Offa's Dyke Journal

Volume 3

Edited by Howard Williams and Liam Delaney

Aims and Scope

Offa's Dyke Journal is a peer-reviewed venue for the publication of high-quality research on the archaeology, history and heritage of frontiers and borderlands focusing on the Anglo-Welsh border. The editors invite submissions that explore dimensions of Offa's Dyke, Wat's Dyke and the 'short dykes' of western Britain, including their life-histories and landscape contexts. *ODJ* will also consider comparative studies on the material culture and monumentality of frontiers and borderlands from elsewhere in Britain, Europe and beyond. We accept:

1. Notes and Reviews of up to 3,000 words
2. Interim reports on fieldwork of up to 5,000 words
3. Original discussions, syntheses and analyses of up to 10,000 words

ODJ is published by JAS Arqueología, and is supported by the University of Chester and the Offa's Dyke Association. The journal is open access, free to authors and readers: http://revistas.jasarqueologia.es/index.php/odjournal/. Print copies of the journal are available for purchase from Archaeopress with a discount available for members of the Offa's Dyke Association: https://www.archaeopress.com/

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Volume 3 for 2021

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University of Chester

Exploring Linear Earthworks across Time and Space – Introducing the 'Monumentality and Landscape: Linear Earthworks in Britain' Project

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Linear earthworks of a monumental character are an enigmatic part of the British landscape. Research in Britain suggests that such features range in date from the early 1st millennium BC to the Early Middle Ages. While the roles of these monuments in past societies cannot be understated, they remain a relatively under-researched phenomenon. This article introduces the Leverhulme Trust-funded 'Monumentality and Landscape: Linear Earthworks in Britain' project, which aims to provide a comparative study of linear earthworks focusing on those dating to the Iron Age and early medieval period. This contribution reviews our approach and shares preliminary results from the project's first year, identifying wider implications for the study of linear earthworks.

Keywords: linear earthworks; method; Iron Age; early medieval; social complexity

Introduction

The process of dividing the landscape of Britain with linear earthworks is a longstanding one. Varying in scale and form, these delineations are represented by a range of earthworks, from prehistoric pit alignments, Late Bronze Age linear boundaries and early Iron Age cross-dykes to early medieval monumental earthworks. These, often substantial, structures have been argued to serve multiple and overlapping roles including, but not limited to, territorial boundaries, barriers to control movement and/or political frontiers. Whilst recognising the social significance of earthwork construction in the Late Bronze Age and early Iron Age, in Britain many of the most substantial earthworks appear to date to the Late Iron Age and the Early Middle Ages. Yet there has been limited discussion of the extent to which these constructions reflected contrasting or comparable changes in these societies, potentially marking a shift to delineating areas of landscape alongside a demonstrable ability to mobilise and organise large workforces.

This article introduces the 'Monumentality and Landscape: Linear Earthworks in Britain' project, which aims to provide a comparative study of the often-monumental banks and ditches of the Late Iron Age and Early Middle Ages. Following a review of past research, the aims, research framework and methodology of the project is presented, followed by preliminary observations of data collected for south-east Britain. The article concludes with an outline of further research to be undertaken throughout this three-year project.

Offa's Dyke Journal volume 3 2021
Manuscript received: 25 August 2021
accepted: 25 October 2021

Past research

Research in Britain suggests that there were several phases of linear earthwork construction: the early 1st millennium BC, the Late Iron Age and the early medieval period. Although linear features in the landscape are known from as early as the Mesolithic in Britain and pit alignments and linear earthworks are well known from the Late Bronze Age (Bradley *et al.* 1994; McOmish *et al.* 2002; Murray *et al*. 2009), a spate of monumental linear construction also took place in the Late Iron Age, some related to the phenomenon known as *oppida* (Haselgrove 2016; Moore 2020). While earthworks dating to the earlier 1st millennium BC seem to form part of the demarcation of the farming landscape and perhaps increasing territoriality, those of the Late Iron Age appear to have been part of a different phenomenon. The earthwork systems around the *oppida* extend in some cases for many kilometres, as at Colchester and Chichester, not simply seemingly delimiting settlements but defining areas of dispersed activity and landscape (Haselgrove 2000; Moore 2012; 2017; Garland 2017). These appear to signify a major transformation in the scale and organisation of these societies coinciding with the appearance of greater evidence for kingship, in the form of rich burials and inscribed coinage (Hill 2007; Moore 2017). Associated with these Late Iron Age complexes are a range of other linear earthworks, of monumental form, which appear related to them. Examples include the Scots Dike (North Yorkshire) and the Devil's Ditch (Sussex), each extending for at least 10 km. The role, date and even extent of some of these earthworks remains enigmatic and contentious, yet they appear to have been part of a Late Iron Age use of earthworks to demonstrate the power of emerging polities.

