

Anthropogenic Heathlands in Prehistoric Atlantic Europe: Review and Future Prospects

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Heathlands are unique cultural landscapes that once existed across vast stretches of northern Europe. Their deep-time persistence has formed an intrinsic part of economic and cultural practices. Such a complex interaction requires interdisciplinary approaches, including archaeology, across multiple regions to fully grasp all its aspects. The authors of this article review how research has been conducted in prehistoric heathlands across six nations in north-western Europe and outline the heaths' general characteristics. They discuss the major issues in that research, namely recurring narratives derived from history, an overall absence of consideration of the cultural aspects of heathlands, and a paucity of cross-regional initiatives. They suggest a series of theoretical and methodological approaches to improve this situation across expanded geographical and temporal scales.

Keywords: anthropogenic heathlands, archaeology, palynology, *Calluna vulgaris*, pastoralism, agriculture

INTRODUCTION

Heathlands are open, human-altered landscapes that are often dominated by heather (the dwarf shrub *Calluna vulgaris*), which thrives on sandy or rocky subsoils. They depend on disturbances of various forms to expand and persist, including both abiotic and anthropogenic factors. The role of humans in intentionally maintaining and expanding the heaths has been recognized since the late nineteenth century. Scholars such as Gradmann (1898) have suggested that postglacial open landscapes were intentionally kept open through agriculture and pastoralism by Neolithic settlers. A long-standing debate ensued, regarding the effects of sheep grazing or mowing in open grass- or heathlands that are otherwise deemed supportive of forest vegetation

growth (e.g. Gradmann, 1901; Watt, 1947), to which one may now add the potential role of wild herbivore grazing (Vera, 2000). This makes heathlands a highly topical field of research that cuts across traditional research boundaries, including those between archaeology and the environmental sciences. Compared with related forms of disturbance ecologies, heathlands provide a unique opportunity to study the deep-time dimensions of anthropogenic ecologies and how they cross-cut present-day national boundaries.

So far, heathlands have largely been studied within separate research domains and fixed, nationally specific narratives, preventing the complexities and relevance of anthropogenic heathlands from being elucidated and communicated to a broader intellectual community. Despite the wide

distribution of heathlands across north-western Europe and their intrinsic relation with humans and non-humans (e.g. animals, plants, soils), our understanding of their emergence in prehistory and persistence through time is patchy. Moreover, we lack a deeper understanding of the role of humans and non-humans in these processes.

Our main aim is to present a review of publications over the last eighty years of research on anthropogenic heathlands at the interface between archaeological and palaeoenvironmental research. We focus on how this topic has developed as an emerging domain and examine the main concepts, methods, and dominant interpretations. We assess the major trends in investigating and conceptualizing the earliest prehistoric heathlands based on a selection of published studies of Atlantic inland heaths, and compare them critically across regions. Three major trends characterize this field: 1) heathland interpretations tend to rely on historical deduction; 2) palaeoecology and archaeology have largely developed along monodisciplinary trajectories; and 3) most heathland research is confined to national or administrative borders. Based on this review, we table some proposals to improve the options and infrastructure for cross-regional research. This should promote a conceptual openness towards alternative emergent forms of landscape organization, improve the methods used in studying heathland dynamics, and enhance our ability to interrogate the critical human/non-human relationships that heathlands can reveal.

Our review emerges from the ERC-funded project ‘Anthropogenic Heathlands: The Social Organisation of Super-Resilient Past Human Ecosystems’ (ANTHEA), which investigates the emergence of heathland regimes in late prehistoric northern Europe (Løvschal, 2021).

THE DRY ATLANTIC HEATHS

Following large-scale deforestation linked to livestock grazing and burning, anthropogenic heathlands emerged as multispecies assemblages more than 5000 years ago (e.g. Odgaard, 1999; Prøschedanielsen & Simonsen, 2000). They reached a peak in the early nineteenth century, when their extent covered millions of hectares (Webb, 2008). In late prehistoric and historic times, heathland vegetation and its associated cultural practices connected large areas throughout northern Europe. The north-western European heathland regions displayed major similarities in domestic architecture (e.g. longhouses or byre houses), funerary traditions (e.g. mound burial sites), and exchange and communication networks (particularly evident in the Early Bronze Age and Corded Ware culture) (Bradley, 2014). Archaeological evidence also suggests that these regions experienced periods of prosperity, as attested by the thousands of barrows built on heathlands in the Corded Ware culture (c. 2850–2350 BC) or the large-scale communal funerary and domestic building projects in the Earliest Iron Age (c. 600–200 BC). Additionally, a range of historical and contemporary documentation exists for comparable heathland communities managing the heaths for winter grazing or other purposes, such as the provision of fuel, building, thatching, and bedding materials, and soil improvement (Kaland, 2014). Their great chronological depth bears witness to complex deep-time entanglement and dependence on human commitment (Løvschal, 2021).

