THE FIRST FARMERS OF EUROPE

An Evolutionary Perspective

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rapid and must have had a major seaborne coastal element. There is evidence that it occurred when it did because climatic warming moved the frontier for successful farming further north than it had previously been. The immigrants brought a full agricultural package of cereals and domestic animals with them, including the skills to manage them successfully, not least the knowledge and ability to manipulate annual cattle reproduction to get two birth seasons a year to ensure a continuous supply of milk. However, they also exploited marine resources to a significant degree, raising the question of how they acquired the relevant expertise and how difficult this really was. The earliest farming may not have been a mobile slash-and-burn system but it certainly involved burning and the creation of secondary forest, with a strong element of animal, especially cattle, keeping. By 5600 BP or so it was being replaced by the ard-based cultivation of fields using animal traction.

It is unclear whether long barrow burial was an ancestral practice present from the start but flint mining, exploiting the outstanding flint resources of Denmark and Scania certainly was. In any case, long barrows were certainly being constructed by 5800 BP, marking the beginning of a process of tomb-building, first long barrows then dolmens and to a lesser extent passage graves, that is unparalleled in its intensity elsewhere in Europe, especially in the EN II period, c.5500–5300 BP. Large numbers of enclosures are also constructed at this time and it is hard to avoid the conclusion that the high rate of monument construction is an indicator of exceptionally intense competition for good farming resources.

In the last centuries of the 6th millennium BP there are indications of a population decline in north Germany, Jutland and Scania, reflected in evidence for forest regeneration in pollen diagrams, but in the Danish islands this does not occur until after 5000 BP. At the same time Pitted Ware forager groups of Mesolithic ancestry expand southwards from central Sweden, apparently taking advantage of the farming decline, while shortly afterwards Corded Ware farming groups of mixed steppe and European Middle Neolithic ancestry began to infiltrate the whole of the Baltic region.

CHAPTER 8

THE FARMING COLONISATION OF BRITAIN AND IRELAND

The expansion of farming into Britain and Ireland occurs immediately before and after 6000 BP, at almost exactly the same time as in southern Scandinavia, and it is therefore hard to avoid the idea that in some way the two processes were connected (cf. Rowley-Conwy, 2011). We will return to this question below but first we need to look at the evidence for early farming in Britain and Ireland and the processes responsible for its arrival, to assess whether or not it fits into the pattern that has been emerging.

IMMIGRATION OR DIFFUSION?

As in all the other regions examined so far, the key issue that has attracted most discussion is whether or not agriculture was introduced by colonising farmers. However, perhaps more so than in other regions, the broad theoretical commitments of researchers have influenced these debates, because in Britain the Neolithic period has been the main single substantive focus in the development of post-processual archaeology, with its emphasis on the impact of modern ideologies on interpreting the past. Thus, to suggest farming was introduced by colonists rather than being locally adopted is to assume that foragers lacked agency, with the imputation that this represents a residue of colonialist ideas about the capacity of native peoples. Taking this sort of perspective leads Thomas (2013: 425), for example, to the view that the complete lack of evidence for mixed Mesolithic and Neolithic assemblages, rather than pointing to lack of continuity from one to the other, is the result of conscious decisions by Mesolithic communities all over the land to decisively reject their past and consciously 'become Neolithic', having sent apprentices across the English Channel to pick up the relevant skills together with the crops and animals. Much has also been made of the possibility that Mesolithic groups *could* have been using sea routes to establish contact with farmer communities in northern France and Brittany (Garrow and Sturt, 2011). However, the sheer lack of

indications of contact is striking when we compare it to the extensive evidence of contact between the Mesolithic groups of southern Scandinavia and the farming groups to the south that we saw in the previous chapter. The one exception to this is the site of Ferriter's Cove in south-west Ireland (see map, Fig 8.1, for all sites mentioned in this chapter), where the presence of cattle bone and a sheep tooth in a Mesolithic context dated to the second half of the 7th millennium BP points to contact with continental Europe (Woodman et al., 1999). Sheridan (2010) considers that this represents the theft of animals from an unknown early farming settlement, which certainly seems more probable than foragers sailing to France and bringing back the animals; moreover, isotope analyses from human bones at the site point to a diet dominated by marine resources and therefore in keeping with Mesolithic patterns (Schulting, 1999, cited in Pailler and Sheridan, 2009). Certainly, there is no reason why such voyages should not have occurred occasionally and this may be one of those rare instances where we find one of the very earliest examples of something, against all the odds. However, like all isolated observations that do not (yet) conform to a pattern, the Ferriter's Cove evidence remains hard to evaluate.

Since at least the middle of the last century the key evidence for the continental connections of the British Neolithic, apart from the domesticates themselves, has been the pottery, in particular what is now known as the 'Carinated Bowl' tradition (Sheridan, 2007), which has strong similarities with the Chasséen and Michelsberg of northern France and Belgium discussed in Chapter 6. The problem for many scholars has been that there has been no exact match between British assemblages and those from specific known sites on the European mainland. However, the likelihood of finding specific ancestral sites is small. Moreover, as David Clarke long ago pointed out, archaeological entities such as cultures are 'polythetic'; site assemblages are never identical – they are linked by family resemblances, sharing some features and not others. Indeed, Vander Linden and Bradley (2011: 36) specifically point out the 'constantly changing' nature of Chasséen assemblages and 'the polythetic character of groups responsible for the recolonisation of the sandy and clayey areas of Belgium' at this time. Finally, in the case of the colonisation of new regions, as we saw with the LBK, it is highly likely that founder effects and drift would have been operating in any groups that crossed the Channel. That is to say, specific founder communities would only have produced some fraction of the range of forms present in their ancestors, and that initial range itself would have been subject to the vagaries of individual choices and preferences over subsequent years and generations (cf. the discussion in Whittle et al., 2011: 859–861). What was certainly transferred across the Channel, on the other hand, was the level of expertise to produce the high-quality pottery characteristic of the British and Irish Early Neolithic.

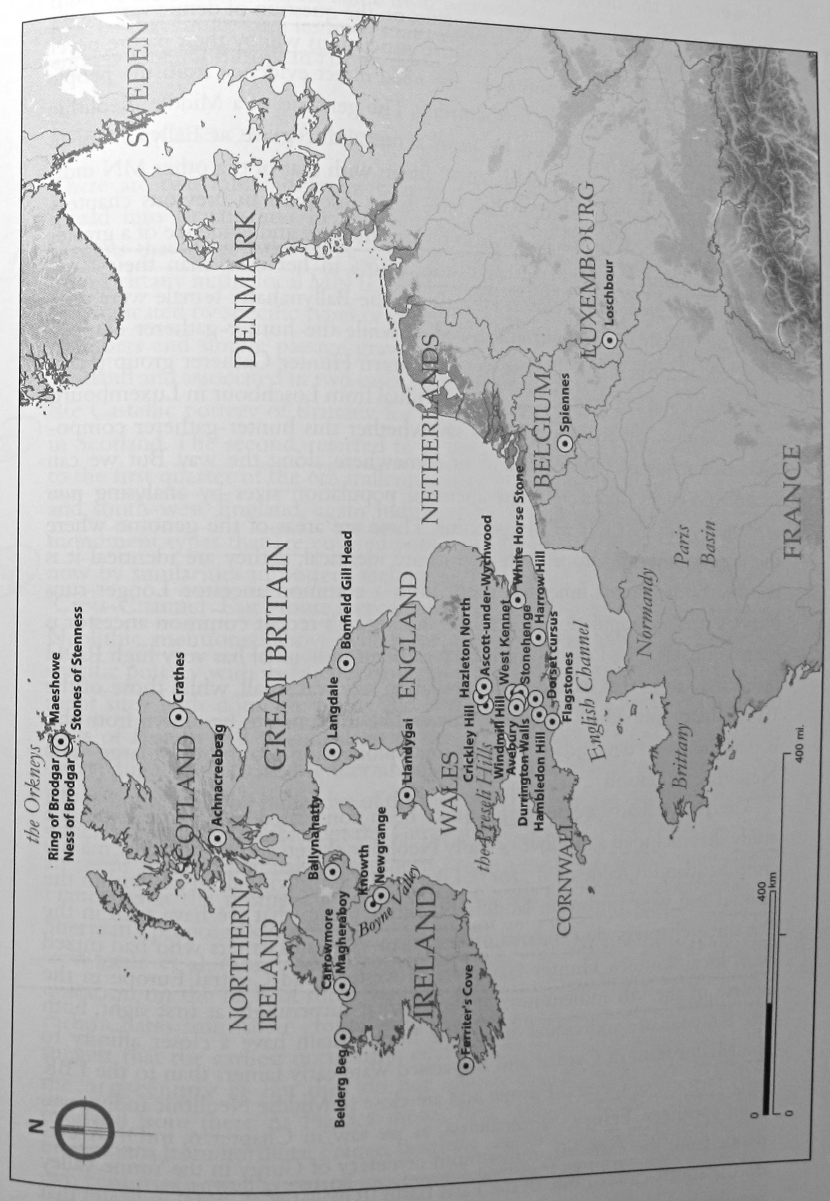

Fig 8.1. Map of sites and regions mentioned in Chapter 8.

