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# **FILLING THE GAPS: A CHRONOLOGY OF BRONZE AGE SETTLEMENT IN IRELAND**

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## **ABSTRACT**

Some recent significant work has been carried out using “big data” to analyse chronological trends within prehistoric Ireland. However, these analyses are sometimes lacking in archaeological context. This paper hopes to bridge that gap, by providing a chronological framework based on the settlement data from Bronze Age Ireland. It updates previous research and implements Kernel Density Estimates as well as providing a contextual discussion to the results. Five phases of settlement activity are apparent in the analysis. Settlement Phase 1 (2200–1700 BC) represents the tentative beginnings of visible domestic architecture. It sets the scene for a rapid rise and widespread adoption of visible settlement in Settlement Phase 2 (1700–1300 BC). Settlement Phase 2 is a long phase of growth and sustained density and includes the origins of the nucleated village at Corrstown, Co. Londonderry. This is followed by a significant decrease in the perceptible level of settlement activity during Settlement Phase 3 (1300–1100 BC). In Settlement Phase 4 (1100–800/750 BC) there is a renewed increase in visible activity although not on the scale observed during Settlement Phase 1. By Settlement Phase 5 (800/750 BC onwards) there is a significant collapse in visible settlement activity. This phasing is compared with the trends in other facets of the archaeological record, notably burnt mounds, trackways, and hillforts. The remainder of the paper explores a variety of aspects of society – such as population change, changes in the subsistence economy, changes to the economic system as recognised within the metalworking corpus, and an increased importance in the sense of place and property – that should be addressed alongside the evidence from the domestic sphere which is presented here.

## **INTRODUCTION**

This paper examines the chronological development of Bronze Age settlement in Ireland. Before the rise of development-led archaeological excavations, the direct evidence for Bronze Age settlement in Ireland was relatively limited. One island-wide study (Doody 2000) was only able to list 78 Bronze Age houses. However, since 2000 the number and analysis of Bronze Age structures has increased dramatically. Two unpublished surveys (Cleary 2007; Ó Néill 2009) collated evidence for up to almost 600 Bronze Age structures, representing a 700 % increase in settlement numbers in less than a decade. The research presented here draws upon a dataset of settlement sites and their associated available radiocarbon dates previously collated by Ginn (2012; 2016) and since updated, in order to create and evaluate a current settlement chronology that can be used as a basis for further understanding the social-cultural developments of the Irish Bronze Age. Additionally, it implements Kernel Density Estimates as an alternative analytical tool for understanding the chronological distribution of known settlements.

There is a recent upsurge in using “big data” to analyse chronological trends within archaeology (see e.g. Armit *et al.* 2013 and McLaughlin in press regarding prehistoric Ireland). However, although these analyses may be statistically robust, they are sometimes lacking in archaeological context (see especially McLaughlin in press). This paper hopes to bridge that gap, and to provide a more contextual discussion to the chronological trends identified within the settlement record of Bronze Age Ireland.

## **KNOWN CHRONOLOGIES**

Alterations in the metalworking corpus have long formed the backbone of established Bronze Age chronologies, and have been also used to define alternating periods of affluence and recession (Eogan 1965; 1974; 1983; 1994; Needham 1996). Needham’s (1996) periodisation and Eogan’s Irish research remain at the vanguard of such chronologies, and while later studies may shed further light on refining and defining these phases (e.g. Becker 2006), their chronological outlines remain fundamentally

important (Fig. 1). While Needham has revised the British metalworking chronologies, there has been no such undertaking in Ireland. Particular periods within these metalworking chronologies stand out as notable in terms of social change and these are discussed further below.

*Figure 1: Comparative chronological chart (<sup>1</sup>Needham 1996; <sup>2</sup>Plunkett et al. 2013; <sup>3</sup>Becker 2006; Eogan 1994; 1995; Ó Faoláin 2004; Waddell 1998; <sup>4</sup>Kristiansen and Larsson 2005) (Ginn 2016, fig. 4.11).*

Fig. 1 also highlights other established chronologies. Plunkett *et al.*'s (2013) work on the trackway evidence successfully identified clear phases of increased wetland construction interspersed with periods of decreased activity. Plunkett *et al.*'s trackway chronology indicates that the socio-cultural dynamism suggested by the metalworking evidence may not be supported by other facets of Bronze Age life; this is further explored below.

## **CREATING A SETTLEMENT CHRONOLOGY**

There is now a considerable corpus of available radiocarbon dates associated with Bronze Age settlements in Ireland (Fig. 2). The updated dataset used in this research was systematically compiled from all available grey and published literature, and supersedes that presented previously by Ginn (2012; 2016). A total of 755 radiocarbon dates were collated from 202 domestic sites. The radiocarbon dates were rated according to sample type, and to the strength of their association with the house's principal occupation. The criteria for "High Quality" dates followed, as closely as possible, that set out elsewhere (e.g. Sheridan 2007, 93–4; van der Plicht *et al.* 2009, 215, Bayliss *et al.* 2011, 38–40), and dates with excellent or good samples and with an excellent strength of association were defined as High Quality. A total of 177 dates from 83 sites (i.e. 41 % of known settlements) were subsequently defined as High Quality and were used within the analyses (Fig. 2; Table 1). Multiple dates from the same structure were combined (R\_Combine; see below) to obtain a representative age.

