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Marginal Mounds and Maritime Shepherding. A Landscape Archaeological Survey of a Late Medieval Sheep Mound in the Belgian Coastal Plain

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ABSTRACT

The 'Scaperie' site in Knokke-Heist (Belgium), identified through a topographic analysis of a sixteenth-century map and located in a maritime sedimentary environment, serves as the focal point for this research. Employing a landscape archaeological approach, this study integrates multiple data sources including ceramics, historical maps, aerial photographs, LiDAR-data, geophysical surveys, and a coring survey. The dataset revealed the remnants of a anthropogenic sheep mound, evidenced by a localised microtopographic elevation, subsoil anomalies and surface artifacts associated with dairy production. More generally, this paper contributes to the understanding of the dynamic interplay between humans, sheep, and the coastal environment, offering new insights into historic land use and the archaeological characteristics of coastal mounded features. The study introduces a tripartite pattern of spatial organisation of animal husbandry, encompassing parent farms, droveways and satellite dwelling mounds. Encroached by the advancing embankments, this sheep-related taskscape was gradually marginalised both socio-economically and spatially.

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Middle ages; taskscape; animal husbandry; archaeological prospection; historical cartography; landscape archaeology; terps; sheep

Introduction

Wool production from local sheep-breeding is considered as one of the most important drivers of the rise of the cloth industry and the urban and economic development in medieval Flanders. The subject has therefore attracted scholarly attention from some of the most renowned Belgian medieval historians since the early twentieth century (e.g. Pirenne 1905; Verhulst 1998). Initial research predominantly aimed at elucidating wool and textile production, processing and trade. Subsequent scholarship increasingly underscores the significance of ecological and environmental factors (e.g. Thoen and

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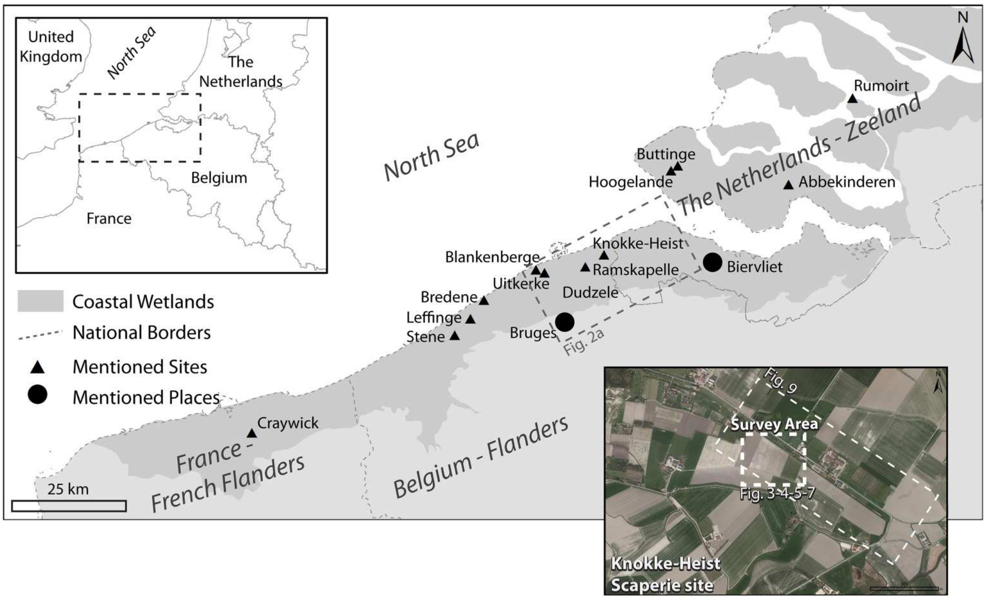

Figure 1. Map of the medieval coastal wetlands of Flanders, Zeeland and French Flanders with the indication of sites and most relevant places mentioned sites in this paper.

Soens 2008; De Keyzer 2016). Notably, landscape-archaeological contributions to this area of study have been relatively scarce. This paper aims to address this gap by conducting a landscape-archaeological survey of a purported late medieval sheep mound (i.e. a human-made raised platform in the intertidal area for safeguarding both sheep and shepherd), situating it within a supra-regional and diachronic framework (Figure 1). Therefore, we build on the theoretical concept of taskscapes, introduced by Ingold (1993, 153) as 'the pattern of dwelling activities that shape a landscape', or as aptly reformulated by Gruppuso and Whitehouse (2020, 588) as 'the array of practices that human and non-human beings carry out in the temporal process of inhabiting their environment'. Since its inception, this socio-anthropological concept has been eagerly embraced within archaeology (Rajala and Mills 2017a) and more recently also in historical transhumance research (Costello 2021), for reasons that are pertinent to the present paper.

Firstly, the concept of taskscapes facilitates the integration of different classes of landscape-archaeological evidence that might otherwise have been presented separately in distinct publications (Thomas 2017, 269). This holistic approach is beneficial for our case study as it integrates cartographic, archaeological, remote sensing, geophysical and coring data. More specifically, taskscapes find significant application within fieldwalking research, as they recognise artefact distributions as patterns of activity that extend beyond merely reflecting settlement, but also encompass social and economic activities (Rajala and Mills 2017b, 9; Thomas 2017, 270–272). This approach allows to move beyond the confines of single-site phenomena to explore traces of activity on a wider spatial and temporal scale. The present study heavily relies on surface assemblages and aims to further underscore the spatio-chronological value of surface finds (building on e.g. Brooks 2008; Fellner 2013; Trachet et al. 2017), and advance the debate by demonstrating the validity of functional analysis of ploughed-out ceramics. Furthermore, the conjunction of time and space, by linking tangibly different temporalities and precise locations (Rajala and Mills 2017b, 6), is highly relevant in this case study, as it seeks to trace the spatial and temporal trajectory of a specific activity in a dynamic environment. Finally, the acknowledged role of non-human actors, such as animals or tides (Ingold 1993, 163) is of utmost importance when discussing the landscape that was shaped by coastal herding strategies, and thus the interplay between humans, sheep and wetland.

Sheep Herding and Wool Production in the Belgian Coastal Plain – A Historical Narrative

To gain a comprehensive understanding of sheep husbandry and the processing, manufacturing and trading of sheep products in medieval Flanders, it is imperative to contextualise these activities within the broader economic and landscape dynamics of the southern North Sea region. This area experienced a growing significance of sheep-breeding along its coasts during the early medieval era, possibly even earlier (Verhulst 1998; de Langen and Mol 2022). In this period, the Belgian coastal plain transitioned from a supratidal peat bog incised by relatively stable tidal channels into a dynamic tidal basin, characterised by mudflats and saltmarshes, intersected by shifting tidal inlets. From 550 /750 AD, it gradually evolved into a more stable supratidal area, with tidal inlets filling in with sediments and salt marshes maturing into salt meadows (Baeteman 2018, 318–321). This increasingly silted yet saline and pristine coastal environment provided an ideal setting for sheep-breeding.

The salt marshes on which the sheep grazed in the 8th and 9th century are specifically referred to in the historical sources as *marisci* ('salty moorland'). Free peasant sheep farmers herded flocks and processed wool on-site (Verhulst 1998, 33). They lived and worked within the tidal area on manmade mounds (terps) or atop silted inlets (roddens). Historical records indicate that sheep-breeding reached its (initial) zenith in the maritime plain around the latter half of the 10th century (Thoen and Soens 2008, Figure 2). Concurrently, efforts to reclaim the coastal plain began, transforming common wasteland utilised for grazing into embanked landscapes under comital control, earmarked for arable farming (Soens, Tys, and Thoen 2014, 139). Wool produced in the coastal area during this period ceased to be processed and traded locally, increasingly finding its way to the burgeoning urban centers of Bruges and Ghent, thus evolving into a fully commercialised product by 1000 AD (Verhulst 1998, 34–39).

The insatiable demand for land by central authorities, booming cities and the abbeys propelled the embankment process and transformation of tidal marshlands into landlocked polders during the eleventh and twelfth century. The decline of salt meadows led to reduced sheep-herding opportunities and subsequently diminished wool production (Thoen and Soens 2008, 79). The flourishing cities, reliant on the cloth industry, mitigated this local shortfall by importing English wool from the early twelfth century onwards (Verhulst 1998, 38).

In the late medieval period, the expansion of commercial agriculture favoured large-scale arable farming (Thoen 2004; Thoen and Soens 2008). North of Bruges, these large farms often did not hold any sheep in their stock, while the remaining small peasants maintained modest flocks of 10–20 sheep (Verhulst 1970, 12). Despite the marginalisation of both the number and location of sheep herding sites in the coastal plain, small scale sheep production likely persisted throughout the medieval period, especially on the remaining common wastelands at the coast as well as inland (Verhulst 1970; De Keyzer 2016). Unfortunately, their economic disadvantage rendered them increasingly obscure in historical sources and consequently overlooked in academic research.

Sites with Sheep – The Archaeological Contribution

From an archaeological perspective, our understanding of sheep-breeding in the coastal plain remains scant. Even during the early medieval zenith, when it is speculated that 'several hundred sheep farms must have been scattered around in the large tidal landscape of Flanders and Zeeland' (Tys 2020, 777), the number of archaeologically attested sites in Flanders showcasing compelling archaeological evidence for sheep-breeding and/or wool production is minimal. Among these sites, three are situated on human-made dwelling mounds. Notably, the Roman sites of Stene and Ramskapelle featured raised platforms dominated by sheep bone in their zooarchaeological collections (Demey et al. 2013; Verwerft et al. 2023). Similarly, the medieval site of Leffinge-Oude Werf exhibited a high percentage (74%) of sheep bone on a slightly elevated platform, dating from the late 7th to the eleventh century (Ervynck et al. 2012). Four other sites are situated atop or at the edge of silted ridges. At Uitkerke-Lissewegestraat (Van Remoorter, Sadones, and Vanoverbeke 2016) and Uitkerke-Schaapstraat (Müldner, Britton, and Ervynck 2014), a combination of a high percentage of sheep bone, skeletal fragments of (sheep?) dogs, and artifacts like wool combs, tridents, needles, and weaving disks suggests the presence of wool production units dating from the 6th to the first half of the 10th century. At Dudzele-Zeelaan (In 't Ven et al. 2005) and Bredene-Ebbestraat (Deconynck et al. 2016) particularly the relatively high rates of sheep bones suggest the possible continuation of local wool production throughout the High Middle Ages.