However, as the debates of the last 50 years in both Britain and the other regions examined have shown, arguments on the question of demic versus cultural diffusion based on material culture associations will by their nature never be conclusive. To resolve this issue, we need direct evidence from the people themselves, and this is now forthcoming. The genome of a Middle Neolithic woman dated 5343–5020 cal BP from a megalithic grave at Ballynahatty in Northern Ireland (Cassidy et al., 2016) fits in with that of the other MN individuals from western Europe that have been discussed in previous chapters, with a majority of Anatolian–Aegean farmer ancestry and evidence of a greater degree of hunter-gatherer introgression, c.40% in her case, than their Early Neolithic ancestors. The closest affinities of the Ballynahatty female were with MN individuals from Spain and Sweden, while the hunter-gatherer component was, unsurprisingly, closest to the Western Hunter Gatherer group (Haak et al., 2015), and in particular to the individual from Loschbour in Luxembourg. At the moment it is impossible to say whether this hunter-gatherer component was acquired within Ireland or somewhere along the way. But we can make inferences about relevant ancestral population sizes by analysing *runs of homozygosity* (ROH) in the genome. These are areas of the genome where the copies inherited from both parents are identical; if they are identical it is because both parents inherited them from a common ancestor. Longer runs imply a smaller population, where the sharing of a recent common ancestor is more probable. The Loschbour hunter-gatherer individual has very high ROH levels indicating that its ancestral population size was small, while those of the Ballynahatty individual were much lower. The inference to be drawn from this is that she was a descendant not of a small pioneering group but of large-scale Neolithic migration.

The Ballynahatty evidence has since been confirmed by a more extensive study that included a number of Early Neolithic skeletons from Britain, mainly from Scotland (Olalde et al., 2017). Like the Irish individual, all fall within the central and west European Middle Neolithic group that we have seen in the last three chapters, descendants of Anatolian–Aegean farmers who had mixed with local Western Hunter Gatherers in western and Central Europe in the course of the 7th millennium BP. Somewhat surprisingly at first sight, both the Ballynahatty individual and those from Britain have a closer affinity to the Mediterranean Cardial and Impressed Ware early famers than to the LBK early farmers of Central Europe and are close to Middle Neolithic individuals from southern France. Nevertheless, as we saw in Chapter 6, mtDNA evidence from the early 7th-millennium cemetery of Gurgy in the Yonne valley on the south-eastern side of the Paris Basin (Rivollat et al., 2015) indicates that mixing had already been going on between individuals of Mediterranean and Central European farmer descent, as well as with indigenous hunter-gatherers.

Moreover, this is in keeping with the archaeological evidence for north–south contacts in France, starting already at the end of the 8th millennium. However, most of the British samples come from western and northern Scotland and it may be that future samples from south-east England will reveal individuals of entirely Central European farmer descent.

THE PROCESS OF COLONISATION

There are two rather different current views of how farming and farmers spread into Britain and Ireland. Sheridan (e.g. Pailler and Sheridan, 2009) suggests that there were three different routes and movements, one starting from Brittany in the local MN II c.6300–6000 BP and going north via the Irish Sea, indicated by specific types of collective tombs including closed polygonal chambers and simple passage graves, found on the west coasts of Wales and Scotland and associated in two cases with pottery that apparently resembles the late Castellic pottery of Brittany, for example from the site of Achnacreebeag in Scotland. The second, referred to as the 'Cross-Channel West' route, dates to the first quarter of the 6th millennium BP, and links Normandy with south and south-west England, again indicated by the presence of specific burial monument types that are covered with small circular mounds and confirmed now by similarities in pottery technology (Pioffet, 2017). Finally, there is the 'Cross-Channel East' route, represented by the so-called Carinated Bowl Neolithic, mentioned above, which has more extensive evidence, not just the specific pottery with its Michelsberg and Chasséen antecedents but also settlement sites with domestic plants and animals; evidence of its arrival in large parts of Britain and Ireland dates to the period 6000–5800 BP. Olalde et al. (2017) suggest that the Mediterranean connections indicated by the British EN genomes may be indicative of the proposed early movement from Brittany, which is certainly possible, but the Gurgy mtDNA results imply that there was an input from individuals of southern origin across the whole of northern France, so at the moment it appears that it could be associated with any of Sheridan's proposed streams.

Whittle et al. (2011) take a rather different view of the pattern of colonisation on the basis of their Bayesian analyses of the sequences of radiocarbon dates from their ground-breaking dating programme. Their results suggest that the earliest occupation occurred in south-east England during the 61st century BP but they do not assume that farming simply spread overland from there. As Fig 8.2 shows, they envisage further continental movements from northern France, Belgium and Brittany over the following two centuries as well as coastal movements within Britain, especially on the eastern side.

The speed of the spread is worth emphasising. The analysis by Bocquet-Appel et al. (2012) of the speed of expansion of the different regional cultures

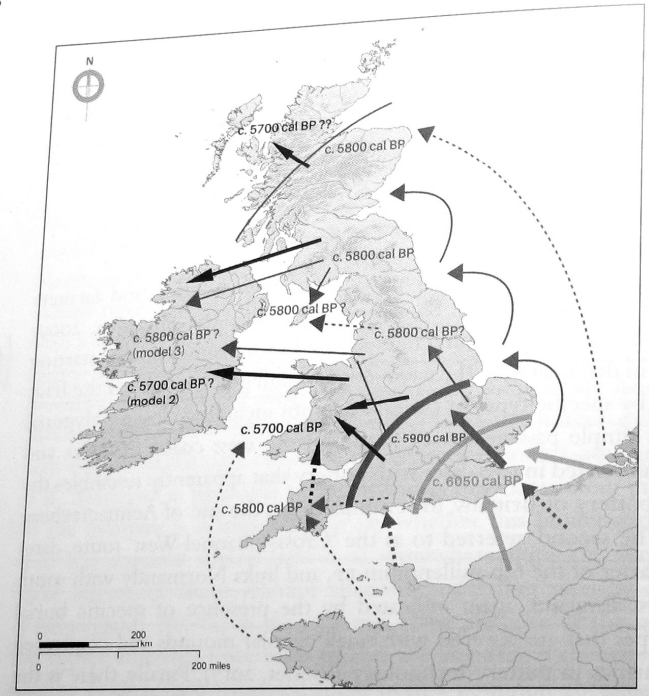

Fig 8.2. Contact and colonisation routes from continental Europe to Britain. Reproduced from fig 15.8 in Whittle, A.W.R. et al., *Gathering Time: Dating the Early Neolithic of Southern Britain and Ireland*, 2011, Oxbow Books, with permission from the author and Oxbow.

associated with the spread of farming shows that the rate of expansion of the Carinated Bowl tradition is only matched by the seaborne spread of the western Mediterranean Impressa, thus supporting the idea of a coastal expansion; the average rate of spread is three times as fast as the LBK. By c.5800 BP, if not earlier (Sheridan, 2017), farming and pottery, of the Carinated Bowl tradition, had reached Ireland and northern Scotland. Clearly this implies that the same sort of leapfrog or long-distance movement pattern that is apparent in the west Mediterranean was operating in the case of the colonisation of Britain and Ireland as well, with rapid movements into new territories by fissioning groups long before there was any question of local carrying capacity limits being reached. As we have seen, in the case of the western Mediterranean, and indeed the LBK, there is no evidence that the speed of spread can be explained by the adoption of farming by local forager groups, and the same is true in the case of Britain. However, this does not exclude the absorption of what must have generally been low-density Mesolithic groups into Neolithic communities.

