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RURAL LANDSCAPE AND SETTLEMENT IN THE DINAS POWYS ENVIRONS: HIGH-RESOLUTION ANALYSIS OF A ROMAN AND MEDIEVAL POLLEN SEQUENCE AT NANT YR ARGAE IN THE EASTERN VALE OF GLAMORGAN

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Introduction

The analysis of off-site pollen sequences has long been used to explore past patterns in land-use, but studies focused on the Roman and medieval periods have often been constrained by two major methodological problems. First, most pollen studies focus on samples collected from upland contexts, typically blanket bogs, which may be considered marginal to lowland areas that were the focus of settlement and agriculture during these periods. Second, there are usually insufficient numbers of absolute dates from these cores, and this – combined with the broad sampling intervals between pollen counts – means that few studies have achieved a level of chronological resolution that is sufficient to address culture-historical research themes. Our aim in the present study is to address these two problems, presenting the results of the high-resolution analysis of a well-preserved Roman and medieval pollen core from a lowland sampling site situated in a densely settled historic landscape in the Vale of Glamorgan (Fig. 1).

This is the first analysis of a Roman and medieval pollen sequence from a non-coastal lowland context in south Wales, a region which has hitherto been relatively neglected in pollen research (Rippon *et al*. 2015; Davies 2015; 2019; 2022a). Moreover, in contrast to much of Wales and western Britain, where rural settlement evidence is poorly represented in the archaeological record, particularly for the early medieval period, the evolution of rural settlement in the Vale of Glamorgan is comparatively well understood (Fig. 2). The sampling site's environs include the important early medieval promontory fort known as Dinas Powys, whilst key historical sources, such as the charters of the *Book of Llandaff*, provide important evidence for socio-political and economic development in the region (Davies 1978; Sims-Williams 2019). The Vale of Glamorgan was also subject to documented early Norman settlement (Crouch 1985). The pollen core sampled for this study spans the first to thirteenth centuries AD. The fast accumulation rate of the deposits, combined with high-resolution radiocarbon dating, has facilitated a sampling resolution that permits examination of comparatively short-term changes in land-use. This analysis provides particularly important data for examining continuities and change between the Roman and medieval periods in the environs of major settlement foci, including Dinas Powys – an internationally significant settlement with occupation spanning the late fifth to seventh centuries AD. Given the significance of the lowland origins of the data, we first describe the location of the sampling site within the context of the evolution of the historic rural landscape, before setting out the results of the high-resolution pollen analysis. We then consider how land-cover, as reconstructed through the pollen record, may have related to changing patterns of settlement, land-use and associated agro-economic regimes.

The sampling site and its context in the Roman and medieval landscape

The Nant yr Argae core was collected from ST 1307 7170 (Fig. 1). It derives from a spring-fed bog, the exact size of which could not be established in the field due to access limitations but is estimated to be no more than *c*. 40 m in width. Such a bog can be expected to have a comparatively local pollen catchment, providing direct evidence about land-use in the area immediately surrounding the sampling site. The spring lies at 37 m AOD, close to the source of the Nant yr Argae stream, which flows south-east for 1.3 km where it runs into Cog Moor, an extensive area of wetland lying at *c.* 10 m AOD that is also fed by the Cadoxton River and Sully Brook.

The drier ground surrounding the sampling site has been heavily occupied since later prehistory (Fig. 2). Analysis of the spatial distribution of settlement in the eastern Vale of Glamorgan indicates a dense but generally dispersed settlement pattern, with evidence for habitation sites clustering around the boundaries between areas with free-draining and impeded soils (Seaman 2011, fig 5). The *Roman Rural Settlement Project* characterised the Vale of Glamorgan as part of its 'central belt zone' (Smith *et al.* 2016, 16), and there are a number of Romano-British settlement foci within

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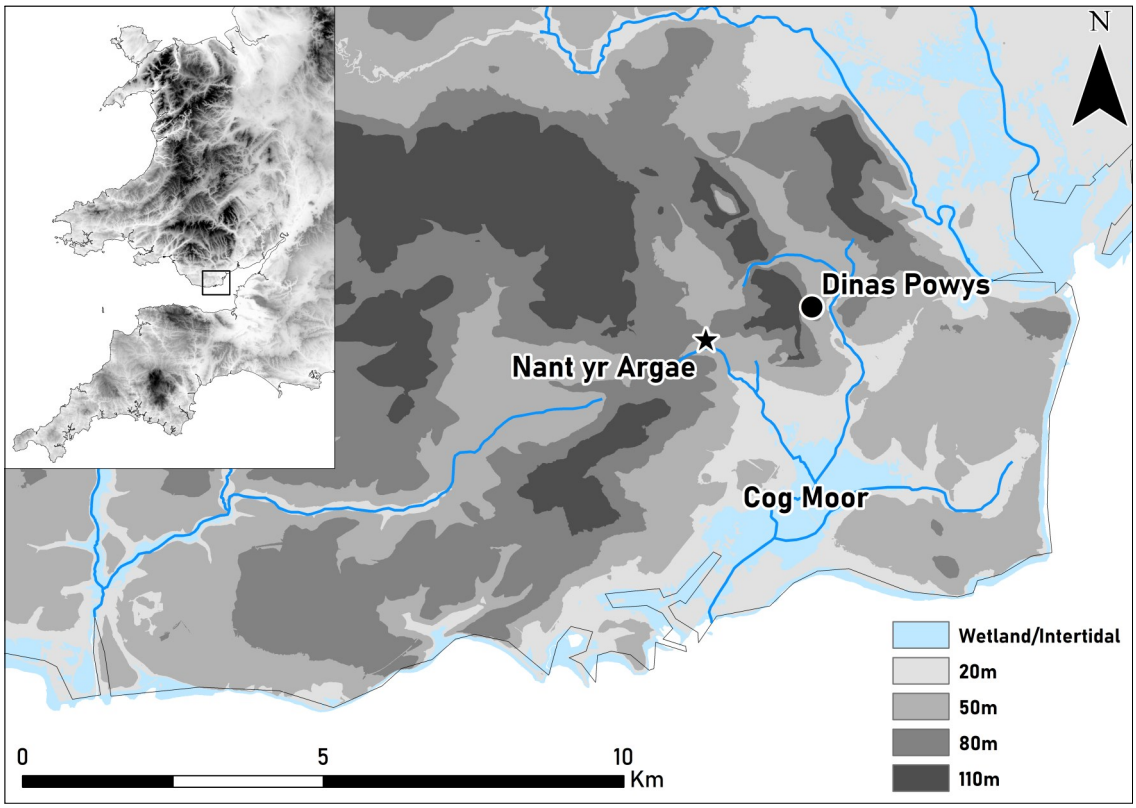

Figure 1 Location map showing sampling site and Dinas Powys promontory fort (figure by Andy Seaman).

