



FALSE ASTRAGALI AND PROBLEMATIC BOWLING PINS: THE PHENOMENON OF PHALANGES USED IN MEDIEVAL AND EARLY MODERN EUROPE

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Abstract. In connection with a series of development projects in Chełmińskie Przedmieście in the city of Toruń, between 2023 and 2025 a team of archaeologists from the company Ciszak & Ciszak conducted extensive archaeological excavations over an area exceeding 34 ares. The explored cultural layers reached a depth of nearly 8 meters, particularly at the ECFC investment site. During the excavation of

features in one of the large-area trenches, a damaged vessel was discovered containing a set of ten animal phalanges of similar size. The find prompted a discussion concerning the type of game at play and its rules. First, attention must be drawn to the terminology in use, which may lead to confusion when identifying the type of game. Another element of the discussion involved an analysis of traces resulting from the deliberate drilling of the bones in order to alter their weight, as well as the filling of selected knucklebones¹ with lead.

Keywords: Chełmińskie Przedmieście, games, bowling pins, knucklebones, Toruń.

Introduction

Following the investment project entitled ‘*Construction of the ECFC Studio Building*’ in Toruń, preventive archaeological excavations were carried out by the company Ciszak & Ciszak. Site 577, located within AZP area 40-43/688, forms part of the former Chełmińskie Przedmieście [Chełmno Fore-town], which extended north of the Old Town beyond the now-defunct Brama Chełmińska [Chełmno Gate]. From 13 November 2023 to 8 May 2024, a total area of more than 1,700 m² was examined. The excavation reached a depth of approximately 8 m. The near-surface zone (down to 1 m) consisted of a heavily anthropogenically transformed horizon composed of rubble, installations, and artefacts of various dates, including objects attributed to a transit camp operated by the Germans during WWII, located behind the present-day Marshal’s Office. At a depth of approximately 2.75 m, a manure-rich horizon began, with thickness amounting to 1.15-1.55 m. Its contents: shoes, textiles, and ceramics date back to the 17th-18th centuries (Grupa et al. 2024, pp. 83-86). Below a depth of 4.3 m, horizons and features dated respectively to the 14th-16th centuries were recorded. The find of interest (inv. no. 9), consisting of a damaged pot known as a *siwak* (an unglazed clay vessel, grey, steel-grey, or black in colour; Fig. 1), filled with phalanges and other fragments of the vessel, was in the fill of feature no. 37, within a layer dated to the 14th-15th century (Fig. 2). Notably, this feature was situated at the base of a recorded functional building interpreted as an inn/tavern, at a depth exceeding 6.35 m. Before proceeding to a detailed description of the find, we will first outline the spatial context of the deposit and the history of games involving phalanges against the background of other games regarded as bowling.

¹ Due to the lack of a precise historical equivalent in English for games using specifically cattle phalanges, in the text of the article the word “knucklebone”, which is now primarily associated with astragalus, refers only to cattle phalanges, for the sake of clarity of the presented arguments (see Willemsen 1998, p. 412).



Fig. 1. Bovine phalanges *in situ* (Ciszak & Ciszak Archive)

The history of Chelmińskie Przedmieście in Toruń

In the past, the area subjected to archaeological research had undergone frequent and multifaceted transformations. The city of Toruń developed in accordance with Blaschke's model: *Altstadt – Neustadt – Vorstadt* (i.e. Old Town – New Town – Suburb), already in outline form in the 13th century, from the relocation of Toruń within the bounds of the present-day Old Town in 1236, through the foundation of the New Town in 1264, and the construction of the first public utility buildings: mills (Trzeposz, Nowy Młyn), a hospital (Holy Spirit), and a chapel (St Lawrence) in the suburban areas (Blaschke 1970; Jasiński 1982, p. 6; Mikulski 1999, p. 41). Chelmińskie Przedmieście was established as the second suburb, immediately after Portowe Przedmieście, and was concentrated around the Chelmno and Gdańsk routes, which led north out of the city through the Chelmno and Prawa Gates. Reconstructions of the suburban road network carried out by Tomasz Jasiński and subsequently by Krzysztof Mikulski suggest that, with a high degree of probability, the site in question can be located between Cicha Street (*Stummengasse*) and Mieczowa Street (*Schwerdtgasse*). The latter was renamed Środkowa Street (*Mittelgasse*) in the late 14th century and was still known as 'Pośrednica' in the



Fig. 2. Knucklebones from feature 37 arranged in a reconstructed *siwak* (photo by H. Ciszak)

17th century (Jasiński 1982; Mikulski 1998, p. 19). In the immediate vicinity of the site, in its heyday in the 14th century, it attracted all the most important institutions of suburban life. Between the aforementioned Cicha Street and Końska Street (later renamed Różana Street due to the similarity of the German words *Ross* – horse and *Rose* – rose), which ran from the Chełmno Gate along the city walls toward Rozgarty (*Rossgarten* – the municipal stud), a suburban court (*Dinghaus*) had been in operation since at least 1386 (Jasiński 1982, pp. 46, 104; Mikulski 1999, pp. 343, 388, 394-395). At some distance, to the northeast of the site, a leprosarium dedicated to St George was established in the late 13th century under the patronage of the City Council, and shortly thereafter a church under the same dedication was founded. On the opposite side of the Chełmno/Gdańsk route from the site, the aforementioned Chapel of St Lawrence was consecrated as early as in 1263. In the first half of the 14th century it was expanded into a church, beside which a hospital/almshouse operated. Immediately adjacent to it, in 1327, the Benedictine nuns relocated from Przedmieście Portowe; in addition to a convent, a Church of the Holy Cross was erected for them in the second half of the 14th century (Mikulski

1999, p. 44; Tandecki 1999, p. 177; Zimnowoda-Krajewska 2011, p. 59). Both mentioned church-hospital establishments, along with Przedbramie Chełmińskie [Chełmno Fore-gate], formed three points of population concentration in the immediate vicinity of the site, which developed dynamically between 1330 and 1380. Artisans handling transport, wheelwrights, coachmen, porters, specialists in metalworking, construction, ceramics, linen production, and leatherworking gathered here. Gardens, vineyards, and hops were cultivated; birds were hunted, cattle and pigs were raised and bees kept (Jasiński 1982, pp. 106-115; Biskup 1992, p. 74; Mikulski 1999, p. 46). The development of the suburbs was not hindered even by the fires attributed to military actions in 1414, 1422, and 1455, followed by a rapid reconstruction (Tandecki 1995, p. 8). By 1629, the density of buildings continued to increase with the influx of population and the establishment of additional economic facilities, as well as gardens and patrician family manors (Cackowski 1994, p. 11). The densely built Przedmieście Chełmińskie was only brought to an end by the Swedish siege in February 1629, during which a decision was made to burn the suburbs. By April 1629, construction of the first ramparts and bastions began. By 1631, the construction of the Chełmno bastion (marked as no. 6) was completed which, along with the surrounding moat, completely covered the site of interest, as well as a large portion of the former Chełmińskie Przedmieście alongside the St. Lawrence bastion (Stankiewicz 1972, pp. 36-37, 45; Tandecki 1995, p. 8; Dybaś 2024, pp. 8-12). After significant transformations, the bastion still existed in the 1920s, when it was demolished to make way for the Toruń Ring – a space designated for the construction of new public utility buildings and parks (Deptuła 2014, p. 67).