The limited archaeological visibility of these sites can be attributed to the dynamic landscape conditions in which they operated, as well as to inadequate survey techniques. Particularly, the potential re-use and multifunctionality of wetland mounds once enclosed within embankments have stalled landscape-archaeological interpretations on this matter (Tys 2004, 258). After uncovering misinterpretations regarding presumed sheep mound sites (Verhaeghe 1980) and disproving the geological paradigm for the development of the coastal plain (e.g. Ervynck et al. 1999), most researchers have become rightfully cautious about far-reaching interpretations without excavation data (Zwaenepoel and Vandamme 2016, 20–23). The lack of case studies from the coastal areas of Flanders, and by extension, the entire North Sea coastal zone between France and Denmark, in a recent overview of historical archaeologies of transhumance across Europe (Costello and Svensson 2018) suggests that landscape-archaeological research of such phenomena in these historical coastal wetlands is falling behind international trends.

While excavation remains superior for attributing chronology and functionality to these complex sites (van der Heide 1957, 163–164), this paper argues that integrated use of archaeological survey methods can offer fresh insights into how sheep-herding was practiced in and influenced the medieval coastal plain. Drawing upon a broad landscape-archaeological assessment of a sixteenth-century painted map by Pieter Pourbus portraying the coastal plain north of Bruges (Trachet 2021, Figure 2), this study endeavours to (1) archaeologically characterise the depiction an unknown mounded sheep farm and (2)

Figure 2. Pieter Pourbus' painted map of the Liberty of Bruges (1571) (above) with a detail of the area of the *Scaperie*-sites near Knokke-Heist (below). (© Musea Brugge, 0000.GRO0220.I, www.artinflanders.be, photo: Dominique Provost).

historically contextualise sheep-farming strategies in the evolving maritime cultural landscape of the eastern corner of the Belgian coastal plain through comparative geophysical, surface artefact and coring surveys.

Materials and Methods

The painted map in question was commissioned by the Liberty of Bruges in 1561 with the objective of detailing its entire territory. After a decade, in 1571, the map measuring 620 cm x 335 cm was completed on canvas using oil paint (De Smet 1947, 34–35). Recent research has revealed that Pourbus personally executed his cartographic work, drawing upon Gemma Frisius' treatise on applied trigonometry (1533) for his mapping methodology (Trachet 2024). The present case-study on the two *Scaperieën* (sheepfolds/sheep-pens) depicted on the left bank of the Zwin tidal inlet (Figure 2), originates from the assessment of the map's topographic accuracy. Both locations are positioned in an unembanked area, situated between the dunes to the northwest and the mudflats and salt marshes to the southeast. South of the mounds, the late-thirteenth-century Graaf Jansdijk marks the end of the high medieval embankment process, leaving the mounds and its surrounding environment unembanked for over 400 years, until the Oude Hazegraspolder eventually enclosed it in 1627 (Verhulst 1995, 60–62). The northernmost *Scaperie* is closer to the dunes and comprises a mound upon which three houses are constructed. In contrast, the southernmost *Scaperie* is positioned on the edge of the mudflats and consists of a bare mound connected to the nearby dike with a pathway. Due to disparities in available sources, only the latter mound will be further analyzed in the subsequent discussion.

To validate the presence and nature of the archaeological remains of this southernmost *Scaperie*, a landscape-archaeological approach, previously employed in the investigation of nearby contemporary harbour towns (Trachet et al. 2017; De Clercq, Trachet, and De Reu 2019), is applied. Initially, a desktop study gathered and analyzed available remote sensing data within a GIS environment. First, aerial photographs – both recent and historical – were scrutinised, using the online services of Geopunt, NGI-Cartesius, ESRI WAYBACK, and the catalogue of World War I and II imagery from the Centre of Historical & Archaeological Aerial Photography (CHAL), based at Ghent University. The second remotely sensed data source is the Digital Elevation Model of Flanders (DHMV II), derived from LiDAR-technology. This second generation DEM features an average resolution of 16 laser measurements per square meter, enabling detailed analysis (Meylemans and Petermans 2017). For this research, the filtered laser data was resampled using Nearest Neighbour interpolation, resulting in a 1 m x 1 m grid DTM. Utilising these legacy data, a zone of 3.5 ha was delineated, within which new detailed field data was collected via geophysical, fieldwalking and coring surveys.

The initial phase of fieldwork involved geophysical investigation using Electromagnetic Induction (EMI) surveys with a DUALEM 421S sensor. This method allows for the simultaneous estimation of the electrical conductivity (EC) and magnetic susceptibility (MS) of a defined soil volume (Saey et al. 2016). Soil EC is mainly influenced by various physical soil parameters such as clay content, moisture content, organic matter and soil density. Any subsurface trace or structure deviating from these parameters can result in a locally elevated or reduced EC. Magnetic susceptibility (MS) indicates the magnetisability of the (soil) material under investigation. As the top layer of soil is rich in organic matter, it exhibits higher magnetic susceptibility. Consequently, soil MS measurements primarily detect soil disturbances resulting from interventions in this surface layer or from disturbances in slightly deeper layers followed by backfilling with organic-rich soil material. Moreover, heated or burnt soil material, such as ovens, brick structures, or other ceramic material generates a pronounced increase in the MSs. The EMI instrument used to scan the study area consists of one transmitter coil and six receiver coils at different distances and with different orientations compared to the transmitter coil. Simply put, information is thus obtained from both surface and deeper electrical and magnetic phenomena down to a depth of about 3–6 m below the instrument. The survey was conducted at the end of March on a relatively flat, weed-covered field that had been ploughed five months earlier. The raw EMI data were georeferenced by linear interpolation of the RTK-GPS data and corrected for the distance between the GPS antenna and the center point between transmitter and receiver coils of the sensor. The data were then corrected for instrument drift, i.e. for changes in the measurements due to external influences (such as temperature changes during a day).

That same area was subsequently surveyed for ploughed out artefacts. However, because the artefact distribution was abruptly cut off at its southern border, the survey area was expanded by an additional 1.5 ha on the adjacent field separated by a dirt track. Surveyors conducted line-walking with an inter-distance of 1.5 m, ensuring full visual coverage of the surface. The survey was conducted by four experienced surveyors under semi-overcast conditions in a cornfield with plants approximately 25 cm high. These circumstances provided good conditions for fieldwalking, as the artefacts had been exposed to rain for weeks after sowing, and the rows of seedlings formed convenient east–west oriented survey lines. Applying an artefact-accurate survey strategy (De Clercq, Trachet, and De Reu 2019), all relevant artefacts were bagged and registered using a Trimble R10 GNSS with RTK correction. Identification of the category, form, date and provenance of the finds allowed quantitative, spatial and functional analyses. Additionally, a metaldetecting survey aimed to locate metal finds in the ploughsoil. This survey was conducted by two licensed specialists when the field was void of crops and without a predefined survey pattern. The finds were likewise labelled and registered with the differential GPS and studied by find specialists.

The third survey method involved augering and was aimed at (1) identifying and verifying the subsoil anomalies detected in the EMI survey, and (2) gaining insights into the local soil stratigraphy and characteristics. All cores were obtained with a combination of gouge and Edelman augers. The top 100 cm of sediments were cored with a 5 cm diameter Edelman auger, the underlying sediments were surfaced with a 2.5 cm diameter semi-cylindrical gouge. Eleven cores were plotted on two perpendicular intersecting transects centered on the top of the raised mound.

Results

Remote Sensing

Despite the extensive collection of aerial photographs, only three images exhibited apparent indications of archaeological features through soil – and cropmarks. Photographs captured in the winters of 2000–2003 and 2014 (Figure 3a and b) depicted light-coloured circular soil marks approximately 35 m in diameter within the ploughed soil, potentially