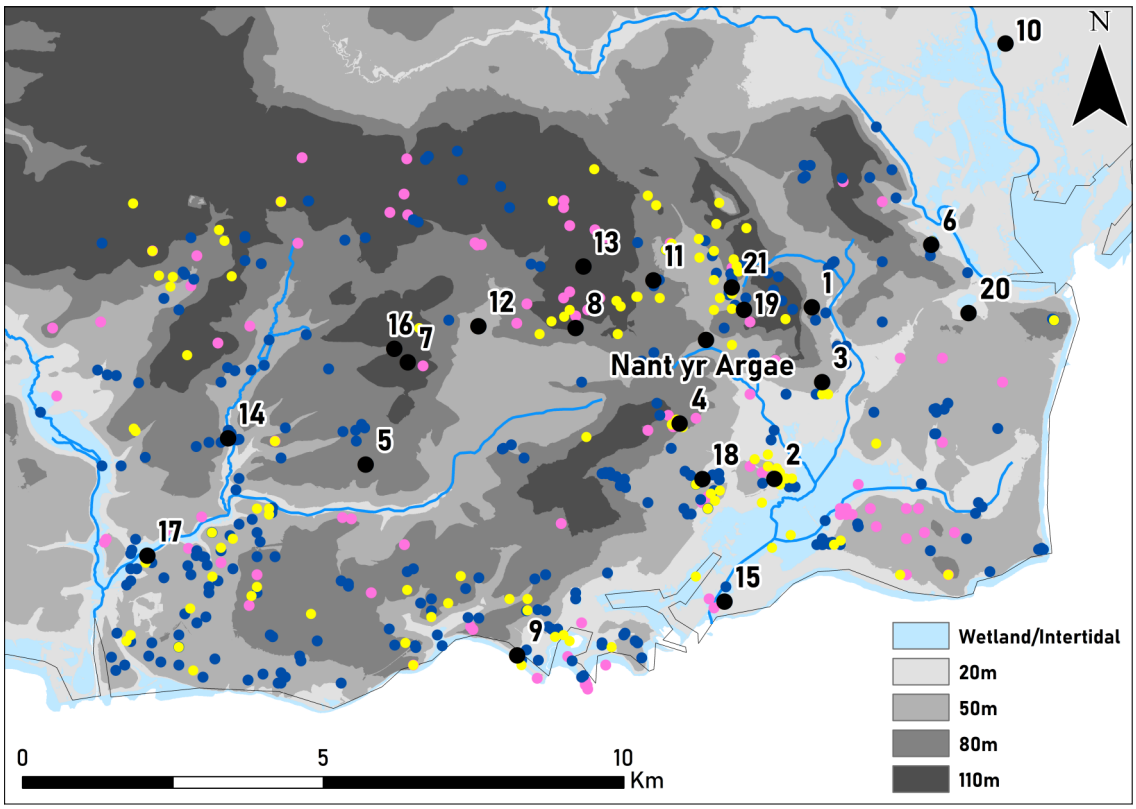

Figure 2 The eastern Vale of Glamorgan, showing the sampling site location and prehistoric (pink), Roman (yellow) and medieval (blue) settlement evidence derived from the Historic Environment Record. Sites mentioned in text: 1. Dinas Powys; 2. Biglis; 3. Dinas Powys Common; 4. Pencoedtre Wood; 5. Moulton; 6. Llandough; 7. Whitton; 8. Goldlands Wood; 9. Cold Knap; 10. Cardiff Castle; 11. Wenvoe; 12. Dyffryn; 13. St Lythans; 14. Llancarfan; 15. Atlantic Trading Estate; 16. Whitton Cross; 17. Fonmon; 18. Cadoxton; 19. Beauville; 20. Cogan; 21. Wrinstone (figure by Andy Seaman).

