray pots were made using a belt-and-slide technique. New types of ce-

[30] Marcin Wiewióra, Wojciech Bartz, Jadwiga Łukaszewicz, Karolina Witkowska, Sławomir Jóźwiak, and Paweł Molewski, "Local or imported? The origin of the raw material used in manufacturing bricks from castles of the Teutonic knights in north-central Poland and their significance to our understanding of medieval construction techniques," *Archaeometry* 66, no. 2 (2023): 282–305, https://doi.org/10.1111/arcm.12925.

ramic forms appear after the period of the Crusades. The technology involved in their production was brought with the colonists and can sometimes be linked to their geographical origin, from Silesia to the eastern regions of the Holy Roman Empire. Ceramic pottery of this type, called grayware pottery, was produced on a potter's wheel and fired in a reducing atmosphere. This technology appears most quickly in the Chełmno area as early as the first half of the 13th century. It is typical of the period of German colonization.[31]

The collection of architectural details obtained as a result of the research, ranges from simple standard forms (such as roof tiles) to sophisticated ones (a piece of architectural sculpture). Particularly noteworthy, however, is a fragment of brick found in Starogród, which lay on a pavement dating to the period of the oldest timber and earth fortress. This brick, dated to the 2nd quarter of the 13th century, can therefore be considered one of the oldest or the oldest in the Chełmno Land. In addition to its small size, it is characterized by being made of yellowish-green clay and poor firing.[32] A very interesting design element discovered in Starogród castle, is a fragment of a sculpture. As we believe, on the basis of analogies between the sculptures from Elbing and Marienburg (today Malbork), it is a part of a decoration from the old castle chapel which functioned until the mid-15th century as a place of worship of Saint Barbara. The fragment, only 12 cm in height, is a part of a semi-plastic figural representation of the figure of a woman – probably a saint. The whole figure could measure no more than 40 cm. The original location of the figure remains hypothetical. But we believe that the described sculpture was part of a larger gallery of figures which belonged to the architectural decoration of a portal: a jamb or, an archivolt base. According to the author of the study of the sculpture, Juliusz Raczkowski, there is no question that we are dealing here with a part of the portal decoration of the castle chapel, but at this stage of research it is not possible to say much about its ideological content. The character's attribute, a round can with a cover – seems to indicate St. Mary Magdalene.[33]

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[31] Piotr Błędowski, "Ceramika naczyniowa," in *Castra Terrae Culmensis*, vol. 2, ed. Wiewióra, 96–141; Aleks Pluskowski, *The Archaeology of Prussian Crusade. Holy War and Colonisation* (Abingdon-New York: Routledge, 2012), 105–109.

[32] Wiewióra, Wasik, Molewski Misiewicz, Małkowski, and Bogacki, "New historical data," 135–152.

[33] Juliusz Raczkowski, "Not only the Golden Gate? A newly discovered fragment from the decoration of the castle chapel portal in Althaus (Starogród) as a contribution to the identification of ceramic sculpture in the Teutonic Order's State in Prussia," *Ordines Militares Colloquia Torunensia Historica. Yearbook for the Study of the Military Orders* 23 (2018): 339–357.

During archaeological investigations of the high castles in Papowo Biskupie and Starogród, tiles with a heating channel outlet hole, typical of hypocaust heating, were discovered. This confirms the presence of a heating system in the castles, which most likely heated the refectories. This is evidenced by information preserved in written sources. During the research of Unisław castle, an element of the stronghold's heating system – a hypocaust type furnace – was also discovered. This is quite a rare discovery, in the context of the oldest defensive architecture of the Teutonic Order knights. The remains of the furnace were located during the exploration of a trench in which a fragment of the foundation of the arcaded castle house was found.[34] The appearance of hypocaust devices in Poland can be linked to the process of colonization under German law in the second half of the 13th and 14th centuries. Settlers arriving in Polish lands, primarily from Thuringia, Saxony, the Rhineland and Westphalia, certainly also brought knowledge of this heating technique. Teutonic Order sources repeatedly mention heated rooms with a chambered earthen furnace, operating in the "hypocaust" system, which were refectories.[35] Typical convent castles generally housed a single room that served as a refectory. Heating devices were located on the lower floors of the buildings, connected to the room lying directly above them by ducts, and the rooms lying higher by additional chimney pipes. Such systems have been preserved in the castles of Radzyń Chełmiński and Popowo Biskupie, among others.[36]