Why did the farming colonisation of Britain and Ireland not take place sooner, given that farmers had reached the Normandy coast by 7000 BP and that the Villeneuve-St-Germain Culture continued to expand rapidly westwards into Brittany in the early centuries of the 7th millennium BP? In the case of the expansion into southern Scandinavia we saw that it probably resulted from the development of a new farming system in west-central Europe in the Michelsberg phase in the late 7th millennium, but also from rising temperatures that increased the northern range of effective cereal-growing and might have had negative effects on marine resources. Although a climatic explanation has been suggested for Britain as well (Bonsall et al., 2002), the evidence is currently weak (Woodbridge et al., 2014). However, it seems likely that the development of the expansive MN II Chasséen-Michelsberg farming system of the late 5th millennium was relevant, as in southern Scandinavia. We have already seen in Chapter 6 how it was associated with a re-occupation of the areas abandoned after the LBK and a big extension of the settled area into areas of sandy soils in the Low Countries. The radiocarbon population proxy curve for western France (Fig 6.3b) indicates that the population reached a peak c.6200 BP, and then declined to a trough at c.5700 BP. Similarly, the Paris Basin proxy (Fig 6.3a) rises to a Middle Neolithic peak c.5800 BP before decreasing to a trough at 5500 BP. It is thus at least plausible to see the population peak as an indicator of population pressure that could have prompted a colonisation movement to Britain, and the subsequent decrease as evidence that a significant part of the population did indeed leave.

POPULATION BOOM AND BUST IN BRITAIN AND IRELAND

In the same way as we have seen already for other regions, the demographic patterns inferred from summed radiocarbon probabilities reflect the impact of the arrival of farming. This was first demonstrated by Collard et al. (2010), who showed that there was a very marked increase in population size from c.6000 to 5600 BP, followed by an even more rapid decrease in the period to c.5300 BP, to a level less than half that of the peak. The low level lasted to c.4500–4400 BP before rising continuously to 4000 BP, at which point the date series stops. Removing from the dataset those dates from highly visible Neolithic monuments made no difference to the EN pattern of dramatic population rise and fall although of course the peak was lower. As Collard et al. pointed out, the rapid population increase synchronous with the arrival of domesticated plants is not consistent with a slow indigenous uptake of farming, and the recent ancient DNA results described above have confirmed this. Subsequent more rigorous analyses (Shennan et al., 2013; Timpson et al., 2014) (Fig 8.3) using the methodology described in previous chapters have confirmed that the population patterns are statistically significant, with a dramatic rise to a peak over the period 6000–5600 BP, followed by a drop of 50% or more from

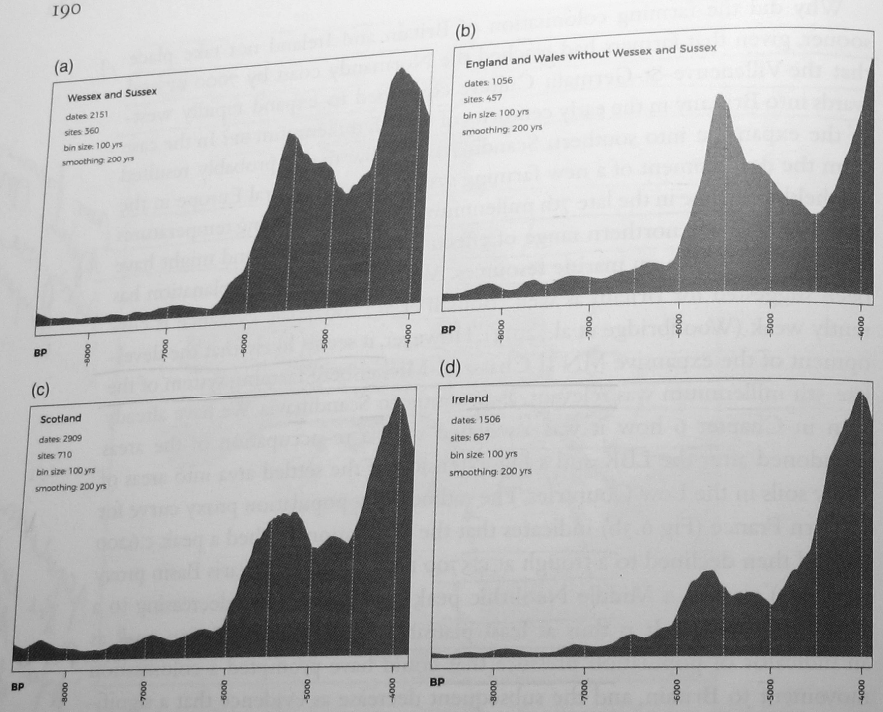

Fig 8.3. Radiocarbon population proxies for Britain and Ireland. a) Wessex and Sussex; b) Rest of England and Wales; c) Scotland; d) Ireland. b) and d) Data from EUROEVOL project; a) and c) Data from EUROEVOL project, updated by Professor A. Bevan.

the peak over the next 200–300 years. In other words, as in most of the other areas we have seen, the arrival of farming is followed by a population boom and then a bust, which in Britain and Ireland is especially marked.

In the light of suggestions that the summed radiocarbon probabilities cannot be considered a valid representation of population, Woodbridge et al. (2014) compared the radiocarbon data for Britain with an independent proxy for human population: human impact on the environment as reflected in pollen diagrams. Fig 8.4 shows pollen-inferred land cover through time divided into three categories: deciduous woodland, semi-open arboreal and semi-open pasture, at a resolution of 200 years, plotted against the radiocarbon demography proxy. It can be seen that between 6000 and 5500 BP the proportion of woodland decreases and semi-open arboreal landscapes increase in correspondence with the population boom as primary forest is cleared. The reverse occurs between c.5500 and 5300 as the population goes down and woodland increases again. The proportion of woodland remains high until c.4500 BP when population levels rise and open environments expand once more, with a substantial