To understand the deposition of the find, it is essential to consider the factors that may have influenced its presence at this location. Here, the role of trade at Brama Chełmińska becomes particularly significant. In its immediate vicinity, there were nine large and eleven small stalls mainly leased by suburban shoemakers. Cattle (German: Geiselermarkt) and horse (German: Rossmarkt) markets were also held here. The name of the first market derives from Geisler/Geiselere, the cattle traders, whom Stanisław Herbst and Jan Baszanowski regarded as distinct from the butcher guild and opposed by them. In contrast, Józef Buława and Tomasz Jasiński viewed them as a faction within that guild (Herbst 1933, p. 105; Buława 1971, pp. 18-19; Baszanowski 1977, p. 143; Jasiński 1982, p. 105). The first known mention of the cattle market dates back to 1460, when the council granted permission to a certain Hans Grätsch from Chełmno to slaughter cattle at the cattle market until St. Bartholomew's Day – August 24 (Praetorius 1832, p. 216; Voigt 1904, p. 92). By the early 16th century, Toruń was essentially self-sufficient in supplies of cattle grazed on municipal pastures or brought in from the surrounding area. However, by around 1515, Toruń butchers were compelled to organize expeditions to Masovian cities (Biskup 1992, pp. 134-135). The beginnings of a legal cattle driving route of regional significance that ran through Toruń, as well as an

illegal route of supra-regional importance in its vicinity, can be approximately dated to 1534. In that year, King Sigismund I the Old responded to the Prussian envoys regarding the customs duty imposed in 1507 on oxen from the Ukrainian steppes, previously not exported to Prussia, as the Prussians had a sufficient supply of oxen from Pomerania and Masovia (Baszanowski 1977, pp. 31-32). As the demand for cattle in Royal Prussia increased, so did the profitability of cattle drive itself. Based on the number of transactions, Józef Buława suggested that some artisans completely abandoned their trades, citing the brewer Andrzej Gretsches, who in 1543 obtained permission from the Toruń council to drive one hundred fattened oxen for sale that year (Buława 1971, pp. 18-19). In 1579, butchers and merchants from Toruń, Gdańsk, and other Pomeranian cities, and in 1581 also Prussian nobility, obtained exemption from customs duties for driving royal oxen to Prussia, upon taking at the chamber an oath that they would not be sold abroad (Baszanowski 1977, pp. 32, 38). However, both the basic and main legal cattle driving routes passing through the Polish Lithuanian Commonwealth bypassed Toruń, which served as a transit point only at the regional level, stretching from Golub to Chełmno, while primarily being a destination in itself (Baszanowski 1977, Fig. 2; Górski 1983, p. 484). Several factors contributed to this situation, aside from geographical considerations [the significant distance from the main roads leading from the borders of Moldavia (suppliers) to the borders of the Holy Roman Empire (consumers)]. One major influence was staple right according to which traders were required to offer the cattle for sale for three days to supply butchers and city residents. This regulation remained in force at least until the second partition (1793), despite the city losing staple right in 1537 (Herbst 1933, p. 106; Koczy 1933, p. 73). However, nothing mentioned above applies to illegal routes, especially since the introduction of the new customs duty. Dishonest merchants and noblemen engaged in trade circumvented the customs checkpoints (along the line from Międzyrzecz along the Noteć and Vistula rivers, and further along the border of the Duchy of Prussia to Augustów) through perjury or false exemptions. They reached the Duchy of Prussia where, unbothered by customs officials, they profitably drove herds to the Holy Roman Empire and Ducal Prussia (Baszanowski 1977, pp. 43-49). The above outline of the history of cattle trade in medieval and early modern Toruń demonstrates that, aside from the city slaughterhouses, the area around the Chełmno Gate served as a primary source of raw materials for artisans until at least 1629. These craftsmen used bones to produce various items: game pieces, buttons, rosary beads, double-sided combs, and long-toothed combs.

Notably, to maintain peace in the cities of Chełmno region, designated play areas were established. Unfortunately, we have no information on where such a playground might have been located in Toruń. In Chełmno, this area was designated in front of Brama Grubieńska [Grubno Gate] (Mastykarz 2010, p. 170). This is not solely typical of the towns in Chełmno region. One of the playgrounds in Amsterdam was located in front of St Olaf's Gate. Between 1350 and 1425, a to-

tal of 48 cattle phalanges (including 5 decorated, 1 weighted, and 1 perforated) ended up in the surrounding moat, likely as a result of play, along with 7 astragali: 6 from cattle and 1 from a pig (Willemsen 1998, pp. 166-168).

The phenomenon and meaning of play in human life

In its simplest sense, play can be described as an activity undertaken by a person in their free time. It may be treated as relaxation from work and the stresses of everyday life, or as a way to pass the time and overcome boredom. Games follow their own rules. They are played according to specific principles, within a specific time and place. They are usually repeatable and passed on to others (for example, to observers) or repeated within the same social group. Any form of play can fully absorb its participants and observers alike. However, it can generally be interrupted without consequences – unless it involves an element of competition, in which case the decision to stop depends on the participants involved. The end of a game involving at least two participants marks victory over another person. This is associated with feelings of joy, satisfaction, and pride in oneself. In a specific group, a winner may gain respect and admiration or, in the case of repeated victories, provoke envy, resentment, and the question, “Why him again?”. Every game requires perseverance in refining one’s skills, dexterity, and patience. It also demands the ability to maintain balance and composure in the face of defeat – that is, psychological equilibrium (Huizinga 1985, pp. 15-79). All these qualities should characterize the players participating in the games described below.