Constructing monumental linear earthworks in the early medieval period has been interpreted within two principal explanatory frameworks. The first places these features in a late fourth- or early fifth-century context of disintegrating Late Roman administration and emergency measures put in place to attempt to fend off Germanic incomers (Myers 1964; Fowler 2001). While the second proposes that they reflect the emergence of the earliest medieval kingdoms in the seventh and eighth centuries, perhaps sometimes related to historically documented events (Reynolds and Langlands 2006; Ray and Bapty 2016; Reynolds 2020: 273) and in some cases repurposing enduring prehistoric earthworks (Bowden 2005: 35–37).

Our current knowledge comes from a series of selected studies of individual earthworks, shown usually to be of either Iron Age or early medieval date. For the Iron Age, these include Ave's Ditch, Oxfordshire (Sauer 2005), the Oxfordshire Grim's Ditches (Bradley 1968; Copeland 1988; Cromarty *et al.* 2006) and the multiple ditch systems of East Yorkshire (Fenton-Thomas 2005; Fioccoprile 2015). Meanwhile, for the early medieval period, considerable attention has been paid to the well-known earthworks of Offa's Dyke (Ray and Bapty 2016; Malim 2020) and Wansdyke (Fox and Fox 1958; Reynolds and Langlands 2006) but relatively little about other linear monuments (but see Grigg 2015). Despite this division, both chronological and scholarly, individual

studies have investigated the longevity of certain earthworks. Some, such as Shire ditch, Herefordshire and some of those earthworks in Cambridgeshire, previously assumed to be early medieval earthworks shown to have origins in the Late Bronze Age or Iron Age (Barber 1999; Bowden 2005; Mortimer 2017).

The socio-political importance of linear earthworks is evident in part by the fact that they form part of a wider phenomenon visible in both Ireland (e.g. Armit 2007; O'Drisceoil *et al.* 2014) and Continental Europe (e.g. Dobat 2008; Tummuscheit and Witte 2019). However, in Britain these earthworks remain an under researched phenomenon in relation to other features, but also in comparison to each other. Indeed, scholarly enquiry has tended to focus upon individual features or regionally distinctive groupings (e.g. the Cambridgeshire Dykes: Malim 1997). The neglected nature of these linear earthworks can be attributed in part to the difficulty of investigation (e.g. Williams and Delaney 2019: 1–5). Current knowledge largely derives from the most substantial and best-preserved examples, mainly studied in relative geographic and chronological isolation (e.g. Aves Ditch: Sauer 2005; Offa's Dyke: Ray and Bapty 2016). While recent research has produced some useful national overviews, the focus has often concentrated on the discussion of specific periods at the expense of others (i.e. Bell 2012; Grigg 2015). In part, these chronological concerns stem from insecure dating evidence, which makes cross-comparison difficult. However, it can also be suggested that the main reason for the lack of a more in depth cross-period comparative study is due to the compartmentalised study of 'cultural' periods as traditionally defined in British Archaeology. As such there has been a historiographic tendency to focus on the early medieval role of these earthworks, either to link them specifically to this period and/or specific events.

The 'Linear Earthworks in Britain' project aims to rectify the imbalance of previous research by a thorough reassessment of the corpus in its wider landscape and cultural context (UCL and Durham University 2020). This article outlines the aims and approaches of this venture as well as some preliminary observations from the investigation of these earthworks so far. While the outputs of academic projects largely follow completion, the impact of the Coronavirus pandemic has restricted our ability to engage with fellow scholars through conferences and other presentations. This publication seeks to connect with interested parties and to solicit feedback in the early stages of our project to enhance our approach to data collection and modes of analysis.

Introducing the 'Linear Earthworks in Britain' project

'Monumentality and Landscape: Linear Earthworks in Britain' is a Leverhulme Trust-funded three-year research project hosted by the UCL Institute of Archaeology and the Department of Archaeology, Durham University (UCL and Durham University 2020). Our project seeks to understand how and why human societies chose to delineate landscape in such a highly visible form and why such socio-political behaviour is evident particularly in the Late Iron Age and the Early Middle Ages. While we note