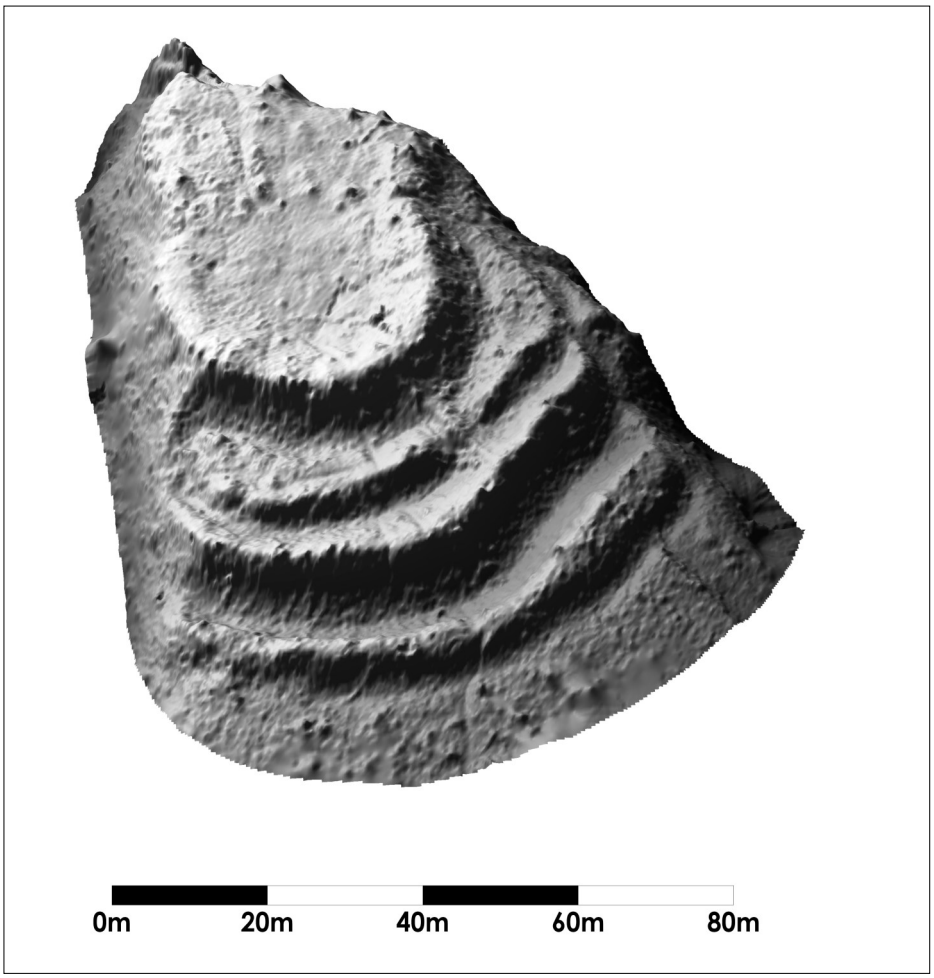

Figure 3 Laser scan of the promontory fort earthworks (figure by Andy Seaman).

the vicinity of the sampling site including farmsteads at Biglis, Dinas Powys Common and potentially Pencoedtre Wood, as well as villas at Moulton, Llandough, and Whitton. There is also evidence for Roman-era lead mining nearby at Goldslands Wood (Evans 2018). Some rural settlements were associated with paddocks and small field systems, and excavated assemblages point to a mixed farming economy in which cattle were prominent alongside sheep/goat and pigs (Evans 2018; Smith *et al.* 2016, 183–191). The wide range of pottery from these rural settlements shows that they were integrated into the market economy (Evans 2018).

Whilst the Vale of Glamorgan is usually seen as part of a civil *civitas* focused on Caerwent (*Venta Silurum,* Monmouthshire, *c.* 40 km to the east), it was separated from the latter by the *territoria* of the legionary fortress at Caerleon and the fort at Cardiff, and it is possible that the Vale remained outside of *civitas* control (Mattingly 2006, fig 10). Indeed, excavations of the villa at Whitton produced evidence for military-style granaries and military/official artefacts, including a silver crossbow brooch (Manning 1975; Jarrett and Wrathmell 1981; Guilbert *et al.* 2024). There are also a late Roman sword scabbard slider and a potential piece of scale armour from Llandough villa (Robinson 1988, 159, 172). Such military/official material is rare at 'civil' villas in Britain and suggests, at the very least, a close interaction between these sites and the regional imperial administration, which should be seen in the light of imperial installations in the region, including a coastal *mansio* at Cold Knap and the fort at Cardiff Castle.

Coin lists and dated pottery assemblages from rural settlements in the Vale generally run into the mid- to late fourth century AD. Theodosian coinage and the latest pottery types are rare and, as is the case elsewhere in southern Britain, firm evidence for occupation beyond the early fifth century is difficult to identify archaeologically. Possible early medieval burials and isolated artefacts are known from a few sites, including Biglis, Ely, and Whitton, and hint at later activity, but there does appear to have been a significant disjuncture in the rural settlement patterns during the fifth century (Seaman 2018, 129–130).

Early medieval settlement evidence is very rare in Wales, but the Nant yr Argae sampling site is unparalleled in its proximity to a well-excavated and dated early medieval settlement. The Dinas Powys promontory fort is located just 1.8 km west of Nant yr Argae. It is the most extensively excavated and richest settlement – in terms of the quality and quantity of the material evidence – dating to the post-Roman period (fifth to seventh centuries) in Wales (Alcock 1963). Dinas Powys was excavated in the 1950s, but re-analysis of the stratigraphy and the finds assemblage alongside a recent programme of radiocarbon dating has significantly enhanced our understanding of its chronology and interpretation (Campbell *et al*. 2023). There is evidence of prehistoric activity, but the promontory appears not to have been occupied in the late Roman period. Early medieval occupation

commenced *c.* 480/500 and continued through to *c.* 650 (Figs 3–4). This phase is associated with impressive earthwork defences, and the artefact assemblage includes high-status imported pottery and glass. Large assemblages of animal bone and non-ferrous metalworking debris indicate regular feasting activity and the manufacture of prestige items, including brooches.

Collectively, the evidence indicates that Dinas Powys was an elite residence, most likely associated with local rulers (Alcock 1963; Campbell 1991; Seaman 2013). It has been possible to reconstruct aspects of the site's political context through analysis of early medieval charters, and it has been argued that the fort lay within a 'petty kingdom' that encompassed the eastern Vale of Glamorgan and Cardiff basin (Campbell 1991, 225; Seaman 2013, fig 5). The Nant yr Argae sampling site would have been located within this territory. The substantial animal bone assemblage consisting predominantly of cattle, sheep/goat and pigs also offers insights into the economy of Dinas Powys. It has been argued that the slaughter patterns represented within a small sub-sample of this assemblage showed that the site received food renders from surrounding rural settlements and was not a home farm (Gilchrist 1988). The provision of food renders was an important feature of early medieval kingship and Dinas Powys could have been provisioned by settlements within its territory (Charles-Edwards 1993, 365–88, 396–99). The strength of these arguments is compromised, however, by a lack of evidence for the exploitation of the wider rural landscape, the small size of the animal bone assemblage, and the bias produced by the excavator's sampling strategy.

Dinas Powys appears to have been abandoned around the middle of the seventh century, at around the same time as the abandonment of many (re)occupied hillforts in western Britain (Comeau *et al.* 2023, fig. 1). After the seventh century, settlement evidence becomes difficult to identify throughout Wales, although continued settlement and farming in the eastern Vale of Glamorgan is well attested through the grants of pre-Norman rural estates recorded in the Llandaff Charters (Davies 1979). The Nant yr Argae core is, for example, located close to rural estates focused on the documented early medieval churches at Wenvoe, Dyffryn, and St Lythans. The grant of the former is recorded in a charter dated to *c.* 1040, and the latter two in a more dubious charter of *c.* 685 (Davies 1979, 102, 127). The tenants of these estates would have paid food-rents, which in the case of the estates recorded in the Llandaff Charters had been granted to the church by royal and lay landholders (Davies 1978, 43–65; Seaman 2019, 156; Comeau 2020, 113–15). We do not know exactly to which churches the estates recorded in the Llandaff charters were granted, but the important documented monasteries at Llancarfan and Llandough are potential beneficiaries (Davies 1978, 21; Knight 2013).