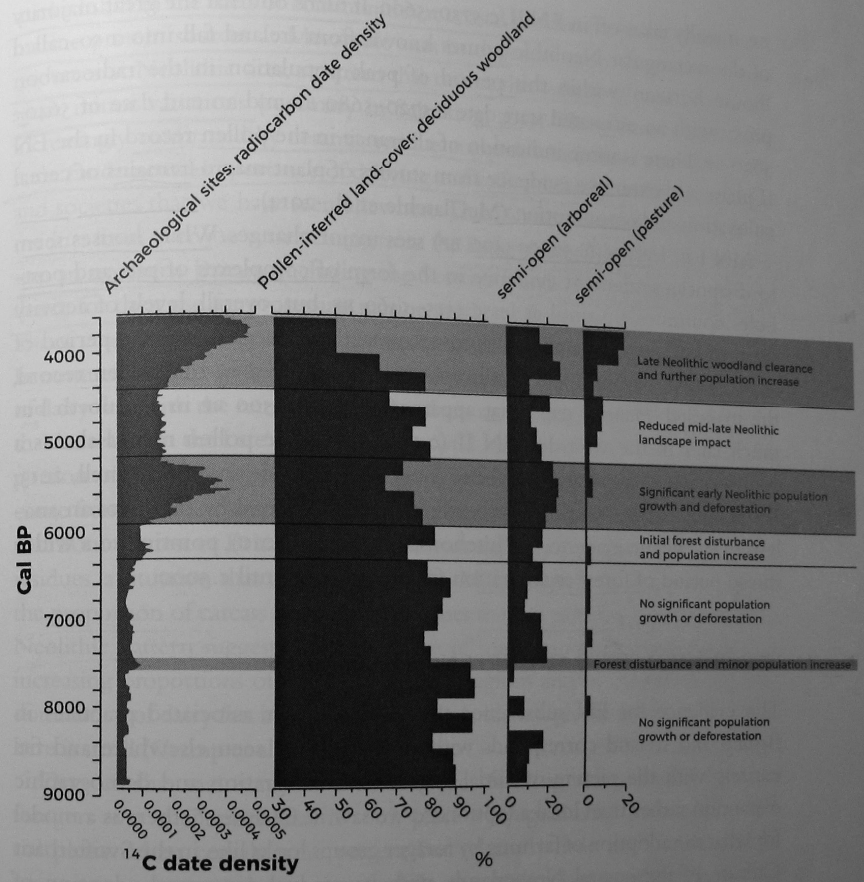

Fig 8.4. Radiocarbon population proxy and pollen-inferred land clearance history for Neolithic Britain. Reprinted from fig 5 in *Journal of Archaeological Science* 51, Woodbridge, J. et al., The impact of the Neolithic agricultural transition in Britain: a comparison of pollen-based land-cover and archaeological 14C date-inferred population change, pp. 216–224, copyright 2014, with permission from Elsevier.

decrease in woodland from c.4000 BP. In other words, the pollen evidence confirms the boom–bust pattern. The idea that there was some sort of Middle Neolithic downturn, indicated by forest regeneration and decreased settlement evidence, has often been suggested in the past (e.g. Bradley, 1978), and linked by some to a shift to a more mobile pastoralist economy, but Whittle's (1978) perceptive suggestion that this involved a population downturn as a result of over-exploitation of resources was largely forgotten.

In Ireland too, the boom and bust pattern seen in the demographic proxy has been confirmed by other evidence (Whitehouse et al., 2014). Although there is some indication of Neolithic activity in the EN I period, c.6000–5750

BP, it really takes off in EN II, c.5750–5600. It turns out that the great majority of the rectangular Neolithic houses known from Ireland fall into a so-called 'house horizon' within this period of peak population in the radiocarbon proxy, with an estimated start date c.5720–5680 BP and an end date of 5640–5620 BP. There is some indication of clearance in the pollen record in the EN II phase and extensive evidence from studies of plant macro-remains of cereal cultivation and consumption (McClatchie et al., 2014).

MN I in Ireland (c.5600–5400 BP) sees major changes. While houses seem to disappear, settlement evidence in the form of complexes of pits and post-holes continues, up until at least 5515–5460 BP, but, overall, levels of activity seem to be lower. This phase also overlaps with the beginning of a period of less intensive land use and reafforestation documented in the pollen record, the so-called '*Plantago* gap', that apparently starts c.5500 BP in the north but much later in the west. In MN II (c.5400–5100) the pollen record shows a continuation of decreased land-use intensity (Ghilardi and O'Connell, 2013; Whitehouse et al., 2014), and this inference is confirmed by results of an analysis of the beetle evidence (Whitehouse and Smith, 2010), pointing to a widespread period of forest regeneration from c.5500 BP until c.5000.

EARLY NEOLITHIC SUBSISTENCE PATTERNS

The evidence for EN subsistence patterns and their associated practices in Britain and Ireland corresponds with what we have seen elsewhere and fits entirely with the picture of initial large-scale immigration and demographic expansion rather than local adoption. As we saw in Chapter 6, there is a model for what the adoption of farming by forager groups looks like, in the Swifterbant Culture of the coastal Netherlands, with its gradual piecemeal adoption of domestic animals and crops. In contrast, in Britain and Ireland, with the exception of Ferriter's Cove as we have seen, there are no bone assemblages with domestic animals prior to the beginning of the Neolithic at c.6000 BP and the proportion of domestic animals in the British EN (5900–5300 BP) is over 90% (Manning, unpublished analysis). It is notable that the same high proportion, well over 90%, is seen in the faunal assemblages of the Paris Basin in the period 6400–5800 BP. Moreover, Tresset (e.g. 2003: fig 3.2) has shown that the relative proportions of the different domestic animals at EN sites in southern England are matched by those at sites in Normandy and the Paris Basin, while analyses of the sizes of domestic cattle show that these are also very similar. In other words, the pattern is consistent with the introduction of a set of established practices by colonists from adjacent parts of continental Europe rather than their gradual adoption over time, as in the case of the Swifterbant Culture.

This picture of an introduced set of subsistence practices has been confirmed in recent years by increasing numbers of isotope studies. Analyses of stable carbon and nitrogen isotopes in human skeletons showed that that there was a very

marked shift in the diets of communities at coastal sites from a heavy reliance on marine protein sources at Mesolithic sites to dependence on largely terrestrial resources at Neolithic sites, a pattern that occurs throughout Britain albeit with some minor variations (summary in Schulting, 2013). These studies have been increasingly confirmed by ceramic residue analyses, which have also shown the same fundamental importance of dairying and milk processing in EN economies and societies that we have seen elsewhere. Thus, Cramp et al.'s (2014a) study of residues from over 300 vessels dating from the Early to Late Neolithic from coastal sites in northern Britain, including the Scottish islands, found virtually no evidence for their use for processing marine products; these were found in less than 1% of vessels from over 40 sites, a major difference from southern Scandinavia. In contrast, around 80% of the EN and MN vessels with residues showed traces of dairy fats, with the remainder coming from ruminant carcass fats, a proportion that increased in the Late Neolithic. Since wild animals make up only a small proportion of the animal bone assemblages, it follows that the carcass fats too must come from domestic animals. The evidence from northern Britain is paralleled by that from the rest of Britain and Ireland, with similarly high proportions of dairy residues, a situation that continues into the MN, although in southern England the proportion of carcass fat residues increases to over 30%. Interestingly, the Late Neolithic pattern suggests the appearance of some regional specialisation, with increasing proportions of meat fats in some regions and an overwhelming predominance of dairy fats in others, notably Ireland, though the number of samples here is small (Cramp et al., 2014a: fig 1, g–i).

One of the mainstays of the view that farming was adopted by local foragers was the belief that it took place very gradually, with a long initial phase when cereals were present but relatively little used, perhaps only on special ceremonial occasions, while the main plant resource exploited continued to be hazelnut (e.g. Thomas, 2003). This idea was undermined by Jones and Rowley-Conwy (2007), who emphasised the importance of taphonomic factors in accounting for the differences in representation of cereals versus hazelnuts on sites: hazelnut shells are waste and as such are more likely to be deliberately thrown on to fires than cereal grains, which are consumed and thus only burned as a result of accidental spillage; if allowances are made for this disparity the evidence suggests that cereals were the major plant food source. At the same time a study of directly dated cereal grains (Brown, 2007) showed that they were actually more frequent in the earlier than the later Neolithic of Britain. In keeping with Brown's argument that the only reliable source of data for the incidence of particular species is directly radiocarbon-dated samples of plant remains, Stevens and Fuller (2012) took this study further on the basis of an updated database of directly dated remains from the Early Mesolithic through to the post-Medieval period in Britain and Ireland. Their results indicated that cereals were introduced c.5950–5850 BP and the summed probabilities of the dated samples rose extremely rapidly