*Figure 2: Settlement sites and associated radiocarbon data.*

*Table: 1 High Quality radiocarbon dates from settlement sites.*

#### *Radiocarbon dates as data*

Summed probability densities (SPD) (also known as cumulative probability density functions) stack the individual calibrated distributions of each radiocarbon date in order to provide an estimate for the frequency distribution of the dated events in a given phase (Bronk Ramsey 2017). The process is a widely used time-series analytical technique which does have potential shortcomings (see e.g. Bayliss *et al.* 2007, 1, 9; Williams 2012). These include the shape of the underlying radiocarbon calibration curve, and the fact that every distribution is an “amalgam of individual dates, accentuating the various quirks and idiosyncrasies of the constituent dates” (Kerr and McCormick 2014, 493). However, it remains a technique with considerable legitimacy, especially when used as a comparative tool for graphically displaying the spread of dates or as a means for analysing broad trends (see. Gamble *et al.* 2005; Shennan and Edinborough 2007; Kerr and McCormick 2014). Indeed, Williams (2012, 587) concluded that SPDs “are a more robust **first-order indicator of trends** in prehistoric occupation than often assumed” (emphasis added).

Recently, the concept of Kernel Density Estimation (KDE) has been incorporated into age-modelling of radiocarbon datasets (e.g., Bronk Ramsey 2017; McLaughlin 2019). This method entails the weighting of the calibrated age distributions and essentially smooths the combined probabilities, reducing noise caused by, for example the shape of the calibration curve. Here, we include KDE modelling as an additional test of the frequency of recorded Bronze Age activity using the KDE Model function in OxCal (Bronk Ramsey 2017).

#### *Other evidence*

KDEs have been produced from the full dataset of settlement radiocarbon dates. These also include 124 dates from trackways (Plunkett *et al.* 2013); 60 from 13 hillforts (O’Driscoll 2019; O’Brien and O’Driscoll 2017); 35 from nine copper mines (O’Brien 1995; 2004; O’Brien 2019); 468 from burials (Chapple 2019); and 422 from burnt mounds (Ginn 2012). Hawkes’ (2018) discussion on the chronology of burnt mounds does not include a published list of radiocarbon dates, but shows a similar

pattern to that observed in Ginn (2016) (Alan Hawkes, pers. comm.). These KDEs allow for a basic comparison with the settlement data.

## RESULTS

The settlement SPD/KDE based on High Quality dates was compared with one produced using all the unrefined radiocarbon dates collated from Irish Bronze Age settlements (755 radiocarbon dates from 127 houses at 202 settlements; Fig. 3). There was little difference between the two graphs. Although this paper concentrates on the settlements associated with High Quality dates, it is apparent that there is a wider resonance with all of the dated Bronze Age settlements.

Visual examination of the SPD/KDE conveys the existence of five phases of settlement activity (Fig. 3). The inclusion of new dates has not altered the phases previously published by Ginn (2016). Several sites have dates commencing before 1700 BC, and these represent the emergence of non-ephemeral domestic architecture (largely absent in Ireland since the Early Neolithic) in the roundhouse form. After this date, a dramatic surge in visible construction activity is apparent. This expansion clearly lasts until *c.* 1300 BC after which a fall-off in perceptible activity is noted which endures for approximately 200 years. There appears then a little resurgence in house occupation, before a rather stark hiatus which commences *c.* 800/750 BC. These patterns have been categorised as phases, and are further explored below.

*Figure 3: SPDs and KDE of the Bronze Age datasets. Note the probability density scales are variable for each dataset.*

### *Settlement Phase 1: 2200–1700 BC*

This phase represents the tentative beginnings of visible domestic architecture in the Bronze Age. No Neolithic houses have been dated beyond 3600 BC, which happens to coincide with a decline in evidence for farming activities in various sites across Ireland (Smyth 2014). Additionally, very few Chalcolithic settlements are known (Carlin 2018, 92). It is therefore more than likely that the bulk of domestic architecture between the latest Neolithic house and the earliest dated Early Bronze

Age house (from c. 3600–2200/2000 BC) consisted of insubstantial houses which left no lasting footprint.

Eight very early structures with secure dating evidence are known from seven sites. The structures at Jordanstown 1, Co. Kilkenny (Kyle 2009), Dogstown 151.3, Co. Tipperary (Doody 2009), and Ballylegan 207.1, Co. Tipperary (McQuade 2009a), may be enclosures rather than houses: only one arc of postholes was observed at Jordanstown 1 rather than a complete circle, and the postholes are very widely spaced (c. 2 m and 2.5 m apart) at Dogstown 151.3 and Ballylegan 207.1 (Structure 2 at Ballylegan 207.1 was found near two definite enclosures; see Fig. 4). Although well-defined with postholes, stakeholes and a foundation trench, the structures at Kilmainham 1C, Co. Meath (Walsh 2011), and Derrybane 2, Co. Tipperary (Kiely and O'Mahony 2011), are perhaps too small (2.4 × 1.5 m; 2.7 × 2.3 m; 2 × 2 m) to be interpreted as dwellings (Fig. 4). The footprint of Structure 1 at Skilganaban, Co. Antrim, was overlapped by a later structure but consisted of various gullies, pits and postholes. Although its precise layout is unclear, it does seem to be the best example of a Phase 1 house (Barkley 2013). There was a dearth of artefacts associated with these Phase 1 structures: two Food Vessel sherds came from the structure at Dogstown 151.3, and a small quantity of hazelnut shells from Kilmainham 1C. Therefore, although the evidence for substantial buildings during this period is limited, the presence of the roundhouse form, especially at the latter sites, implies that traditions surrounding domestic architecture were beginning to change.