The knucklebones from Toruń

What distinguishes the Toruń and Groitzsch finds from the hundreds of other processed knucklebones discovered across Europe is their completeness. The find that is the subject of this article consists of a set of 10 bovine proximal phalangeal bones (Fig. 4-6; inv. no. 9), also found in a broken vessel of the *siwak* type (Fig. 2). The vessel was found inside relics interpreted as the remains of an inn (Fig. 3, no. 37). Only one of these is weighted with metal poured into a longitudinal through perforation, specifically a hole with a diameter of 5 mm connecting the proximal and distal ends of the bone, resulting in its weight increasing to 47 g (Fig. 5). Due to its versatile processing, this is also the most interesting specimen from the set. On the convex side (the front of the knucklebone visible to players when set up, prior to knocking it down), it was flattened slightly to smooth the surface, and over 20 irregular notches were made in the area (Fig. 6). Additionally, its previous owner drilled/cut a transverse hole in the knucklebone near the proximal end of the bone on the left side (when positioned). The hole, shaped like

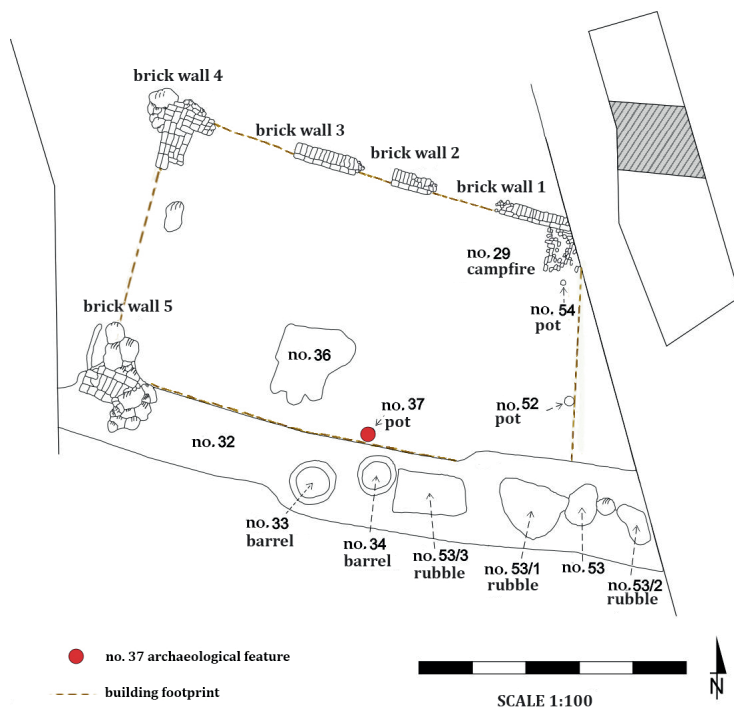


Fig. 3. Toruń, Site 577, Archaeological research during the construction of the Camerimage film studio. Area 7-10, Location of object 37 (drawing and compilation by J. Michalik, M. Waško)

a cone and measuring 5 mm in diameter, reaches into the metal-filled medullary cavity. The entire surface of the knucklebone is significantly polished due to intense use. The longitudinal crack formed across the notches can also be attributed to prolonged use, unless it is a result of post-depositional processes. Its dimensions are 50 mm in height and 30 mm in width at the proximal base. Another interesting specimen is a broken knucklebone with a non-through longitudinal perforation at the proximal end. Further research may indicate what material was used for its original filling. It measures 49 mm in height and weighs 8 g. The remaining 8 knucklebones (like those from Groitzsch) were not modified in any way, and evidence of their use for play is suggested only by marks from impacts and chips on the convex side. Their weights were 11, 12, 13, 13, 13, 14, 15, and 18 g, respectively.

Above, we discuss the find from the pot, but these were by no means the only knucklebones discovered during the research in Chełmińskie Przedmieście. We have mentioned the significance of the site as a place for cattle to be brought for market and likely also for occasional slaughter, so the large accumulation of cattle bones is not surprising. The vast majority of these bones showed no signs of pro-



Fig. 4. Knucklebone (inv. no. 9) with visible polishing, cut marks, and a perforation at the distal end (photo by J. Jarosz)



Fig. 5. Knucklebone (inv. no. 9) with visible excess metal and traces of an attempt to force it into the bone (photo by J. Jarosz)

cessing and were not found in contexts suggesting they were anything more than waste, leading to their inclusion in the mass inventory of animal bones. The designation of the site as a playground is potentially supported by the discovery of a knucklebone weighted with metal (inv. no. 9) found in a mixed layer. This knucklebone is polished and features a non-through perforation at the proximal end. What distinguishes this phalangeal bone is the excess metal measuring 15×11 mm, which appears to have been pushed into the interior of the knucklebone using a tool with a round cross-section measuring 1/1.5 mm. It measures 50 mm in height, 27 mm in width at the proximal base, and weighs 56 g. Another knucklebone (inv. no. 11), also from the mixed layer, features a non-through



Fig. 6. Knucklebone (inv. no. 9) with visible cut marks and a flattening cut on the convex side (photo by J. Jarosz)

perforation at the proximal end, distinguished only by partial filling of the hole with metal, leaving it empty up to 12 mm deep. Possibly, the initial filling was insufficient, or part of it fell out. The knucklebone is polished only partly on the right convex side (when positioned). The rest of the bone surface has been completely worn away. It measures 48 mm in height, 28 mm in width at the proximal base, and weighs 35 g. From the clay layers, there are two “sets” consisting of individual processed knucklebones along with specimens from the immediate vicinity. There is no complete certainty if they were used for play. The first of them consists of a group of seven phalanges (inv. no. 13), of which only one bears a blind perforation at the proximal end and two knife-cut incisions at the distal end. It measures 49 mm in height, 25 mm in width at the proximal base, and weighs 15 g. The remaining phalanges display no distinctive features and are only slightly polished. The second “set” (inv. no. 14) consists of nine phalanges, of which the most noteworthy (not perforated) bears more than twenty incisions on its convex side over a length of 25 mm; over a length of 12 mm these incisions were additionally flat cut. It measures 49 mm in height, approximately 17 mm in width at the proximal base, and weighs 15 g. What makes two other specimens distinct is the initial drilling of holes at the proximal end, with a diameter of 4 mm and a depth of approximately 1-3 mm. They measure 55 mm and 53 mm, 23 mm in width at the proximal base, and weigh 22 g and 16 g, respectively. In contrast to the previous “set”, most of the remaining knucklebones are heavily polished, and some also show signs of impacts. They weighed 15 g, 16 g, 18 g, 19 g, 20 g, and 22 g, respectively. Thus, out of a total of 28 mentioned phalangeal bones of cattle, 9 show definitive signs of processing, including 3 that are weighted (one of which has notches), 1 with a hole and no filling, 1 broken with a hole, 1 solely with a hole, 1 solely with notches, and 2 with initiated drillings.