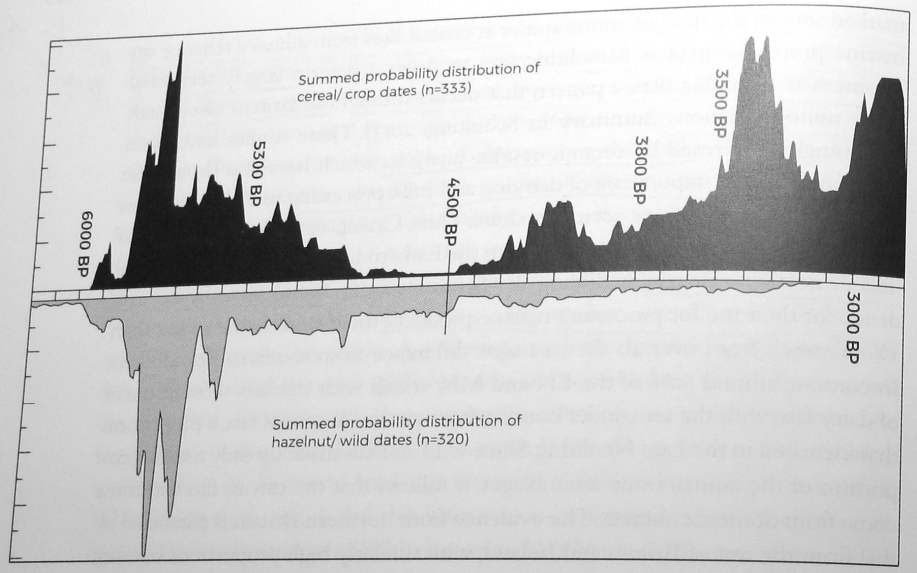

Fig 8.5. Summed probability distribution of direct radiocarbon dates on cereals and wild plant remains through time in Neolithic and Bronze Age Britain. Reproduced, with permission, from fig 3 in *Antiquity* 86, Stevens, C.J. and Fuller, D.Q., Did Neolithic farming fail? The case for a Bronze Age agricultural revolution in the British Isles, pp. 707–722, 2012.

after that date (see Fig 8.5). As they pointed out, this seems an extremely unlikely pattern if cereal agriculture spread through adoption by indigenous groups because it implies that they acquired not only the crops but more importantly all the knowledge required to grow them successfully, virtually instantaneously, a knowledge that embodies years if not generations of transmitted practice. Apparently more surprising in the light of the argument that has been made so far is the fact that numbers of directly dated samples of wild foods, in particular hazelnut shells, increased dramatically in tandem with the cereals. At first sight it might be thought that this is evidence in favour of the continuity of forager traditions. In fact, it reflects the creation of secondary woodland, of which hazel, as an early coloniser of cleared ground, is a key constituent that was no doubt further encouraged for its food value. This is clearly demonstrated in Tipping et al.'s (2009) high-resolution study of pollen from the site of the Early Neolithic so-called 'hall' at Crathes in north-east Scotland. This showed that cereal cultivation was dominant in the immediate environs, with indications that it was intermixed with stands of secondary woodland dominated by hazel, a situation that we have seen already in post-LBK Central Europe.

The earlier Neolithic farming systems in Britain and Ireland seem to have been very similar to one another (Jones and Rowley-Conwy, 2007;

McClatchie et al., 2014, 2016). The range of crops was narrow, comprising emmer and to a lesser extent barley as the main crops, with very little evidence of einkorn or free-threshing wheat (the latter a contrast with central and northern Europe) and no evidence of pulses; the genetic diversity of the crops that did reach Britain may have been similarly impoverished (Fuller and Lucas, 2017). The great majority of the weed species recovered are characteristic of disturbed ground rather than woodland and the proportions of annual and perennial weeds are roughly equal. This latter pattern is more or less the same as that for the LBK and in both cases the weed data are interpreted as evidence of farming plots that would have been in use for at least ten years, rather than slash-and-burn farming. As we have seen, the argument has been further developed by Bogaard and colleagues (e.g. 2013) in recent years on the basis of patterns of nitrogen enrichment in cereal grains that suggests the use of manuring. Evidence for this practice is also found in the British earlier Neolithic, albeit with variation in the intensity of manuring from site to site. Nevertheless, the farming system as a whole was not unchanged since the LBK. As we saw in Chapter 6, in Central Europe, even if intensive working of small fields continued, it was accompanied by a new forest-based dimension, perhaps associated with the creation of forest pasture for cattle, that led to the creation of extensive areas of secondary forest. It is this sort of system that characterises the first farming in southern Scandinavia and probably Britain and Ireland as well. High-resolution pollen analysis of a core from the site of Bonfield Gill Head in the North York Moors (Innes et al., 2013), admittedly an upland area, led to the conclusion that an Early Neolithic phase of clearance activity lasting c.100 years indicated 'forest farming', probably focussed on stock-keeping. Tree girdling would have produced 'stump-sprout woodland' good for cattle-grazing for a number of years. This would have been followed by a phase of cereal-growing in the resulting clearing, with conditions improved by the burning of dead wood, succeeded by a period of coppice-woodland management. Strontium isotope analyses of skeletons from the EN long cairn of Hazleton North in the Cotswold region are in keeping with this sort of activity pattern. The majority have values that are not consistent with permanent sedentism in the region where they were buried but point to regular movement to a region with a different geology, at least 40 km away, possibly as part of a transhumant cycle since cattle share the same isotope pattern as people (Neil et al., 2016).

MIDDLE NEOLITHIC SUBSISTENCE AND THE POPULATION 'BUST'

Regardless of the nature of the farming system, what is striking is the fact that, according to Stevens and Fuller's data, after increasing rapidly to a peak c.5700–5600 BP the numbers of directly dated wild plant foods and cereals in

Britain both decline quite rapidly, with cereals showing an initial sharp fall from c.5600 BP and wild plant foods from c.5400. An almost identical pattern in the chronological distribution of directly dated cereal and hazelnut remains has now been found in Ireland (McClatchie et al., 2016), with a rapid rise to a peak from c.5750 BP and a virtual disappearance of both from c.5300 BP. It is immediately apparent that Stevens and Fuller's cereal date pattern matches the Great Britain population curve and also the forest clearance pattern documented by Woodbridge et al. (2014), including the upturn in population and evidence for clearance seen at the end of the sequence in the late 5th millennium BP. The hazelnut curve is very similar although it does not show the same late upturn, and as such is in accordance with the pollen evidence that the landscape was becoming increasingly open. The Irish plant macro-remains pattern, too, largely matches both the population picture for Ireland and the pollen evidence for forest regeneration from c.5500 BP onwards seen above (Whitehouse et al., 2014), though the records deviate from one another from c.4500 BP, when the population curve shows another major upturn that is not visible in the directly dated macro-remains.

Although Stevens and Fuller's evidence and their inference of a decline in the importance of cereals has been questioned, especially for Scotland (Bishop, 2015), they show in a further analysis that their argument can in fact be sustained (Stevens and Fuller, 2015). In northern England and mainland Scotland both emmer wheat and barley are cultivated during the population peak but after 5600 BP wheat largely disappears from the record while barley, the more resilient cereal, continues, until it too almost entirely disappears c.5000 BP; at the same time hazelnut frequencies increase, a pattern that continues until c.4300 BP (Fig 8.6). The Scottish islands are different, however, as Stevens and Fuller had already pointed out. Here the cereal peak runs from 5500 to 4800 BP, and coincides with major monument construction in the Orkneys (see below). The northern islands seem to have had a different population and subsistence trajectory from the rest of Britain, booming in the period from c.5500 to c.4900 BP when the rest of Britain was in decline.