An important part of the equipment of the castles was armament. Complementing the information on the equipment of castle armories found in the Teutonic Order's historical sources, during archaeological research a large number of objects were obtained, including crossbow bolts, arrowheads and fragments of armor, useful for further analysis and research.[37]

During the archaeological excavations in the western part of the Unisław castle house, a large number of iron slags were discovered, concentrated in a layer of

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[34] Bogusz Wasik and Marek Kołyszko "Ceramika budowlana," In *Castra Terrae Culmensis*, vol. 2, ed. Wiewióra, 157–165.

[35] Barbara Pospieszna, "Urządzenia grzewcze zamków krzyżackich w Prusach. Zabytki techniki, sztuki i kultury życia codziennego" (Ms., Uniwersytet Mikołaja Kopernika w Toruniu, 2007); Sławomir Jóźwiak and Janusz Trupinda, *Krzyżackie zamki komturskie w Prusach. Topografia i układ przestrzenny na podstawie średniowiecznych źródeł pisanych* (Toruń: Wydawnictwo Naukowe UMK, 2012), 75–76, 117, 148–151, 157, 161, 163, 165–167, 169, 175, 186, 188, 251, 253; especially the discussion with B. Pospieszna: 262–265, 316, 328–330, 332, 335–336, 342, 439.

[36] Wojciech Bis, "Ze studiów nad piecami typu hypocaustum z terenu ziem Polski," *Architectus* 1–2, no. 13–14 (2003): 3–28.

[37] Maciej Majewski, "Uzbrojenie średniowieczne w ziemi chełmińskiej" (Ms., Instytut Archeologii, Uniwersytet Mikołaja Kopernika w Toruniu, 2018).

burnt wood. These lumps (dules) were interpreted as the melted remains of iron objects as a result of high temperature. A half-finished spearhead with a pin was also recovered from the upper layers in the same part of the excavation. A comparison of the elemental composition of the two objects leads to the conclusion that the unfinished bolthead was made from a similar raw material to slate. The small percentage variations are probably related to the heterogeneity of iron smelting in the smokestack process and the subsequent forging process. It is worth noting at this point the significant content of rare earth metals in both of these examples. This indicates contamination of the iron ore with monazite, the largest known deposits of which are located in Lower Silesia region. This raises the question related to the source of the iron ore used for smelting. Archaeological findings at Unisław Castle (lumps of slag and half-finished arrowheads) suppose the existence of smelting furnaces here during the Teutonic Order's period. Iron production and the manufacture of steel objects played a very important role in the erection and operation of both residential and defensive structures. The castle in Unisław, from which the analyzed objects originate, fulfilled both functions. Dominating among its surroundings and serving as a facility for securing border areas, it should have had access to raw materials and a developed blacksmith's workshop. The production of everyday items aimed at agricultural needs could have been located freely in the space outside the castle's walls. However, as indicated by the presence of raw material and semi-finished product, it is reasonable to assume that the high castle itself should have had a forge focused on the production and repair of militaria as needed, which could have operated especially in times of danger.[38]

Pastimes, including board games (checkers, chess), and dice games, were practiced by members of the military orders, despite the explicit restrictions or prohibitions contained in the monastic rules. If a rule forbade a certain activity, it can be assumed that this is evidence that the activity was practiced. Thus, in the statutes of the Knights Hospitallers, it was forbidden to play chess, read romances and eat forbidden foods while in the castle infirmaries.[39] During archaeological investigations of Teutonic Order castles, evidence of games popular in the Middle Ages including checkers and chess were discovered. Two chess pawns were found in the castle in Kowalewo Pomorskie, in an excavation located in the northwestern part of the site. The pawns were found on stone paving, accompanied by large amounts

[38] Artur Ginter and Marcin Nowak, "Analizy bryły żelaza i półproduktu grotu bełtu do kuszy z zamku w Unisławiu," in *Castra Terrae Culmensis*, vol. 2, ed. Wiewióra, Annex CD.