*Figure 4: Structures from Settlement Phase 1: Dogstown 151.3 (after Doody 2009, fig. 3.6); Derrybane 2 (after Kiely and O'Mahony 2011, fig. 11); Ballylegan 207.1 (after McQuade 2009a, fig. 3.21, marked as EBA pits); Jordanstown 1 (after Kyle 2009, plate 1).*

This (re)emergence of the roundhouse form may also indicate that the way in which the landscape was used was changing at a wider scale too. This is reinforced by the Irish pollen records from the Early Bronze Age which suggest an increase in activity in the latter half of the third millennium BC, and at some sites intensive farming is evident. For example, the records from Cooney Lough and Lough Dargan emphasise

a strong renewal of farming *c.* 2175 BC and 2125 BC, respectively (Ghilardi and O’Connell 2013, 639; O’Connell *et al.* 2014).

Other changes within the archaeological record can be observed. As can be seen in Fig. 3, there is a significant increase in the number of burnt mounds after 1750 BC (see also Hawkes 2018, fig. 5.4). Hawkes (2018) has recently argued convincingly for the use of these sites primarily as cooking places for small family groups, and although they may have had a wider social significance, we can regard them as a component of domestic activity. In contrast to the settlement evidence, burial sites are rather steady throughout this phase. The Early Bronze Age is well known for its changes and evolution to burial rites that occur throughout the centuries (see e.g. Needham 1996, 130; Brindley 2007), with pottery for funerary use diversifying, and the number of grave goods increasing (*ibid.*; Becker 2006). Changes are also apparent in the metalworking of this period (the Ballyvalley Phase), and significant tool development included flat axes and halberds (*ibid.*).

#### *Settlement Phase 2: 1700–1300 BC*

This phase sees a rapid rise and widespread adoption of visible settlement, and represents the floruit of Bronze Age domestic occupation. The spread and adoption of this site type is, like the spread of raths in early medieval Ireland, quick and remarkable. It is a long phase of growth and sustained occupation, and includes the origins of a nucleated village at Corrstown, Co. Londonderry (Ginn and Rathbone 2012), as well as enclosed and unenclosed sites. Both the SPD and KDE models show this period to represent the mainstay of Bronze Age occupation.

Large houses (over 80 m<sup>2</sup>) appear during this period – including 12 from Corrstown – and these form a consistent component of the settlement record along with smaller houses (Fig. 5). Site types also diversify, and lakeside habitations appear (e.g. Cullyhanna Lough, Co. Armagh (Hodges 1958)). Houses which have small surrounding enclosures emerge as a type in the 18<sup>th</sup> century. For example, at Gransha, Co. Londonderry, the enclosing ditch and associated structure have similar date ranges (enclosure 1613–1461 BC; combined structure dates: 1730–1268 BC) (Chapple 2004; 2010), and at Ballybrowney, Co. Cork (Cotter 2005), three enclosures were occupied between 1900 and 1520 BC, one of which contained a house (Fig. 5).

It is notable that the act of enclosure was not as current in Ireland as it was in Britain, with only *c.* 35 % of houses being enclosed in Ireland, compared to between almost 65 % in Britain (Brück 1997).

The emergence of the Corrstown village is of particular importance. Only a few sites exist across Ireland and Britain where occupation has exceeded more than one or two contemporary houses (Ginn 2014), but at Corrstown 74 domestic roundhouses were excavated (Ginn and Rathbone 2012). Of these, at least 50 were most likely occupied contemporaneously (*ibid.*; Ginn 2011). McSparron (2012) identified a “Growth Phase” which began after 1550 BC, which was followed by a “Village Phase”, beginning in the mid-14th century, with population estimates between 200 and 300 (Ginn and Rathbone 2012, 223–4). The majority of the 74 house plots had evidence for several successive re-builds during the Village Phase, indicating that settlement continuity was important. This trend of sequential rebuilding on the same site was also observed at other settlements, including Dogstown and Skilganaban (both mentioned above in Settlement Phase 1).

There are approximately 26 houses with their main probability between 1700 and 1500 BC, 18 houses with their main probability between 1500 and 1400 BC and then 11 houses with their probabilities between 1400 and 1300 BC. These distributions suggest that the height of house construction was prior to 1300 BC which is paralleled by a sustained increase in the number of burnt mounds (Hawkes 2018, 124) and noticeably high level of burials, particularly between *c.* 1500–1400 BC (Fig. 3). A similar pattern can be seen in the peatland trackway data which exhibits a notable concentration from 1700–1375 BC (Plunkett *et al.* 2013, 24) (Fig 3). Levels of arboreal pollen dip between 1700–1250 BC, suggesting widespread opening up of the landscape (Plunkett 2009a; 2009b). After 1300 BC settlement declines. O’Brien’s recent dating of hillforts – notably Rathnagree – has demonstrated that they emerged at the same time as this settlement decline (O’Brien *et al.* 2016, fig. 10; O’Brien 2016, table 7.1, figs 7.4, 7.16; see also Fig. 3).

Settlement Phase 2 also overlaps several Irish metalworking phases (Fig. 1). The Killymaddy Phase of metalworking broadly dates to the 15<sup>th</sup> century. It has been defined as a recession due to the declination of the cross-channel impact of the Irish

bronze industry (Eogan 1994; 1995; Waddell 1998, 180; Ó Faoláin 2004). The decline of important copper mines at Mount Gabriel, Co. Cork (O'Brien 2013), and Great Orme, north Wales (Timberlake and Marshall 2014), is likely to have influenced metalwork production, exchange, and deposition practices. It coincides with the sustained high levels of domestic settlement. The Bishopsland Phase of metalworking begins *c.* 1400 BC and is characterised by the emergence of new gold ornament types and weaponry, and by an increase in influence and imports from central Europe, possibly reflecting newly established networks of metal supply. Trade between Ireland and Britain was considerable, and many Irish artefacts were deposited in the Thames region, which was obviously an important centre of bronze production and Continental imports during this phase (Eogan 1964). It has been suggested that the Middle Bronze Age growth of metalworking in the Bishopsland Phase was based upon an agricultural surplus (*ibid.*). However, the data presented here demonstrate that domestic occupation may have declined during this metalworking phase.