The origins of these and other monasteries in the eastern Vale are poorly understood, but they are generally thought to have been established in the later fifth and sixth centuries, around the same time as Dinas Powys (Edwards 2023, 316). Llandough is located *c.* 4 km east of Nant yr Argae and is thought to have had a close relationship with Dinas Powys (Knight 2005). It lies close to a Roman villa, and excavations of the monastic cemetery have identified a burial sequence extending from the late fifth through to the twelfth century (Holbrook and Thomas 2005; O'Brien Butler and Holt, forthcoming). The monastery at Llancarfan is also thought to have been established in the late fifth or sixth century, but has not been subject to excavation. The twelfth-century *Life of Saint Cadog* suggests that in the immediate pre-Norman period, Llancarfan was associated with a number of small landholdings held by members of the monastic community that were dispersed throughout Llancarfan and neighbouring parishes (Charles-Edwards 2013, 604–5). Recent excavations in the course of modernisation of the Five Mile Lane (B4266), 5 km to the west of Nant yr Argae, have identified evidence for an outdoor assembly site at Whitton Cross, associated with a long-lived cemetery and a large number of corn-drying kilns (Guilbert *et al.* 2024). This lay within the pre-Norman estate of Llancarfan and may have functioned as a tribute collection centre for the monastery. Excavations here produced a substantial animal bone and plant macrofossil assemblage, which Rhiannon Comeau interprets as deriving from a mixed farming economy organised around a system of infield-outfield cultivation (Comeau 2024).

Archaeological evidence for actual early medieval rural settlements is sparse but includes re-occupation of the Roman *mansio* structure at Cold Knap (radiocarbon-dated to between the seventh and twelfth centuries); corn-drying kilns at Atlantic Trading Estate Barry, Whitton Cross, and Fonmon; and a scatter of finds reported to the Portable Antiquities Scheme, including a Viking Age weight *c*. 1.5 km to the south of Nant yr Argae (Comeau, forthcoming; Evans *et al.* 1985; Redknap 2022).

Glamorgan came under Anglo-Norman control in the 1080s and 1090s (Crouch 1985). The Vale was heavily colonised and became an 'Englishry' in which a manorial structure developed rapidly. This contrasted with the 'Welshry' of upland Glamorgan that remained under a Welsh system of tenure (Davies 1987, 96–100; RCAHMW 1991, 11; Stevens 2019, 25–29). Nant yr Argae lay within the lordship of Dinas Powys, focused on the castle *c.* 500 m south of the earlier promontory fort. Archaeological evidence for rural settlement becomes much more visible from the twelfth century with the re-emergence of local pottery manufacture and coin use. There are several manorial centres close to Nant yr Argae, including castles, ringworks, and moated sites. These include Cadoxton, Beauville, Cogan, Wrinstone, and Wenvoe (RCAHMW 1991). The late medieval rural settlement pattern included both isolated farmsteads and nucleated settlements (RCAHMW 1983). Field survey at the small shrunken settlement at Wrinstone (1 km to the north-east of the sampling site) identified a series of crofts associated with enclosures and small open fields (Wrathmell and Vyner 1978). The evidence points to a mixed farming economy, in which pastoralism was again prominent (Forward 2013). Open fields are well evidenced but are not on the same scale as those of midland England (Davies 1954–55). There is little evidence for the use of heavy ploughs that would have produced ridge-and-furrow and selion-shaped fields. Rather, strips within open fields were divided by low turf balks (Davies 1956, 94–96). The pattern of

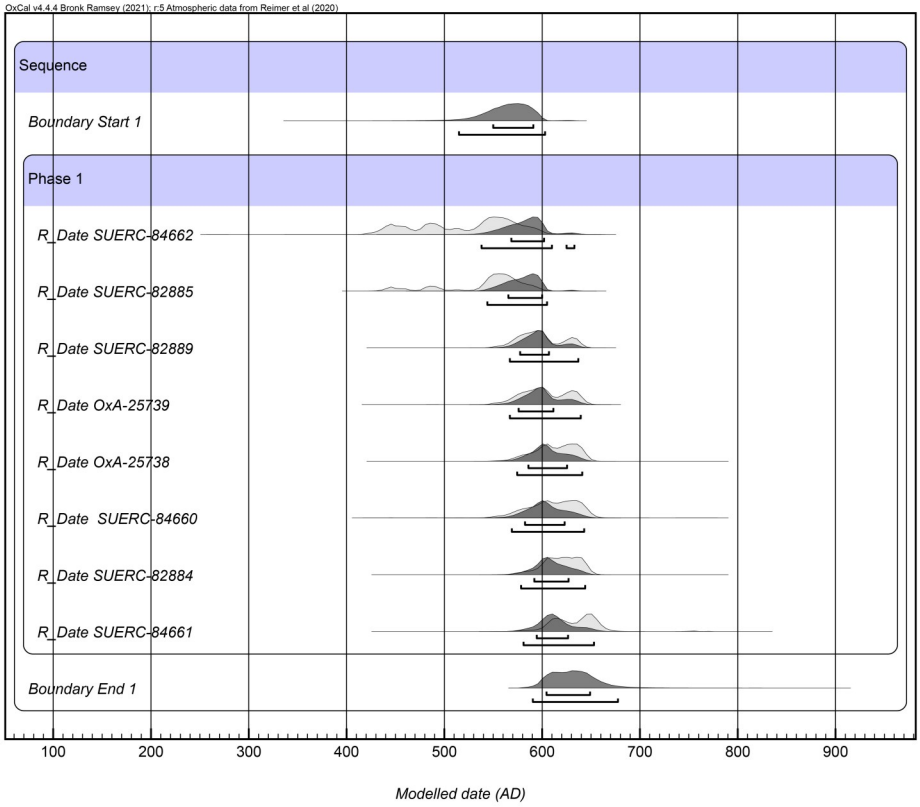

Figure 4 Single-phase model for radiocarbon dates from Dinas Powys (Campbell et al. *2023). Modelled in OxCal 4.4 using the IntCal 20 curve (Bronk Ramsey 2009; Reimer* et al. *2020) (figure by Andy Seaman).*