Today, only a small percentage of heathlands have survived as protected land or as grounds for game hunting and military training activities (Diemont et al., 2013; Fagúndez, 2013; Schellenberg & Bergmeier, 2020). However, because many

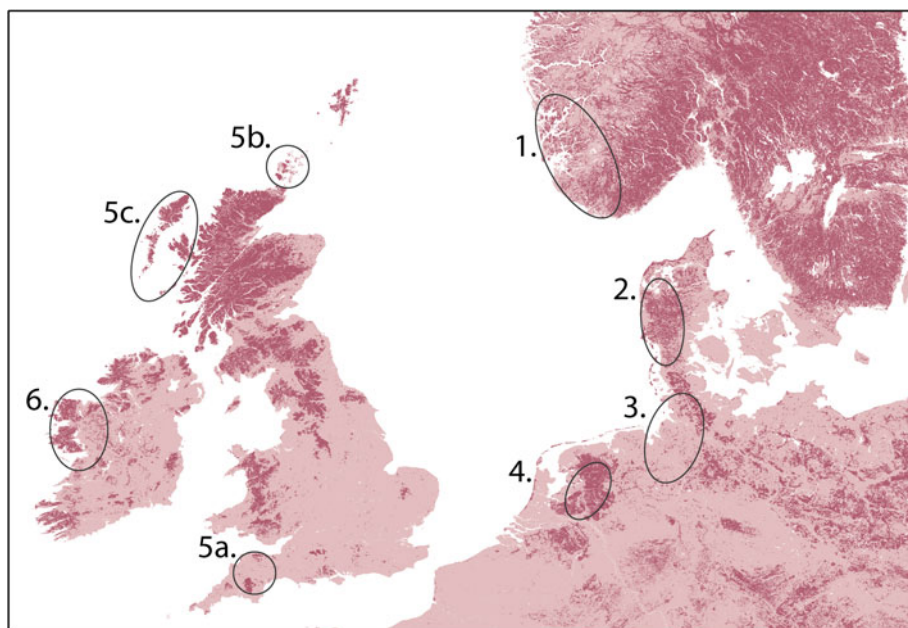


Figure 1. Estimated historical distribution of heathlands with indications of the six regions reviewed, based on CORINE (© European Union, Copernicus Land Monitoring Service 2018, European Environment Agency). Categories: natural grasslands, moors and heathlands, pine forests. This map includes geomorphological data from the central and north-eastern Netherlands (Koomen & Maas, 2004). Study areas: 1. South-western Norway; 2. Denmark (western Jutland); 3. North-western Germany; 4. The Netherlands (Drenthe and Veluwe); 5. British Isles (5a. South-western Britain; 5b. Orkney Islands; 5c. The Hebrides); 6. Western-central Ireland.

of these areas have been heathlands for thousands of years, they preserve relict prehistoric landscapes, including barrows, funerary sites, cairns, and field systems, that have elsewhere disappeared.

METHODS AND BACKGROUND

Our geographical scope comprises the anthropogenic heathlands of northern Atlantic Europe, i.e. inland heaths across six countries in north-western Europe where heather (*Calluna vulgaris*) has been dominant and where a distinct heathland research tradition can be identified. As discussed below, *Calluna vulgaris* is the commonest species in most dry inland heaths in our area and has been identified to species level in most palynological

studies. The six study regions that we have selected here include: south-western Norway, western Jutland (Denmark), north-western Germany, the Netherlands (the Veluwe and Drenthe), the British Isles (upland moor and heathlands in south-western Britain, the Orkneys and Hebrides), and finally Ireland (Figure 1). These study areas form the main empirical focus of our review because they represent regions where heathlands have expanded ever since prehistoric times (though discontinuously) and are similar in terms of their relationships with anthropogenic development. Additional Atlantic areas containing past heathland landscapes—such as the central-eastern Netherlands, north-eastern Germany, mainland north-western Scotland and several uplands in Britain (e.g. the Peak District or the lowland Brecklands of East

Anglia)—are mentioned in our broader synthesis.

Literature selection

Attempts to synthesize heathlands include cultural–historical studies (e.g. Diemont et al., 2013; Degn, 2019), larger-scale inter-regional approaches to heathlands (e.g. Lang, 1994; Nielsen et al., 2012; Fagúndez, 2013; Fyfe et al., 2013), and investigations of land-use traditions (e.g. Haaland, 2002). Additionally, heathland ecology is well researched, with work conducted, for example, on heathland succession (Gimingham, 1972), anthropogenic rejuvenation practices (Mallik & Gimingham, 1983), soil conditions (Schellenberg & Bergmeier, 2020), and atmospheric nitrogen deposition (Heil & Bobbink, 1993). This line of research is, however, limited to a geographically fragmented and unintegrated understanding of prehistoric heathlands. Because heathland research has not developed into a distinct cross-disciplinary field of enquiry in Europe that takes its earliest (pre)history into account, a substantial gap in our knowledge needs filling and holds immense promise for future interdisciplinary research.