[39] Boas, *Archaeology*, 203.

of charcoal, and other objects made of bone.[40] The pawns have an Arabic form, which suggests their shape, and a practical lack of decoration.[41] The game of dice is one of the oldest and most popular games known to mankind. Dice were made mainly of bone and antler, sometimes also of other materials such as amber, taking the traditional cube form.[42] The 1 × 1 cm cube, excavated during the research of the Bishop's castle in Wąbrzeźno, was made of animal bone. Analyzing the distribution of meshes on the walls, it is a left-handed cube. On the surface of its sides one can see traces of cutting and grinding. The object was made quite carefully.[43]

Conclusions

The first Teutonic Knights came to Chełmno Land in the 1230s. They soon established their first strongholds in Thorn (Toruń) and Althaus (Starogród), and immediately thereafter the town of Kulm (Chełmno) was established at its first location. The first earth-and-timber strongholds surrounded by ramparts were established at the sites of older, abandoned strongholds. Next to them, a group of early Teutonic Order strongholds referred to as "transitional-type" or "colonising" castles was identified that were erected with no association with any pre-existing defensive structures at their location. The defeats of the Teutonic Knights during the Prussian uprising of the 1240s revealed the weakness of these strongholds. These losses resulted in work beginning on the construction of new, brick castles.[44] These small and initially irregular (trapezoidal, horseshoe-shaped) undertakings that often comprised single buildings do not differ in form from the 12th- and 13th-century seats of feudal lords in Germany and Bohemia. After the conquest of

[40] Agata Momot and Bogusz Wasik, "Badania archeologiczno-architektoniczne zamku krzyżackiego w Kowalewie Pomorskim w roku 2013" (Ms. Instytut Archeologii, Uniwersytet Mikołaja Kopernika w Toruniu, 2013), 16.

[41] Ewa Gąssowska, "Wczesnośredniowieczne szachy z Sandomierza," *Archeologia Polski* 9 (1964): 148–169.

[42] Monika Fryszkowska, "Gry i zabawy w średniowiecznej Europie w świetle badań archeologicznych i historycznych" (Ms. Instytut Archeologii, Uniwersytet Mikołaja Kopernika w Toruniu, 2014).

[43] In both of the cases of the chess figures and the dice, we are not sure today whether they were made and used during the medieval period. Like the dice, the bier and figurine were found, admittedly, in the context of ceramic material generally dated to the late medieval period, but it cannot be ruled out that they are modern materials when the castle was in the possession of a Polish *starosta*.

[44] Wiewióra, Molewski, Makowiecki, Bienias, and Badura, "Castles and towns," 13–16.

Chełmno Land, conditions arose that enabled the development of brick construction. During this period, a new model of the commandery castle was adopted in Prussia. It was a regular, four-sided castle.[45]

One of the key outcomes of the latest archaeological research is that the hypothesis of a two-way pattern of development of Teutonic Order defensive architecture has been confirmed. The oldest group of irregular masonry-wall castles that were gradually extended around one castle building were – virtually without exception – constructed in places where there had been prehistoric or early medieval castles. In these places, the Teutonic Knights first built small earth-and-timber strongholds. In the 1230s they used old Slavic fortified settlements that had been abandoned a century earlier (*quondam castra*). A model of such an adaptation and transformation has been observed in, among other places, Thorn (Toruń) and Graudenz (Grudziądz). Besides that group, a set of early Teutonic strongholds, called "transitional type castles" or 'colonising castles' has also been identified that were built with no association with earlier defensive buildings. But a detailed discussion on the construction of the oldest Teutonic Order strongholds today remains impossible. The fortifications identified in the excavations have been investigated to only a limited extent. There are also headquarters known from historical sources that, despite archaeological studies, have so far failed to be located, but they were without doubt not located by brick castles (e.g. Schönsee (Kowalewo Pomorskie), Rehden (Radzyń Chełmiński)). The research results from Birglau (Bierzgłowo), Leipe (Lipienek) and Wenzlau (Unisław) bring new information to the discussion on the history of castles and the presence of the Teutonic Knights in the Polish-Prussian borderland. Little is still known about what the first Teutonic Order strongholds looked like. They were not simply a continuation of the early medieval fortresses because they had other functions related to implementing colonisation and a new social system. These strongholds were protected by ramparts. Historical sources show that the earliest construction in timber of such places included, among others, chapels, kitchens and refectories. Towers were also built in these timber castles.[46]

The key issue in reconstructing the geographical environment of the sites and surroundings of castles during their construction in the 13th and 14th centuries is to reconstruct the land cover, and thus to identify characteristic elements of the area around them. Undoubtedly, forests accounted for a significant share

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[45] Wasik, "The beginnings of castles," 167–190.