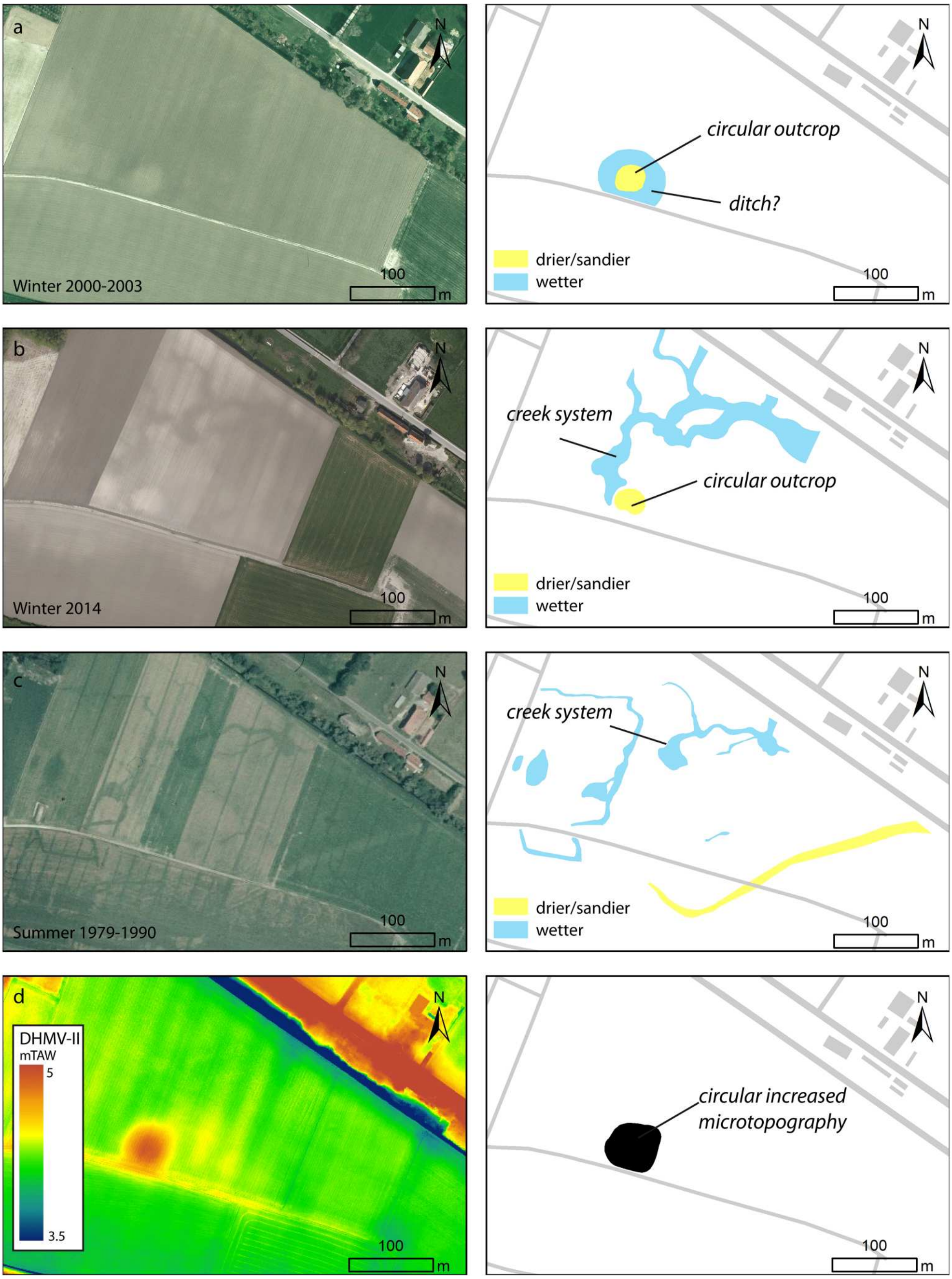

Figure 3. Remote sensing imagery of the *Scaperie*-site (left) with interpretation of the soil – and crop-marks of the aerial photographs (a-b-c, right) and LiDAR-data (d) (© Agentschap Digitaal Vlaanderen).

indicating a sandy outcrop within the clay-covered polders. Conversely, summer photographs taken somewhere between 1979 and 1990 (Figure 3c) revealed a jagged network of dark-coloured lines. These 'positive' summer crop marks suggest a local increase in soil moisture and likely represent remnants of the former tidal creek system.

Additionally, the DTM (DHMV-II) revealed a further positive feature for the southernmost *Scaperie*. The aforementioned soil manifestations captured in the aerial photography are further supported by a local circular increase in microtopography at the exact same location (Figure 3d). Within a diameter of approximately 50 m, the local elevation rises from around 4.2 m TAW (Belgian Ordnance Datum/horizontal reference level) on the edges, to 5.2 m TAW on top of the mound.

Geophysical Survey

The initial fieldwork comprised the above-described EMI-survey, with only the most pertinent layers (i.e. the apparent EC measured with coil configurations) being presented here. The deepest slice (ca. 0 to −6 m) of the ECa signal reveals several anomalies with elevated ECa in and around the subsoil of the mound (Figure 4a). A circular element,

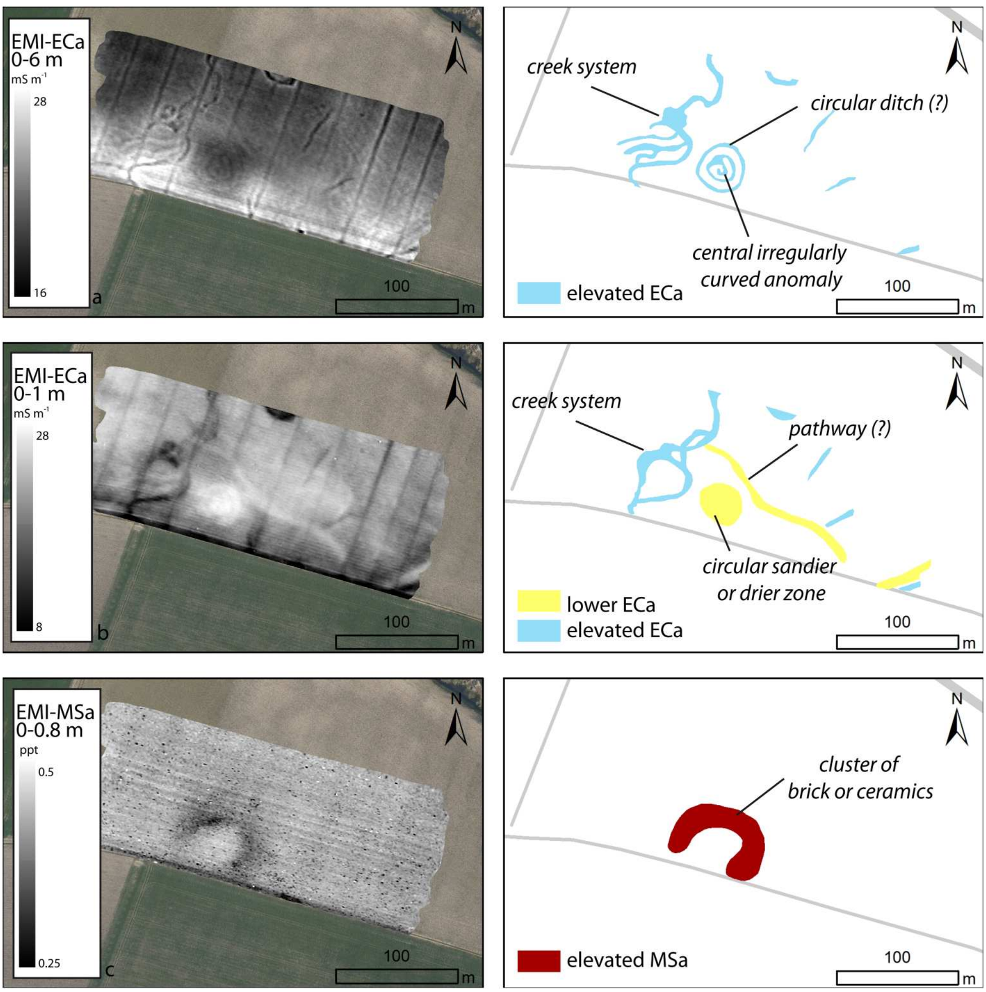

Figure 4. EMI-survey of the *Scaperie*-site. The most relevant data from the individual coil pairs showing apparent electrical conductivity (a and b) and apparent magnetic susceptibility (c) are depicted on the left, interpretation of the subsoils anomalies are depicted on the right.

with a diameter of around 35 m, outlines the mound, with an irregularly curved anomaly discernable inside this circle. Considering the depth of these signals, they likely reflect the basis or internal structure of the mound. Surrounding the mound, a jagged pattern of increased ECa lines is interpreted as a network of tidal creeks based on its morphology along the entire sequence of ECa layers. However, the mound itself appears as a circular zone with low ECa in the upper layers, indicating a sandy or drier soil (Figure 4b). In these top layers, the mound is flanked on its east side by a low-ECa curved linear feature, possibly corresponding to the pathway depicted by Pourbus. Unlike the ECa-response, which features relevant anomalies throughout all depth coil pairs the MSa response only presents relevant features in the topsoil (0 to −0.8 m) (Figure 4c). This soil volume largely corresponds to the ploughsoil layer and is irregularly scattered with point-like elevated apparent magnetic susceptibility anomalies. Since the anomalies were not detected in the ECa data, they likely correspond to brick or ceramics, ruling out metal. However, the only area deviating from this pattern is the mound and its immediate surroundings. While the top of the mound features fewer anomalies, its base is accentuated with a higher concentration of anomalies. Taking into account the decades-long ploughing activities of mechanised agriculture and the impact it has on mounded features in Flanders (Louwagie, Noens, and Devos 2005, 94–96), the features constituting the MSa anomalies are possibly displaced from the top of the mound towards its base.

Fieldwalking Survey

In total, 952 finds were recorded and collected for further analysis. The majority of finds consisted of ceramics (n = 921), supplemented by a limited number of metal (n = 31). Brick and natural stone were neither collected nor systematically measured.

The spatial distribution of the finds reveals a strong pattern similarity with both the elevated mound (Figure 5) and the topsoil MS anomalies observed in the EMI survey. Consequently, these anomalies are represented by mobile ploughsoil artefacts linked to the mound. Interestingly, away from the mound, the field yielded no significant archaeological material. Thus, while ploughsoil and surface material are clearly locally reworked by ploughing, the spatial redistribution within the entire field seems to be fairly limited.

The pottery, in particular, provide insight into the material culture at the site. Ceramics were quantified by sherd count and a rim-based minimum number of vessels (MNV) (Table 1). The vast majority of local redware, along with a small portion of local greyware and imported German stoneware and Meuse whiteware, allows for a tentative dating of the assemblage between the thirteenth and seventeenth century, with the majority dating from the fourteenth to sixteenth century. Functional analysis of the assemblage (Table 2) reveals a substantial presence of large bowls (63%). These vessels are typically interpreted as containers used for skimming milk, and hence equipped with a pouring lip (Tieghem and Cartier 1976, 113) (Figure 6). The accompanying metal detecting survey yielded little relevant evidence. Of the 25 collected artifacts, one could be identified as a brass ‘korte’ coin of Charles V, dating around 1550.