Current work comparing the population trajectories for Britain and Ireland as a whole with the chronological distribution of directly dated plant macro-remains using a massively increased dataset (Bevan et al., 2017) confirms these patterns and the correlation between them. Here again the Initial Neolithic boom is associated with a high proportion of wheat species. As population decreases this goes down, to virtually zero by 5200 BP, and the proportion of both barley and hazelnuts rises. The former reaches a peak by the same date and then also declines to virtually zero, so that by 4500 BP hazelnut makes up virtually 100% of the dated plant remains. In other words, it is not simply that there were far fewer people and therefore far less subsistence activity overall, but its nature had changed. Wheat was replaced by barley, which can flourish in worse conditions but produces lower yields, but then even this was largely abandoned

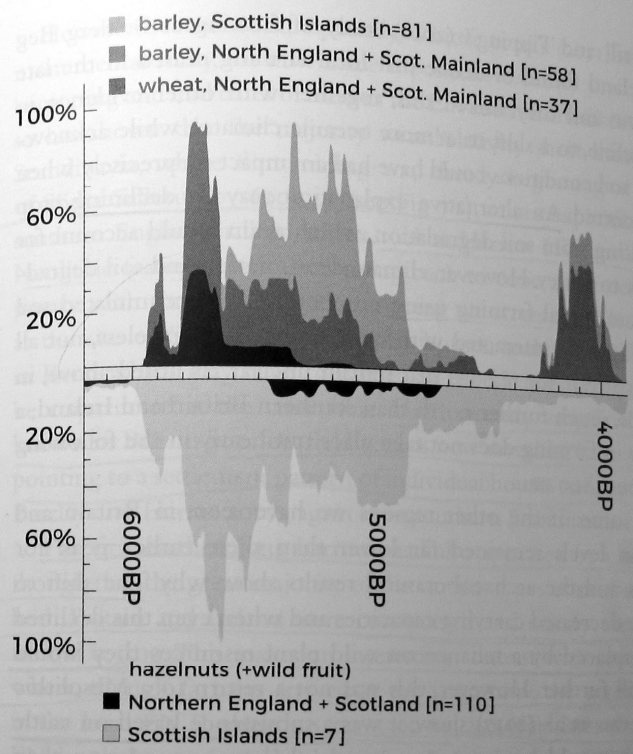

Fig 8.6. Summed probability distribution of direct radiocarbon dates on identified crops, indicating the relative contribution of dates on wheat from northern England and mainland Scotland, barley from northern England and mainland Scotland, and barley from the Scottish islands; inverted in grey and black is the SPD for direct dates on hazelnut shell and other wild foods. Reproduced from fig 3 in *World Archaeology* 47(5), Stevens, C.J. and Fuller, D.Q., Alternative strategies to agriculture: the evidence for climatic shocks and cereal declines during the British Neolithic and Bronze Age (a reply to Bishop), pp. 856–875, 2015. Taylor & Francis Ltd. www.informaworld.com. With permission.

for an ever-increasing reliance on wild plant resources, reaching a peak c.4500 BP, after which there is a rapid renewed increase in the proportion of barley.

It is clear from what we have seen that the agricultural system brought to Britain and Ireland by the first farmers was initially successful, but it could not be sustained, hence the boom and bust. Cultivation of wheat gave way to less productive but more robust barley, which was then itself virtually abandoned; the question is why? Worsening climatic conditions for cereal-growing, for which there is extensive evidence in the later 6th millennium (e.g. Ghilardi and O'Connell, 2013), were probably one of the reasons, and would certainly account for the shift to barley. In Ireland the period c.5600–5400 BP sees a decline in the bog-oak record that has been taken to indicate increasingly cool and wet climatic conditions, which continue down

to c.5100 BP. Verrill and Tipping's (2010) study of farming at Belderg Beg in north-west Ireland found evidence that local farming ceased in the late 6th millennium BP and they linked this, together with other evidence in the region for decline, to a shift to a 'more oceanic climate', while acknowledging that local soil conditions could have had an impact on precisely when abandonment occurred. An alternative explanation may be declining crop productivity resulting from soil degradation, which again would account for a shift from wheat to barley. However, climate deterioration and soil degradation resulting from initial farming using up centuries of accumulated soil fertility could easily have interacted with one another. Nevertheless, not all areas fit into this pattern, for reasons that remain unclear. As noted above, in the Scottish islands, much further north than southern Britain and Ireland, a substantial decline in farming does not take place until early in the following millennium, c.4900–4800 BP.

In contrast to some of the other regions we have seen, in Britain and Ireland population levels remained far lower than their earlier peak for hundreds of years and the archaeobotanical results show why. The shift to barley would have decreased carrying capacities and when even this declined and was largely replaced by a reliance on wild plant resources they would have decreased still further. However, this was not a return to a Mesolithic way of life. As Bevan et al. (2017) show, it was a subsistence based on cattle pastoralism, which would have supported a much lower population than cereal agriculture. This system lasted far longer than the climatic downturn that may have been an/the initiating factor. In the language of complex systems (Downey et al., 2016 and see Chapter 9 for further discussion) it can be seen as a 'phase shift' in the system from one equilibrium to another at a much lower density.

SOCIAL AND CULTURAL CHANGE

So far the focus has been on the demographic and subsistence aspects of the appearance of the first farmers with their domestic crops and animals in Britain and Ireland, though attention has been drawn to the 'family resemblances' in the pottery assemblages on both sides of the English Channel, but of course many other novel phenomena were also introduced, just as in the case of southern Scandinavia. These include long barrow burial mounds, megalithic tombs, rectangular post-built houses, flint mines and causewayed enclosures. They all have predecessors in continental north-west Europe although, with the possible exception of the flint mines and causewayed enclosures, the similarities are generic rather than specific and cannot be readily tied down to a single area. In some cases it remains unclear whether the innovations result from ongoing interaction with continental Europe or descent from a common cultural ancestor.

However, recent work, especially Whittle et al.'s (2011, see e.g. fig 14.140) monumental study, has now made it possible to clarify the chronology of the beginning and end dates of most of the EN site and artefact types, and in doing so has shown that the majority were relatively short-lived. As in southern Scandinavia, where flint mining was already beginning at the Scanian site of Södra Sallerup by 6000 BP (see Fig 7.1), mines exploiting the flint in the southern English chalk in Sussex, such as Harrow Hill, are among the earliest Neolithic features, with dates going back to 6000 BP, if not before, contemporary with similar developments going on across the Channel, for example at the site of Spiennes. Rectangular houses, such as at White Horse Stone in Kent, which may have continued in use for over 200 years, also begin to be constructed at the same time. Until recently very few EN houses were known in Britain but new fieldwork is now revealing increasing numbers and pointing to a settlement pattern of individual houses and small hamlets (see e.g. Barclay and Harris, 2017), again as in southern Scandinavia.

The first earthen long barrows had also appeared by c.5800 BP. It is clear though that the great majority of the various types of sites and monuments in both Britain and Ireland were constructed and mainly used between c.5750 BP and c.5500. This makes an interesting contrast with southern Scandinavia where, though farmers arrived at the same time, the construction peak was in the local EN II phase, c.5500–5300 BP, 250 years later than in Britain. The EN house boom in Ireland has already been mentioned. At the same time the earliest circular megalithic passage tombs in Ireland were constructed at the site of Carrowmore (Bergh and Hensey, 2013), while the earliest megalithic so-called court tombs in their trapezoid mounds begin only slightly later (Schulting et al., 2012). In Britain the construction and use of Cotswold-Severn chambered tombs, such as Ascott-under-Wychwood and West Kennet, also took place at this time and the large rectangular timber buildings found in Scotland, such as Crathes, mentioned earlier, were also built, as were the causewayed enclosures of southern Britain, for example the well-known site of Windmill Hill. In addition, there is evidence of extensive exchange. Beginning c.5800 BP the quarries in Langdale in northern England were producing thousands of axes that were distributed over large areas of England and Scotland, as well as across the sea to Ireland.

By c.5600 BP the currency of Carinated Bowls as well as of the Scottish 'halls' had come to an end; from c.5500 to 5400 BP we see the end of the Sussex flint mines, of digging new ditch circuits at causewayed enclosures, of stone axe exchange networks, and then groundstone axes themselves. By c.5300 BP the southern British enclosures are no longer used, though long barrows and cairns, linear monuments and the miscellaneous category of diverse and small monuments continue later. In Ireland the house phase is finished by c.5600 BP, while pit complexes seem to end or decline massively in frequency shortly after c.5500 during MN I. The construction of court tombs also appears

to cease although their use continued. In contrast, however, the building of passage graves, which had begun during the EN II settlement boom not only continued but apparently peaked during the MN II phase, c.5400–5100 BP with the construction of the major tombs such as Knowth and Newgrange in the Boyne Valley.