[46] Wiewióra, "Najstarsze fazy," 29–4; id., "Najstarsze krzyżackie," 230–238.

of the land cover, though these shrank as settlement progressed, as a function of the growing share of land devoted to agriculture. Deforestation correlated with areas of fertile soil. As a result, pine forests began to dominate the distribution of forest types in the heavily deforested Chełmno Land. The pollen diagrams show that arable lands predominated in deforested areas, with a prevalence of cereals and a smaller share of meadows and pastures.[47]

It can be assumed that in the initial stages of the Teutonic Order's settlement, the first colonists came from the Holy Roman Empire and Śląsk and obtained oak and pine growing in the immediate vicinity of the inhabited areas. These were taken from local forests, which provided many types of wood of different functional characteristics. The construction sites were very close to the tree felling sites because forests were extensive at that time; this minimised the complication and costs of transport. Wood and other construction materials were transported by local roads, and over longer distances by water. The extensive deforestation of the area was not only to obtain land for cultivation, but also to provide materials for construction, crafts and fuel. With regard to the latest research on Chełmno Land, the question that remains unanswered is where castle workers obtained plant products from. Studies of pollen from the vicinity of the castles surveyed here indicate a high proportions of cereals, including rye, which proves their dominance in the range of crops. It can therefore be assumed highly probable that the smaller castles in Chełmno Land were mainly provisioned with local products. The indicators in the diagrams show the presence of meadows and pastures, which were used for grazing and to supply fodder for animals kept in the castles.[48]

Excavations conducted in recent years have brought new sets of faunal data for parts of Prussia. In social terms, the knights of the Teutonic Order maintained a dietary regime typical of that mandated for religious orders in the relevant regulations. The castles were certainly inhabited by various social groups, but the knights' diets and eating habits are excellently described in historical texts, as comparative analyses clearly show. In general, the relationships between animal species bred and consumed by the inhabitants of castles and baileys can be seen to be almost identical to those noted elsewhere in Prussia. As in the period prior to the Crusades, livestock far exceeds wild species in abundance. The analysis of assemblages from Chełmno Land shows much higher percentages of wild mammals than in Gdańsk Bay or the western side of the Vistula. In Chełmno Land, most

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[47] Molewski, "Próba rekonstrukcji," 7–28; Bienias, "Materiały antrakologiczne," 224–229.

[48] Maciejewska, Badura, and Merdalski, "Materiały karpologiczne," 221–223

fish remains are of carp and pike, with significant amounts of cod, sturgeon and catfish (*Silurus glanis*). Pork was the staple meat, but its predominance over beef is not nearly as pronounced as the difference in preference for domestic animals over wild ones. Meanwhile, in assemblages from Unisław (Wenzlau) and Lipienek (Leipe), a distinct preference for pork over beef is visible, while the percentages of individual animal species went practically unchanged from the pre-Teutonic Order period until the castles were abandoned by the Order. At Starogród (Althaus), the situation is slightly different: the preference for pork over beef is minimal. In Papowo Biskupie (Papau), by contrast, a slight preference for beef over pork was recorded.[49]

Primary sources:

Reguła Zakonu Szpitala Najświętszej Marii Panny Domu Niemieckiego w Jerozolimie. Translated by Janusz Trupinda. Malbork: Wydawnictwo Zamkowe, 2023.

Secondary sources:

Badura, Monik, and Beata Możejko, "The plant element in the diet of the inhabitants of Danzig (Gdańsk), Elbing (Elbląg), and Marienburg (Malbork) during the rule of the Teutonic Order: historical and archaeobotanical perspectives." In *Ecologies of crusading, colonization and religious conversion in the medieval Baltic. Terra Sacra II*, edited by Aleks Pluskowski, 95–110. Turnhout: Brepols, 2019.