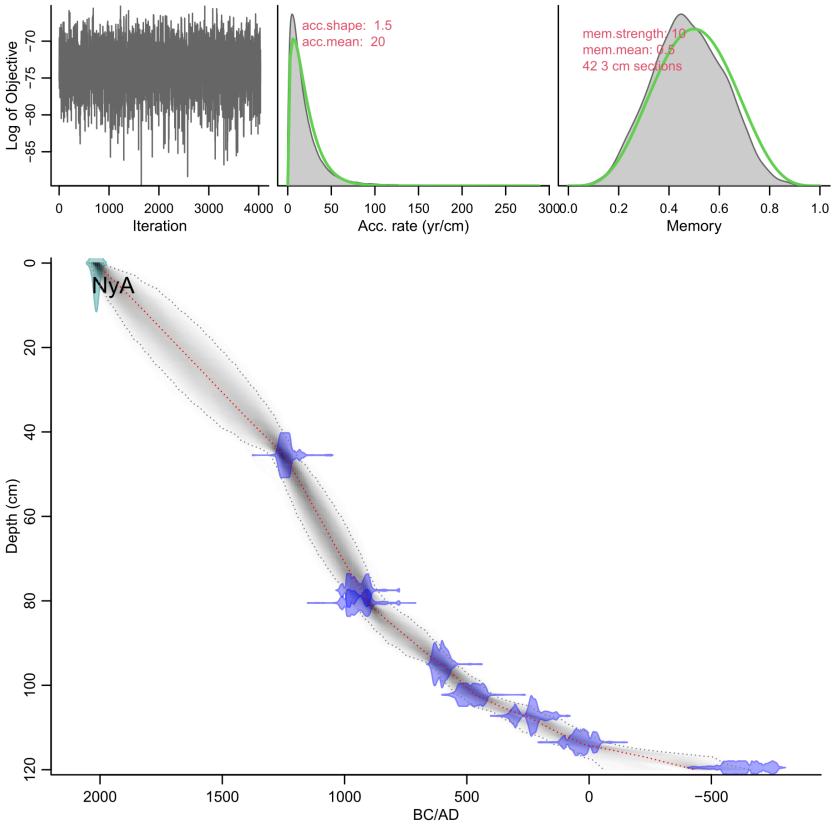

Figure 5 Age-depth model for Nant yr Argae, produced using Bacon 4.0.5 (Blaauw and Christen 2011) (figure by Tudur Davies).

agriculture is likely to have included some system of convertible husbandry (cf. Hall 2014, 89–90).

Pollen analysis methodology

The core was collected in 2013 using a Russian Corer. A pollen preservation assessment and range-finder radiocarbon dating were undertaken as part of a pilot study focused on identifying lowland pollen sites in the Vale of Glamorgan (Davies *et al.* 2015, 166). This identified a sequence of undisturbed peat deposits with strong research potential for the Roman and early medieval periods. Six further radiocarbon dates were obtained as part of the current project and used to construct a Bayesian inferred age-depth model for the core that spanned the first to thirteenth centuries AD (Table 1; Figs 4 and 5). Pollen samples were taken throughout this profile, but a particularly high sampling resolution was obtained for the crucial period *c.* 250–650 (Table 1). These samples were prepared using the standard protocols described by Moore *et al.* (1991). Pollen identification counts were taken to at least 300 terrestrial pollen grains, using a light microscope at 400x and 1000x magnification with the keys provided by Faegri and Iversen (1989) and Moore *et al.* (1991). Cereal-type pollen identification followed the criteria of Andersen (1979). Microcharcoal was quantified alongside pollen identification, counting charcoal fragments by size using a graticule grid as described by Swain (1978). The results are presented in Figure 6 and Table 3.

Discussion

The results of this analysis indicate a generally open landscape throughout the pollen sequence. Levels of pastoral and arable indictors are much higher than those seen in most pollen cores from western Britain, a fact that no doubt relates to the lowland context of the sampling site. Cereal-type pollen grains identified within the core are believed to reflect genuine variability in arable activity as opposed to wild grass variants falling within the same size range as cereal-type pollen. It certainly does not fluctuate in correlation with wetland taxa (e.g. sedge family, meadowsweet, sphagnum moss), which might indicate that it consisted of the most common wild cereal-type variant, *Glyceria* (sweet grass; cf. Andersen 1979). The continuously high levels of cereal-type pollen and other farming indicators suggest that the landscape around the sampling site was continuously farmed, but there are patterns that can be discussed in relation to socio-political and economic changes over time and the evolution of rural settlement in the region described above.

Phase 1: early Roman

This phase is characterised by pollen indicative of a high intensity of both arable and pastoral activity in the neighbouring landscape. Although levels of cereal-type pollen are comparatively low in relation to later phases of the core, they are still substantially higher than in most other pollen studies from upland landscape contexts. Whilst arable indicators remain high throughout this phase, there is an increase in pastoral activity that plateaus in the mid- to late second century. This pattern is evidenced elsewhere in the south Wales region and can feasibly be related to an intensification of agricultural production associated with the imposition of imperial administration (Davies *et al.* forthcoming), including the levying of taxes and production of provisions for the military garrison. Locally this was manifested in the establishment of villa estates and farmsteads in the late first and early second centuries, perhaps under direct imperial supervision. The high levels of pastoral indicators in the pollen record correspond with the large quantities of cattle and sheep bones in zooarchaeological assemblages from sites like the Whitton villa. Levels of wetland taxa are extremely high in the pollen record, possibly reflecting the proximity of the sampling site to large wetland areas at Cog Moors.

Phase 2: late Roman

There is a slight increase in woodland indicators in this phase and a significant decline in pollen indicative of both arable and pastoral habitats, although both remain at comparatively high levels in relation to other pollen studies from Wales. These trends also correspond with other sequences from the region (Davies *et al.* forthcoming) and could be seen within the context of a reduction in the size of the military garrison in south Wales *c.* 300, and the decline in activity at rural settlements from the mid-fourth century. It is important to note that the decline in agricultural intensity seen in this phase *pre-dates* the ending of Roman administration in Britain in the early fifth century.