Of course, what links the various comings and goings together is their connection to the pattern of population booms and busts in Britain and Ireland that we have seen earlier in the chapter. They appear as the population begins to rise and they largely disappear as it declines. The reasons for the coincidence of the beginnings and endings of these varied phenomena with the population boom and bust are likely to have been varied. Innovations like the new pottery types that appeared early in the 4th millennium quite possibly simply increased and then decreased with the population while random processes of innovation and drift could have led to the emergence of new types, such as Middle Neolithic Peterborough Ware (Ard and Darvill, 2015). Exchange networks of stone axes, involving production far beyond local needs, were no doubt responding to the demand created by a large population for both clearance tools and ritual/prestige objects. The larger population might also have resulted in an increased demand for social distinction which exotic artefacts would have met. The same may be true of burial monuments, since, just as in southern Scandinavia, only a small proportion of the population were buried in them. However, these would also have been a response to the need of local groups to assert claims to territory as population grew, and their varied styles of monumentality are clearly about much more than just burial.

The peak of construction of causewayed enclosures in southern England occurs during the period of the population peak, beginning c.5700 BP. Whittle et al. (2011: fig 14.20) (see Fig 8.7) show that the majority of the ditch construction for the enclosures they examine in detail occurs in the 57th century BP, with a subsidiary peak in the 56th century. By 5500 BP construction is effectively over and they are almost all out of use by c.5300 BP. The previous two chapters have shown that the immediate origin of the enclosures lies in adjacent areas of continental Europe in the mid–late 7th millennium, following patterns that arose in the LBK, and that they plausibly represent the largest collectively acting group. In southern Britain, as we have just seen, they only occur from c.5700 BP, after c.300 years of farming occupation. Whittle et al. (2011: 894–898) suggest that their construction is associated with intergroup competition. When we see the relationship between enclosure construction and the population pattern it becomes clear why that would be the case. As with the agricultural colonisation of southern Scandinavia, the reason they were not constructed initially was because there was no need for them during the period of initial colonisation when no pressure existed. Initial settlement would have followed the ideal-free distribution and it

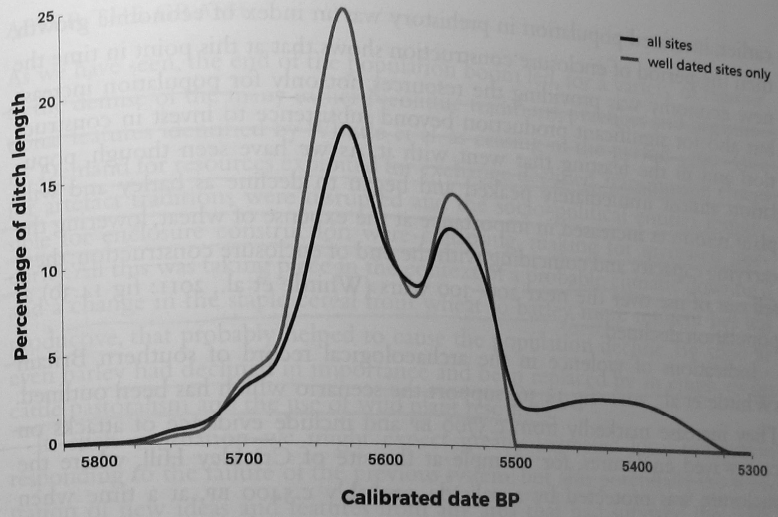

Fig 8.7. Chronology of causewayed enclosure building in Britain. Reproduced from fig 14.20 in Whittle, A.W.R. et al., *Gathering Time: Dating the Early Neolithic Enclosures of Southern Britain and Ireland*, 2011, Oxbow Books, Oxford, with permission from the author and Oxbow.

was undertaken by individual households and small groups, evident in the dispersed pattern and small scale of early settlements. But we then have to suppose either that some knowledge of the relevant practices was transmitted through perhaps 8–12 generations without being put to use, or that contact was maintained with the adjacent continental groups from which they came and which had continued the enclosure tradition because populations there were high and competition was prevalent; perhaps groups continued to come to Britain for 200–300 years, or interaction continued. If transmission was based on continuing contact between south-east England and the adjacent continent, then, as Whittle et al. suggest, that could help to explain the lack of enclosures in Scotland, where, as we have seen, the population boom–bust also occurs.

As in late 7th-millennium BP continental west-central Europe and in southern Scandinavia, their construction should be seen as the result of costly signalling of group strength and thus a discouragement to attack, as regional population rose to a peak and competition increased. As elsewhere, it seems entirely likely that it was such competition that caused the creation of the higher level social-political entities represented by the enclosures in the first place (cf. Zimmermann, 2012), the construction of the enclosures perhaps itself being part of the process that created the new entities. At the same time, the high population resulting from the successful farming economy also provided the labour to make construction possible. In other words, if, as we have argued

earlier, increased population in prehistory was an index of economic growth, then the period of enclosure construction shows that at this point in time the new economy was providing the resources not only for population increase but also for significant production beyond subsistence to invest in construction and in the feasting that went with it. As we have seen though, population almost immediately peaked and began to decline as barley and wild plant resources increased in importance at the expense of wheat, lowering the carrying capacity and coinciding with the end of enclosure construction; these fell out of use over the next 200–300 years (Whittle et al., 2011: fig 14.30) as population declined.

Indications of violence in the archaeological record of southern Britain (Whittle et al., 2011: fig 14.36) support the scenario which has been outlined. They increase markedly from c.5700 BP and include evidence of attacks on causewayed enclosures, for example at the site of Crickley Hill, where the enclosure was protected by a palisade, probably c.5400 BP, at a time when population was declining but the enclosures remained in primary use. The enclosure at Hambledon Hill, which was also the subject of attack, had seen extensive palisade and earthwork construction around the same time (Bayliss et al., 2017). Nevertheless, although population was declining and enclosures being abandoned, the period from c.5500 to 5200 seems to be the main period of construction of so-called cursus monuments, linear features made up of a pair of parallel banks and ditches often around 100 m apart. The largest, the Dorset cursus, is made of two such monuments, each c.5 km in length, placed end to end. In what ways these were a response to the decline of the enclosures and what scale of effort they involved at any given time remains unclear. In any case, these too had ceased to be constructed by c.5200 BP (Bayliss et al., 2017: fig 17.14).

In the context just described, the enclosure at Magheraboy in north-west Ireland presents a widely recognised anomaly. Under all the possible current models for its construction date, it belongs to the beginning of the Neolithic colonisation of Ireland, shortly after population began to rise and not as it was nearing its peak, as in Britain (Whittle et al., 2011: 665–666). Sheridan (2017) plausibly sees it as an indication of early 'Carinated Bowl' settlement that had arrived in Ireland from the north, via Scotland, and there are now some other early dates for occupation material that would support this. It is as if the need for an enclosure was assumed to exist by the first settlers, on the basis of the situation prevailing where they came from, even though the competitive conditions that had led to enclosure building did not exist at this time in Ireland, and its initial irrelevance meant that enclosure building was never taken up on any scale. In any case, Scotland and Ireland both demonstrate that enclosure construction and the practices that went on there were not necessary responses to local population increase and inter-group competition.

AFTER THE CRASH

As we have seen, the end of the population boom led, for a variety of reasons, to the demise of the many earlier Neolithic traditions, practices and organisational features identified by Whittle et al. as ceasing in the period 5500–5300 BP. Demand for resources exploited for exchange declined, transmission chains for artefact traditions were disrupted and the socio-political entities responsible for enclosure construction were collapsing, making for increased insecurity. All this was taking place in the context of a probable climatic downturn and a change in the staple cereal from wheat to barley, more resilient but less productive, that probably helped to cause the population decline. By 5000 BP even barley had declined in importance and been replaced by an emphasis on cattle pastoralism and the use of wild plant resources.