We focus on the major trends detected in six study areas that cover the primary distribution of heathlands in north-western Europe. The selection of the study areas and their publications is based on archaeological and palynological studies that are either fully or partly dedicated to heathlands from c. 3000 BC to c. AD 1000. The review derives from a systematic database and search engine–based (Google Scholar and Core) compilation of such studies. The search terms used included ‘heathland’, ‘*Calluna*’, and ‘vegetation history’, translated into the language of each of the regions in question. References in palynological papers covering large-scale geographic areas in any of the selected

countries or regions were systematically checked for the inclusion of publications dealing with prehistoric heathland research. Other work involving heathlands has been excluded unless it had an observable influence on the archaeological or palaeoecological literature that followed.

Table 1 summarizes the publications on past heathlands that were collected; these are detailed in Table S1 in the online Supplementary Material. It also includes literature from other identified heathlands outside the study areas, as noted above. The literature review revealed a total of 166 publications involving prehistoric heathland research. Tables 1 and S1 show the unequal distribution of publications in the various study areas. Quantity may, however, not necessarily reveal the degree of attention given to heathland research in the different regions. For example, publications from south-western Norway are relatively few compared to those from western Jutland, north-western Germany, and Britain, yet the research from south-western Norway contains publications with a high engagement in heathlands. Similarly, publications in which heathlands are the sole focus are quite scarce in north-western Germany and Britain, but they contain relatively more studies in which heathland patterns have been integrated into an overall vegetation history. Moreover, the attention given to heathland research from an archaeological approach appears disproportionately low compared to the contributions from the palaeoecological disciplines, as reflected in a much greater proportion of journals dedicated to ecology or the environment.

Geological and ecological background

Most of the study areas are dominated by heather heathlands. Drier heathlands, where *Calluna vulgaris* most commonly

Table 1. Heathland studies in archaeological or ecological publications summarized by type and study area. Details of all publications and their references are listed in Table S1 in the online Supplementary Material.

Study area	Archaeology	Ecology/Environment
International Total: 6	Total: 0	Total: 6 2 books (1975, 1994) 4 journal articles (1974–2013)
Norway Total: 13	Total: 6 1 book (1998) 3 book sections (1979, 2009, 2014) 1 conference proceedings (1998) 1 journal article (1971)	Total: 7 1 book section (1986) 6 journal articles (2000–2016)
Denmark Total: 20	Total: 6 2 books (2004, 2013) 4 journal articles (1985–2021)	Total: 14 3 books (1935, 1935, 1950) 11 journal articles (1944–2008)
Germany Total: 21	Total: 5 2 books (1884, 2005) 1 conference paper (2001) 2 journal articles (2000, 2002)	Total: 16 2 books (1898, 1994) 1 book section (2005) 13 journal articles (1967–2006)
The Netherlands Total: 28	Total: 10 3 books (1947, 1954, 2013) 1 book section (2002) 6 journal articles (1963–2014)	Total: 18 1 book section (1988) 17 journal articles (1954–2017)
Great Britain Total: 60	Total: 25 3 books (1996, 2002, 2007) 3 dissertations (1994, 2004, 2016) 19 journal articles (1957–2022)	Total: 35 1 book (1962) 2 dissertations (1977, 2000) 32 journal articles (1971–2017)
Ireland Total: 18	Total: 5 5 journal articles (1953–1999)	Total: 13 2 book sections (1988, 2013) 11 journal articles (1949–2021)
Totals: 166	57	109

dominates, often cover the fluvio-glacial, sandy soils running from western Jutland through north-western Germany into the eastern and central Netherlands, frequently on podsolized soils (Behre, 2000a). These regions are marked by low-relief areas of moraine deposits formed during the Saalian Glaciation, alternated by sandy, loamy soils formed during the Weichselian Glaciation, or by peat- and moorlands.

They are interspersed with higher-altitude boulder clay plateaus, sandy dunes, and valleys towards the north-eastern and central Netherlands. In south-western Norway, coastal heathland dominated by *Calluna vulgaris* may cover lower-altitude areas, gradually merging into inland heath or higher-altitude, rocky landscapes

around fjords. The species turnover rate of the heathlands ranges from *Calluna vulgaris* degeneration and forest encroachment within twenty years to the persistence of heathlands for a century or more (Løvschal & Damgaard, 2022). The dry inland heaths provide grazing opportunities for livestock, especially in the first five years of heather growth, as well as fuel and fodder.

Wet heaths are more common in upland areas in Britain and Ireland, generally characterized by acidic soils, including peaty soils of various depths. Roughly speaking, the degree of soil wetness and pH creates a range from wet to dry open land, resulting in areas of mosaic-like, open landscapes attractive to grazing

animals (e.g. Dimbleby, 1962). It is noteworthy that upland regions in Britain and Ireland, as well as some coastal rocky heaths across south-western Norway, have long provided environmental conditions in which heath- or moorland-related species may naturally occur. This may increase the complexity of prehistoric heathland research across such areas.