*Figure 5: Structures from Settlement Phases 2 and 3: Ballybrowney Lower (after Cotter 2005, plate 3); Gransha (after Chapple 2010, fig. 18); Corrstown (Structure 17; after Ginn and Rathbone 2012, illustration 2.17); Haggardstown (after McLoughlin 2010, plate 14).*

### *Settlement Phase 3: 1300–1100 BC*

This phase is represented by a collapse in the level of apparent settlement activity. Levels do not fall as low as observed in Settlement Phase 1, however, and 18 sites lie within this phase. The dates of several structures at Corrstown (e.g. Structure 47), and at other settlements, continued from the previous phase through to Settlement Phase 3, including at Ballydrehid (Structure 2), Co. Tipperary (McQuade 2009b), Drumbaun 2, Co. Tipperary (Kiely *et al.* 2011), and Gransha (Chapple 2004; 2010), among others. Occupation at Corrstown flourished for approximately 100 years (*c.* 1360–1250 BC) before beginning to wane during Settlement Phase 3 (*c.* 1270–1140 BC ((McSparron 2012, 274–88)). Newly established sites are not as apparent as previously observed.

In other avenues of evidence a decline of activity can also be observed. There is a notable reduction in funereal and burnt mound activity at *c.* 1300 BC, and the volume of trackway activity depletes from 1375–1225 BC (Plunkett *et al.*'s (2013) "Trackway

Activity Lull B”) (Fig. 3). Pollen analysis suggests disruptions to the subsistence economy and broad forest regeneration throughout the 13<sup>th</sup> century, although there are localised exceptions (e.g. Overland and O’Connell 2008). The metalworking during this period is defined by the Roscommon Phase when British and Continental trade links were disrupted, leading to a loss of local initiative in Ireland. This resulted in a rise of scrap bronze, a reduction in hoarding, and lower levels of productivity, and led to this period being described as a recession (Becker 2006). However, the dating evidence from Derrycagoon copper mine, Co. Cork, centres on the late 13th century BC and suggests that this resource was exploited during this phase (O’Brien 2019). Yet against this period of decline is the construction and continuation of some hillfort sites, such as Rathgall (O’Brien 2016; Waddell 1998, 277–8; Raftery 1994, 58–9) which begins its journey as an important centre of activity. It is possible that 1300 BC there is a shift towards a more consolidated settlement pattern (e.g. Corrstown), or a contraction to key upland areas (e.g. Rathnagree (O’Brien and O’Driscoll 2017)).

#### *Settlement Phase 4: 1100–800/750 BC*

This phase represents a renewed revitalisation of activity, although not on the scale observed during Settlement Phase 1, and is characterised by fundamental changes to the domestic sphere.

Twenty-nine sites with High Quality dates belong to this period, and it is during this phase that hillfort construction became very significant (O’Brien *et al.* 2016, fig. 10; O’Brien 2016, Table 7.1, figs. 7.4 and 7.16; O’Brien 2017, fig. 16). Multiple hillforts have radiocarbon dates associated with this phase: e.g. Knockdhu, Co. Antrim (MacDonald 2016), Rathgall, Co. Wicklow (Raftery 1994, 58–9; Waddell 1998, 277–8), Rahally, Co. Wicklow (O’Sullivan and Stanley 2008; Mullins 2014), among others. (See O’Brien *et al.* 2016; O’Brien 2016; O’Brien 2017; O’Driscoll 2019 fig. 5 and table 1 for full details of hillfort chronologies.) The dating evidence suggests that the construction of hillforts pre-empted the increase in settlement evidence but was coeval with an increase in trackway construction (Fig. 3). More substantial, plank-built trackways featured from the 11th century (Plunkett *et al.* 2013), contemporary with the peak in settlement evidence. The nature of lakeside settlements, such as Moynagh Lough, Co. Meath (Bradley 1991), altered notably, and became discernibly

more production orientated, with increased evidence for tool manufacturing, especially swords.

The resurgence in settlement activity evidence during this phase is paralleled by the trends observed for burnt mounds and burial sites which both show increased activity 1150–800 BC (Fig. 3) (also observed by Armit *et al.* 2013; Hawkes 2018, fig. 5.4).

This phase is broadly concurrent with the Dowris Phase (*c.* 1000–800/750 BC) of metalworking, during which time there was an increase in the amount of metal in circulation, and a greater variety in objects and exhibitionism portrayed through the elaborate nature of the gold working. Links with central Europe were again established, and influences and imports can be observed on a variety of forms, such as several buckets from Antrim and an important hoard from Tamlaght, Co. Armagh (Warner 2006, 24). It is therefore apparent that by the Late Bronze Age Ireland was able to network beyond Britain, and to develop and export along its own external trade routes. Conclusions based primarily on the metalworking evidence suggest that this period was “a time of major economic expansion that affected agriculture as well as metallurgical production” (Eogan 1994, 92). From 1100 BC Plunkett (2009a; 2009b) observed in pollen records a substantial increase in the impact of farming, and in the importance of crops. This phase represents the peak of farming activity with the maximum farming and woodland clearances taking place 1155–935 BC at many sites, and a substantial level of land-use evident until 840 BC.