Finds of knucklebones in archaeological materials

Over the years, so many theories and interpretations of knucklebone finds have accumulated in literature on the subject that this article does not provide sufficient space to confront all of them with the results of the survey in question. The automatic conclusion stemming from reading these studies is the inadequacy of material analysis carried out in isolation from the historical and iconographic contexts, especially when so many sources relevant to this topic remain unused. The most important conclusion concerning games that used knucklebones was put forward by Paulina Romanowicz who (on the basis of archaeological research conducted in sixteen chartered towns of the southern Baltic region and an analysis of 245 finds of knucklebones) determined that the relevant game accompanied German colonization, which in the case of Poland can be dated to the 13th century (Romanowicz 2016, pp. 12-15, 18, 92, 237-238, 242). It is, however, difficult to agree with another claim made by this author, namely that only perforated phalanges should be regarded as 'knucklebones'. The line of reasoning is that, after a few days, bones not cleaned of soft tissues would smell intensely and unpleasantly (Romanowicz 2016, p. 178). It seems that in medieval and early modern towns with poor sanitary conditions, the role of unpleasant smells should not be overestimated, provided that the decomposition of the marrow did not directly lead to the disintegration of the bone and, consequently, rendering the game impossible to continue. Knucklebones found together in a single location (both weighted, perforated specimens and unmodified ones) rather suggest that the latter were also used in play. To date, the weighting of knucklebones has been explained in two ways: either as a means of improving their stability when set upright, or in order to enable stronger throws and thus facilitate the knocking down of other knucklebones (Willemsen 1998, pp. 79-82; Samariter 2007, pp. 163-164; Lackner 2012, pp. 88-89; Miścicki 2022, pp. 468-469). The first interpretation, while the most widespread, does not withstand critical scrutiny. Nearly all researchers addressing this topic refer to Pieter Brueghel's painting *Children's Games* from 1560, which depicts four children playing knucklebones, throwing some pieces while knocking over others set upright along a wall (Fig. 7). Some scholars stress the fact that this is one of the more frequent representations of the game. There are, of course, also depictions of knucklebones not supported by walls. It is puzzling, however, that the fact that the knucklebones are braced against walls is rarely linked to their instability (Gomułka 2018, p. 1023). Iconographic sources therefore seem to demonstrate that knucklebones did not need to stand stably to be used in play. This, however, is not the only objection. Among other things, the multiplicity of interpretations of knucklebones results precisely from the fact that not every knucklebone became more stable after being weighted. This is hardly surprising given the morphological variability of phalanges among different individuals even of the same species, and consequently, for example, differences in the structure of the



Fig. 7. Game of knucklebones/Kotenspiel (detail from the painting “Children’s Games”, Pieter Bruegel the Elder, Kunsthistorischen Museum, Gemäldegalerie 1017, 1560)

medullary cavity. The above observation applies to longitudinally perforated phalanges; in the case of “pins” perforated transversely, it cannot even be assumed that the purpose of this procedure was to improve stability. The assumption that users sought to stabilize knucklebones is unconvincing for yet another reason. To date, excessive attention has been paid to setting the phalanges upright, and too little to the very essence of the game, namely knocking them down. We would venture the claim here that bovine phalanges were preferred for this game not because of their stability, but quite the opposite: while many of them can be set upright, most are unsteady – and this is hardly accidental. After all, the objective is to topple them. If the proposed explanation were the main criterion for raw material selection, we would have to assume that, as decidedly more stable, knucklebones made from the first and second phalanges of horses would have been preferred and, consequently, found more frequently in the archaeological record. This leads us to another issue, which is the selection of the species of material used for the game in question. Almost all known, indisputable examples of knucklebones have been made from cattle phalanges. Some researchers think that they might also have been made from horse phalanges, and Povilas Blaževičius also mentions bones from pigs, goats, and sheep, though he also notes that so far, in Lithuania, only cattle phalanges have been excavated (Willemsen 1998, pp. 79-82; Blaževičius 2008, p. 95). The authors are also unaware of using bones from animals other than cattle, although it is worth mentioning that the game *Bunnock*, currently played in Canada and having Russian roots, specifically relies on the first phalanges of horses. Its ancient lineage is evidenced by a 19th-century composition

by the painter Karnéijeff, which depicts Russian peasants engaging in this game in front of a tavern (Allemagne 1906, p. 81). The earlier conclusion by Paulina Romanowicz about knucklebones being part of the set of games that arrived in Polish lands with German colonization in the 13th century contradicts the claims that the 11th century marked the beginning of the occurrence of the knucklebone phenomenon. While this would require in-depth studies, it is possible that this discrepancy is merely apparent, as most phalangeal finds from before the 13th century could rightly be interpreted in a way other than as objects used for play. Without going into detail, the archaeological literature has so far suggested possible uses for these objects as pendants, amulets, whistles, rattles, fishing weights, or weights for scales (Ulbricht 1984, p. 63, Tab. 47.5-12; Norska-Gulkowa 1985, pp. 252-254, Fig. 12R-s; Rębkowski 1996, p. 339; 1998, p. 280; Konczewska 2010, p. 247; Gomułka 2018, pp. 1022-1025). Among the discussed knucklebones, there is also an example that could be interpreted as a rattle (inventory no. 12-11) due to two loose metal fragments that produce sound when shaken. However, considering the context outlined in this article, this effect was likely unintentional. Another frequently discussed research issue is the significance of the markings cut into the discovered phalanges, which were most often placed on the front side of the bones. A coherent system among these markings is hard to define. The most common finds include knucklebones incised across or with drilled points, while rarer examples feature representations of geometric figures or patterns resembling boards for tabletop games. It should be emphasized that almost all these markings were made in a very chaotic manner, resembling scribbles. Most often, they are assumed to have served decorative purposes, acted as identifying marks for the owner, or functioned as a scoring system (Heuvel 1994, pp. 159-160; Willemsen 1998, pp. 79-82). The source that seems to validate the above theses and address the questions posed by archaeologists is the already mentioned account by J. Francq van Berkhey. It could be reasonably contested that we should not mechanically apply the rules of knucklebone games specifically prevalent in the Netherlands in the 18th century to the entire multi-century phalangeal phenomenon. It would also be a truism to state that the rules of the game and the terminology of knucklebones certainly varied depending on geographical location and period. Nonetheless, it should be considered, particularly in relation to the German-Dutch origins of the game. Notably, the mentioned author described three ways to play knucklebones. For J. Francq van Berkhey, the version resembling bowling, which is most often depicted in iconographic sources and serves as the main representation in Polish archaeological literature, was only the third method of playing knucklebones. In the other two ones, victory was determined by the fall of the knucklebone, such that the side referred to as *stoof* was visible. As specified, this required skill or a “trick” (Francq van Berkhey 1773, p. 1420). The author clearly associated this “trick” with weighting the knucklebones. It hardly requires proof that children often imitate adults in their play. We might therefore assume that the game of knuck-