Based on the most significant publications, we attempt to synthesize the present state of heathland research in northern Europe. Such an overview had been hampered by the fact that heathlands cut across regions, and academic disciplines had not addressed the topic in a cohesive way. With this in mind, we focus on: 1) the narratives explaining heathland expansion; 2) the research contexts and methods applied; and 3) the geographical scales on which this research was conducted. Observations, either shared between regions or specific to a given region, will be discussed to identify relationships between narratives and methods, leading to insights and suggestions to broaden the currently dominant narratives.

A SURVEY OF THE LITERATURE

The following provides a region-by-region assessment of the major strands in heathland research since 1940, focusing on publications that have made a significant contribution or have influenced most later studies.

Region 1: South-western Norway

The literature on past heathlands in south-western Norway shows a remarkable effort to research the timing of heath emergence and expansion through (pre)history, including a wide range of palynological methods. The timing of heath emergence was

initiated by palaeoecological research on arboreal taxa, which heath vegetation appears to have replaced, as suggested by palynologist Fægri (1939) and his student Hafsten (1950). Subsequent highly influential studies by palaeobiologist Kaland in Nordhordland (1986, 1979) and by palaeoecologists Prøsch-Danielsen and Simonsen (2000) across much of south-western Norway revealed evidence of meta-chronous heath expansion with an anthropogenic origin. Prøsch-Danielsen and Simonsen (2000), along with many later studies, further suggested past heathlands were a component of the historically known ‘infield–outfield’ systems. The analogy to that system implies that a heath would have been a component of the outfields, in which grazing animals roamed to produce manure for the infields (Bakka & Kaland, 1971). Infields were fenced off areas close to settlements and used for more intensive arable agriculture. The influence of these studies is reflected in a repeated re-engagement with the questions of meta-chronous anthropogenic heath expansion in later papers, which either further improved palynological resolution (e.g. Hjelle et al., 2010), comprehensively integrated palaeoecological data with archaeological evidence (e.g. Høgestol & Prøsch-Danielsen, 2006), or combined palynological data with various analytical methods (e.g. Overland & Hjelle, 2009). However, the historically based infield–outfield narrative explaining heath expansion has received little critical attention.

Region 2: Western Jutland (Denmark)

The earliest understanding of heathlands in western Jutland stems from geological work in the late nineteenth century and later (Müller, 1884; Bornebusch & Milthers, 1935), whereas palynological studies only started including prehistoric

heathlands from the 1950s onwards (Jonassen, 1950; Iversen, 1964). Over the last thirty years of heathland research in Denmark, the use of palynological investigation within archaeological contexts has played a key role and its influence extends beyond western Jutland. This was achieved in particular by the palynological work of Odgaard, based on data from lake sediments (Odgaard, 1994), prehistoric barrows (Odgaard & Rostholm, 1987), and soil profiles from Grøntoft (Odgaard, 1985). Because of the extensive and continuous presence of heaths from as early as 3000 BC, Odgaard suggested that heathlands were strongly related to pastoralism, thus indicating a reliance on animal husbandry from the Late Neolithic onwards. Their significance is evident in the deliberate maintenance of heath. Several other papers report detailed palaeoecological work in field systems (Enevold et al., 2019) and prehistoric barrow contexts (Andersen 1994–95), but few show an integration of palynological work in archaeological contexts at a larger geographical scale (a notable exception being Meistrup-Larsen, 2004). Despite lacking archaeological data, Landscape Reconstruction Algorithm (LRA) and REVEALS-based landscape modelling by Nielsen et al. (2012) has made a significant contribution to our understanding of the opening of the landscape and expansion processes of heathland beyond individual sites, emphasizing the importance of cross-border research.

Region 3: North-western Germany

Heathland research in north-western Germany has largely been achieved through brief discussions within vegetation histories derived from peat or lake sediments in Lower Saxony, Ostfriesland, Schleswig-Holstein, and the Lüneburger Heide (Urban & Becker, 2006). These mostly focused on the broader relationships between archaeological

settlement patterns near sampling sites, with heathland as a landscape type receiving little attention compared to the regions previously described. The emergence of heaths is frequently interpreted as a consequence of agricultural land-use or (light woodland) grazing (e.g. Behre, 1979; Dörfler, 1989; Jahns, 1999; Urban & Becker, 2006), usually in relation to settlement patterns.

A more significant and extensive study of the ecological development of peatlands and bogs was undertaken by Overbeck (1975). It discusses the emergence of heathlands across north-western Germany, Denmark, and the Netherlands and distinguishes between anthropogenic heather-dominated heathlands and earlier, natural emergences of heath dominated by the genus *Empetrum* (crowberry). Lang (1994) followed with a large-scale quaternary vegetation history of Europe, where Atlantic heathlands are also discussed in relation to anthropogenic activities.