Phase 3: late Roman to early medieval

This phase spans the crucial late Roman to early medieval transition period and was examined in particularly high resolution (see Table 1). The record at Nant yr Argae is in fact unbroken, with individual samples representing *c*. 20-year increments from the mid-/late fourth to mid-fifth centuries. Locally, it is also the period in which we see a major disjuncture in rural settlement patterns in the fifth century and the emergence of Dinas Powys as an elite centre. The pollen record shows no evidence for an increase in woodland indicators that would suggest large-scale woodland regeneration brought about by the abandonment of agricultural land following the ending of Roman administration. Indeed, this phase sees a slight decline in woodland indicators, whilst the continued presence of cereal-type pollen (at levels that are higher than many other studies in Wales; cf. Davies 2019) and other arable indicators (e.g. yarrow-type and goosefoot family pollen) suggests cultivation very close to the sampling site. Nevertheless, pastoral indicators continue to decline from the high levels seen in the second and third centuries, suggesting an abatement in pastoral intensity, perhaps associated with a reduced military presence, until *c.* 550, when there is a significant and sustained increase in pastoral indicators, followed by a decline in woodland. Locally, this follows the onset of high-status occupation at Dinas Powys *c.* 480/500, and potentially the foundation of monasteries such as Llandough and Llancarfan. More broadly, the late fifth/early sixth century was also the period during which recognisable kingships emerged within western Britain and renewed trade with the eastern Mediterranean is evidenced (Campbell 2007; Seaman, in press). All these factors could be compatible with the pollen signature observed at Nant yr Argae.

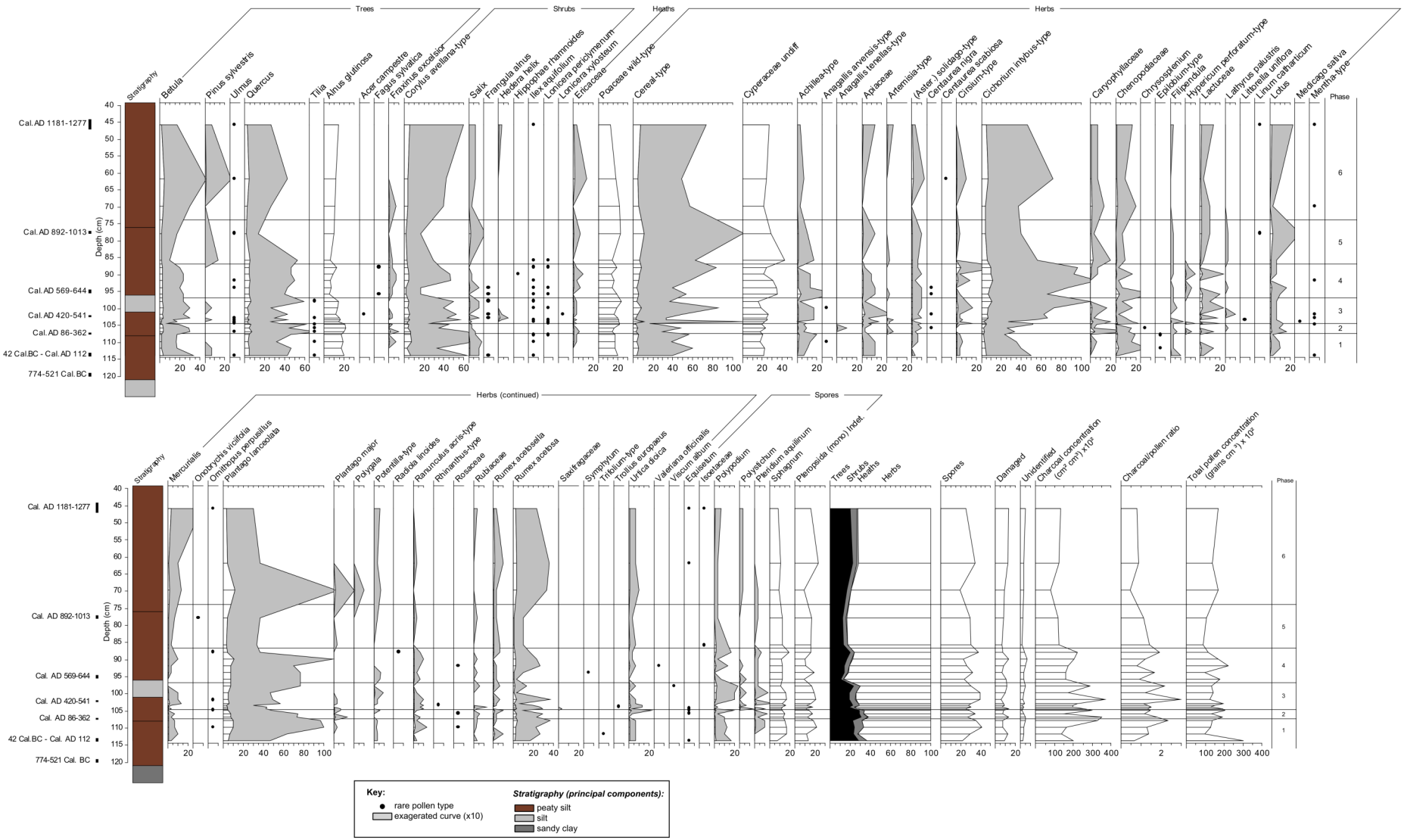

Figure 6 Pollen percentage diagram for Nant yr Argae (figure by Tudur Davies).

Lab ID	Depth (cm)	Radiocarbon date (BP)	Calibrated date
UBA-31925	44–47	802 ± 29	Cal. AD 1181–1277
UBA-35036	77–78	1093 ± 25	Cal. AD 892–1013
UBA-31923	79–82	1096 ± 32	Cal. AD 889–1019
UBA-40988	94.5–95.5	1466 ± 24	Cal. AD 569–644
UBA-40989	102–103	1596 ± 27	Cal. AD 420–541
UBA-?	107–107.5	1817 ± 25	Cal. AD 132–326
UBA-41378	113–114	1987 ± 24	40 Cal. BC – Cal. AD 113
UBA-27801	119–120	2495 ± 28	Cal. BC 773–520

Table 1 Radiocarbon dates. Calibrated using Bacon 4.0.5 (Blaauw and Christen 2011).