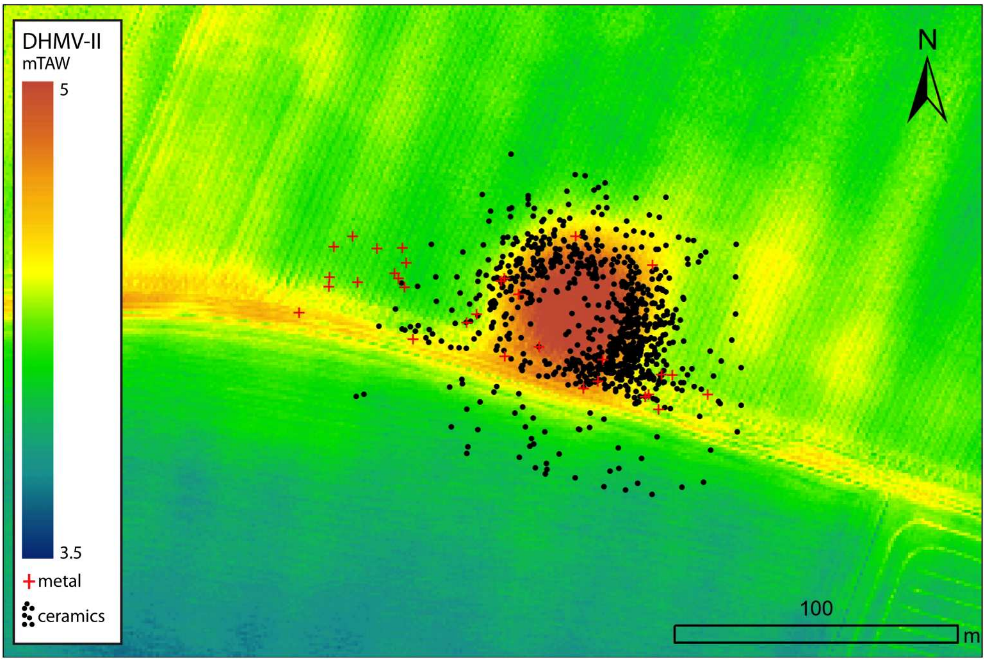

Figure 5. Spatial distribution of surface artefacts measured in a fieldwalking survey of the *Scaperie*-site, projected on the LiDAR-data.

Table 1. Quantification of surveyed ceramics.

		Sherd count		Number of vessels	
		n	%	MNV	%
Local	Greyware	35	4	3	1
	Redware	820	89	265	96
Import	Stoneware	60	7	7	3
	Whiteware	6	1	1	<1
Total		921		276	

Table 2. Quantification of pottery forms (MNV).

	Greyware	Redware	Stoneware	Whiteware	Total	%
Cooking pot		29			29	11
Drinking bowl			1		1	<1
Frying pan		12			12	4
Globular pot	1				1	<1
Jug	2	2	5		9	3
Large bowl		173			173	63
Plate		14			14	5
Porringer		1			1	<1
Spindle whorl			1		1	<1
Storage jar		1			1	<1
Unknown		33		1	34	12
Total	3	265	7	1	276	

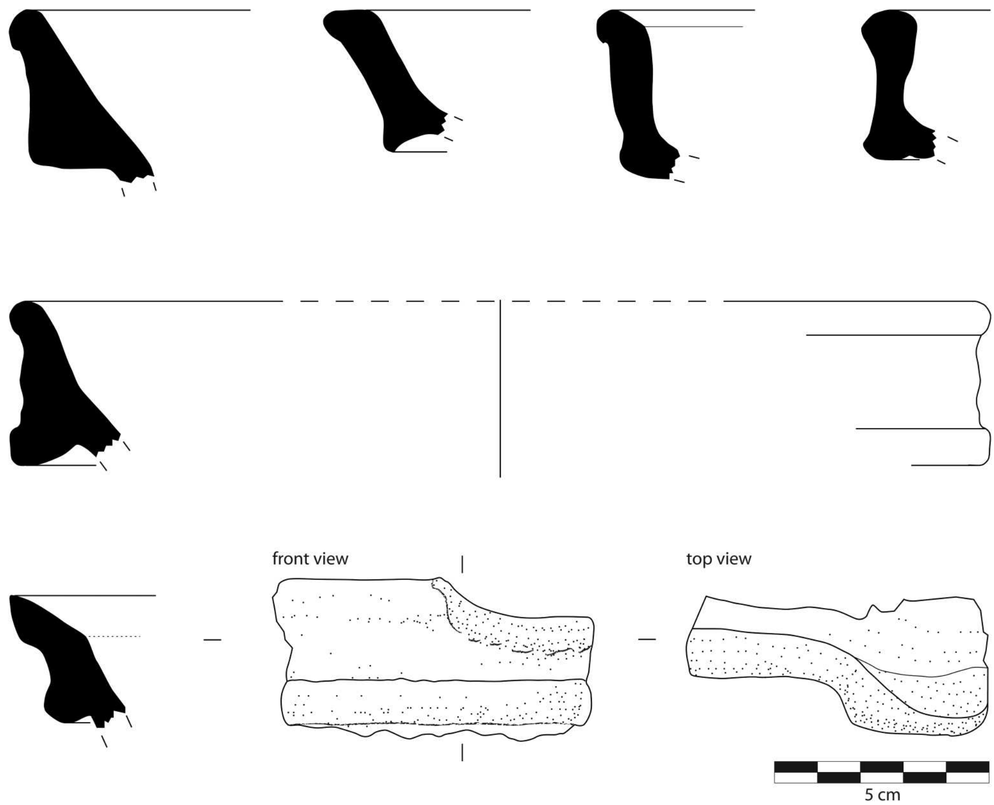

Figure 6. Drawings of some of the rim fragments of milk bowls.

Coring Survey

The cores reached depths between 110 and 150 cm below surface, which equals elevations between 3.50 and 3.80 m TAW (Figure 7). Based on the lithology; the 11 cores can be roughly divided into two groups. The first group (S1, S6, S7 and S11) more or less represents the 'natural' stratigraphic sequence. Beneath the 40 cm thick brown topsoil of clayish sand, S6, S7 and S11 feature a 25–30 cm thick layer of grey-brown clay with a slight increase in the sand fraction. Although such clay soils can be expected under the ploughsoil in embanked areas, they could also be part of the manually raised soil of the mound. S1 did not exhibit this intermediate layer but transitioned into a 50 cm thick layer of grey-yellow to yellow sand at 4.50 m TAW. The second group of cores (S2, S3, S4, S5, S8, S9 and S10) is located centrally in the transects and can be more reliably associated with the mound. Underneath the relatively constant 40 cm thick plough soil, a layer of coarse raised yellow sand serves as the first clear marker of the mound feature. On the top of the mound (S4) and its eastern flank, this layer is 15 cm thick, whereas it thickens into 20 cm (S5), and 30–35 cm (S8 and S10) on the other sides. Beneath this sandy layer, some of the central mound-related cores again feature a layer of yellow to grey-brown clay speckled with charcoal (S2, S3, S8, S10) or ceramics (S5). Remarkably, central cores S4 and S9 do not feature this clay-layer, which could mean it was locally levelled or eroded. Below this layer, all cores