Work by palaeoecologist Behre (2000a, 2000b) followed and directly engaged with anthropogenic heathlands. This explained the timing and causes of prehistoric heathland emergence as a consequence of soil degradation following pastoralist activities across Germany and other parts of central Europe. Based on historical examples, Behre (2000a) also drew attention to the historically known arable agriculture-related ‘plaggen’ system, where cut turves are mixed with animal dung to provide soil nutrients for rye production, resulting in impoverished soil-driven heath expansion.

Region 4: The north-eastern and central Netherlands

Compared with the other regions, exceptional early palynological work from archaeological barrows and tombs was conducted by archaeologist van Giffen (1947) and palaeoecologists Waterbolk

(1954) and van Zeist (1955). This led to the general acceptance of an anthropogenic origin of heaths being maintained by sheep grazing or through agriculture, climate, and soil impoverishment (van Giffen, 1947). The arable-agricultural component of past societies was further emphasized by Casparie and Groenman-van Waateringe (1980), who compared the change in vegetation caused by barrow-building to landnam phases, of which heaths were largely thought to be the result. In recent decades, a few scholars have focused more on heathlands as an independent cross-disciplinary topic and have investigated heathland landscapes at a broader level than that pertaining to barrows alone to determine their potential long-term role in prehistoric societies. For instance, Sevink et al. (2013) attempted to date the timing of heath formation based on palaeosol pollen analyses in Laarder-Wasmeren near Hilversum, and Doorenbosch (2013; Doorenbosch & van Mourik, 2016) considered the social organization and management of heathland in palaeoecological work from palaeosols in Laarder-Wasmeren and in relation to Bronze Age and Iron Age barrows.

Region 5: Britain (south-western Britain, the Hebrides, and the Orkneys)

Until the 1980s, heathlands had mainly been the target of ecological work conducted by Watt (1947) and Gimingham (1972), who focused on human interference at an exceptionally early stage compared to their peers. Yet, within palaeoecology, most research concentrated on deforestation patterns and peat inceptions. Heath vegetation did not receive attention beyond recording their emergence, resulting in an overall view that heaths were an unintended consequence of human land-use (e.g. Keatinge & Dickson, 1979; Simmons & Innes, 1988).

From the 1980s onwards, a shift in archaeology emerged from the

identification of extensive field systems in upland areas, including those of Dartmoor and Wessex (Fleming, 1978; Johnston, 2005). Examples from modern ecology had a growing influence, reflected by an increase in investigations of the relationship between land-use and vegetation or the relative abundance of grasses *versus* heather (e.g. Mallik & Gimingham, 1983).

Although the general trend towards land-use and vegetation histories continued in the following decades, heathland research received little attention, bar a few examples. The work of Dimbleby (1962) represents the first larger-scale multiple-pollen analysis that used radiocarbon-dated archaeological sites and related heaths to soil development. Later, based on pollen data from two lake sediments from the Orkney Islands, Bunting (1996) was one of the few palaeoecologists to focus on heathland emergence and persistence, and Gilbertson et al. (1996) presented a large-scale study of environmental and archaeological research in the Outer Hebrides.

Two extensive palaeoecological studies, though not specifically of heathlands, must be mentioned: Tipping's (1995) initial landscape reconstruction of Scotland focused on deforestation patterns, and Fyfe et al.'s (2013) landscape reconstruction targeted both Britain and Ireland. The latter included a reconstruction of most heather-based heaths at this scale, thus taking initial steps towards mapping the spatio-temporal distribution of heathlands on a larger scale and outlining a potential future for heathland research.

Region 6: Western-central Ireland

The coastal areas of western to north-western Ireland have received relatively greater attention from both archaeologists and palaeoecologists (e.g. Dodson & Bradshaw, 1987; Huang, 2002; Ghilardi &

O’Connell, 2013). As in Germany and Britain, most early studies in this region involved vegetation histories, with only a few focusing on heathland expansion, mostly referred to as natural vegetation. As for palynological and archaeological studies, they started to develop much later, in the 1980s and 1990s. Such studies, in the form of vegetation histories, began to ascribe records of *Calluna vulgaris* to woodland clearance or to a decrease in cultivation (e.g. Molloy & O’Connell, 1990). More recent work by Overland and O’Connell (2008), O’Brien and Comber (2009), and O’Connell et al. (2020) has identified the time and patterns of heath emergence in south-western and mid-western regions of Ireland. Furthermore, through a combination of palynological data and non-pollen palynomorphs, Feeser and O’Connell (2009) and O’Connell et al. (2021) have shown the potential of using large-scale multidata studies, providing an important regional overview of heather-dominated heaths over time. Their potential roles in past socioeconomic systems are yet to be explored.