Banerjea, Rovena, and Monika Badura, "Settlement life in Livonia and the impact on its territories: the geoarchaeological and archaeobotanical evidence." In *Environment, colonization and the Baltic Crusader states. Terra Sacra I*, ed. Aleks Pluskowski, 175–205. Turnhout: Brepols, 2019.

Banerjea, Rovena, Monika Badura, Alexander Brown, Lionello Morandi, Mirosław Marcinkowski, Heiki Valk, and Alexander Pluskowski, "Feeding the Crusades: archaeobotany, animal husbandry and livestock alimentation on the Baltic Frontier." *Environmental Archaeology* 25 (2019): 135–150.

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[49] *Environment, colonization*, ed. Pluskowski; *Ecologies of crusading*, ed. Pluskowski; Makowiecki, Makowiecka, and Wiejacka, "Kości zwierzęce," 199–200; Wiewióra, Molewski, Makowiecki, Bienias, and Badura, "Castles and towns," 13–16.

Bienias, Dorota. "Materiały antrakologiczne." In *Castra Terrae Culmensis – na rubieży chrześcijańskiego świata*, vol. 2, edited by Marcin Wiewióra, 224–229. Toruń: Wydawnictwo Naukowe Uniwersytetu Mikołaja Kopernika, 2020.

Bis, Wojciech. "Ze studiów nad piecami typu hypocaustum z terenu ziem Polski." *Architectus* 1–2, no. 13–14 (2003): 3–28.

Błędowski, Piotr. "Ceramika naczyniowa." In *Castra Terrae Culmensis – na rubieży chrześcijańskiego świata*, vol. 2, edited by Marcin Wiewióra, 96–141. Toruń: Wydawnictwo Naukowe Uniwersytetu Mikołaja Kopernika, 2020.

Boas, Adrian. *Archaeology of the Military Orders. A Survey of the Urban Centres, Rural Settlements and Castles of the Military Orders in the Latin East (c. 1120–1291)*. Abingdon–New York: Routledge, 2006.

Brown, Alexander, and Monika Badura, "Cēsu pils aizsarggrāvī un pirmajā priekšpilī atrasto augu makroatlieku un putekšņu analīze: liecības par apkārtējās vides apstākļiem un augu izmantošanu." In *Cēsu pils raksti*, vol. 1, *Cēsis: Cēsu pils saglabāšanas fonds*, edited by Gaundars Kalniņš, 101–113. Cēsis: Cēsu pils saglabāšanas fonds, 2017.

Brown, Alex, Rowena Banerjea, Wynne Amanda Dawn, Normunds Stivrins, Marc Jarzebowski, Lisa-Marie Shillito, and Aleks Pluskowski. "The ecological impact of conquest and colonization on a medieval frontier landscape: combined palynological and geochemical analysis of lake sediments from Radzyń Chełmiński, northern Poland." *Geoarchaeology* 30, no. 6 (2015): 511–527, https://doi.org/10.1002/gea.21525.

Brown, Alex, Anneli Poska, and Aleks Pluskowski. "The environmental impact of cultural change: palynological and quantitative land cover reconstructions for the last two millennia in northern Poland." *Quaternary International* 522 (2019): 38–54, https://doi.org/10.1016/j.quaint.2019.05.014.

Ecologies of crusading, colonization and religious conversion in the medieval Baltic. Terra Sacra II. Edited by Aleks Pluskowski. Turnhout: Brepols, 2019.

Environment, colonization, and the Baltic crusader states: Terra Sacra I. Edited by Aleks Pluskowski. Turnhout: Brepols, 2019.

Fryszkowska, Monika. "Gry i zabawy w średniowiecznej Europie w świetle badań archeologicznych i historycznych." Manuscript, Uniwersytet Mikołaja Kopernika w Toruniu, 2014.

Gąssowska, Ewa. "Wczesnośredniowieczne szachy z Sandomierza. " *Archeologia Polski* 9, no. 1 (1964): 148–169.