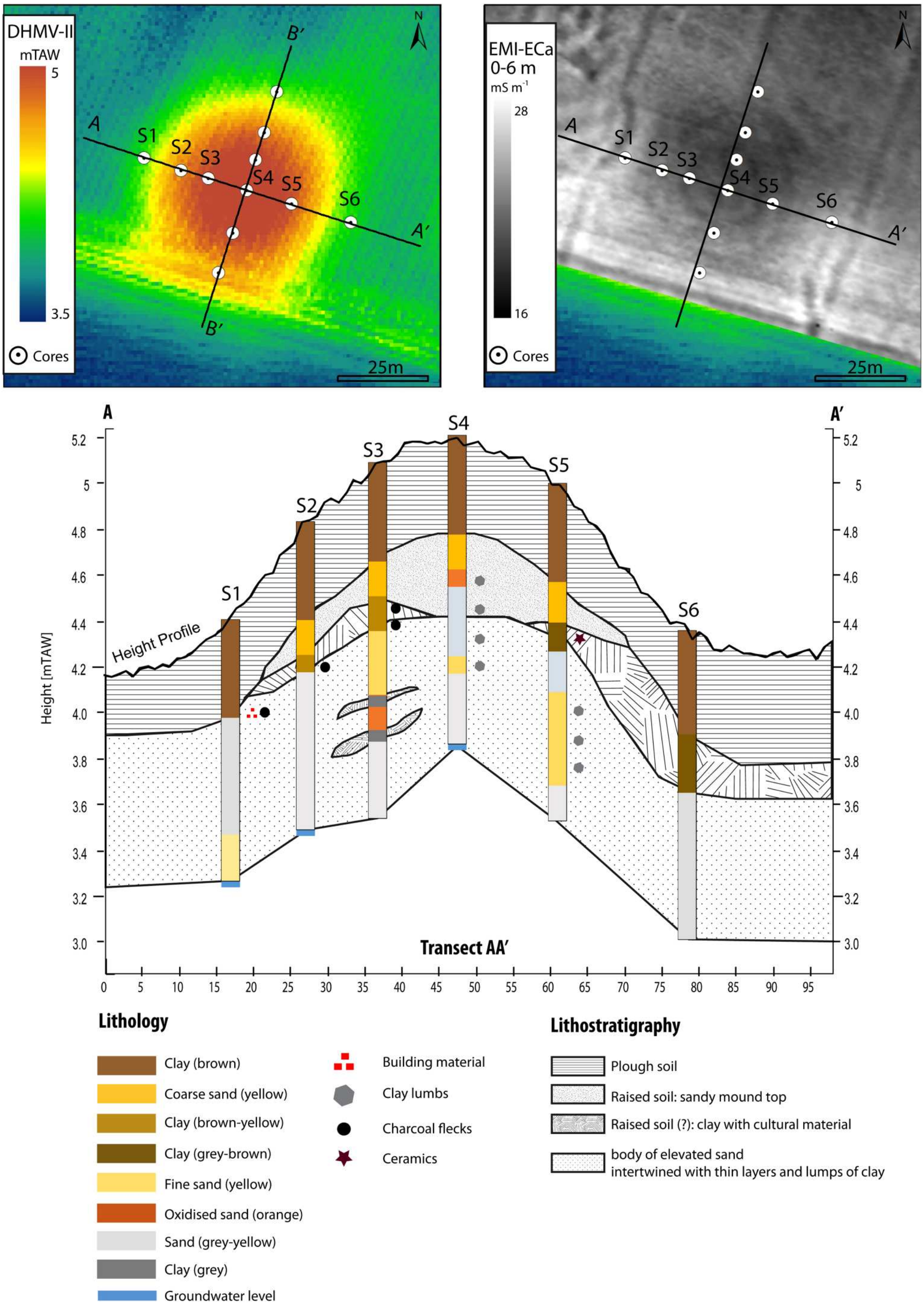

Figure 7. (a) Coring transect AA′ projected on the LiDAR-data (above left) and ECa data (right), with the corresponding lithologic descriptions and lithostratigraphic interpretations descriptions (below). (b) Coring transect BB′ projected on the LiDAR-data (above left) and ECa data (right), with the corresponding lithologic descriptions and lithostratigraphic interpretations descriptions (below).

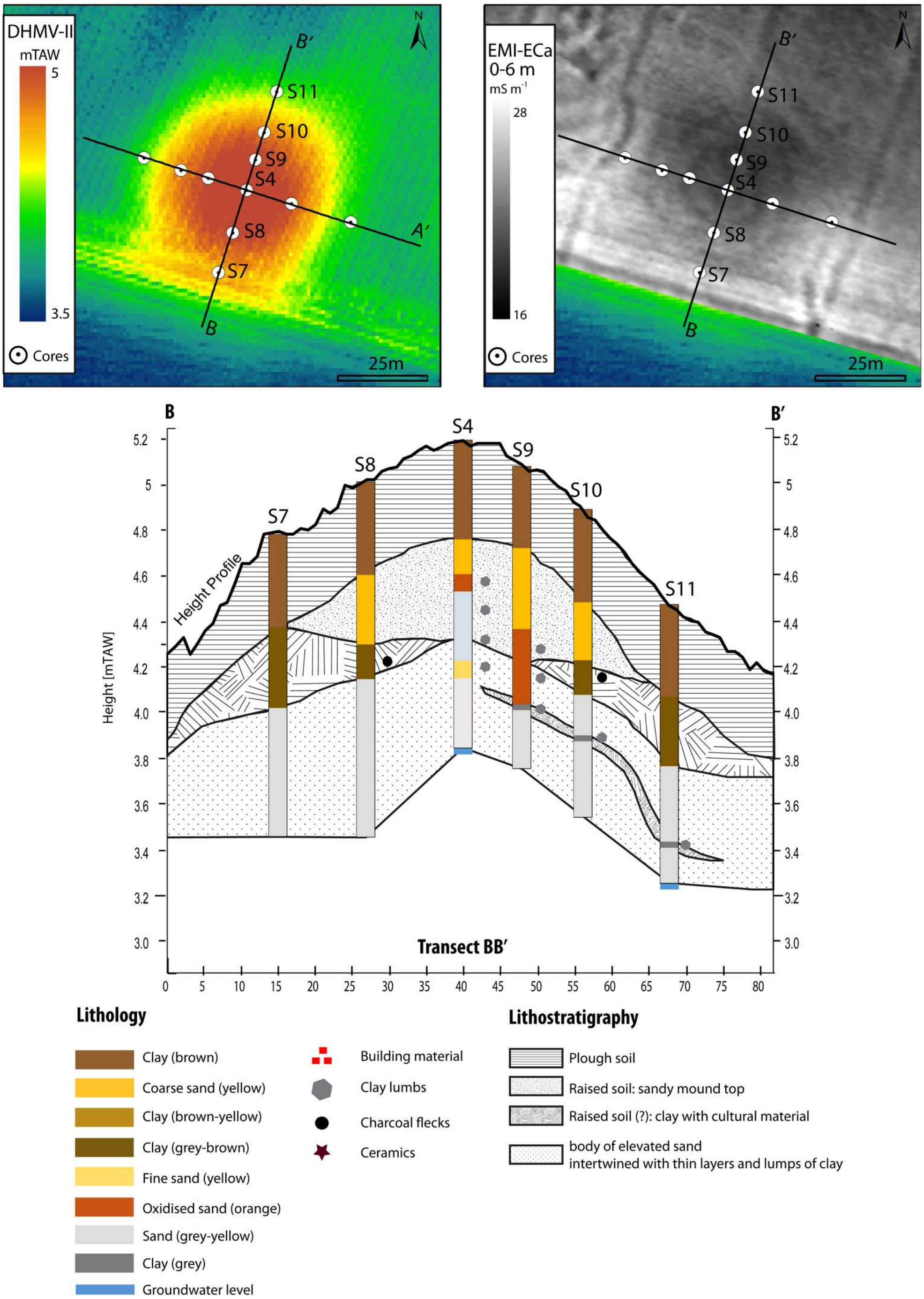

Figure 7. Continued.

consist of large body of (finer) sand, which is at some locations (S3, S10 and S11) laminated with intermediate fine gray layers of clay lumps at various depths between 4.15 and 3.80 m TAW. The natural sequencing of sand and clay in intertidal areas combined with the likelihood that the mound was constructed using local intertidal sediments, complicates the interpretation of the depositional nature of both these finer clays and clay lumps at the base, as well as the clay sediments containing cultural materials on top. These could be either naturally deposited or manually raised. The cores also elucidate why a higher density of surface finds was discovered on the eastern flank of the mound. As the local elevation between S6 and S5 steeply rises by 50 cm, the ceramic-speckled layers of S5, with their lower limits at 4.35 m TAW, are more strongly affected by ploughing, which indeed reaches a level of 4.35 m TAW at S6. The slightly thicker (5 cm) plough layer at S6 confirms the local accumulation of topsoil (45 cm) in this core.

Discussion: Integrated Field Data Interpretation

The conducted desktop analysis and landscape-archaeological field surveys unequivocally confirmed the presence of a sheep mound at the location depicted by Pourbus. What remains is characterised as a local elevation of maximally 100 cm above surface level in the agricultural land. The mound itself primarily consists of a body of sand, occasionally interrupted by layers of clay, which are the locally available sediments provided by the salt marshes and mudflats of the intertidal area. Although it can be assumed that a local natural elevation in the salt marshes forms the basis of this mound, human intervention in the subsequent raising of the mound is suspected in the presence of an irregularly curved anomaly of elevated Eca in the center of the mound, in layers of manually displaced clay lumps attested in the cores and above all, as a cluster of ploughed-out artifacts at its surface. This ceramic assemblage first of all allowed the structure to be dated to the fourtheenth to sixteenth century, aligning with the period when this specific location was situated closest to the embanked land, just outside the dikes in the intertidal area, suggesting that occupation of the mound commenced after the embankment of the adjacent Vagevierspolders (end of the thirteenth century) and ceased with the embankment of the Oude Hazegraspolder (1627) (Verhulst 1995, 60–62). Moreover, the functional analysis of the ceramics also revealed a notable presence of milk bowls, indicating a high likelihood that the mound served as a location for holding and milking sheep, consistent with Pourbus' designation of the site. In the subsequent paragraphs, these different components – the mound, the material culture, and landscape setting – will be discussed and contextualised within their local, regional and international contexts.

The Mound

As mentioned in the introduction, the potential multiple use and reuse of artificial dwelling mounds in the coastal plain, along with the limited archaeological research on those features, has brought research in Flanders to a standstill. However, across the borders in the coastal regions of the Dutch province of Zeeland and the coastal area of French Flanders, more comparable sites are available. Although similar debates on the multifunctionality of such mounds have complicated the research in these areas as well (van Heeringen et al. 2007, 9; de Klerk, van der Meulen, and Vervloet 1969), several archaeological excavations provide a more solid comparative framework to contextualize our dataset (see Figure 1).

Excavated mounds in Abbekinderen, Buttinge and Hoogelande (The Netherlands) for example, offer comparable morphogenetic features (Halbertsma 1952; Trimpe Burger 1958). All mounds were constructed within intertidal environments and had a basic diameter of 25–40 m. In Abbekinderen and Buttinge, a circular levee was erected from local sediments during the initial construction phase (Figure 8). Such an incipient wall may correspond to the irregular anomaly with increased Eca detected in the deepest subsoil anomalies of the EMI-survey in Knokke (see Figure 4a). Furthermore, the sandy infill and clay-lump layers characteristic of the Abbekinderen mound are also recognised in the augered lithostratigraphy at Knokke. Trimpe Burger (1958) compares the initial phase of Abbekinderen to a *hollestelle*: an artificial dwelling mound in the intertidal area with a freshwater reservoir (*vate*) at its center. Similar names for such freshwater-mounds are *dobbe* (Dutch) or *abreuvoir* and *mare* (French). The central anomaly in the deepest layers of the EMI-survey or a different interpretation of the attested clay lumps could also be indicators of such a central freshwater pool in Knokke.