the significance and will record earlier linear monuments, including Late Bronze Age earthworks such as the so-called ranch boundaries, pit-alignments and cross-ridge dykes found in many regions, our project focuses on considering the wider context of the more substantial Late Iron Age and early medieval linear features. Our investigation will assess social complexity through the lens of societal and organisational capacity and shed light on a fundamentally important shift in human behaviour and political identity during each of these periods. We do not have the space here to fully explicate the complexities of the comparative aspects of our project, but there are many parallels to be drawn between these two periods. These factors include comparable political territories in spatial terms, coin use, evidence for social elites with similar material expressions (i.e. burials), the building of fortifications and the emergence of urban places. Although beyond the scope of this interim publication, exploring such comparisons has fundamental implications for understanding the landscape of Britain, including more generally the ways in which social, political and territorial identities emerged and changed over time. A further aim of our project is to establish whether a clear scale-change in monument construction can be detected both within later prehistory as well as before and after the Roman period.

Despite prior research, there remains a fundamental need to understand the range and nature of linear earthworks across Britain, the major monuments having attracted the greatest attention over the years. Our project will gather information from across Britain to compile a standardised national dataset, which will allow us to characterise the physical attributes of these earthworks and to establish a geographical distribution which can be compared to a range of topographical and archaeological phenomena. In addition, by collecting data for all the known archaeological investigations for each linear earthwork we will be able to determine the nature and quality of dating evidence for each and—where possible—to establish a clear chronology of individual earthwork biographies over time. With such an overview in place, we will then seek to distinguish relationships between linear earthworks, the natural environment and evidence for human occupation on a regional level, in part by carrying out high-resolution survey and targeted archaeological investigation. The regional data will be contextualised at a local scale by examining specific case studies alongside other known archaeological evidence such as settlement patterns, field systems and distributions of material cultural relating to specific social and cultural groupings. At this local scale, these methods will also allow us to study the role of linear earthworks as part of wider social and political changes across these periods.

The project began in March 2020 and runs until March 2023. During our first year we have assessed in detail the surviving evidence for linear earthworks in south-eastern Britain and collated records of all known archaeological fieldwork concerned with these monuments. Below we outline the progress of the project in the first year, including our consideration of how we define these monuments, the structure of the national dataset and insights from our initial data collection.

Definition and interpretation

The study of linear earthworks has resisted imposing a strict definition on the form and/or function of such monuments, and instead presents a wide array of descriptions and interpretations. In part, this diversity has been inspired by the differences observed within period-specific research traditions. Linear earthworks of the early 1st millennium BC in south central Britain have often been characterised as 'ranch' boundaries (Crawford and Keiller 1928; Hawkes 1939; Cunliffe 2005: 420–422). Interpretations of their roles varies; some regard these as part of a greater emphasis on pastoralism (Cunliffe 2005: 589) or perhaps delineating agricultural estates (McOmish *et al.* 2002: 64–65). Most argue these features acted as a form of territorial definition (Fowler 1964; Sharples 2010: 46) with the location of some relating to Iron Age hillforts (Cunliffe 1994). Other, smaller, linear earthworks known as cross-dykes probably defined areas of settlement or for the corralling of animals (Sharples 2010: 45–46) while others, like that at Kidlandlee, Northumberland, might have been used to control existing routeways (Oswald 2010). There has also been an increasing discussion of the role of linear earthworks in facilitating and controlling movement of livestock both in southern Britain (Tilley 2004) and for the complex of linear earthworks in East Yorkshire (Fioccoprile 2021). Interpretations of some other, seemingly Late Iron Age, linear earthworks have been variously described as representing 'tribal' (Sauer 2005; cf. Moore 2011) or territorial boundaries (Lambrick 2009: 70), while more complex systems have been interpreted as defining the extents of territorial *oppida* (Haselgrove 2016; Garland 2017; Moore 2020). By contrast, and as discussed below, early medieval scholarship proposes additional explanations focusing on their defensive and militarised aspects (Reynolds 2013) or the formalised delineation of borderlands into physically attested frontiers (Ray and Bapty 2016; Reynolds and Brookes 2019).

That period-based perspectives have produced contrasting theoretical and conceptual approaches is a matter of considerable interest in our enquiry (Moore *et al.* in prep). While many prehistorians increasingly regard one aspect of Iron Age linear earthworks as channelling movement through the landscape (Fioccoprile 2021), defining areas of assembly or choreographing new forms of power (Moore 2012; 2017; Garland 2017; 2020), contemporary early medieval scholarship regards these monuments as expressions of the boundaries and/or frontiers of early medieval kingdoms constructed with a raft of specific intentions (Reynolds and Langlands 2006; Ray and Bapty 2016). The scale and naming of many of the major early medieval dykes, for example, allows them to be read as a means of creating and imposing political identity through collective action either voluntarily or, perhaps more likely, in the context of increasing ties of lordship and legal obligation (Reynolds and Langlands 2006; Reynolds 2013). Wansdyke and Offa's Dyke appear to be named with reference to a deity or ancestor, while the very many 'Grim' names found in association with such earthworks can be seen to be of equivalent type, with Grim representing a cognate of Woden among Germanic societies (Stevenson 1902, 629, n. 10). In addition, a strong case has been made that both the eighth century King Offa and his eponymous dyke were named after a heroic ancestor found in the earlier (probably 6th