Ginter, Artur, and Marcin Nowak. "Analizy bryły żelaza i półproduktu grotu bełtu do kuszy z zamku w Unisławiu." In *Castra Terrae Culmensis – na rubieży chrześcijańskiego świata*, vol. 2, edited by Marcin Wiewióra, Anex CD. Toruń: Wydawnictwo Naukowe Uniwersytetu Mikołaja Kopernika, 2020.

Jóźwiak, Sławomir, and Janusz Trupinda. *Krzyżackie zamki komturskie w Prusach. Topografia i układ przestrzenny na podstawie średniowiecznych źródeł pisanych*. Toruń: Wydawnictwo Naukowe Uniwersytetu Mikołaja Kopernika, 2012.

Maciejewska, Karolina, Monika Badura, and Marek Merdalski. "Materiały karpologiczne." In *Castra Terrae Culmensis – na rubieży chrześcijańskiego świata*, vol. 2,

edited by Marcin Wiewióra, 221–223. Toruń: Wydawnictwo Naukowe Uniwersytetu Mikołaja Kopernika, 2020.

Majewski, Maciej. "Uzbrojenie średniowieczne w ziemi chełmińskiej." Manuscript, Instytut Archeologii, Uniwersytet Mikołaja Kopernika w Toruniu, 2018.

Makowiecka, Grażyna, Daniel Makowiecki, and Mirosława Zabilska. "Wyniki badań zwierzęcych szczątków kostnych." In *Zamek w Grudziądzu w świetle badań archeologiczno-architektonicznych. Studia i materiały*, edited by Marcin Wiewióra, 302–351. Toruń: Wydawnictwo Naukowe Uniwersytetu Mikołaja Kopernika, 2012.

Makowiecka, Marzena, Daniel Makowiecki, and Dorota Bienias. "Analiza źródeł przyrodniczych." In *Zamek biskupów chełmińskich w Wąbrzeźnie w świetle badań archeologiczno-architektonicznych. Studia i materiały*, edited by Marcin Wiewióra, 177–205. Toruń: Wydawnictwo Naukowe Uniwersytetu Mikołaja Kopernika, 2014.

Makowiecki, Daniel, Grażyna Makowiecka, and Martyna Wiejacka. "Kości zwierzęce." In *Castra Terrae Culmensis – na rubieży chrześcijańskiego świata*, vol. 2, edited by Marcin Wiewióra, 199–220. Toruń: Wydawnictwo Naukowe Uniwersytetu Mikołaja Kopernika, 2020.

Molewski, Paweł. "Próba rekonstrukcji stanu środowiska geograficznego miejsc położenia i otoczenia zamków w czasie ich budowy w XIII–XIV wieku." In *Castra Terrae Culmensis – na rubieży chrześcijańskiego świata*, vol. 2, edited by Marcin Wiewióra, 7–28. Toruń: Wydawnictwo Naukowe Uniwersytetu Mikołaja Kopernika, 2020.

Momot, Agata, and Bogusz Wasik. "Badania archeologiczno-architektoniczne zamku krzyżackiego w Kowalewie Pomorskim w roku 2013." Manuscript, Uniwersytet Mikołaja Kopernika w Toruniu, 2013.

Pluskowski, Aleks. *The Archaeology of Prussian Crusade. Holy War and Colonisation.* Abingdon-New York: Routlege, 2012.

Pluskowski, Aleksander, Monika Badura, and Marc Jarzembowski, "Exploiting plants: macrobotanical remains from Prussia." In *Environment, colonization, and the Baltic crusader states: Terra Sacra I*, edited by Aleks Pluskowski, 377–403. Turnhout: Brepols, 2019.

Pospieszna, Barbara. "Urządzenia grzewcze zamków krzyżackich w Prusach. Zabytki techniki, sztuki i kultury życia codziennego." Manuscript, Uniwersytet Mikołaja Kopernika w Toruniu, 2007.

Przybylak, Rajmund. "Zmiany klimatu Polski i Europy w ostatnich stuleciach." *Kosmos*, *Problemy Nauk Biologicznych* 57, no. 3–4 (2008): 195–208.