Recent archaeological research in Craywick (France) also revealed dozens of such *mares* (Deschodt et al. 2021). Initially recognised as large circular cropmarks and anomalies in both aerial photographs and geophysical survey, excavation and coring of two features revealed the presence of large human-made circular freshwater pools. Also here, the levees of the mound were constructed from local tidal sediments and were filled in with layers of clay and sand. The walls of the pond were lined with deliberately placed sods of clay to make them waterproof. Rather than a mounded feature, the central zone of the *mares* was excavated into the mudflat. Their geophysical fingerprint differed from the Knokke mound, characterised by high-conductive (clay) zones in a low-conductive (sandy) environment. This may be linked the specific abandonment of the mares in Craywick, with tidal sediments constituting the final infill of these reservoirs.

Another argument in favour of interpreting the Knokke mound as a *hollestelle* is the discovery of a possible nearby successor. Three mid-eighteenth-century maps depict a circular blue feature in the intertidal area, approximately 200 m north of the dike that embanked the Oude Hazegraspolder in 1627 (Figure 9 depicts one of them). Labeled

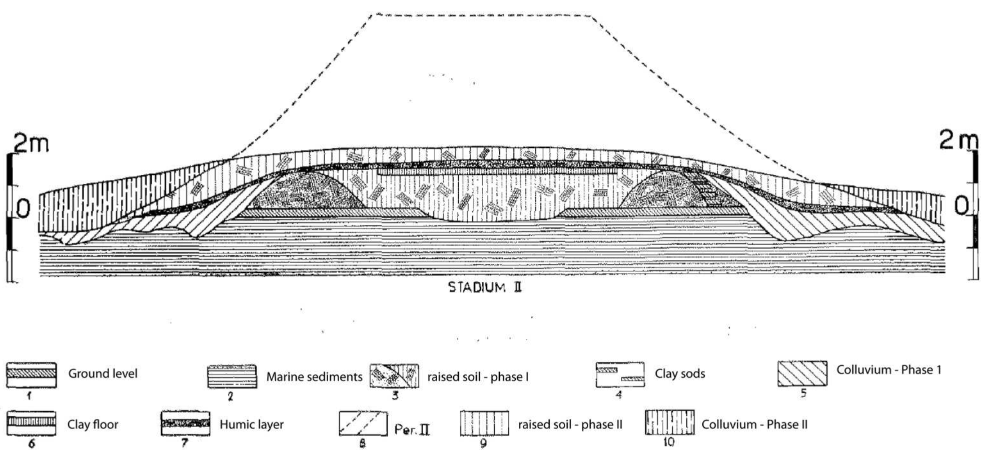

Figure 8. Profile drawing of the excavated mound of Abbekinderen (Trimpe Burger 1958, 127, Figure 12).

Figure 9. Detail of one the maps of the Hazegras salt marshes, before the embankment of the Nieuwe Hazegraspolder (1755–1784), showing the freshwater pond (blue), with indication of the disappeared Scaperie (red cross) (© General State Archive, Collection of Maps & Plans in manuscripts, series I, n° 2624).

as a *puit d'eau douche* [freshwater pond] and *abreuvoir du dit schorre* [water trough of the aforementioned salt marsh], these maps suggest a topographic inclination through shading.

Additionally, alongside the material evidence, also the idealised depiction of a *schaepenwerf* in Andries Vierlingh's sixteenth-century theoretical treatise on dike building and water management, 'Tractaet van dyckagie', bears similarities to the survey data of Knokke (de Hullu and Verhoeven 1920) (Figure 10). Vierlingh's textbook mound, enclosed with a ditch, has a diameter of approximately 23 m and a height of about 2 m. Also the surrounding landscape depicted in the treatise strongly resembles the tidal creek system depicted by Pourbus, and observed in the aerial photography and geophysics.

Sheep, Shepherds, Sheds and Sherds

Now that the mound at the site is understood as a topographic wetland feature, attention turns to the human activities that took place there. The significant presence of ceramic milk bowls suggests the local processing of sheep milk, consistent with the name of the mound. This inference aligns with findings at the mounds of Buttinge and Hoogelande, where sheep farming is suggested based on the excavation of numerous sheep bones (Trimpe Burger 1958, 142; 149).

The specific ceramics found in Knokke are illustrated on a miniature from around 1500 (Figure 11). The miniature depicts a shepherd leading a flock to the fields while a women is churning butter inside the house. Four milk bowls are showcased on a table between both scenes, illustrating their use in cream skimming. This cream could then be used to produce butter or milk (Tieghem and Cartier 1976, 113). In a culinary digression from his technical treatise on dike building, Vierlingh mentions the production of *grote groene schaepenstellencasen* [large green sheep mound cheeses] on the aforementioned

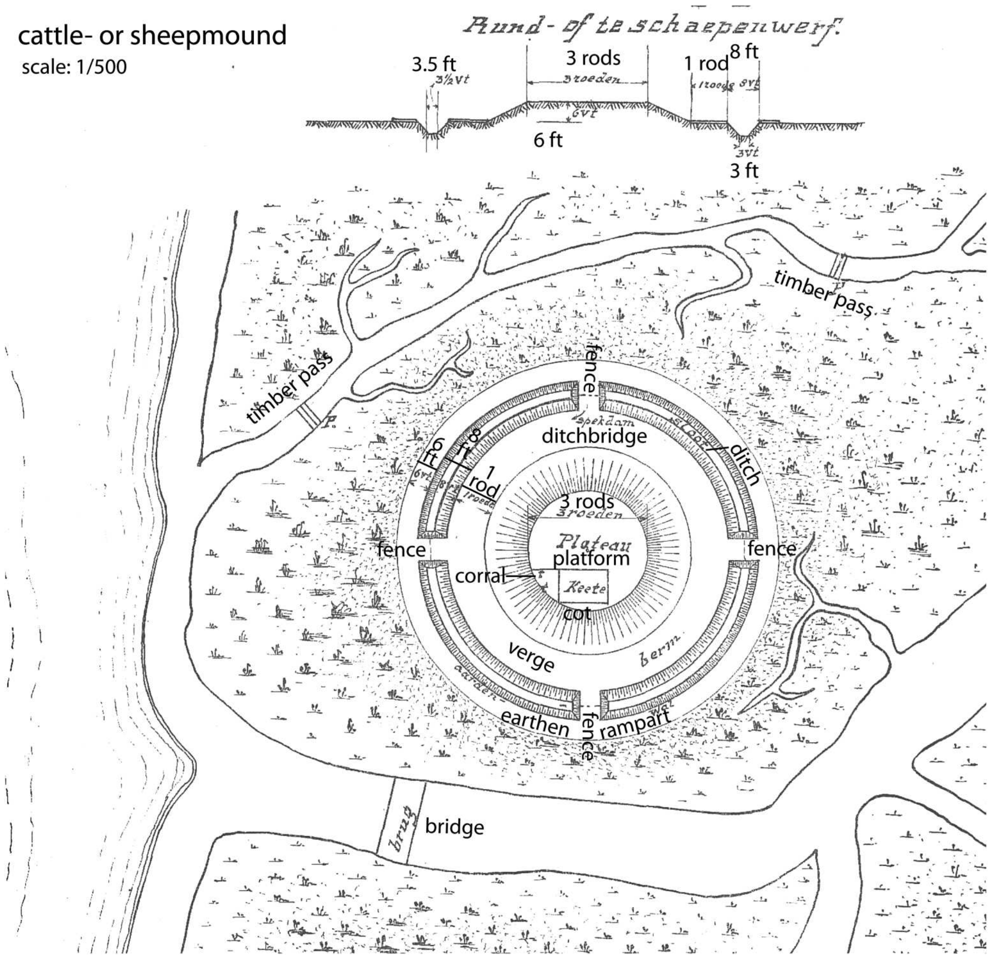

Figure 10. Orthogonal plan and transect of the ideal sheep or cattle mound, as described by Andries Vierlingh (1578) (Tractaet van dyckagie, Figure 4).

schaepenwerf he drafted (de Hullu and Verhoeven 1920, 29). However, if the milk and cheese processing did indeed occur on the Knokke mound, one would expect some kind of shelter or construction to facilitate these activities.

Vierlingh indeed foresees a small shed or cot (*keet*) on top of the mound for the shepherd to shelter, along with a fenced corral (*bocht van thuijnen*) in which sheep could be herded for milking, shearing or grooming. Such small buildings have been archaeologically attested on the mounds of Abbekinderen, Buttinge and Hoogelande, and also elsewhere they are typically associated with animal husbandry in marshland pasture (e.g. James 2015, 80) or woodland (e.g. Margetts 2021, 344–346). De Bruin (1952) describes a wide variety in the use and organisation of such inhabited mounds in Zeeland, ranging from permanently inhabited with brick houses and thatched roofs, to occasionally occupied with shabby shacks. The former seems to be depicted on Pourbus' painted map at the northernmost *Scaperie*, as it is built-on with three half-timbered houses. A *stelle* on the Scheldt Map near Biervliet, is then again depicted with an open pole barn atop

Figure 11. Miniature depicting milk bowls on a table (ca. 1500) (Brevarium Mayer van den Bergh, Meester van Jacobus IV van Schotland, Antwerpen, © Museum Mayer van den Bergh, MMB.0618, folio 3).

Figure 12. An open-pole barn depicted on a *stelle* on the Scheldt Map (1504) (© Felixarchief Antwerp, n° 12#2475).

(Figure 12). Several fifteenth-century manuscripts also depict flocks of sheep and fenced constructions in combination with mobile shelters (Figure 13). Twentieth-century examples of shepherd sheds (*kavanes*) in both France and Flanders suggest that these constructions remained largely unchanged for centuries (Figure 14) (Devliegher 1998;

Figure 13. Miniature from a late medieval *kavane* and adjoining fenced area (ca. 1400) (© Royal Library Brussels, Manuscript 11060, Livre d'Heures de Jean de Berry, folio 82).