*Figure 6: Structures from Settlement Phases 4 and 5: Ballylegan (after McQuade 2009c, fig. 3.18); Skreen 3; (after O’Neill 2009, fig. 11) Derrybane 2 (after Kiely and O’Mahony 2011, fig. 9); Tober (after Walsh 2014, fig. 2).*

#### *Settlement Phase 5: 800/750 BC onwards*

Generally, the visibility of settlement decreases during this phase, and only 10 sites with High Quality dates fall within this phase. Activity at some hillfort and hilltop sites continues, e.g. Haughey’s Fort, Co. Armagh (Mallory 1995), and other domestic sites also exhibit evidence for continuity of occupation, such as Skreen 3, Co. Meath (O’Neill 2009), and Tober, Co. Offaly (Walsh 2014) (Fig. 6). Some sites are returned to for domestic occupation such as Ballylegan, Kilmainham 1C, and Derrybane 2

(also occupied during Settlement Phase 1) (Fig. 6). Other new sites, such as Navan Fort, Co. Armagh (Waterman 1997), emerge as notable settlements. Occupation of the Corrstown village has, by this stage, ceased.

No High Quality dated sites span the Hallstatt calibration plateau; this is not a consequence of the data selection but appears to be a real fall-off. A similar decline in general activity was reported by Armit *et al.* (2013). The roundhouse as a site-type may have been in terminal decay before this date, and certainly the inference from the paucity of dated settlement sites from the Early Iron Age is that the Irish population in these centuries was living in a manner which has left very little archaeological trace.

The decrease in settlement during Settlement Phase 5 is matched by a sharp cessation in the density of burnt mound sites (Hawkes 2018, fig. 5.4), and a rapid decrease in the probability density of funerary activity (Fig. 3). The international exchange networks that had been required to support bronze-based economies appear to break down. Plunkett's (2009a) pollen evidence signifies reduced pressure on the land, with varying levels of wood regeneration occurring across sites (including Carrownaglogh, Lough Sheehauns, Mooghaun Lough, Red Bog, Essexford Lough, and Whiterath Bog). A corresponding lack of trackway activity occurs during this phase, and peatland hydrology points to a shift to wetter and/or colder conditions (Plunkett *et al.* 2013; Swindles *et al.* 2013). It is a period described as one suffering from economic collapse due to soil exhaustion (Raftery 1994), socio-political competition, or the impact of iron-working (Waddell 1998). The pollen evidence suggests that formerly important centres, such as the Loughnashade area, returned to prominence, and that settlement may have contracted to key areas.

## **DISCUSSION**

What can the settlement data contribute to the discussion regarding the nature of Bronze Age society in Ireland? The remainder of this paper will explore a variety of aspects of society – population change, changes in the subsistence economy, and an increased importance in the sense of place and property, among others – while considering the evidence from the domestic sphere.

### *Population change*

Does the re-emergence of well-built permanent buildings indicate a population increase? Radiocarbon datasets (whether SPD or KDE) are often taken as proxies for population levels, whereby an increase in the dates is interpreted as a rise in activity resulting from population increase, and a drop in the curve is conversely viewed as a proxy for a population decrease. The assumption that dates-as-data reflect population trends is upheld by some archaeologists (e.g. Williams 2012; Timpson *et al.* 2014; 2015), while others caution against what they perceive as the simplistic and sometimes determinist equivalence of aligning peaks with population increase (e.g. Contreras and Meadows 2014; Crombe and Robinson 2014; Torfing 2015).

The modelled radiocarbon dates presented here should only as first order of trends (as above). However, the increase in visible settlement activity at 1700 BC may imply a considerable increase in the population living in Ireland during the Bronze Age. This is supported by the palaeoenvironmental evidence which indicates the widespread opening of new agricultural lands. By the same token, there may have been a subsequent rapid decline in population *c.* 800/750 BC.

McLaughlin (in press) states that Bronze Age Ireland was densely populated inhabiting “in the order of **2,000,000** persons until 800 BC” (emphasis added). He sees the evidence for such high population levels being borne out in the palynological studies and in charcoal analysis from settlements. The settlement record, however, simply does not currently accord with McLaughlin’s conclusions, which have failed to incorporate the archaeological evidence appropriately. Houses are generally short-lived (one or two generations at most), they occur in small numbers, and the **only** known Bronze Age village in the whole of Ireland and Britain is Corrstown where up to 300 people may have lived contemporaneously during the Village Phase (Ginn and Rathbone 2012). In order for 2,000,000 people to be living in Ireland throughout the Bronze Age, the density of roundhouses would need to be vastly increased, and many more villages would have appeared in the archaeological record. Of course, other upland sites in Ireland have evidence for multiple houses, although the dating and contemporaneity of the houses has not been established (e.g. Knocknashee, Co. Sligo (Brandherm *et al.* 2020)). It is possible that the bias brought about by the location of development-led archaeology is seriously affecting the data; however, the fact that

only hundreds of houses dating to the **entirety** of the Bronze Age have been found in Ireland (with a similar scale to Britain: Caswell 2019) indicates that McLaughlin's population estimates are grossly exaggerated.

### *Changes to subsistence strategy*

What can changes to the settlement record inform us about changes to the subsistence economy? Could a revolution in farming techniques account for periods of increased construction, and the over-exploitation of resources result in lulls in activity?