In such a situation we might expect greatly increased local innovation responding to the failure of the previous system, but also potentially the infiltration of new ideas and features from any area that had survived the crash. Given that the new subsistence system was based on cattle pastoralism rather than cereal agriculture, we can also expect there would have been changes in value systems and social institutions. It is in this context that the first stage of Stonehenge was constructed c.5000 BP or shortly after, consisting of a ditch with internal and external banks, and the circle of so-called Aubrey Holes, containing the famous bluestones imported from the Preseli Hills in south-west Wales, as well as cremation burials (Darvill et al., 2012). There were also stone and post features in alignment with the midsummer sunrise and the northern major moonrise. Nor was Stonehenge the only site of its kind being constructed at this time. Similar large 'henge monuments' with evidence of stones and cremations, slightly earlier in date, have been found at Llandygai in north Wales and at Flagstones in Dorchester, which is 50 miles to the south of Stonehenge and at the centre of another major group of Neolithic monuments (Parker Pearson, 2012: 316–319). Similar but smaller cremation enclosures of roughly the same date are now known quite widely from southern England to Scotland.

However, arguably the most impressive monuments constructed in Britain around 3000 BC are to be found in the Orkney Islands in northern Scotland, in the context of the major ritual and settlement complex on and around the Ness of Brodgar, which seems to have been a centre for the whole of the Orkney Islands. The monuments include the Stones of Stenness henge monument and stone circle, as well as the Ring of Brodgar and the monumental stone buildings of the recently discovered Ness of Brodgar site (www.orkneyjar.com/archaeology/nessofbrodgar/), apparently a walled ceremonial centre, which began to be constructed c.5200 BP, as well as the Maeshowe-type passage tombs, which borrow features from the Irish Boyne Valley tombs, such as the orientation of the passage on the mid-winter solstice found at

Maeshowe itself. Moreover, finely carved stone balls and maceheads plausibly suggested to be 'symbols of power' also occur at these sites (details summarised in Sheridan, 2017). As we have seen, the Scottish islands do not show a marked drop in the incidence of dated cereals until c.4850 BP, in contrast to mainland Britain, where it occurs c.5350, in parallel with the population crash we have seen above. In other words, the Scottish islands in general and Orkney in particular seem to have continued to flourish and develop new and exceptional monumental, ritual and social forms at a time when there was decline elsewhere, and were widely emulated subsequently as a result. Thus, the Stones of Stenness remains the earliest 'true' henge, that is to say a circular monument with a bank outside the ditch, though it is uncertain at present whether these monuments originated in Orkney and spread south from there given the wide distribution of similar monuments across Britain at the end of the 6th millennium BP. On the other hand, it does seem clear that Grooved Ware pottery had its origin there, perhaps by c.5200 BP (Brophy and Sheridan, 2012: 68) and subsequently spread to the rest of Britain and to Ireland, where it is mainly found in ceremonial/monumental contexts. It was prevalent across Scotland by 5000 BP and had already spread to southern England by 4800 BP (Parker Pearson, 2012: 330). In Ireland it occurs in the Boyne Valley passage tomb cemeteries, beginning c.5000 BP and continuing down to c.4500/4400 BP (Sheridan, 2004), as it did in Britain, but this is after their construction and initial use in the late 4th millennium. The construction of the great Boyne Valley passage tombs in Ireland precedes those in Orkney, which used features from them, as we have seen, and occurred at the end of the population crash in Ireland.

What is abundantly clear is that developments in Britain from the end of the 6th to the late 5th millennium BP were very different from those that preceded them. The likelihood that subsistence was now based on cattle pastoralism fits in with the evidence for exceptionally extensive long-distance contacts within the British Isles that involved novel ritual and social developments, at a time when contacts with continental Europe had largely if not entirely ceased. It is difficult to imagine the sorts of social and economic arrangements that made it possible to move the bluestones from south-west Wales to Stonehenge, while the evidence that some cattle were being brought from as far away as Scotland in connection with the feasting evidenced at the site of Durrington Walls during the period of the massive second phase of construction at Stonehenge, c.4570–4430 BP is also striking (Viner et al., 2010). It is hard not to see all this as indicative of a growing capacity to centralise power that is evidenced earlier in the Boyne Valley tombs and the monuments of Orkney. Parker Pearson (2012: 331) suggests that, 'The work of moving the bluestones was not that of a small devoted sect but entailed the mobilization of an entire society, possibly a growing political domain or kingdom', which also attempted to unify cosmic

as well as human forces on an unprecedented scale, a scale that was taken even further 500 years later with the second phase of construction at the site. It is all the more striking that these extraordinary enterprises and the novel social developments they reflect were taking place at a time when population was low and the role of cereal agriculture minimal, *contra* the usual models of social evolution.

From c.4500 BP, however, the proportion of barley in the record increases rapidly, and the activities at the major monuments began to be transformed with the renewed contacts with mainland Europe represented by the appearance of Bell Beakers, associated with new burial rituals and the beginnings of copper and gold metallurgy. We now know that this was the result of a large-scale infiltration of new groups of people, with a mixed ancestry that included the pre-existing Middle Neolithic population of western and Central Europe and the steppe populations of the 6th millennium BP (Olalde et al., 2017), arriving just as Grooved Ware monument construction at such centres as Stonehenge and Avebury was at its height. Just as southern Scandinavia saw the arrival of such groups with the Corded Ware Culture after 5000 BP, so later descendants reached the far west more than 500 years later. Perhaps the low populations of the Middle and Late Neolithic once again made Britain and Ireland a viable target for migration and a renewed agricultural adaptation, just as the low forager populations of the Mesolithic had done over 1500 years earlier.

SUMMARY AND CONCLUSION

All the evidence points to the remarkably speedy introduction of a well-established farming subsistence economy, including cereal agriculture and an emphasis on dairying, and no doubt the values and beliefs that went with it, by colonising groups from adjacent areas of continental Europe in the 200–300 years after c.6100 BP. It may have been prompted by population pressure but the colonisation of Britain and Ireland was far too rapid to be considered the result of a gradual wave of advance – there was settlement in Scotland and Ireland long before there is any suggestion of a population peak further south – so, once again, we see evidence of leapfrog migration. The result of the expansion was a massive increase in population over the next 300–400 years, which was accompanied by the building of burial and other monuments such as causewayed enclosures, forms that had their origin in adjacent continental Europe. Interestingly, monument construction reached a peak in Britain earlier than it did in southern Scandinavia though it appears never to have been so intense. After this initial expansion phase that lasted until c.5600–5500 BP there was a crash in population over the following centuries, culminating in a low point at c.5000 BP, associated with the failure of the agricultural system,

whether as a result of climate change, soil degradation or some combination of the two. The result was the emergence of a new system based on cattle pastoralism associated with new forms of monument on a massive scale that was to last for hundreds of years, before the arrival of Bell Beaker immigrants after 4500 BP.

CHAPTER 9

CONCLUSION: EVOLUTIONARY PATTERNS AND PROCESSES

Although the particular long-term history that this book has described is unique, we can recognise within it the action of a number of general evolutionary processes operating at different timescales.

The origin of farming in south-west Asia should be seen in terms of the interaction between payoffs to hunter-gatherers at the day-to-day scale and those at the generational scale. As long as higher day-to-day payoffs could be obtained by focussing on the exploitation of low-density mobile animal resources there was no possibility of regional population increasing beyond a low level, because the carrying capacity of this mode of subsistence was low; increased fertility would not be rewarded with successful recruitment to the next generation. If such resources decline, for whatever reason, then the rate at which people encounter them will drop and people will broaden their subsistence activities to include resources with lower return rates that are encountered more frequently and thus increase return rates overall. If the resources that are then introduced are both dense and sustainable then people will become more sedentary. In these circumstances the previous population ceiling will be lifted; more children can be born and raised successfully and population will increase up to the limit of the new resources. In the case of the Late Pleistocene Fertile Crescent, spatial distributions of resources were constantly changing as a result of climatic fluctuations and the evidence suggests that more sedentary subsistence systems came and went in response. However, in the 1500 or so years before the beginning of the Holocene, including the Younger Dryas, modelling of the available data suggests that conditions in both the northern and southern Levant were sufficiently stable and benign that populations relying on dense and sustainable locally available plant resources could increase to the unprecedented level observed in the radiocarbon population proxy. At this point the beginning of the Holocene introduced exceptionally good conditions for plant growth in terms of both temperature and precipitation. It may have been the ensuing expansion of woodland that led people to cultivate to ensure continued access to sustainable grass/cereal crops,