Demasure 2020). Seasonally or occasionally inhabited mounds, featuring such small sheds or lightweight shelters, may have left little archaeological trace detectable with the applied survey methods.

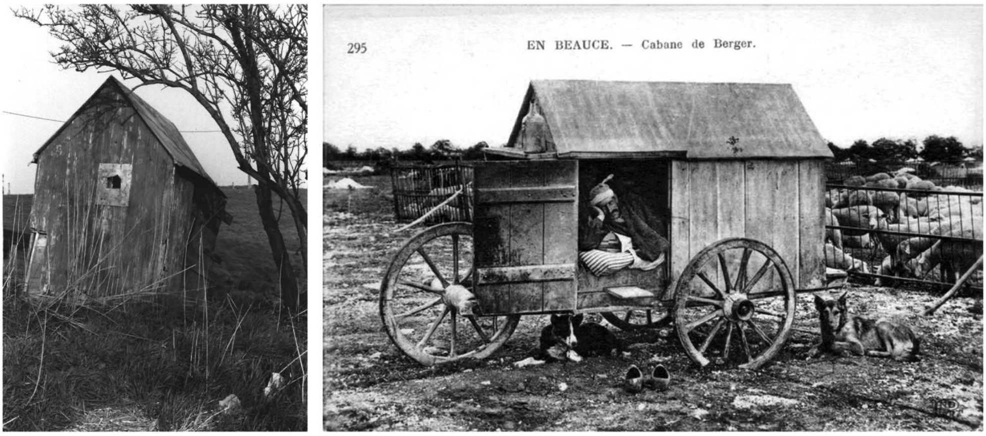

Figure 14. Photographs from twentieth-century *kavanes* near Knokke-Heist (Belgium) (left, © Collection Centre for Agrarian History) and Beauce (France)(right, © Wikimedia Commons).

The attribution of sheep- or dairy-related activities through the presence of specific material culture can also be validated by similar finds elsewhere in the Low Countries. For example, at the 40th Stelle of Westermeer in Joure (The Netherlands) both the name (*stelle*) and historical data identified this multi-period farm as a place where milk production played an important role. This milk-focused management was confirmed through both the excavated material culture (e.g. milk bowls) and structures (e.g. milking house and churning corner), dating from the late medieval period onwards (van Dijk 2018).

In cases where site-based written or cartographic evidence is absent, archaeological excavations rely solely on the material remains and their landscape context for their interpretations. For instance, at the site of Aalter-Woestijne (Belgium), a large amount (up to 42% of all ceramic vessels) of twelfth- and thirteenth-century milk bowls were interpreted as clear markers for the local herding of dairy cattle and the production of butter (De Groote and Van De Vijver 2019, 261). The placename *Woestijne* refers to the medieval word *wastina*, which is a type of semi-open landscape on a poor sandy soil resulting from overgrazing (Verhulst 1995, 115), indicating the site's historical use for animal husbandry (De Groote and Van De Vijver 2019, 393).

Also other inland Flemish sites dating between the 14th and sixteenth century, such as Ronse-Pont-West (De Graeve 2018, 631; 672–674; 681–682), Deinze-Karreweg (De Mulder and Vanholme 2019, 42; 55) and Retie-Meierend (Jennes and Weekers-Hendrikx 2020, 88–90) witness particularly high percentages of milk bowls and storage jars, and are therefore related to cheese production or other dairy-related activities. The fourteenth-century site of Puurs-Pullaar however provides a cautionary tale against the all too straightforward connection between milk bowls and dairy processing. The soot traces observed on many vessels, lead the archaeologists on the path of craft-related activities (De Groote and Van De Vijver 2019, 108–115). Residue analysis of a 'milk bowl' at the site of Middelburg-in-Flanders has moreover shown that also other foodstuffs can be prepared in these vessels (Poulain et al. 2016, 41).

While more residue analysis may be needed to provide specific functions for certain forms (Oudemans and Kuiper 2022, 129), the dominance of milk bowls, especially when combined with associated ceramics and the landscape-historical context, can provide compelling evidence to ascribe dairy processing to an archaeological site. The exact workings of local dairy processing at the mound in Knokke-Heist remain however unclear. On the one hand, we might expect to find infrastructure to control the milking process and at least temporarily store the milk, but none was discovered. This could reflect the limitations of our survey methods in detecting potentially temporary or ephemeral constructions. Additionally, the eroded top of the mound and the generally attested low archaeological visibility of late-medieval farms in Northern Flanders (De Clercq, Trachet, and De Reu 2019, 48; 62) should be taken into account. As a consequence, the absence of evidence does not necessarily imply their non-existence. On the other hand, it is difficult to envision a spatial organization atop of the mound that could accommodate both dairy processing (and its related infrastructure) and a (large) freshwater pond. Unfortunately, the survey data provide only a basis for hypotheses regarding the possible infrastructure of the mound. The international comparative framework indeed suggests that the specific nature of buildings and freshwater ponds on such mounds could thus far only be definitively validated through archaeological excavation.

Sheep Herding in a Transformed Landscape

Finally, this discussion aims to place the practice of sheep-herding in the coastal plain within a landscape-historical perspective that extends beyond the boundaries of the specific site itself. Through retrogressive projection, a recurrent tripartite pattern of spatial organisation emerges, or a so-called local taskscape of sheep-herding. The first element of this taskscape is a permanent parent farm, typically positioned away from the tidal flats, either on higher grounds or protected by a dike. The second element is the dwelling mound located in the intertidal area, serving as a satellite ad hoc retreat for both sheep and shepherd when they roam the silty grasslands. These mounds can feature both freshwater-reservoirs and building infrastructure, ranging from simple sheds to fully-fledged farms. The third element is the connection between the parent farm and the dwelling mound; a kind of droveway, which although not always materialised, is practically indispensable. Although on a larger scale, in a different environment (woodland) and with other animals (swine), a similar tripartite system between parental settlement/farm and detached/seasonal outliers connected through droveways has been identified for south-east England (Margetts 2022).

The most recent manifestation of this sheep-herding taskscape in the research area can be observed on the eighteenth-century maps (see Figures 9 and 17c), where sheep farms (*Bergeries*) erected on the *Stelledijk* [dike of the sheep mound] that enclosed the Hazegraspolder served as parental farm from which the adjacent intertidal zone was exploited. Despite further embankments disconnecting these farms from the adjoining tidal lands, the farms in the Zwin area remained amongst the most well-established in Flanders and continued employing shepherds until the mid-twentieth century (Demasure 2020, 51–52).

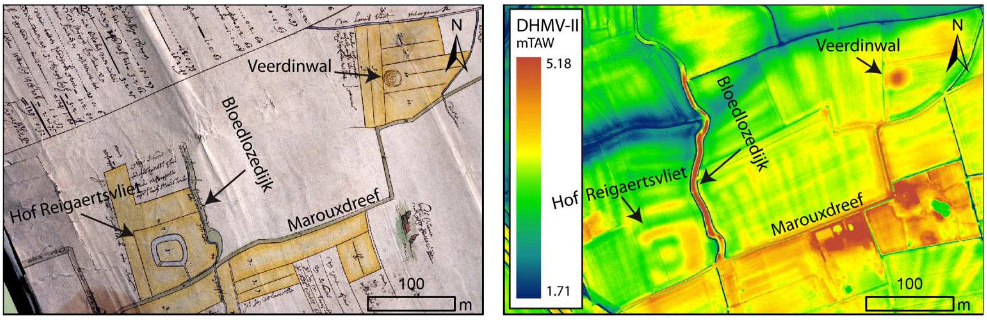

Figure 15. The tripartite system of sheep herding associated with the *Hof Reigaertsvliet* as depicted on a historical map (© Bruges State Archive, Maps & Plans Mestdagh, n°1897A) and the LiDAR-data (right, © Agentschap Digitaal Vlaanderen).

Taking a step back in time, the local retrogressive projection of sheep-herding leads to the sheep mounds depicted by Pourbus (see Figure 2b and 17c). In this case, the parent farm *Witten Hof*, can be regarded as the base farm, while the southernmost *Scaperie* functioned as an affiliated mound in the tidal area. Pourbus also depicted a pathway to the east of the mound, possibly connecting the base farm *Witten Hof* with the mound in the marshes. Some of the later eighteenth-century maps suggest a continuation of that connection. Moreover the adjoining ditch was called *Schapengracht* [sheep ditch] (Zwaenepoel and Vandamme 2016, 48).

An older equivalent can be found three kilometers southwards (Figure 2a). Protected by one of the first known dikes of the area (the *Bloedlozedijk*, embanked in the eleventh or twelfth century), a map from 1714 shows the then already deserted *Hof Reigaertsvliet* (Figure 15, left). Six hundred meters east of the dike, the map depicts a mound named *Veerdinwal* on a piece of land named *Spaers Stick* (Coornaert 1981, 278; 455; Coornaert 1985, 117), a placename that is explained as a 'salty meadow for sheep' (Wintein 1967, 31). As Coornaert suggested, this mound probably provided shelter for the sheep of the *Hof Reigaertsvliet* which functioned as the parental farm in its earliest phase, when it still bordered the tidal wetlands. A cattle path now named *Marouxdreef* connected both the base farm and the mound. All three elements are still visible in the local topography (Figure 15, right, Figure 17b).