Certainly, the Neolithic farming revolution has long been attributed to the emergence of a settled domestic scene (e.g. Smyth 2014), but what of the Bronze Age? The majority of settlements appear to have had access to the materials required for basic pottery and lithic tool production, which was small and local in scale (Ginn 2016). Faunal remains are largely absent within the domestic archaeological record until towards the end of the Middle Bronze Age; however, the results from pollen cores taken from a variety of locations across Ireland (e.g. Cross *et al.* 2001; Molloy and O'Connell 1993; 1991; Plunkett 2009a) suggest that the Middle Bronze Age is characterised by pastoral farming, which fluctuated in intensity. Agricultural production during Settlement Phases 1 and 2 appears to have been organised at the level of small, relatively autonomous household units, and was most likely, at times, also "dependent on communal resources and the help of other households" (Hill 2011, 253).

The development of hillforts in the Middle Bronze Age may indicate a shift towards a community-focus to farming, suggesting that farming was operating on a larger scale than previously. This may consequently reflect changes to the availability of resources, and have had an effect on the nature of the settlement activity. By the start of the Late Bronze Age, c. 1200 BC, the pollen record signifies a reduction in farming activity, and possibly a contraction of population to particular settlement areas (Plunkett 1999; 2009a, 288, 292; 2009b, 49). This is possibly combined with further field systems (e.g. the Antrim uplands (Francis 1987; Gardiner *et al.* 2019)) and the continued development of hillforts (O'Driscoll 2019).

Do we then see a pooling of resources to key areas? Kohler and Van West (1996) suggest that this occurs during periods of high productivity. Indeed, Haughey's Fort has one of the largest cereal assemblages from well-dated Late Bronze Age deposits in Ireland, and signifies the importance of crop production at this time. McClatchie (2014, 39) has demonstrated that many of the cereal deposits which were brought to Haughey's Fort to be deposited were harvested from different environments or farms in the locality which were then brought to this centralised location. Certainly, farming was one of the core economic functions of hillforts; "There is... evidence that farming was a critical resource, with hillforts connected in different ways to a wider landscape of agricultural settlement" (O'Brien 2017, 3). Thus it could be suggested that community-focused farming (possibly also including the redistribution of resources and the creation and maintenance of social ties through feasting) was becoming more important, and was changing the nature of the settlement landscape. It was resulting in the extensive deforestation of areas near these hillfort sites (O'Driscoll 2017a, 75; 2019) and "an intensification of farming that extended into uplands and other parts of the landscape not previously inhabited" (O'Brien 2017, 54).

#### *Changes to the wider economy*

Could there be an association between changes in settlement patterns and the fluctuations in the wider economy? Ireland had significant copper and gold resources during the Bronze Age, importing its tin primarily from Cornwall (O'Brien 1995). Imports and exports are significant, and demonstrative of a thriving prestige goods economy operating at some level within society. The available dates for copper mining activities in Ireland peak at the outset of Settlement Phase 2 (Fig. 3), corresponding to the Derryniggin Phase of metalwork. While the Mount Gabriel mines continue to be exploited until *c.* 1400 BC (O'Brien 2003), metal analysis reveals the use of copper from Great Orme, Wales, in Irish bronzes during the period corresponding to Settlement Phase 2 (Williams and Le Carlier de Veslud 2019, 1185). During the Killymaddy Phase (*c.* 1500–1400 BC), the insularity of the forms of the characteristic socketed kite-shaped spearheads, leaf-shaped side-looped spearheads, dirk, sickles, tanged blades, and palstaves (Eogan 1995; 1994; Ó Faoláin 2004), combined with a paucity of imports, has been used to suggest that Ireland's cross-channel influence had somewhat diminished (Waddell 1998, 180), perhaps in response to dwindling home supplies of copper. Large quantities of objects were

nevertheless produced, and the dispersed distribution of stone moulds across the island points to widespread expertise in metal casting (Boutoille 2012), however the raw materials were obtained. These changes in metal supply-and-demand occur against the rise and continued development of the domestic settlement landscape (Settlement Phase 1). It therefore appears as if, during this period at least, there is a disjointedness between the wider economic realm, and domestic life. The self-sufficient homesteads that have been excavated in Ireland since the early 2000s bear testament to a separate economic sphere (see Ginn 2013). The nature of power and politics is unclear during this time, but it is separate from the roundhouse.

The Bishopsland Phase (*c.* 1400–1250 BC) follows. It was “a time of spontaneous creative combustion that positively affected many aspects of life – economic, social and ritual” (Eogan 1995, 130). New gold ornament types emerged, influences and imports from central Europe are apparent (for example the two bronze bracelets with Continental parallels from Clooneenbaun, Co. Roscommon), and a change in combat equipment is denoted by the development of the Ballintober sword (*ibid.*). Trade with Britain was considerable and although a more elaborate and influential style than its preceding phase, the volume of material is not overwhelming and this could lead to some questioning over its significance. It develops alongside the lull identified in the settlement and trackway evidence (Settlement Phase 3) and the emergence of hillforts, and may not be based on an agricultural surplus as previously suggested by Eogan (1964). (Plunkett’s (2009a, 286) pollen analysis at case studies from across Ireland was not able to discern a definite intensification of farming during this phase).

During the Roscommon Phase (*c.* 1250–1000 BC) when metalworking is noticeably reduced and insular, hillforts continue to come into prominence, and there follows a period of expansion within the domestic settlement record (Settlement Phase 4). So here we have another metalworking “recession” which immediately precedes huge changes in the landscape: a growth in settlement construction, labour-intensive land clearance episodes, and labour-intensive community-building projects such as hillforts. The metalworking decline was likely linked to a diminished supply of copper from Great Orme and a need both in Ireland and Britain to establish new lines of supply; however, fresh endeavours to secure local sources are reflected by mining activity at Derrycagoon, Co. Cork (O’Brien 2013).