century) figure found in the Mercian royal genealogy (Yorke 2005, 16). By combining the approaches of prehistorians and early medievalists, our large-scale comparative analysis will examine these periods together, thus providing an opportunity to understand how the construction of linear earthworks was connected to the emergence of complex societies. This approach also addresses the chronological complications that are so often ascribed to these linear earthworks. While previous research has tended to consider linear monuments as period-specific and from a socio-political perspective, the scale and physicality of these earthworks indicates that, once built, they had the capacity to structure landscape organisation in subsequent periods. It is also possible in later periods to define a series of specific behaviours in relation to linear features, including conflict, assembly, fairs and public execution (Brookes and Reynolds 2019).

The ambiguity of interpretative terminology is visible also in the disparity between definitions across UK-based heritage bodies. In England, the characterisation of linear earthworks falls within period specific boundaries (Historic England 2018a) or as representative of particularly large-scale examples (e.g. Offa's Dyke) (Historic England 2018b). While Historic Environment Scotland (HES) highlights the 'substantial' nature of these features, the definition specifically relates to dividing "adjacent landholdings" (Historic Environment Scotland 2021). The division of landholdings is equally present in the definition provided by the Royal Commission on the Ancient and Historical Monuments of Wales (RCHAMW), with the caveat that the majority 'date from the late Bronze Age and Iron Age' (RCAHMW 2021). In each instance, these variations likely reflect local and regional differentiation in the archaeological evidence, as well as denoting dominant assumptions about the role of these monuments.

Consequently, for the purposes of our project the definition of linear earthworks remains necessarily broad as: a substantial demarcation of landscape in the form of monumental banks and ditches of varying morphology dating to the period between c.800 BC to c. AD 800. As part of the project we expect to produce a classification with metrological parameters. The chronological range of our project allows us to explore earthworks over the longue durée, while focusing on those that traditionally date to the Iron Age and early medieval periods. At this stage, we have excluded earthworks designated as 'cross-ridge dykes', in part due to the large numbers found in the UK, but also due to their evident topographical distinctiveness as a monument type. Within several case study regions, we aim to assess the evidence for linear earthworks dating to the period c. 800 BC to c. AD 800 alongside the evidence from the Bronze Age, and features such as cross dykes to assess the relationship between these different earthwork types. This approach allows us to contextualise linear earthworks against the wider temporal and spatial use of linear earthworks to define landscapes over time.

Research framework

Our project will provide for the first time a British corpus of linear earthworks within a relational database to understand the shaping of the British landscape. This national corpus represents the largest of three scales of analysis undertaken by the project. This

will be followed by an exploration of topography, movement and landscape position through eight regional case studies and finally their relationship to the emergence of polities and social transformation through four local case studies. The principal output will be a print and online *Atlas of Linear Earthworks in Britain*.

The baseline data for the extent and character of all British linear earthworks is being obtained from national historic environment records (HERs) including the National Record of the Historic Environment (NRHE), Canmore: National Record of the Historic Environment for Scotland and the National Historic Assets of Wales (Cadw). For specific regions, the initial data collection is being supplemented with data from local HERs, to provide the spatial extent of individual earthworks and references to any associated archaeological fieldwork. The importance of consulting local and national HERs reflects the wealth of new information uncovered through developer-funded archaeology. Similar recent British research-led archaeological projects have demonstrated the advantages of understanding archaeological monuments and landscapes through the consultation of archaeological grey literature (Fulford and Holbrook 2011; 2018). For linear earthworks, many of the small-scale archaeological investigations undertaken in developer-funded environments have received limited publication and little synthesis in relation to wider archaeological and historical knowledge (see below). The collation of all known data for linear earthworks across specific regions will allow us to enhance existing local and national HERs by depositing our findings once the project is complete.