Raczkowski, Juliusz. "Not only the Golden Gate? A newly discovered fragment from the decoration of the castle chapel portal in Althaus (Starogród) as a contribution to the identification of ceramic sculpture in the Teutonic Order's State in Prussia." *Ordines Militares Colloquia Torunensia Historica. Yearbook for the Study of the Military Orders* 23 (2018): 339–357.

Radzimiński, Andrzej. "Przy stole rycerzy i duchownych zakonu krzyżackiego w Prusach." In *Życie codzienne w regionie kujawsko-pomorskim*, edited by Waldemar Rozynkowski and Małgorzata Strzelecka, 10–19. Toruń: Urząd Marszałkowski Województwa Kujawsko-Pomorskiego, 2011.

Wasik, Bogusz. "Architektura i technika budowy zamków murowanych w Starogrodzie, Bierzgłowie, Lipienku, Papowie Biskupim i Unisławiu w kontekście budownictwa zamkowego Prus." In *Castra Terrae Culmensis – na rubieży chrześcijańskiego świata*, vol. 2, edited by Marcin Wiewióra, 248–252 Toruń: Wydawnictwo Naukowe Uniwersytetu Mikołaja Kopernika, 2020.

Wasik, Bogusz. "The beginnings of castles in the Teutonic Knights' state in Prussia." *Castellologica Bohemica* 18 (2018): 167–190.

Wasik, Bogusz. "Zamki krzyżackie w okresie późnośredniowiecznym i nowożytnym. Analiza źródeł architektonicznych." *In Castra Terrae Culmensis – na rubieży chrześcijańskiego świata*, vol. 2 edited by Marcin Wiewióra, 42–95. Toruń: Wydawnictwo Naukowe Uniwersytetu Mikołaja Kopernika, 2020.

Wasik, Bogusz, and Marcin Wiewióra, "Próba rekonstrukcji układu przestrzennego zamku wysokiego (domu konwentu) w Kowalewie Pomorskim na podstawie źródeł historycznych i najnowszych wyników badań archeologiczno-architektonicznych." *Wiadomości Konserwatorskie* 45 (2016): 53–65.

Wasik, Bogusz, and Marcin Wiewióra, "Zamek w Kowalewie Pomorskim. Dzieje warowni w świetle wyników badań archeologiczno-architektonicznych." *Acta Universitatis Nicolai Copernici*, *Archeologia* 35 (2017): 129–158.

Wasik, Bogusz, and Marek Kołyszko. "Ceramika budowlana." In *Castra Terrae Culmensis – na rubieży chrześcijańskiego świata*, vol. 2, edited by Marcin Wiewióra, 157–165. Toruń: Wydawnictwo Naukowe Uniwersytetu Mikołaja Kopernika, 2020.

Wiejacka, Martyna, Daniel Makowiecki, Monika Opelkova, Marcin Wiewióra, and Aleks Pluskowski. "Birds at the Teutonic Order's castles in Prussia (Poland)." *Quaternary International* 626–627 (2022): 133–141.

Wiewióra, Marcin. "Badania archeologiczno-architektoniczne średniowiecznego zamku w Papowie Biskupim w ziemi chełmińskiej." *Archaeologia Historica Polona* 17 (2007): 293–305.

Wiewióra, Marcin. "Badania archeologiczno-architektoniczne zamku głównego w Radzyniu Chełmińskim w latach 2008–2009." In *XVII Sesja Pomorzoznawcza*, vol. 2, *Od późnego średniowiecza do czasów nowożytnych*, edited by Henryk Paner and Mirosław Fudziński, 169–178. Gdańsk: Muzeum Archeologiczne, 2013.

Wiewióra, Marcin. "Gród i zamek w państwie krzyżackim – miejsce tradycji czy tradycja miejsca?" *Archaeologia Historica Polona* 24 (2016): 195–231.

Wiewióra, Marcin. "Najstarsze fazy osadnictwa krzyżackiego." In *Castra Terrae Culmensis – na rubieży chrześcijańskiego świata*, vol. 2, edited by Marcin Wiewióra, 29–41. Toruń: Wydawnictwo Naukowe Uniwersytetu Mikołaja Kopernika, 2020.