A narrowing between the prestige goods economy and the domestic sphere can be seen during the expansion of the Dowris Phase (1000–800/750 BC). It is during this metalworking phase that “Irish smiths truly came into their own” (Ó Faoláin 2004, 9). Influence still came from England, especially from the Ewart Park Phase material – which was itself a mixture of Baltic and west/central European trends – but by this stage the Great Orme mines were fully out of use and specific artefacts, such as sleeve fasteners, pins (disc-headed and sunflower as at Haughey’s Fort), and the Cape Castle bucket from Antrim (a locally made product with European nuances (Warner 2006, 24)), demonstrate more direct links to north and central Europe. The distribution of these artefact types, notably the fasteners and pins, suggests that they did not follow the same patterns of importation or influence, indicating that multiple trade networks existed. Settlement Phase 4 largely corresponds with the Dowris Phase – a period of expansion; however, settlement activity quickly falls off (Settlement Phase 5) as the Dowris and its British counterpart, the Ewart Park Phase, come to an end. What happens to the settlement then? Is there once again a separation between the socio-cultural dynamism suggested by the metalworking (and the hillforts) and other facets of more domestic life? Or does the settlement activity get further concentrated and contracted?

For Armit *et al.* (2014, 17047), the introduction of iron technology meant that the long-established economic networks that had underpinned the social structure in the Late Bronze Age were made redundant: “Resultant social destabilisation may well be the cause of the population collapse at the end of the Bronze Age.” However, the separation between the metalworking periods of recession and influence and those in the Middle to Late Bronze Age settlement patterns is significant. Perhaps Warner (1993) is correct, that

“true periods of social strain and culture change may manifest themselves not as “dark ages”, but as phases of high visibility in the archaeological record. In this sense, rather than indicating an economic boom, the proliferation of metalwork during the Bishopsland and Dowris Phases may instead signify periods of cultural instability”.

Certainly, this seems to be partly borne out in the settlement evidence. Or perhaps when the wider socio-economic sphere was under stress, the need for large, secure,

seemingly intransient houses became more important, and when that wider sphere was operating successfully emphasising legitimacy and power at a domestic level was less significant.

### *Changes to the importance of place and property*

Could the (re-)emergence of substantial domestic architecture and its trends be reflective of changes in the way in which property rights and ownership operated?

The dearth of substantial, archaeologically visible domestic structures in the preceding periods may suggest that concepts of ownership and property had been very different, or had been articulated in different ways. By 1700 BC, however, it appears that something began to change. Single generational houses (those without discernible repairs and rebuilds) emerge. Perhaps during this period the ability to pass on property rights or ownership to others may have been restricted (either through social norms, or for political means). From 1600 BC though there appears to be an increasing trend towards stable, longer-term settlements. After 1600 BC houses with evidence for maintenance, repair and rebuilds (multi-generational houses) become more apparent. This is best seen at Corrstown, where there was a long association between particular house platforms and often-repaired houses (Ginn and Rathbone 2012). This continuous, repeated construction of houses in the same places, for presumably long periods of time, “reveals... the sense of place, the rootedness of homes, and the idea of perpetuity” (González-Ruibal 2006, 160). It also suggests that perhaps the control or ownership of property may have been more systematic than previously, and that it could extend across several generations of the same family or kin group.

These “multi-generational” houses are accompanied by an increasing number and variety of enclosing elements such as associated fencelines and demarcating ditches. It is likely that the creation of these defined spaces had a plethora of functions (e.g. segregating stock from arable lands, manipulating social concepts of inclusion and exclusion (Hingley 1984), controlling movement (Cleary 2007, 209)), and one of these could well have been to create boundaries between owned and non-owned land, thereby reflecting an awakening of “territorial consciousness” (Harding 2009, 262). Indeed, settlement and land enclosure, along with agricultural intensification, has a

recognised anthropological link which leads to land becoming more valued as a form of property (Thomas 1997; Earle 2002, 9–10).

What we see then is the rise of a private encapsulated, multi-generational, self-sufficient house with associated enclosing features. The presence of these enclosing features, such as fences and field systems, on a small and a large scale, implies control of land and productive resources at the levels of the individual household and the community. This development may well reflect altered, stronger sense of property rights, of owning the land.

### *Environmental change*

Establishing associations between past socio-cultural change – such as alterations to subsistence patterns, including radical architectural developments or shifts in population trends – and the direct effects of climate change – either gradual or sudden – is a difficult process. The human response and adaptation to climate change is not always predictable, geographically consistent, or archaeologically and palaeoenvironmentally visible. Still, it is a process debated by many archaeologists (e.g. Turney *et al.* 2006; Plunkett 2009a; 2009b; Armit *et al.* 2014).

Climatic reconstructions based upon paleoenvironmental proxy data indicate several significant events in Bronze Age Ireland. These events include those occurring at 1628 BC and 1159 BC (identified in the oak chronologies: Baillie and Munro 1988) and at 800–758 BC (identified in peatland records and dated with the GB4-150 tephra horizon: Plunkett 2006; Swindles *et al.* 2007; 2013); however, none of these appear to have had any long-term impact on settlement patterns or the subsistence economy (Plunkett 2009b; Armit *et al.* 2014).

Evidence that smaller, more localised climatic shifts may have altered phases of activity, or farming practices is no less conclusive either. Plunkett's research and analysis (among others) has repeatedly argued that there is no or little discernible correlation between environmental change and events which can be observed within the archaeological record (see Plunkett *et al.* 2013 regarding trackways and Plunkett *et al.* 2020 combining palaeoclimate reconstructions and land-use histories inferred from the pollen record). It is difficult to identify any evidence, therefore, that climate

changes undermined the subsistence base to any discernible extent, and certainly not to the level of population collapse.