The relational database was created within a PostgreSQL database management system and has been designed to incorporate several, multiscale, cross-referenced data tables (Table 1). The database will incorporate information relating to individual earthworks, as commonly defined in existing monument records (e.g. Grim's Dyke) and, where available, specific archaeological investigations along each earthwork. Care has been taken to ensure that the project database is compatible with UK Heritage datasets to allow data sharing following completion of the project. These measures include adhering to the minimum level of information required for recording heritage assets, as outlined by MIDAS (English Heritage 2012), and the use of compatible terminology. Where possible we have utilised accepted vocabularies from the Forum on Information Standards in Heritage (FISH 2020), which is supported by UK and European data infrastructures, via the Ariadne Project (ARIADNE 2012).

PostgreSQL is an open-source object-relational database (PostgreSQL Global Development Group 2021), which can be extended to store and manipulate spatial data using PostGIS (POSTGIS Project 2021). Most major GIS software packages (e.g. QGIS, ArcGIS) and powerful scripting languages (e.g. R, Python) interface directly with PostgreSQL databases to facilitate the use of a wide range of analytical spatial tools and will streamline data analysis. Once data collection is complete we will utilise this sophisticated set-up to examine earthwork morphology and landscape setting, calculate labour estimates for earthwork construction (e.g. Harris 2021) and trace mobility through the landscape in accordance with these physical barriers (e.g. Fioccoprile 2021; Verhagen *et al.* 2019).

Table 1: Outline of database structure

Table name	Table description	Sub-table	Sub-table description
Earthwork	Summary description of overall earthwork		
Intervention	Description of archaeological fieldwork undertaken at specific points along each earthwork	*Investigation type*	Type of archaeological fieldwork (e.g. excavation, geophysical survey, watching brief)
		Dating evidence	Type of dating evidence (e.g. radiocarbon dating, OSL, pottery, artefacts, stratigraphic relationship)
		Earthwork Structure	Arrangement of earthwork features (e.g. ditch and bank, ditch only, ditch with two flanking banks)

To assist with earthwork detection, characterisation and analysis, baseline environmental data will also be collected for each regional area of interest. These geospatial datasets include background mapping (Ordnance Survey mapping – 1:25,000), historic mapping (Historical Ordnance Survey maps of Great Britain – 6-inch and 25-inch editions), aerial imagery (via Edina Digimap), elevation data (primarily airborne LiDAR from the Environment Agency), hydrology, bedrock and superficial geology (British Geological Survey) and historic land use classifications. Earthwork transcriptions from the National Mapping Programme (Historic England 2021) will be consulted if required to assist in mapping the route of linear earthworks.

Preliminary observations

To test the structure of the database, one region of Britain was initially targeted for data collection and analysis. South East Britain, here taken as incorporating the English counties of Oxfordshire, Berkshire, Hampshire, East and West Sussex, Surrey and Kent (Figure 1), was chosen as an area that includes both well-investigated linear earthworks (e.g. the South Oxfordshire Grim's Ditch), but also comparatively under researched regions (e.g. Kent). As it currently stands, the dataset includes 101 separate earthworks and a record of 204 individual archaeological investigations. Labelled here as 'interventions', these entries relate to each specific piece of archaeological fieldwork undertaken at an individual point along each linear earthwork. Details from more general surveys of monuments are included in the database as part of the summary for each earthwork. This dataset provides a suitable sample from which preliminary observations can be made regarding the investigation of linear earthworks across Britain. The following analysis will be updated once the full dataset has been compiled to facilitate an examination of regional patterns of archaeological investigation of these monuments.

Figure 1: Plan of study area with extent of known linear earthworks in south-east Britain. Contains OS data © Crown copyright and database right (2021)

Earthworks

Preliminary data collection for the south-east suggests that there are relatively low numbers of earthworks in most counties, with exceptions (Table 2). High numbers of recorded earthworks appear in both Hampshire and West Sussex and reflect the presence of two Late Iron Age territorial *oppida*: Silchester/Calleva and Chichester/Noviomagus Reginorum respectively. Each of these settlements is defined by an extensive system of linear earthworks each of which has received significant archaeological attention (Williams-Freeman 1934; Bradley 1971; Creighton and Fry 2016; Fulford *et al.* 2016, 2018). These studies have provided detailed investigations of each of the linear earthworks in these large-scale systems which have subsequently been entered into the project database as individual entities.