DISCUSSION

Our review reveals overarching trends in the development of heathland research. First, there is a tendency across all countries to explain the deep-time history of heathlands through historical deduction, irrespective of differences in the level of investigation dedicated to prehistoric anthropogenic heathlands. We thus lack an understanding of the timing of heathland expansion, and, importantly, alternative scenarios have not been explored. Second, most heathland research remains confined within traditional research boundaries. Heathland research in all countries began with palaeoecological studies, while archaeology started to

examine heathland livelihoods at a later stage. In this sense, palaeoecologists have developed a much larger range of methods for studying heathland histories than archaeologists. Moreover, in Great Britain, Ireland, the Netherlands, and Germany there is a quite strong focus on palaeoecological approaches separate from archaeological research, whereas in Denmark and south-western Norway archaeological integration is more prevalent. Third, almost all questions concerning the prehistory and history of heathlands have been addressed on a national basis, resulting in a fundamental lack of supra-regional syntheses. Countries without strong national narratives (e.g. the Netherlands) frequently invoke ‘natural’ conditions for the emergence of heaths, whereas areas with stronger national narratives emphasize intentionality, as in Denmark and south-western Norway. In these regions—along with the Orkneys and Hebrides—heathlands have a distinct pastoral value, being considered better for grazing than less palatable grasses (Odgaard, 1994) and replacing the need to collect winter fodder. In the remaining study areas, heaths are considered to be situated on poorer soils of little value or relatively low returns for prehistoric food production.

Narratives and approaches informed by historical inference

Across all six regions, the most common interpretations of anthropogenic heathlands rely on analogies to historic heathland use. This is evident in the reference to the infield–outfield system in south-western Norway (e.g. Prøsch-Danielsen & Simonsen, 2000) and Britain (e.g. Groves et al., 2012) applied to prehistoric heathland organization. Other examples stem from the marginality debate surrounding upland land-use (e.g. Johnston, 2005;

Verrill & Tipping, 2010) or from the historical 'plaggen' use in north-western Germany (Behre, 2000a). Although heathland longevity and enduring accompanying practices seem very likely, the links between prehistoric and historic times have not been systematically investigated. This hampers the discovery of other, potentially contradictory, forms of organization and ignores that some presumptions may be fundamentally wrong. Moreover, interpretations frequently rely on Enlightenment ideals of productivity, surplus, and maximizing production, presenting agricultural regimes as more desirable and civilized than heathlands. These assumptions are reflected in numerous studies, both palynological and archaeological, where heathlands are regarded as the unintended consequence of abandoning cultivated fields (e.g. Jonassen, 1950; Fleming, 1978; Urban & Becker, 2006). Failing to critically engage with such presumptions may result in a debate in which alternative theories are left unexplored. Limited yet important research from Denmark (Odgaard & Rostholm, 1987; Odgaard, 1994) and Germany (Behre, 2000a, 2000b) provides a corrective to such narratives; there, cooperation between archaeologists and palaeoecologists has revealed the role of pastoralism in the persistence of heathlands. Moreover, the study of archaeological settlement patterns may indicate that prehistoric societies were organized in a way that differs from those of historic times, for example through collective governance or open property regimes (Oosthuizen, 2013; Løvschal, 2015).

The strong reliance on historical narratives can explain, or perhaps be explained by, the limited amount of research dedicated to the timing of heath emergence and expansion. Examples of palynological publications attempting to map the spatio-temporal distribution of heathlands are only known from south-western Norway,

western Jutland, and Orkney (Bunting, 1996; Prøsch-Danielsen & Simonsen, 2000; Nielsen et al., 2012). In western Jutland and south-western Norway an array of methodological approaches has been employed, targeting different sizes of catchment zones and geological areas. Such studies are crucial for understanding the complicated development of anthropogenic heathlands over time, as demonstrated by either relatively fast and persistent heath development (as in western Jutland, e.g. Odgaard, 1994) or slow and metachronous expansion (as in south-western Norway, e.g. Kaland, 1979; Prøsch-Danielsen & Simonsen, 2000). In Germany, Britain, and Ireland, on the other hand, heathland research is commonly integrated within vegetation studies. The nature of this type of approach may complicate targeted research on prehistoric heathland emergence and expansion, as reflected by infrequent and brief discussions of these events (e.g. Dörfler, 1989; Jahns, 1999).

Research along different perspectives

Different types of contexts for palynological sampling and archaeological excavations have been included in past heathland research. Unfortunately, little integration between the disciplines of palaeoecology and archaeology beyond that of shared (sampling of) contexts exists.