### *Overall picture*

What begins to emerge is the sense of a changing social landscape. Some rapid cultural shift occurred around 1700 BC which led to the re-emergence of permanent settlement in the roundhouse form. This shift occurred not just in Ireland, but also throughout Britain at the same time (Caswell 2019), and across many regions of temperate Europe (Chytráček 2007, 15). It occurred alongside the opening of new agricultural lands, and led to expanding economic productivity. During this Middle Bronze Age period we see communities most likely engaged in co-operative farming and representing “reasonably autonomous and prosperous units with a strong sense of shared identity” (Grogan 2014, 61). The ownership of high value metal artefacts was “well beyond the aspirations of the inhabitants of the vast majority of settlements” (*ibid.*, 67), or it was simply not the done thing to retain the trappings of wealth or power in a domestic setting. This is seen in the relatively homogeneous and sparse artefact assemblage from settlements during this period (see e.g. Dogstown and Kilmainham mentioned above), exceptions tending to be located in wetland environments, yet access to metal tools at least must have existed. Small communities would still have been linked into the interregional networks, as demonstrated by Well’s work on elite networks in Bronze Age Europe (2016, 174; see also O’Driscoll 2017b, 81). Population levels may have increased, although the settlement record does not indicate that levels were anywhere near the order suggested by McLaughlin.

Over time, and perhaps through an obligation to generate surplus or through significant increases in population density in particular areas, traditional communities which had previously been based on smaller and “kin-bound” social and economic units became part of enlarged social territories (Grogan 2014, 65). There was also a need to (re)produce community identity in increasingly visible and public actions (Downes and Richards 2005, 1126). In Bronze Age Ireland this begins with the village at Corrstown and the introduction of hillforts (see also Ginn 2014; O’Brien and O’Driscoll 2017). These early hillforts, such as Rathnagree, Co. Wicklow, most likely functioned as part of a settlement landscape, “that included small farm holdings with roundhouses, *fulachtaí fía* used for feasting on special occasions, and

monuments such as barrows and standing stones connected to funerary practice” (O’Brien *et al.* 2016, 20–21).

The widespread development of hillforts during Settlement Phase 3 is seen by many archaeologists as representing the progression of a materially well-represented elite into powerful, political entities, as ushering in “a new type of political structure” (O’Brien 2017, 3). They are associated with a maximisation of agricultural productivity (demonstrated by extensive woodland clearance around many hillfort sites), competition over trade routes, and a burgeoning prestige goods market (O’Driscoll 2017a, 73). It is apparent that metal resources were the key to a higher-order social organisation either emerging, or shifting in nature, during this period (*ibid.*). At the same time, we start to see a greater (albeit still limited) accessibility of material wealth in the domestic settlement sphere.

With neither the evidence for all-out warfare nor for an environmental catastrophe, the rapid reduction of visible domestic architecture during Settlement Phase 5 may not solely be explained by a population collapse. Perhaps instead there is another change in the subsistence regime where surplus is no longer required, or a variation in settlement location, or an alteration in the importance of property and permanence in the landscape. The possible result: a reversion to non-visible houses structures such as those which were evidently used at other times, not least during the Middle Neolithic and the Iron Age.

## **SUMMARY AND CONCLUSIONS**

Our analysis of Bronze Age settlement dates accords well with the data derived from Caswell’s British (2019) research, demonstrating that the phases of expansion and contraction within the domestic sphere happen at the same time across both Ireland and Britain. Whether the same processes and variables were in operation across both countries remains to be examined. Patterns similar to this boom–bust cycle also exist across Europe. Gills and Frank (1992) identify almost pan-European alternating patterns of expansion and contraction which, for the Bronze Age, include 1700–1500/1400 BC (contraction); 1400–1200 BC (expansion); 1200–1000 BC (contraction); 1000–800 BC (expansion); 800–550 BC (contraction) (Fig. 1).

Wilkinson (1992a; 1992b) and Bosworth (1992) have tested and confirmed the existence of most of the cycles, while Kristiansen (1993; 1998) has independently identified similarly dated expansions and contractions in Europe. However, the Irish (and British) evidence presented here is somewhat at odds with these models, most notably in relation to trends during the Middle Bronze Age.

This paper has looked at several potential factors that may have contributed to those fluctuations in settlement patterns. It is possible that substantial changes in the population levels are reflected in the SPD/KDE; certainly the palaeoenvironmental evidence which points to the exploitation of new lands for agriculture would seem to support this. Alterations in the way in which the subsistence economy was organised are also likely to have had an effect on settlement patterns. For instance, the reduction in farming levels observed through the Late Bronze Age pollen record, combined with the potential contraction to key areas and the continued development and importance of hillforts within the landscape, may explain the dip in settlement activity represented by Settlement Phase 3. It is also possible that the locational bias in the excavation record (which by the nature of development-led archaeology favours road networks and avoids upland areas) has resulted in a skewed radiocarbon dataset. It is possible that further dating of upland sites may go some way to increasing activity levels in the Phase 3 lull for instance, and may even out the peaks and troughs currently observed. We have also discussed the potential role of the wider economy – namely, the significance of metalworking – upon settlement patterns; however, analysis of this factor is somewhat obscured by a limited understanding of the metalwork chronology in Ireland. Some aspects were discernible though, such as the fact that the rise in activity in Settlement Phase 4 clearly pre-empts the Dowris industry and is driven by factors beyond a prestige goods economy. Finally, we find that the effects of environmental change within the archaeological record remain unobservable.

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