Table 2: Number of linear earthwork monuments and interventions per modern administrative county

County	Number of earthworks	Number of interventions	Average interventions per earthwork
Berkshire	5	6	1.200
East Sussex	2	0	0
Hampshire	35	80	2.280
Kent	7	13	1.850
Oxfordshire[1]	6	51	8.500
Surrey	8	1	0.125
West Berkshire	12	24	2
West Sussex[2]	26	30	1.150
Total	**101**	**204**	**0.495**

Of the total 101 earthworks, 49 (48.5%) have been subject to archaeological investigation, with an average of two interventions per earthwork, although there is variance between counties (Table 2). The data suggest a high instance of investigation in Oxfordshire in comparison to elsewhere in the south-east, which is unsurprising considering the large number of well-known linear earthworks in the region and the long history of archaeological investigation in that county. Notable among surveys and excavations are those of the North Oxfordshire Grim's Ditches (Harden 1937; Thomas 1957; Fine 1976; Chambers 1978; Copeland 1988), the South Oxfordshire Grim's Ditch (Bradley 1968; Hinchcliffe 1975; Cromarty *et al.* 2006) and Aves Ditch (Sauer 2005). Despite such interest in investigating linear earthworks, the total area of each investigation is very limited. Table 3 shows several representative linear earthworks (one for each county),

[1] Includes information from Oxford City Historic Environment Record.

[2] Includes information from Chichester District Historic Environment Record.

each with an estimated percentage of the feature investigated to date. A proxy was used for the size of each archaeological intervention to allow cross comparison between counties (Trench 2, Brocas Lane Linear – 2m width, 25 m length, 75 square metre area – Fulford *et al.* 2016: 8). This figure was multiplied by the number of interventions along each earthwork and divided by its length. As shown, the overall percentage of a linear earthwork investigated can vary between 0.1–1.1% of its total length. This observation demonstrates that interpretations of the form and date of monuments are based on extremely limited areas/extents of investigation.

Table 3: Representative examples of scale of investigation of linear earthworks in South-East England (rounded to the nearest metre)

Linear name	Number of interventions	Length (m)	% investigated	Reference
South Oxfordshire Grim's Ditch (Oxfordshire)	9	18867	0.09	Bradley 1968
Grim's Bank, West Berkshire	6	3466	0.34	O'Neil 1943
Brocas Lane Linear, Hampshire	2	920	0.43	Fulford et al. 2016
Chichester Entrenchments EWA(i), West Sussex	7	6236	0.45	Bradley 1971
Faesten Dic, Kent	9	1632	1.1	White 2020

Table 4: Number of investigation types for linear earthworks in South-East England

Intervention type	Pre-1990	Post-1990	Total
Excavation	93	29	122
Evaluation	16	14	30
Watching brief	12	10	22
Geophysical survey	0	9	9
Auger survey	1	5	6
Topographic survey	4	2	6
Casual observation	4	0	4
Desk-based assessment	0	3	3
Field visit	1	1	2
Total	131	73	204

Intervention type

Table 4 provides a breakdown of the different investigation type defined for each intervention along the linear earthworks of the south-east. The FISH thesauri for

'Events' was utilised to determine the terminology for each intervention type to ensure conformity across the dataset and standardisation with other heritage databases (FISH 2020).

Archaeological investigations are intrusive by nature (60%, n=122), likely reflecting a desire by researchers to understand structure and/or chronology. Of the total number of interventions (n=204), the majority (64%, n=131) were undertaken before the advent of developer-funded archaeology in the UK, defined here by the introduction of 'Planning Policy Guidance 16: Archaeology and Planning' (PPG16) in 1990. In addition, a larger proportion of interventions prior to PPG-16 were represented by excavations, with a greater diversity in archaeological techniques applied post PPG-16 (Table 4). These changes reflect advances in archaeological methodology in the last 30 years, but also greater protection in that many linear earthworks are now nationally designated heritage assets (Scheduled Monuments), requiring a higher threshold of scrutiny from national heritage bodies before intrusive fieldwork is allowed. Changes in interventions in this region pre- and post- PPG16 reflects the development of archaeological fieldwork in Britain in the last century. Prior to 1990 a larger number of interventions were undertaken by local societies (51%, n=67) or academics (36%, n=47), while post PPG-16 most interventions were undertaken by commercial archaeological companies, likely resulting directly from developer-funded archaeology (62%, n=45).

Interventions: sources of information

Of the main sources of information for each intervention, encouragingly the vast majority (75%, n=149) are fully published. Only 25% (n=55) of the total represent unpublished (grey literature) reports or appear only as personal communications in HER records. Of the interventions that took place in the post-PPG16 era (after 1990, n=73), approximately 67% are unpublished (n=49). Most of these references are drawn from grey literature reports on piecemeal investigations by commercial archaeological companies ahead of development (e.g. North Oxfordshire Grim's Ditch, Charlbury: Wessex Archaeology 2006). Much grey literature is now available online, either via the websites of commercial archaeology companies or via the Archaeology Data Service, although they can be easily overlooked, highlighting the need to consult local HERs, especially for more recent investigations.