lebones likely introduced boys to the “adult” world of gambling and dice manipulation. Any modifications made to the knucklebones: perforation, weighting, and handling, could have simply aimed at maximizing the occurrence of *stoof*, which, when successful, resulted in acquiring one of the two most valuable possessions of boys at that time: small coins or the weighted knucklebones (Francq van Berkhey 1773, pp. 1419-1420). In this context, it would not be surprising if the owners of winning (and therefore highly valuable) knucklebones opted for additional markings that could serve as decoration but primarily as a sign of ownership. In the case of the Toruń knucklebones, we are dealing exclusively with the most common form of marking, which consists of horizontal incisions. These representing a scoring system can be reasonably excluded as their high density and overlap would make it impossible to determine how many incisions were actually made without specialized tools. Of special interest is the knucklebone marked in this way from the set with inventory no. 14. After making the transverse incisions, the user decided to trim the resulting “teeth” by cutting from the distal end towards the proximal end. Along with the knucklebone from the set with inventory no. 9 (Fig. 7), which has an unfilled hole likely never used on its left side (when positioned), we would see confirmation of the hypothesis regarding the manipulation of the shape and weight of knucklebones to maximize the occurrence of the preferred side. Alternatively, as suggested by Wilma van den Heuvel and Maarten van Dijk, players might have tossed a specific number of knucklebones into the air, guessed the odds of *stoof* and *schijt*, and earned extra points for marked knucklebones or specific combinations, similar to the game with astragali bones or classic cubic dice (Heuvel 1994, pp. 159-160; Dijk 2004, p. 67). However, it is important to note that even among knucklebones from a geographically closed area, it is difficult to find systematic patterns in their markings.

What, then, determines whether the discovered phalanges were or were not used for the games described above? It seems that if the phalanges were neither perforated nor specially marked by the user, the function could be indicated by signs of wear and atypical marks that may have resulted from being struck by another object. The origins of these marks would be hard to attribute to butchering or other practical reasons. The specimens from the pot bear signs of damage and wear that indicate such usage (Willemsen 1998, pp. 166-168; Samariter 2007, pp. 163-164). A separated specimen with these marks does not necessarily indicate the mentioned function but should draw scholars’ attention to its potentially recreational application. As mentioned, special attention should be paid to processed phalanges originating from layers older than the 13th century, as they may have served different purposes. Establishing if this was indeed the case requires further study.

Random and dexterity games in medieval and early modern Europe

Archaeology-wise, the dating of the game of interest is quite clear. Weighted and/or notched knucklebones gradually made their way to Europe in the 13th century, reaching the peak of popularity in the 15th and the first half of the 16th century, before almost completely disappearing in the 18th and 19th centuries (Romanowicz 2016, pp. 94, 242). History-wise, it is often stated that bowling was played as far back as ancient Egypt (Fittà 1998, p. 22; Blaževičius 2008, p. 95), based on a single discovery made by British archaeologist Sir Flinders Petrie during his expedition from 1894 to 1895 in the burial region stretching from Ballas to Nakada in Egypt. The inventory of a large child's grave dated to the 4th millennium BCE (no. 100) included a set of four porphyry balls, one longer and two shorter blocks made of grey marble, as well as nine alabaster figurines shaped like filled amphorae. The latter were not drilled in any way and could only be placed upright on their "rims". This set of objects, discovered especially during the period of increasing popularity of bowling, naturally led British archaeologists to associate it with the well-known game of skittles, specifically its variant played in the Norfolk area. Namely, balls are rolled to knock down pins that are set up behind a gate made of wooden beams, which the player cannot topple (Petrie 1896, p. 35). While this is an enticing interpretation of the purpose of the discovered items, it seems somewhat wishful. Even the earliest known forms of offerings placed in Egyptian tombs contained alabaster, used to make canopic jars, containers for oils, perfumes, ointments, and kohl for eye makeup. These items have been found in such numbers that they fill many Western museums. The "bowling pins" discovered by Sir Petrie differ from the aforementioned items only in the fact that they were not hollowed out (Lightbody 2020, p. 35).

It seems much more likely that the origin of the game should be attributed to Germanic tribes, among which bowling had deep cultural and mythological roots. This is evidenced by the frequently borrowed term "Kegel", which linguists trace back to the Old High German "chegil/kegil", meaning peg or pin. This word belongs to the same family as "Keil" (wedge), "Kugel" (ball), and "Kiel" (keel). It is possible that all the above developed in the context of the game of bowling (Grimm and Grimm 1873, pp. 388-389; Lackner 2012, pp. 99-100). It was often a favourite game of the heroes in Germanic legends; in this cultural circle (throughout Germany, Austria, Switzerland, and occasionally in France, as well as in border regions of Italy and the Czech Republic) the legend of golden bowling pins is a universally recognized theme. In the case of France and Italy, these legends coexist with tales of golden balls associated with the more popular local games of boule and bocce (Wolf 1852, p. 82). The central motif of many of these legends is an encounter with twelve men: knights, spirits, or old men with long white beards, hiding in a spacious hall just below the summit of a hill or beneath a castle on a hill. They speak an incomprehensible language, feast, and then engage in