Depth (cm)	Sampling frequency (cm)	Date range (approximate centuries AD)	Sampling frequency (years)	Individual sample coverage (years)
45.75–85.75	8–16	mid-/late eighth to mid-thirteenth	*c*. 85–170	*c*. 5–8
85.75–101.75	2	late fifth to mid-/late eighth	*c*. 34–38	*c*. 8–14
101.75–102.75	1	mid- to late fifth	*c*. 33	*c*. 14–19
102.75–104.75	0.5	mid-/late fourth to mid-fifth	*c*. 18–19	*c*. 19–20
104.75–107.75	1	mid-third to mid-/late fourth	*c*. 27–43	*c*. 20–22
107.75–112.75	2	early first to mid-third	*c*. 70–72	*c*. 17–43

Table 2 Sampling frequency and resolution.

Phase 4: late sixth- to mid-eighth-century

The most developed phase of occupation at Dinas Powys in the sixth and seventh centuries corresponds with a decline in woodland, a subtle increase in arable indicators, and sustained high levels of pastoral indicators. This phase also witnesses a distinct increase in wetland indicators as it progresses. Dinas Powys was abandoned around the middle of the seventh century, but pastoral indicators do not start to drop until the early eighth century, before stabilising around 750. The reduced woodland and increased arable indicators support the argument that the end of hillfort (re)occupation – which can be traced across western Britain at this time – was not associated with a major collapse of society or abandonment of this landscape (Comeau *et al.* 2023). Rather, the evidence for decreased pasture suggests that *after* the end of occupation at Dinas Powys there was a shift towards a farming economy focused on arable, albeit still within an overall pattern of mixed agriculture (Edwards 2023, 186). This could relate to a wider trend towards the 'cerealisation' of agriculture in Britain which commenced during the economic revivals of the 'long eighth century' (*cf.* Rippon 2010; Davies 2019; Forster and Charles 2022).

Phase 5: mid-eighth- to mid-tenth-century

This phase sees a stabilisation in levels of woodland and pasture, before a drop in wetland indicators and a spike in arable, which remains high throughout the phase. The drop in wetland indicators might suggest changes locally at Biglis and Cog Moors, but the overall trend is one of continuity, particularly in levels of pasture.

Phase 6: pre-Norman to late medieval

The pre-Norman to late medieval sequence at Nant yr Argae is important since it fills a gap in the geographical coverage for studies dating to this period (cf. Davies 2022a). This phase at Nant yr Argae can again be largely understood in terms of broad continuity of high levels of arable and pasture, although there is a subtle but steady rise in woodland. This small rise in woodland taxa may suggest either small-scale localised reforestation or reforestation on a larger scale further

Local pollen phase	Core depths (cm)	Approximate date (centuries AD)	Description
1	113.75–107.25	Early first to mid-third	Very open landscape with Non-Arboreal Pollen (NAP) dominated by Poaceae wild-type (grass) and Cyperaceae (sedge) and high levels of cereal-type, *Cichorium intybus*-type (Chicory-type, including dandelion), *Plantago lanceolata* (Ribwort Plantain) and *Rumex acetosa* (Common Sorrel). Increasing levels of *Plantago lanceolata* and *Rumex acetosa* with decline in *Cichorium intybus*-type throughout the phase. Woodland taxa possibly decline at the very start of the phase and are dominated by *Alnus glutinosa* (Alder) with lower levels of *Corylus avellana*-type (Hazel-type), and lower levels of *Quercus* (Oak) and *Betula* (Birch). *Sphagnum* and *Pteropsida* (mono.) indet. values also moderately high.
2	107.25–104.5	Mid-third to late fourth	Slight increase in woodland taxa, including *Betula*, *Quercus* and *Alnus glutinosa* alongside declining values for *Plantago lanceolata* (a substantial decline) and lower Poaceae (wild grass) values. Lower average values also noted for Cereal-type pollen and *Rumex acetosa* and lower *Achillea*-type, Apiaceae, *Cirsium* and Chenopodiaceae. Increased microcharcoal concentrations noted, though started at very end of previous phase.
3	104.5–96.75	Late fourth to mid-/late sixth	Declining percentages of woodland taxa (*Betula*, *Quercus*, *Alnus glutinosa*) with corresponding increase in Poaceae (wild), *Cichorium intybus*-type, Lactuceae, and an initial slight increase in Cyperaceae though subsequently declines. Average values for cereal-type pollen higher in this phase. Grazing indicators initially fluctuate, with a trough in *Plantago lanceolata* at the start of the phase but pronounced increased *Plantago lanceolata* percentages observed at its end at a depth of 97.75 cm (*c*. 550).
4	96.75–86.75	Mid/late sixth to mid-eighth	Further decline in woodland levels are noted, which include a substantial decrease in *Alnus glutinosa* and reduced *Corylus avellana*-type. These taxa recover slightly towards the end of the phase, but *Alnus* does not reach previous levels. *Quercus* percentages also increase at the end of this phase alongside the recovery in *Corylus* and *Alnus*. Continued high levels of *Plantago lanceolata*, reaching a peak at a depth of 89.75 cm (*c*. 700), followed by a sharp decline at 87.75 cm (*c*. 735). Gradual increase in cereal-type pollen.

Table 3 Results of pollen analysis (continued on following page).

Local pollen phase	Core depths (cm)	Approximate date (centuries AD)	Description
5	86.75–73.75	Mid-eighth to mid-tenth	Decline in woodland percentages largely caused by fall in *Alnus glutinosa* percentages, but reduced *Betula* and *Corylus avellana*-type pollen and a fall in *Quercus* percentages is also noted alongside a slight increase in *Salix* at the end of the phase. Reduced *Plantago lanceolata* noted at the end of the previous phase marks the start of a period of lower values for pastoral indicators on the whole, including *Cichorium intybus*-type and *Rumex acetosa*. An increase in the average values of cereal-type pollen is observed in this phase. Microcharcoal concentrations also fall at the start of this zone.
6	73.75–45.75	Mid-tenth to early thirteenth	Woodland regeneration (notably *Betula*, *Quercus* and *Corylus avellana*-type and slight increase in *Alnus glutinosa* and *Pinus sylvestris*) alongside a slight increase in heath pollen. Spike in *Plantago lanceolata* at the start of the zone but then falls to previous levels. Increasing *Cichoriym intybus*-type pollen and *Rumex acetosa* pollen may indicate overall increase in pastoral activity in comparison to the previous phase. Initially, lower cereal-type pollen is observed, but this recovers slightly later in the zone.