Exploring publication outlets (Table 5), almost 50% (n=73) of interventions are published in county journals. This aspect perhaps highlights the geographic isolation in which many linear earthworks were investigated, driven by local research questions (and societies) rather than a wider comparative perspective. The remainder of the published investigations are to be found in various academic volumes and in national journals, such as *Archaeologia*, *Proceedings of the Society of Antiquaries of London* (precursor of the *Antiquaries Journal*) and, in some cases, *Britannia*. While national journals are mostly available online, albeit through subscription services, county journals have a variable

online presence. This aspect makes research difficult in certain regions, especially during the Covid-19 pandemic where access to archives has been restricted.

Table 5: Source for published data for each intervention

Publication type	Number
County journal	73
Book	38
National journal	35
Local newsletter	3
Total	149

Table 6: Source for dating evidence per intervention

Dating evidence	Number
None	119 (58.3%)
Pottery	59 (28.9%)
Stratigraphic	10 (4.9%)
Radiocarbon dating	9 (4.4%)
Lumenescence dating (OSL)	3 (1.4%)
Artefacts	2 (<1%)
Coinage	1 (<1%)
Morphology	1 (<1%)

Dating evidence

Data from the south-east indicate that for most interventions, approximately 58.3% (n=119), no dating evidence (either artefacts or ecofacts) was recovered (Table 6). Although several interventions lacking dating evidence represent non-intrusive surveys, 53% (n=96 of total 180) of interventions produced no dating evidence at all. This general trend emphasises our poor understanding of the chronology of linear earthworks across the UK which, despite advances in dating techniques, has not improved over time. Of the archaeologically dated interventions 71.7% (n= 61 of 85) were undertaken prior to 1990, while 28.3% took place after 1990 (n=24 of 85). Of the interventions with dating evidence, the majority (n=59 of total 85) were characterised by small assemblages of pottery recovered from beneath or within bank deposits (e.g. Wallingford bypass: Cromarty *et al.* 2006), providing an approximate date of construction, or from ditch deposits, representing at least part of the period during which the ditch remained open. Most interventions dated by ceramics (61%, 36 of total 59) were represented by pottery recovered from ditch fills. As many of the earthworks remain partially open to

the present, dating evidence from the ditch fills remains problematic for providing a *terminus ante quem* for earthwork construction.

It is clear from these statistics that only a small fraction of interventions (14.1%, n=12 of total 85) in the south-east region is dated by scientific means, such as radiocarbon dating or optically stimulated luminescence (OSL). Of these, there are only three instances dated prior to 1990, reflecting the growth of the use of scientific dating techniques in archaeology. For most examples where radiocarbon determinations were made, only single dates were obtained, either from environmental material found beneath the bank or in one instance from within ditch fills (i.e. Allen *et al.* 2018). Recent excavations as part of the Silchester Environs Project utilised a suite of radiocarbon dates to provide a clearer chronological picture for linear earthworks surrounding the Calleva *oppidum*. Several environmental samples were analysed for both the Wood Farm and Brocas Land linear earthworks providing dates for each in the Middle to Late Iron Age (Fulford *et al.* 2016). For isolated instances where OSL was utilised (n=3), each example was taken from primary ditch deposits where a bank was absent, usually due to later truncation. OSL dating was undertaken from two different interventions through a probable linear earthwork beneath the city of Oxford (Sturdy 2004); one intervention at St John's College provided a Bronze Age date, while the second at New College School (MOLA 2019) was dated to the Late Iron Age (Oxford Archaeology 2018). The third instance represents the use of OSL to date the Devil's Ditch, Chichester, West Sussex (Doherty and Garland 2015). Due to the high gravel content of the ditch fills, however, the dating method could only provide a broad Iron Age date. Although not ideal, in the case of the Devil's Ditch, disagreement over the date of the earthwork in past investigations could be resolved using this technique (Holmes 1968; Bradley 1969; Bedwin 1982).

Dating evidence: rating

A rating system was devised to enable a rapid assessment of the reliability of dating evidence for each intervention in the database (Table 7). The rating system ranged from 5 (no dating evidence) to 1 (multiple sources of dating evidence including scientific dating). Less than 1% of the total interventions fell into the highest category, with only 21.5% (n=44) ranked 3 or above.