Current trends show that the environmental sciences have been used to inform archaeological interpretations, resulting in a limited understanding of the cultural and multispecies aspects of the heathlands' deep-time emergence and persistence. For example, most studies estimate the sizes of heathlands from palynological indications but ignore those from specific archaeological patterns that show alternative scenarios, as attested in the relatively localized palynological sampling of sites in the

Dutch and German study areas. Here, the use of prehistoric barrows, local bogs, or moorlands is often quite local in terms of palynological interpretation. According to older palynological studies from Dutch barrows (van Zeist & Groenman-van Waateringe, 1980), the landscapes surrounding these barrows ranged from forest to open grassland to heathland, which may lead to assumptions the heath was localized or patchy during late prehistory. A more recent attempt by Doorenbosch (2013) is still relatively limited, but, by combining data from multiple barrows close to each other, Doorenbosch was able to identify potential ‘heath corridors’. This suggests that the extent of heathland coverage was previously underestimated, and that heath vegetation may have connected the barrows, echoing suggestions from the Danish literature that sees the heathlands as playing an important role in the economy of prehistoric people (e.g. Odgaard, 1994). This example shows the difference between interpretations of heathlands based on archaeologically informed hypotheses and ecological interpretations. Similarly, the catchment areas of many peat bogs across north-western Germany initially led to interpretations of patches of (natural) heath, which were usually regarded as small until historic times (e.g. Endtmann, 2002; Wolters, 2002). The general trend, in which either palynological data or ecological knowledge is mainly used to inform archaeological interpretations, still prevails, although sampling at a regional scale has tended to involve more heath-focused studies in south-western Norway and Denmark. We suggest that incorporating more archaeological data and a balanced interdisciplinary approach to future heathland research will bear fruit.

An international research field

We contend that heathland research is hampered by the geographical confines within

which past heathlands have been studied. To date, very few examples of research applied at an international scale exist, and amongst these, the archaeological aspects have been largely ignored. This has not only resulted in a lack of understanding of past heathland development in relation to cultural traditions on a broader scale but also points to a wider issue in north-western Europe. First, the relationship between palynology and archaeology differs from country to country: in some countries, palynology is more or less independent of archaeology, in others it is regarded as a subdiscipline of archaeology. Such differences may impede a more cooperative or streamlined approach across different nations and affect the state of prehistoric heathland research. While identifying regional differences or similarities in vegetation development based on ecological and palynological data across larger geographical areas seems relatively straightforward, detecting such differences or similarities in cultural or societal organization may be a greater challenge. Yet such identification is key if we are to understand whether current regionally based observations truly reflect different developmental trajectories or are merely the result of method-based biases.

POINTS FOR POTENTIAL AND FUTURE EXPLORATION

We suggest that heathland research in north-western Europe could be substantially improved on three fronts.

First, improving our knowledge of the timing of prehistoric heathlands could be achieved by increasing our research focus on the myriad heathland-related human and non-human species, not limited to *Calluna vulgaris*, to identify the time of emergence and expansion of heathland regimes. This could be significantly strengthened by more radiocarbon dating

of episodes of heath formation and expansion and confronting these episodes with multiple strands of archaeological evidence, including houses, pits, granaries, barns, enclosures, fields, and funerary structures.

Second, the archaeological record shows that forms of organization associated with heathland use were radically different from those of the historical single farm, such as the villages of western Jutland; the latter were probably based on other principles of collaboration and forms of commoning pertaining to demographically larger communities (Løvschal, 2015). Through further exploration of such organizations, we may also develop alternative narratives to explain prehistoric heathlands, rather than use narratives built on historical documentation. Combining such work with archaeological settlement or funerary data may substantially improve our understanding of heath formation and the relationship between past societies and heath expansion throughout late prehistory. Researching past heathlands with the premise that their emergence or expansion was anthropogenic and intentional may be a valuable approach for future archaeological investigation. In addition, acknowledging the complexity surrounding potentially naturally occurring species requires careful consideration when constructing models of past heathland use in the various study areas.

Third, expanding heathland research from monodisciplinary studies to truly interdisciplinary enquiries would allow us to embrace the entangled human and non-human nature of the heathlands. This could include a greater use of archaeological material to inform palaeoecological and landscape reconstruction models. Landscape divisions known as Celtic fields indicate open grazing and heathland landscapes; we could use the distribution of such Celtic fields to get a sense of the timing and coverage of open landscapes. Additionally, we could compare long-term

chronologies of various forms of land divisions, such as seen in the work of Griffiths et al. (2022), with heath vegetation developments. In the Netherlands, there appears to be a 2500-year-long gap between the vegetation recorded in Early Bronze Age barrows and the heathlands known from historical records and in the plaggen system. Development-led excavation of large-scale cultural–historical landscapes are uncovering traces of large-scale land parcelling systems from *c.* 800 BC onwards in many prehistoric landscapes, not only in the northern and north-eastern Netherlands (Spek et al., 2003) but also more widely in Europe (Arnoldussen et al., 2021). The regular layout of this infrastructure suggests that fields were created in open landscapes and were present by *c.* 1500 BC (ditched and fenced landscapes) and *c.* 800–500 BC (embanked and lynchet fields). These features of open landscapes are furthermore identified in smaller excavations and trenches through banks, suggesting that the field systems divided open heathlands and grasslands (Nielsen & Dalsgaard, 2017).