Table 3 continued.

away (i.e. elsewhere in the region). There is no evidence for a significant shift in agriculture or localised abandonment of the landscape following the establishment of Anglo-Norman control. It is possible that, locally at least, the creation of the Englishry was associated with a continuity of the agricultural systems established during Phase 5, as suggested elsewhere in Wales at this time (Davies 2022a). The increase in woodland indicators is seen elsewhere in the region (Davies 2022a; Davies *et al.* forthcoming); for example, within Bannau Brycheiniog, where it has been attributed to the creation of the Great Forest of Brecknock (Davies 2022b, 48), established in the late eleventh century as aristocratic hunting grounds (cf. Leighton 2012, 129). It is possible that the creation of deer parks in the Vale of Glamorgan could also account for the increased percentages of woodland taxa observed at Nant yr Argae. Although medieval deer parks are poorly documented in south Wales, an area of woodland known as 'Park Wood' that is defined by a substantial medieval boundary to the north-west of Dinas Powys Castle could be identified as a potential example.

Conclusions

In this article we have presented the most comprehensive analysis of a pollen core spanning the Romano-British and early medieval period from a lowland context in south Wales. The rural settlement pattern within the vicinity of the sampling site is comparatively well understood, and this is also the nearest dated pollen sequence to a known early medieval settlement in Wales. Moreover, intensive radiocarbon dating combined with Bayesian age-depth modelling and high-density sampling for pollen counts has allowed us to present a high-resolution description and interpretation of the sequence. In doing this, we respond to Petra Dark's (2022) important critique of previous pollen studies of the Roman to early medieval transition period, where low resolution – and sampling locations that were marginal to occupied landscapes – can be shown to produce potentially misleading results. We have achieved a resolution of *circa* twenty years or less for the crucial period between the mid-third and mid-seventh centuries, although the sampling resolution for other sections of the core is lower. The pollen record for this period shows considerable fluctuation both before and after the ending of Roman administration in the early fifth century, and the sequence cannot be understood within the confines of simplistic models of 'continuity' *vs.* 'change'. We do not see evidence for large-scale woodland regeneration indicative of total abandonment of agricultural landscapes in the fifth century. Rather, there was significant change *within* the late Roman period, perhaps associated with the withdrawal of much of the military garrison around AD 300. Although there is an apparent abandonment of many (perhaps most) Roman rural settlements in the region at this time, a continuity of farming can be demonstrated, albeit at a lower level of intensity compared to that seen during the second and third centuries and after the sixth century.

The strong pastoral signature seen in the sixth and seventh centuries corresponds with the *floruit* of Dinas Powys and is in keeping with our understanding of the site's zooarchaeological assemblage and the importance that can be attributed to animal husbandry in the post-Roman period more generally (*cf.* Davies 1982, 39; Edwards 2023). This adds evidence to the argument that the wealth of Dinas Powys was grounded in a local agricultural base (Alcock 1963, 34–72; Gilchrist 1988) and contrasts with Gresham's (1965, 127–128) characterisation of the site as a 'nest of robbers'. Thus, whilst we have not yet identified contemporary rural settlements and field systems, it is likely that Dinas Powys received food renders from a network of lower-status sites within its environs. The abandonment of Dinas Powys around 650 is followed by a period of woodland regeneration alongside increased arable indicators and continued high levels of pastoral indicators. As such, it cannot be understood in terms of a major breakdown in the farming economy, such as depopulation associated with Justinianic plague (*cf.* Campbell 2007, 132).

Rather, the move away from hillforts appears to have been followed by a broader social and economic transformation that included changes in the focus of farming practices and settlement re-organisation (Davies 2019, 185–189). For example, Nancy Edwards has recently argued for widespread settlement shift and an expansion of field systems in the seventh and eighth centuries (Edwards 2023, 186), drawing upon excavation and survey data from rural settlements such as Rhuddgaer on Anglesey as evidence (Hopewell and Edwards 2018). The majority of Edwards' evidence comes from north-west Wales, but the Nant yr Argae pollen sequence suggests that similar processes were also taking place in the south. In south-east Wales, this was also broadly the period when a regional kingship encompassing the whole of the region developed, and when ecclesiastical states were expanding (Davies 1978); the greater wealth that can be derived from production of cereals could be seen within this context (McCormick 2008). The move towards increased 'cerealisation' during this period is also observed in regional summaries of pollen data across both England and Wales (Davies 2019; Forster and Charles 2022). Indeed, this reflects broader changes in landscape and society observed during the 'long eighth century', when transformations in settlement practices and farming intensity can be observed across western Europe and the Mediterranean (cf. Hansen and Wickham 2000).

Archaeological evidence for rural settlement in the period between the eighth and eleventh centuries is extremely limited in south Wales, but there is good historical evidence for the continued management and cultivation of the landscape. The resolution of our core is lower for this period and much variation could be masked, but the overall picture is one of broad continuity, perhaps rooted in the establishment of long-lasting agricultural systems in the eighth and ninth centuries. Whilst the sampling resolution is again low, we see little evidence for major disruption associated with the Anglo-Norman conquest. Neither do we see evidence for the reorientation of the economy towards the production of cereals when the Englishry was established in the post-Conquest period (cf. Stevens 2019, 24–27). Rather, it appears that changes in landownership and tenure were associated with a general continuity of agricultural practice that conforms with wider regional studies (cf. Davies 2022a). This supports R.R. Davies' (1987, 99) suggestion that the

Norman lordships of lowland south Wales were built on earlier foundations.

The strength of these conclusions should be tempered, however, by the fact that they are based upon a single core with a comparatively local pollen signature. Our research elsewhere in south Wales suggests that pollen cores from different zones within the same landscape can show great variation and that extrapolation from single cores can be misleading (Davies *et al.* forthcoming). We hope, therefore, to supplement this dataset in the future.

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