a game with golden balls and pins. Additionally, it is quite common in German folklore to explain storms as a game of bowling played by angels, St. Peter, or the evangelists. The Brothers Grimm and Johann Wilhelm Wolf perceived these elements as remnants of ancient Germanic beliefs in the form of Wodan and his twelve gods. The famous brothers further conjectured that bowling might have been an element of ceremonies held in his honour, with the meat of horses (or even humans) being intended as a sacrifice, while the remaining bones were used to bowling in his honour, in a manner comparable to the Olympic Games in ancient Greece (Wolf 1852, pp. 118-121; Grimm and Grimm 1873, pp. 385-386). Reference is also often made to an account provided by Wilhelm Pehle (1907), according to which, at the turn of the 3rd/4th century CE, priests added a Christian touch to the game, turning bowling into an allegory of sin, paganism, or the devil, such that a person who succeeded in knocking down all the pins simultaneously defeated Satan. Unfortunately, the author's source of information remains unknown. The first reliable references to this game date only to the 12th century and come from the chronicle of the German town of Rothenburg ob der Tauber from 1157 where bowling is mentioned as a popular form of gambling entertainment (Röttgen 1982, p. 10). For this reason, most of the information on the history of bowling comes from estate, municipal, synodal, or guild statutes that prohibited (or imposed limits on) the scourge of games played for money. Toruń was no exception here: "From the earliest times, Toruń craftsmen also engaged in games of dice and cards, even to the point of losing their clothing. The authorities prohibited gambling, and punished cheating in games by gouging out the eyes" (Herbst 1933, p. 45). The resolution of the Prussian estates of 1445 prohibited the playing of dice in towns and villages under penalty of three marks and eight weeks' imprisonment in the tower on bread and water, while permitting the playing of draughts for small sums (Mastykarz 2010, p. 164). Authorities – secular and ecclesiastical alike – were concerned with preventing the financial ruin of their subjects, but also with the scandal caused by the erosion of estate-based social divisions. Everyone played with everyone: acquaintances and strangers, nobleman with peasant, parish priest with villager – engaging in dice, cards, pick-up sticks, skittles, bowls, balls, knobs, and the like (Geremek 1997, p. 520; Zaremska 1997, p. 247). A telling example is provided by an entry in the Płock consistory book from 1513, which records an indictment against Minister Paweł of Bożewo. As was his custom, he played *kręgle* (bowling) in front of a tavern on Sundays, and (as he had often done before) provoked numerous quarrels in the process, striking and being struck by peasants. It was emphasized that the said minister was subject to punishment for offending the clerical estate and for violating holy canons and the statutes of the Bishop of Płock (Ulanowski 1908, p. 177, no. 371). If Minister Paweł failed to pay, within fifteen days, the penalty of one *ferton* prescribed by the statute for the Diocese of Płock (i.e. a *wiardunek* equal to one quarter of a *grzywna*, which from 1455 represented the customary rate of tax per *lan*), he even faced the threat of excommu-

nication (Ulanowski 1891, p. 90, no. 343; Świętochowski 1928, pp. 50, 75). Over time, however, the stigma of gambling became permanently attached to games of cards and dice, while games of dexterity underwent a certain rehabilitation. As early as in 1680, in statutes approved for the Chełmno Academy, Jan Małachowski, Bishop of Chełmno recommended to students (for the sake of preserving health and providing temporary mental relaxation) the playing of ball games or *pyramids* (as bowling were sometimes called). These were not to be prohibited even on feast days after the evening hours, in contrast to games of chance, card games, and others, which were considered harmful to the soul everywhere and at all times (Lechicka 1963, p. 92; Möller 2012, p. 197). Nevertheless, even in the 18th century, Fr. Jędrzej Kitowicz remarked that it was easy to lose health “...when a quarrel followed a loss, and from that a brawl ensued – without which a game of bowling rarely ever took place – especially where gamblers became involved” (Kitowicz 1925, pp. 377-378). In a book first published in 1830, when discussing games accompanying the education of children up to the age of seven, Łukasz Gołębiowski recommended a ball game involving catching with “paws against a wall, which in time taught the throwing of projectiles or stones from a sling” (Gołębiowski 1884, p. 285). Nearly a hundred years later, in *Zabawy i gry ruchowe dzieci i młodzieży* (*Games and Physical Activities of Children and Youth*), complex and highly variable “Polish bowling” were described: games still remembered in Livonia and in some areas of Małopolska (Piasecki 1919, pp. 110-115). This bowling was characterized by a multiplayer game played on a large field measuring 60 × 25 m, in which the pins were knocked down by throwing (rather than rolling) balls as well as by using pins already knocked down. Possibly, this represents an evolutionary variant of the phalange-based game of our interest here.

The history of games involving phalanges is enigmatic and convoluted. Their origins are often claimed to date back to antiquity (Lehmkuhl and Schäfer 2005, p. 362; Hallem and Weide 1943, p. 112; Dijk 2004, p. 65; Kozikowska 2016, p. 43; Romanowicz 2016, p. 176). However, the evidence cited by scholars in fact refers to games and divinatory practices that were widespread in the ancient world and played using astragali – the talus bones of sheep (Kooiman 1959, p. 256). This seemingly minor error continues to weigh heavily on scholarly discourse to this day, and its causes should be attributed to the lack of knowledge of the bones among earlier European scholars. This was expressed by Erasmus of Rotterdam in Chapter 45 of his *Colloquies*, in which Carolus (modelled on the scholar Karl von Utenhove), together with his pupil Quirinus, discusses astragali and debates, among other things, where the *tali* should be located: near the feet or the knees, the differences in the structure of odd-toed and even-toed ungulates, and if such a bone can also be found in the human anatomical system (Roterdamus 1878, pp. 192-202; Kooiman 1959, p. 256). The significance of this issue lies in the different morphological structure of these bones and, consequently, in the different range of games that could be played using them.

Games using astragali are divided into random and dexterity games. When thrown, an astragalus can land on four out of the six available sides: two wide and two narrow. Each side has a different appearance and scoring, allowing them to be played similarly to the commonly known cubic dice. Divination with them was not much different from predicting the future with similar dice found in books like *Fortuna albo Szczęście* [Fortune or Luck] by Seweryn Bączalski, published as late as in the mid-18th century (Bystrzeński 1933, p. 199). Skill-based games typically require five astragali and involve tossing one while picking up additional ones from the ground during its flight. If a player successfully collects all of them in various arrangements, they then toss all the astragali again and attempt to catch them with the palm of their hand. Naturally, there are countless variations of this game. In Poland, this game persisted longest in the form of *hacele* (caulkins), still occasionally played on school playgrounds in the second half of the 20th century (Piech 2023, p. 107).

Games with *knucklebones* are also divided into random and dexterity games. However, a knucklebone can only land on two sides: convex and concave, allowing for fewer variants of random games. The dexterity-based game involves standing the knucklebones vertically in a row on a flat surface, often in front of a wall, and knocking them down, usually with another knucklebone that is weighted, as one might assume. In the Netherlands, a country of the game's particular popularity, it disappeared from city streets by the end of the 18th century, and from the provinces around 1900 (Gouw 1871, p. 293; Kooiman 1959, p. 259).