Wiewióra, Marcin. "Nowe źródła do dziejów zamku w Grudziądzu." In *XVIII Sesja Pomorzoznawcza*, vol. 2, *Od późnego średniowiecza do czasów nowożytnych. Materiały z konferencji 16–18 listopada 2011*, edited by Ewa Fudzińska, 87–104. Malbork: Muzeum Zamkowe, 2013.

Wiewióra, Marcin. "Sprawozdanie z badań archeologiczno-architektonicznych zamku w Papowie Biskupim w 2008 r." Manuscript, Instytut Archeologii, Uniwersytet Mikołaja Kopernika w Toruniu, 2009.

Wiewióra, Marcin. "Stratygrafia warstw kulturowych i charakterystyka poziomów osadniczych." In. *Castra Terrae Culmensis – na rubieży chrześcijańskiego świata*, vol. 1, edited by Marcin Wiewióra, 59–100. Toruń: Wydawnictwo Naukowe Uniwersytetu Mikołaja Kopernika, 2020.

Wiewióra, Marcin. "*Studia nad średniowiecznym warsztatem budowlanym zamku krzyżackiego w Papowie Biskupim*." *Ochrona Zabytków* 1–4 (2013): 179–198.

Wiewióra, Marcin. "Wstępne sprawozdanie z badań archeologicznych prowadzonych na zamku w Grudziądzu w 2009 roku." In *XVII Sesja Pomorzoznawcza*, vol. 2, *Od późnego średniowiecza do czasów nowożytnych*, edited by Henryk Paner and Mirosław Fudziński, 155–168. Gdańsk: Muzeum Archeologiczne, 2013.

Wiewióra, Marcin. "Wyniki badań archeologiczno-architektonicznych zamku krzyżackiego w Papowie Biskupim w latach 2006–2008." In *XVII Sesja Pomorzoznawcza*, vol. 2, *Od późnego średniowiecza do czasów nowożytnych*, edited by Henryk Paner and Mirosław Fudziński, 113–124. Gdańsk: Muzeum Archeologiczne, 2013.

Wiewióra, Marcin. "Zamek biskupów w Wąbrzeźnie w świetle wyników badań archeologiczno-architektonicznych." In *XVIII Sesja Pomorzoznawcza*, vol. 2, *Od późnego średniowiecza do czasów nowożytnych. Materiały z konferencji 16–18 listopada 2011*, edited by Ewa Fudzińska, 77–86. Gdańsk: Muzeum Zamkowe, 2013.

Wiewióra, Marcin, Bogusz Wasik, Paweł Molewski, Krzysztof Misiewicz, Wiesław Małkowski, and Miron Bogacki. "New historical data on the Teutonic Order crusades in Prussia: geophysical and archaeological research into an earth-and-timber stronghold and city of the 1230s at Starogród, northern-central Poland." *Archaeological Prospection* 27, no. 2 (2020): 135–152.

Wiewióra, Marcin, Bogusz Wasik, Paweł Molewski, Monika Badura, Karolina Maciejewska, Daniel Makowiecki, Paweł Moszczyński, Krzysztof Miśiewicz, Wiesław Małkowski, Miron Bogacki, and Sebastian Tyszkowski, "The Teutonic crusade in Prussia: reconstruction of a medieval fortified settlement complex at Unisław." *Antiquity* 93, no. 369 (2019): 752–771.

Wiewióra, Marcin, Paweł Molewski, Daniel Makowiecki, Dorota Bienias, and Monika Badura. "Castles and towns of the Teutonic Order in Chelmno Land: Environment, animals and plant subsistence. A new archaeological and geo-archaeological study." *Journal of Archaeological Science: Reports* 46 (2022): 2–18, https://doi.org/10.1016/j.jasrep.2022.103681.

Wiewióra, Marcin, Wojciech Bartz, Jadwiga Łukaszewicz, Karolina Witkowska, Sławomir Jóźwiak, and Paweł Molewski, "Local or imported? The origin of the raw material used in manufacturing bricks from castles of the Teutonic knights in north-central Poland and their significance to our understanding of medieval construction techniques." *Archaeometry* 66, no. 2 (2023): 282–305, https://doi.org/10.1111/arcm.12925.