The data demonstrate the scarcity of the application of scientific dating techniques to linear earthworks in the south-east. For securing tighter chronologies it is vital that such techniques are employed in future, particularly considering the materially sterile nature of many earthwork deposits. Moreover, as has been demonstrated elsewhere, linear earthworks are often constructed and developed in multiple phases over time (e.g. Scots Dike: Haselgrove 2016: 25). All opportunities for developing detailed chronological models should be adopted. Detailed strategies for scientific dating should be developed prior to investigation to ensure that multiple methods are applied to individual sequences. A prime example of complex stratigraphy in linear earthworks

and the application of an array of approaches can be seen at the Late Iron Age *oppidum* at Bagendon, Gloucestershire and the investigation of the so-called Dyke 'E' (Moore 2020: 164–171). Here, radiocarbon determinations from land snails were obtained due to poor preservation of organic remains and, alongside a detailed examination of the stratigraphic sequence, suggest that the earthwork likely dates initially to the Middle Iron Age (fourth to third century BC) (Moore 2020: 349–350).

Table 7: Rating system for reliability of dating evidence for each intervention

Rank	Description	Number	%
1 (high)	Robust dating evidence from multiple sources (incl. scientific dating) to substantiate date of earthwork	2	0.9%
2	Moderate levels of dating evidence that correspond with each other to substantiate date of earthwork	8	3.9%
3	One or more types of supporting evidence available found within a secure stratigraphic sequence	34	16.7%
4	Limited supporting evidence to substantiate date of earthwork: i.e. small quantities of material discovered out of context	42	20.7%
5 (low)	No dating evidence present	118	57.8%
	Total	204	100%

Further research

Having completed detailed data collection for the south-east, our project now turns to finalising a characterisation of known earthworks across Britain , incorporating national databases for England, Scotland and Wales. We will then shift focus to several regional studies, collating and analysing comprehensive datasets for each area. Building from the lessons learnt through the collection of data for the south-east, we continue to refine our database structure and to incorporate our findings into planning our second year of research.

Targeted fieldwork is essential to explore the complex chronologies of these monuments and to better understand the long-term biographies of linear earthworks. Adopting a staged methodological approach, sample excavations (of monuments currently being selected) will follow an UAV (unpersoned aerial vehicle) photogrammetry survey of each location, as well as topographic and geophysical surveys of selected areas in and around each excavation trench. Our choice of case studies will focus on poorly dated examples that are likely of a Late Iron Age or early medieval date but will also be determined by a range of factors including regionality, relationships with other features and issues of access. These surveys will complement information gained from excavations about the structure and changes present in different areas but will also allow us to contextualise

the excavation results within a wider understanding of activity both along the earthwork and in the surrounding landscape. Excavations will allow for a detailed examination of earthwork stratigraphy to understand construction of earthworks and sequences of infilling (ditches) and levelling (banks) over time. Most importantly, a detailed program of scientific dating will be devised and employed to build a detailed chronology for each earthwork. Our approach will incorporate multiple methods, where material is available, include new approaches such as optically stimulated luminescence profiling and dating (OSL-PD), which incorporates in-field measurements (Vervust *et al.* 2020) alongside radiocarbon dating and Bayesian modelling (e.g. Hamilton *et al.* 2015). In part, this dating methodology will be achieved via a comprehensive environmental sampling strategy, taking detailed sequences of samples throughout the earthwork stratigraphy. The investigation of archaeobotanical evidence, including pollen and charred cereals, will allow us to build a picture of the environments surrounding excavated monuments and how this changed over time.

In the final year of our project, the evidence from the detailed regional studies and the results of fieldwork will form the basis for several detailed polity-level case studies (i.e. of regions selected to reflect both Iron Age and early medieval political territories). These fine-grained analyses will allow us to interrogate the relationships between earthwork construction and increasingly territoriality and social complexity. Importantly these case studies will also allow us to comparatively explore how and why these societies chose to delineate the landscape in the ways that they did and with such impressive monuments.

Acknowledgements

Our project is generously funded by a Leverhulme Trust Major Research Project Grant RPG-2019-359. We are most grateful to the Trust for their support. Furthermore, we would like to thank the numerous Historic Environment Record officers who provided the data on which this research was based. They are (in alphabetical order) Beth Asbury, West Berkshire Council; Robert Briggs, Surrey County Council; Rose Broadley, Kent County Council; James Kenny, Chichester District Council; Teresa Hocking, Berkshire Archaeology; Jacqueline Pitt, Oxfordshire County Council; David Radford, Oxford City Council; Rachel Salter, West Sussex County Council; Rebecca Seakins; Historic England; Andrew Ward, East Sussex County Council and Alan Whitney, Hampshire County Council. Finally, we would like to acknowledge the useful comments and reactions provided by the two anonymous reviewers.

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