In our opinion, the differences outlined above justify the separation of the histories of the use of these bones, especially since games with astragali are more closely associated with the societies of the Mediterranean basin, while games with knucklebones are linked to the societies of Northern Europe (Romanowicz 2016, p. 242). However, the issue of referring to weighted or notched knucklebones as bowling pins in the archaeological literature is perhaps even more debatable (Romanowicz 2016, p. 92, 176). According to most contemporary definitions of bowling, knucklebones would not be recognized as such, since in the documented form, they are not knocked down by rolling but by throwing (Samariter 2007, pp. 163-164). However, in works concerning the history of the sport, there is a consensus that games aimed at knocking down small standing objects from a distance, whether by rolling or throwing another object at them, should be considered early variants of bowling (Grasso and Hartman 2014, p. 1). However, there is no evidence that medieval and early modern players of knucklebones viewed them in terms of bowling. This issue is not limited to knucklebones. Variants of bowling are also recognized in games such as *Loggats*, *Kayles*, *half-bowl* (*pierbollen*), *quilles*, and *skittles*. However, we must bear in mind that a game of nine pins also existed in nearly the same form as we know it today, with a lane and a wooden or leather ball (Orme 2003, p. 177; Blaževičius 2008, p. 95; Lackner 2012, pp. 99-100). Due to the ambiguity of the term "bowling" and considering that knucklebones were also used in another random game, it seems clearer to revert to one of the histor-

ical terms that specifically describe only the knucklebones used for play. The most widespread variant in the Netherlands and occasionally in Germany was “Koot” in the singular and “Koten” in the plural, with uncertain etymology, referring to a knuckle, joint, or phalanx (Kroonen 2013, p. 283). The Polish equivalent of the name for this game can be traced in the repeatedly published *Nomenclator* by Piotr Artomiusz (1591), intended for students of the Toruń Polish school for Germans. It was an adaptation of the *Nomenclatura* by the Zgorzelec teachers Johann Byber and Martin Mylius (2013), which transformed their Latin-German dictionary into a Latin-German-Polish one. Piotr Artomiusz was, among other roles, a pastor of the Polish Evangelical Church of St. George in Chełmińskie Przedmieście and a teacher at the local Academic Gymnasium. Following Byber and Mylius, in Latin the game is referred to as *Tali/astragali*, in German as *Koten*, and Artomiusz added the Polish term *Koty*, as well as the terms *Talorum jactus/Astralagismus*, *Kotenspiel*, and *Gra kotami* below it. Clearly, this is a case of loanword, leaving the phonetic form nearly unchanged. If the order of entries in the chapter “On Games” of the *Nomenclator* (Artomiusz 1638) was not random and reflected, for example, the level of popularity of the individual games, then the game of dice ranked first, the game of cards second, and the *gra kotami* third. Interestingly, the first entry after the game is “any game for money”. Following this, games like chess, draughts, and various types of ball games are mentioned, with a “bowling pin” and a ball appearing only towards the end of the list. Of course, this is just one possible interpretation, and the order may not have stemmed from anything in particular. It should also be noted that the order of entries would not reflect the conditions in Toruń but rather those in Zgorzelec (Artomiusz 1638, ch. XLIV. On Playing; Tync 1952, pp. 435-439; 1960, pp. 116-118). This arrangement was not the case in *Viertzig Dialogi*², in the dialogues prepared by the Gdańsk pastor Nicolaus Volckmar (2005), a bowling pin was also referred to as “Kegel” in Gdańsk and throughout the Duchy of Prussia. It should be assumed that the names “Koot” and “Kegel”, referring to bowling, could have coexisted in both the Duchy of Prussia and Silesia.

However, to present the history of games involving knucklebones, we must not overlook the Dutch sources, which reveal it in the fullest way. The Netherlands were, in fact, the only place where the bones of interest to us were clearly distinguished by names: *Bickel/pickel*, *Talus ouillus* (Kiliaan 1599, p. 52), and *kote*, *astragalus*, *talus bouillus* (Kiliaan 1599, p. 257). While this was progress compared to the previous conflation of the terms, the knucklebone was still incorrectly referred to as *astragalus*. Another term for the knucklebones was *Klaauw*, meaning

² These were German-Polish phrasebooks published multiple times in the Duchy of Prussia and Silesia. One of them was the Toruń edition from 1625. The last known reprint was published in Gdańsk in 1758. These phrasebooks were also sought after by Polish nobility, as command of the German language was desirable at the court of the Vasa family until the time of Queen Marie Louise Gonzaga (Kizik 2005, pp. VII-XXVI).

“claw” of an ox (Kooiman 1959, p. 261). It is therefore not surprising that these bones were still (more frequently than rarely) confused with each other (Dijk 2004, p. 65). The chaos of terminology is best illustrated by the glossary compiled by Johanna Willemsen for games played in the country between 1100 and 1550. The game of interest was known in Latin as *talus*, in English as *knucklebones*, in German as *Knocheln*, and in French as *astragale*. The proper *astragali* in Latin were to be known as *astragales/talus*, in English as *five-stones/knucklebones*, in German as *Bikkelsteine*, and in French as *osselets* (Willemsen 1998, p. 412). One of the earlier mentions of *knucklebones* can be found in *Des Coninx Sume* from 1408, which is a Middle Dutch version of the French *Somme le Roi* from around 1300. They appear in a comparison regarding immoral behaviour: someone who lives improperly is likened to an adult playing with knucklebones instead of engaging in meaningful activities. This indicates that not only children played with knucklebones. However, the one referred to as *knechtgen*, who was busy filling a knucklebone with lead one day in 1475, was likely a child. Lacking enough lead, he resorted to the only material he could find: a pilgrim’s badge depicting the image of the Virgin Mary from Amersfoort. As he refilled the knucklebone, part of the metal flowed onto the ground and miraculously reformed the image of the Virgin Mary, carefully recorded in the book of miracles of Amersfoort. The above example illustrates that the individuals themselves were involved in weighting the knucklebones (Willemsen 1998, pp. 79-80). A significant source of information about children’s games comes from the Southern Dutch manuscripts of the 16th century (lists of manuscripts concerning *koten*, Orrock 2010, p. 244; Willemsen 1998, pp. 333-334).