The oldest manifestation of this tripartite taskscape is found in the earliest attestation of medieval herding in the coastal area. The aforementioned *marisci* in this case functioned as the satellites: elevated salt meadows in the supratidal area somewhat sheltered from daily tides. For this specific region, a meadow called *Grifningas* is mentioned in 790/862 AD (Declercq 1998, 170–176). This placename is related to the later *Greveningepolder* (embanked around 1170 AD) and should be situated somewhere between Westkapelle and Hoeke. These meadows were often owned by the Ghent abbeys of Saint Peter and Saint Bavo, which had their parent farms on the adjoining elevated Pleistocene sandy ridges (Verhulst 1998, 34). Droveways like the *Spegelsweg* allowed herding cattle back and forth between the parent farms and the salt meadows (Figures 16 and 17a) (De Keyser 1984, 19–20; Hooft, Callaert, and Santy 2006).

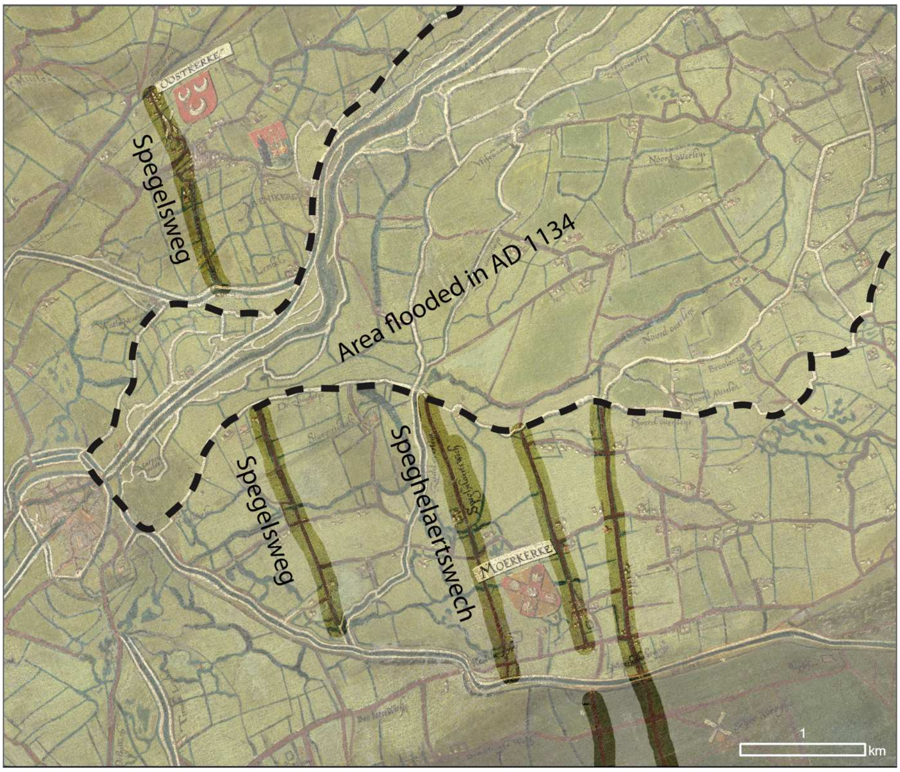

Figure 16. Pieter Pourbus' painted map of the Liberty of Bruges (1571) (above) with a detail of the early medieval droveways (below). (© Musea Brugge, 0000.GRO0220.I, www.artinflanders.be, photo: Dominique Provost).

These examples illustrate how sheep-herding followed the medieval landscape transformation of the coastal area and gradually moved northward on the fringe of in the tidal landscape. Following the northward migrating sheep-grazing areas, earlier embanked sites situated closer to the Pleistocene inland exhibit increased rates of bovine presence already from the eleventh century onwards (Aluwé 2017a, 2017b, 2017c). This trend suggests an increasing prevalence of inland agricultural practices and the husbandry of cattle. The advancing embankments thus increasingly reduced the surface apt for the sheep-related activities and transformed it into a landscape favouring arable farming and trade. After all, when Pieter Pourbus in 1571 describes the territory of the Liberty of Bruges in the map legend, he characterises the area foremost as 'productive grazing land that feeds cattle and horses of high quality and fit for war' (Papy 1998). His follow-up description 'it is rich in milk, cheese and butter' is illustrative for the important role of dairy production in this part of (coastal) Flanders, reflecting a shift away from inland wool production (Verhulst 1970, 7–8). The continuous transformation and adaptation of the landscape also explains the frequent re-use and functional changes of the mounds once they became landlocked (Figure 17). The two sheep-farms depicted by Pourbus near Knokke are thus the marginalised mounds that remain and testify of an older taskscape, shaped by a different social agrosystem.

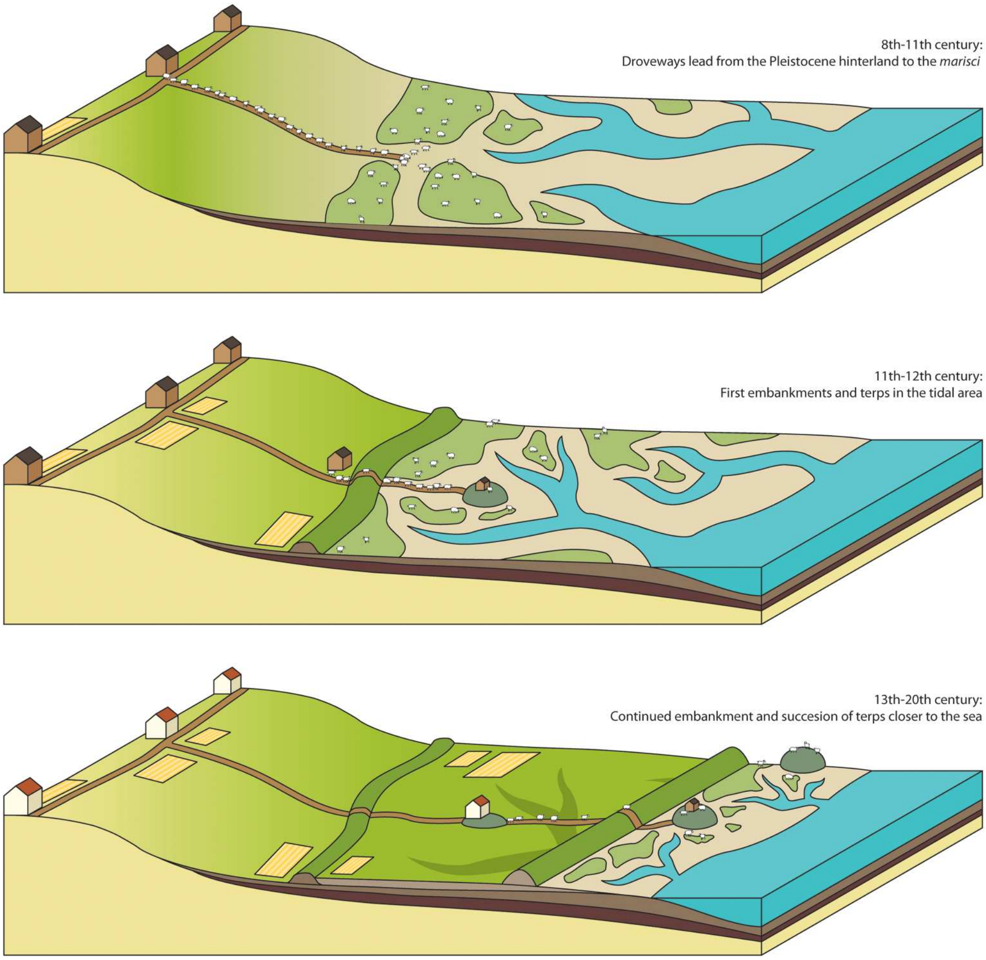

Figure 17. Schematic model of the chronological and spatial development of the sheep-related taskscape in embanked coastal wetlands of the Zwin area.

Conclusion

Mounded sites have been present in the Flemish coastal plain since the Roman period, serving as temporary or permanently occupied places. Their elevated position in the dynamic tidal landscape allowed for habitation and production in a region with difficult accessibility. In the early medieval period, the exploitation of the coastal landscape resulted in a surplus-creation. Eventually this gave way to a shift in the supply mechanisms of wool for the Flemish cloth production, moving from local to more inter-regional sources. However, as embanked polders expanded, intertidal grazing grounds dwindled, leading to the marginalisation of remaining marshes from both a landscape and economic perspective.

The site of the *Scaperie* is one of the last relics of a two-millennia-old tradition and landscape exploitation that characterised the low-lying coastal plains of the North Sea area.

While it no longer represents the early medieval surplus-extraction of wool, it reflects a more small-scale diversified farming system in which sheep were in the first place held for their meat and milk.

Because the earliest phases of this coastal exploitation have already been buried in the first stages of reclamation and have therefore left shallow archaeological traces, the latest variants of this phenomenon might provide the best laboratories to inquire into the dynamics and developments of sheep-herding in the Flemish coastal plain. Although the scale of production had diminished and commodities had changed, the specific taskscape, including cultural traditions and spatial planning related to sheep-herding, seems to have been generally maintained.

While cartographic and landscape-archaeological research has provided new insights into the dynamics of sheep mounds, the comparative framework has also shown that the constructive and taphonomic complexity of these features can only be fully understood through more intensive survey and ultimately invasive fieldwork. From a methodological standpoint, the research demonstrates the efficiency of combining high-detail collection of surface finds and subsoil geophysics to study spatio-temporal characteristics of archaeological sites. Even more, the functional analysis of the surface finds allowed to validate the site as a place for sheep-herding, thus underscoring the landscape-archaeological value, and contributing to the overall accuracy-assessment of Pieter Pourbus' painted map of the Liberty of Bruges. The research does not claim to have uncovered the complete cultural biography of the mound depicted by Pieter Pourbus but rather validated an important phase in its occupation as a late medieval and sixteenth-century sheep production site, and contextualised its morphology within a larger landscape setting.

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Declaration of Interest Statement

The authors report there are no competing interests to declare.

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