Finally, we need to start approaching questions of heathland timing, resilience, and biosocial organization beyond national scales. We could start by addressing settlement organization and agro-pastoral technologies in heathlands across our six study regions. Wide-ranging similarities in material culture, funerary traditions, and house architecture, for example between western Jutland and the north-eastern Netherlands, suggest similar cultural practices, of which the heaths may have been a part.

CONCLUSION

Heathland decline is increasingly being recognized as a present-day European phenomenon (Fagúndez, 2013). This has recently brought the heathlands into sharper focus. As a diminishing cultural landscape,

their decline should be understood in terms of long-term political and social histories and human interventions. Moreover, considering their value at an international level (e.g. NATURA, 2000; Fagúndez, 2013), it is crucial that future research is conducted on larger geographical scales. But, as our review highlights, heathland research has not developed into a distinct interdisciplinary field; it remains split between archaeology, the historical sciences, palaeoecology, and (neo)ecology. Hence, our understanding of the history of the heathlands of northern Europe and their associated agro-pastoral communities and livelihoods is still inadequate. Despite a huge increase in development-led archaeological excavations, theoretical reorientations, and the development of new landscape reconstruction methods, our understanding of prehistoric heathlands tends to fall back on historical analogies. Yet there is immense potential in combining archaeological and palaeoecological methods to target questions in a deep-time, cross-border perspective. This would make heathland research highly relevant to a much broader constituency, including landscape archaeology, environmental anthropology, ethnography, and environmental humanities. Engagement with a deep-time perspective would at the same time draw attention to the current and rapid decline of these vulnerable but crucially important landscapes.

SUPPLEMENTARY MATERIAL

To view supplementary material for this article, please visit <https://doi.org/10.1017/ea.2022.42>.

ACKNOWLEDGEMENTS

The data from which this article draws stem from the project ‘Anthropogenic

Heathlands: The Social Organisation of Super-Resilient Past Human Ecosystems’ (ANTHEA) funded by the European Research Council under the European Union’s Horizon 2020 research and innovation programme (grant agreement no. 853356).

The authors would like to thank friends and affiliates of the ANTHEA project, in particular Anne Birgitte Nielsen for comments and suggestions.

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BIOGRAPHICAL NOTES

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Les landes anthropiques en Europe atlantique pendant la préhistoire : bilan et perspectives d'avenir

Les landes représentent un type de paysage culturel et historique unique couvrant autrefois d'immenses étendues du nord de l'Europe. Leur naissance et persistance sur longue durée font partie intrinsèque des pratiques économiques et culturelles des humains et non-humains. La complexité de ces interactions exige des approches interdisciplinaires entre nations, y compris en archéologie, afin d'en saisir tous les aspects.

Les auteures de cet article examinent comment les recherches concernant les landes anthropiques préhistoriques ont été conduites dans six régions du nord-ouest de l'Europe et brossent un tableau de leurs caractéristiques. Elles relèvent les questions saillantes, c'est-à-dire la présence régulière d'interprétations dérivées de l'histoire, le manque de considération des aspects culturels des landes et la rareté des initiatives interrégionales. Ceci les amène à formuler certaines approches théoriques et méthodologiques permettant d'améliorer la recherche à une échelle géographique et chronologique plus ample. Translation by Madeleine Hummler

Mots-clés: landes anthropiques, archéologie, palynologie, *Calluna vulgaris*, pastoralisme, agriculture

Anthropogene Heiden im ur- und frühgeschichtlichen Atlantischen Europa: Übersicht und Zukunftsaussichten

Heiden sind einzigartige kulturhistorische Landschaften, die einst ausgedehnte Teile von Nordeuropa bedeckten. Ihre Entstehung und langzeitliche Beständigkeit waren einen integralen Bestandteil von menschlichen und nicht-menschlichen wirtschaftlichen und kulturellen Tätigkeiten. Solche komplexen Wechselbeziehungen benötigen interdisziplinäre, multinationale Ansätze, auch seitens der Archäologie, um alle Aspekte vollständig zu erfassen. Die Verfasserinnen dieses Artikels schildern, wie die Forschung hinsichtlich der ur- und frühgeschichtlichen Heiden in sechs nordwesteuropäischen Gebieten durchgeführt worden ist und führen die Haupteigenschaften der Heiden auf. Die wichtigsten Themen dieser Forschung werden besprochen, namentlich eine wiederkehrende Beschäftigung mit historisch hergeleiteten Darstellungen, eine allgemein fehlende Berücksichtigung der kulturellen Aspekte der Heiden und ein Mangel an überregionalen Ansätzen. Verschiedene theoretische und methodologische Vorgehensweisen werden empfohlen, welche die Forschung in einem umfangreicheren geografischen und chronologischen Ausmaß verbessern könnten. Translation by Madeleine Hummler

Stichworte: Anthropogene Heiden, Archäologie, Palynologie, *Calluna vulgaris*, Weidewirtschaft, Landwirtschaft