Illustrations depicting seasonal work of adults were often additionally adorned with borders featuring corresponding games. It was no coincidence that games involving knucklebones and bovine bladders are typically associated with the month of October. Autumn traditionally marked the slaughter of cattle, providing a supply of meat for the winter and leaving more feed for the remaining livestock (Kozikowska 2016, p. 42). Throughout the rest of the year, one could often witness a scene described by Jacob Cats in his poem *Houwelyck. Dat is De gansche gelegentheyt des Echten Staets* from 1625, where he depicted boys eagerly waiting for an ox to fall on the road. As long as it lives peacefully, the streets remain empty of happily playing children. However, once it sadly falls, its legs are quickly divided among the youths, who then make great noise with the knucklebones and bladder (Cats 1625, fol. I(**)r; Hallem and Weide 1943, pp. 111-112; Kozikowska 2016, pp. 47-48). In the third part of his *Natural History of the Netherlands*, Johannes le Francq van Berkhey, a well-known 18th-century Dutch painter, naturalist, physician, and poet, described the ancient history and contemporary use of games involving astragali, which girls engaged in during his time, but also included a brief note about the boys’ game of knucklebones. He referred to the bones as *Tali*, explaining that they were the proper heel bones. He stated that the game



Fig. 8. Children playing with knucklebones on tomb slabs inside a church (Ghent–Bruges Book of Hours, Houghton Library, Cambridge, MA, MS Typ 252, c. 1480, fol. 43r)

was most often associated with gambling. Boys would bet with *duiten* (copper coins of low value), or more frequently on the knucklebones themselves. Interestingly, the author extensively described an unknown form of the game involving knucklebones, which we can only suspect was the most popular during that period. The previously mentioned versions, based on either the principle known as “heads or tails” or resembling a form akin to bowling, were dismissed by Johann Francq van Berkhey as secondary or tertiary in importance. The main art of the mentioned game involved imparting the proper spin to the bone so that it landed on the flat side known as *schijt* (“shit”). The origin of the name is explained either by the fact that anatomically it is the back side of the knucklebone, where walking animals typically relieve themselves, or by the appearance of the two so-called “heels” (*hakken*), which could resemble a backside (Francq van Berkhey 1773, pp. 1419–1420; Stoett 1893, p. 143). The other, convex side was referred to as *stoof*. This term was also used to describe a winning throw, for example, *stoof leid de Koot, je ziet het Chris, en weer dat het spel gewonnen is* (translated as “stoof leads Koot, you see it Chris, and again the game is won”; Dijk 2004, p. 66). While we would now translate this term as “stew,” Frederik A. Stoett argued that it should be interpreted according to its old meaning of “blunt/bent upwards”, referring to the knucklebone that fell with its blunt back curved upwards (Stoett 1893, p. 142). Contrary to the considerations of archaeologists, J. Francq van Berkhey argued that knucklebones were weighted not to make them easier to stand upright or to knock down other standing knucklebones, but to ensure that they would frequently land *stoof* (Francq van Berkhey 1773, pp. 1419–1420). This claim is supported by an experiment by Klaas Kooiman who, based on the exchanges between characters in the play *Spaanschen Brabander* (Bredero 1617, pp. 285–287), concluded that the probability of landing on both sides should be roughly equal, and that an un-



Fig. 9. Children playing with knucklebones in a cemetery – authors' vision (drawing by H. Ciszak)

weighted knucklebone rarely landed *stoof*. Interestingly, a researcher who played knucklebones in the early 20th century did not encounter the practice of weighting them in southern Holland (Kooiman 1959, p. 255). In the version of the game discussed, players also aimed to knock down the opponent's knucklebone. The game started with a throw of the knucklebone onto the ground. The player whose bone landed *stoof* had the throw. They would place the opponent's bone on its "heels" and attempt to knock it down. If successful and their bone landed *stoof* again, they won a *duit* or the opponent's bone. If the player did not hit, the initiative passed to the opponent. However, if they succeeded and their bone landed *schijt*, they would lose. The popularity of the game in the Netherlands is best demonstrated by the numerous restrictions placed on its practice, such as the 1397 decree from Leiden banning *koten* for money, the 1528 laws for the village of Scherpenisse prohibiting children from playing *koten* in church (Fig. 8), in the cemetery (Fig. 9), and on the town hall steps, as well as the Haarlem resolution from 1557 banning children from playing in cemeteries and throwing stones and *koten* at windows (Kooiman 1959, p. 260; Willemsen 1998, pp. 79-82; Fig. 4). In Gdańsk, for example, one could lose a *shilling*³ (Volckmar 2005, p. 112). Only

³ A coin worth 1/3 grosz (6 denarii) (Volckmar 2005, p. 44).

in Groitzsch in Saxony were cattle knucklebones discovered within a crushed, blue-grey vessel. Among a total of 24 knucklebones, two had a perforation at the proximal end. One was weighted with a stone, and the other with lead, while the rest were left unmodified (Vogt 1987, p. 116).

Summary

The analysis of bovine phalanges from Chełmińskie Przedmieście in Toruń provides valuable insights into daily life, entertainment, and social practices in medieval and early modern northern Europe. The examined knucklebones displayed clear signs of wear on their surfaces; one specimen was additionally drilled and filled with lead. Such features indicate intensive use and deliberate modifications affecting game play, both in terms of dexterity and chance. Weighting the knucklebones, as demonstrated by Dutch sources and experiments by contemporary researchers, may have increased the likelihood of landing on a specific side (*stoof*), suggesting the existence of established strategies in the game rather than mere randomness.

The comparison of bovine phalanges from Toruń with materials from other European sites allows us to conclude that the analysed specimens can be classified as early forms of bowling, although they are often mistakenly referred to as astragali in literature on the subject. This issue of nomenclature is significant because it affects the interpretation of the findings' functions and the understanding of the cultural context of the games. Therefore, it is essential to precisely define the type of bones used, their size, the condition of the surface, including the degree of wear and signs of intentional mechanical processing.

The diversity of names used for bowling further complicates the archaeological picture. In sources from the Duchy of Prussia, the terms *Kegel* and *Koot* prevailed, as confirmed in 16th and 17th-century publications, while in the Netherlands and other parts of Europe, terms such as *Bickel*, *Kote*, and *Klaauw* were in use. Linguistic analysis indicates that different names might have referred to the same objects, while similar terms were also used for other bones. For this reason, archaeological research in this area requires close collaboration with linguists to accurately identify objects and their functions in a historical context.

This finding serves as evidence that dexterity games, although often marginalized in written sources, played a significant role in society. Analysing their material traces can greatly enhance our understanding of the importance of games in the daily lives of the former inhabitants of Toruń but also Europe.

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