

Modelling Prehistoric Populations : the case of Neolithic Brittany

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Abstract

The study of prehistoric demography draws inevitably on evidence both imperfect and incomplete, yet is essential for a satisfactory understanding of past communities. It is particularly valuable in addressing controversial questions such as the nature of early farming communities in western Europe, in the period between the adoption of domestic plants and animals and the establishment, centuries or millennia later, of permanent villages and regular field systems. In this article the demography of prehistoric Brittany is considered in the light of evidence presented by monumental tombs and stone settings, artefact distributions, palaeoenvironmental determinations and domestic remains. Whereas the megalithic monuments of Brittany are well known and have been the focus of systematic research since the mid-19th century, relatively little attempt has been made to situate them in their demographic context. The results of this study reveal that while Brittany is, like every region, unique in terms of climate, soils and social traditions, it shares several significant features of demographic patterning – notably its cyclical character – with other regions of Neolithic Europe. This study also demonstrates how incomplete data sources can be used in combination to provide new interpretations of prehistoric demographic patterning and to frame new research questions.

The adoption of farming and the demographic, economic and ideological changes that accompanied it remains one of the major research themes within the later prehistory of western Europe. While there is general agreement that the introduction of domestic plants

and animals altered forever the lifestyles of prehistoric communities, there is considerable controversy about the nature and rapidity of those changes. For some recent authors, the transition from hunting and gathering to harvesting and herding was both relatively rapid and relatively complete (Schulting 2000; Richards & Hedges 1999). For others, the introduction of the new domesticates was very gradual, and the impact of the Neolithic was at first more at the level of material culture and ideology than at that of economy and diet (Thomas 1991).

The gradualist view gains support from the relatively late dating in Britain of developed agricultural systems which include field complexes and permanent villages. The presence of early Neolithic field systems in western Ireland (Caulfield *et al.* 1998; Cooney 2000) does not alter the fact that for southern Britain, a period of some two and a half millennia elapsed between the first introduction of domesticates and the beginnings of what may accurately be described as settled agriculture. The vision of a mobile Neolithic can be extended to other parts of the Atlantic façade. For most of Atlantic Europe extensive evidence for permanent settlements begins only in the Later Bronze Age (Bradley 1997, 30).

If settled agriculture is a late development, there is a need to define more closely the nature of West European societies in the period from the introduction of domesticates to the point at which fixed farming became widespread. We may perhaps expect these societies to conform neither to the classic village-farming model nor to a model of modified hunting and gathering in which a handful of domesticates have been adopted. The character of a mobile Neolithic is likely to be something familiar in certain respects – and these may find analogues in the ethnographic literature – but unfamiliar in its overall configuration. It must in addition be recognised that the diverse geography of western Europe will have elicited varied responses region by region in terms of mobility, scale and social organisation. Hence we must look not for one single pattern, applicable across the whole of western Europe, but for a diversity of social and cultural expressions,

and diverse economic and settlement formulations. In short, we might expect to encounter in western Europe not one uniform Neolithic but many variant Neolithics.

Western Europe ends in a series of promontories which project into the Atlantic Ocean. The name 'land's end' applied to three of these (Cape Finisterre in Galicia, the Finistère département of Brittany and Land's End in Cornwall) highlights their geographical position. Characterised by rocky outcrops, thin and acidic soils and high rainfall, these peninsulas are very different from such classic settings for early European agriculture as the loess lands of central Europe. Thus the populations inhabiting the western peninsulas of Europe will have adopted different social and demographic patterns in accepting the new domesticates. One such response may have been the construction of monumental tombs and megalithic stone settings. Some have attributed the origin of these monumental constructions to the pressure placed on indigenous coastal communities by the expansion of farming groups from the east (Renfrew 1976). Such models, however, assume relatively high densities of population for whom competition for resources was a key issue. This assumption demands fuller investigation in the light of available evidence.

The aim of the present article is to consider the Neolithic demography of just one of these western peninsulas: Brittany, at the north-western corner of France. Famous for its megalithic monuments, including passage graves, stone rows and megalithic art, Brittany has been a focus of archaeological research since the middle of the 19th century. Its prehistoric settlement record, however, is poorly understood. The paucity of house plans that can be dated to the Neolithic period highlights the questions of population density and settlement mobility that have been outlined above. A recent analysis of published evidence for Neolithic settlements in Brittany found only 35 confirmed Neolithic examples, and most of those were assigned to the Late Neolithic (Hénaff 1999). An exception is the trapezoidal house plan at Le Haut Mée, dated to c.4700 BC (Cassen *et al.* 1998). This represents the extension of the Early Neolithic long house tradition from central Europe to the eastern border of Brittany, but has as yet no other Breton parallels. On the other hand the group of massive long houses at Pléchâtel, south of Rennes, with

radiocarbon dates in the range 2870-2460 BC (Tinevez 1995; Giot *et al.*, 1998, 386-88), falls firmly within the Late Neolithic. Other Neolithic settlement evidence consists only of surface scatters, or material (with occasional post-holes) sealed beneath excavated burial mounds (L'Helgouach 1976; Cassen & L'Helgouach 1992). None of these give indications of substantial buildings. To complete the picture, we may add the scanty evidence of settlement within enclosures, again mainly Late Neolithic in date (Scarre 2001a).

At first sight, the inadequacy of the settlement record makes Brittany a curious candidate for a study of Neolithic demographic patterning. On the other hand, Brittany is far from alone in the scarcity of substantial settlement evidence and the difficulties which that scarcity presents. Furthermore, if the settlement patterns of the Neolithic period were indeed mobile and insubstantial, the surviving evidence will be likewise insubstantial. Absence of house plans may be precisely what should be expected. It is necessary therefore to assess whether the nature of the evidence is indeed testimony to the character of the occupation and not, as is sometimes assumed, a product of destruction or inadequate research. Finally, the prominence of monuments in Neolithic Brittany – their number, their clustering and distribution, and their overall scale – can only properly be understood in the context of demography and social organisation.

The study presented here is thus both an essay in understanding the prehistoric demography of a specific region of western Europe, and a methodological exercise, exploring how far it is possible to reconstruct demographic patterns and sequences from the typically incomplete evidence available to archaeology. For Brittany, the key categories of evidence are the distribution and chronology of the major monuments, the contribution of surface collections and field surveys, the distribution of stray finds (notably polished stone axes), and the information of a rather different kind provided by palynology. Here the vegetational sequences recovered from inland and coastal peats make a significant contribution to the overall picture of human impact. Each of these sources of information comes with its own particular limitations. In combination,

however, they present a largely coherent picture of regional Neolithic demography. This not only provides an essential foundation for understanding the Neolithic of Brittany but has implications for the character of Neolithic settlement and society in western Europe as a whole.

The archaeological background

With an indented coast and a geological structure dominated by schists and granites, Brittany is similar in character and geology to Galicia or the south-western peninsulas of Britain. Though cereal agriculture was present in Brittany by the 5th millennium BC, the soils and climate are not especially conducive to cultivation. The long coastline, which has always lent itself to marine exploitation and maritime coastal movement, may all the more readily conjure the image of mobile Neolithic fishermen moving from bay to bay in a systematic and structured exploitation of marine resources. The contrast between the abundance of monuments and the scarcity of settlements, however, makes such images difficult to ground in the archaeological record. Is the apparent scarcity of settlements simply a factor of lack of research? Or is the Breton Neolithic really a story of many monuments but rather few people?

Previous accounts have tended to envisage relatively substantial populations. Giot, for example, has estimated that the Mesolithic population of Brittany may have been numbered in thousands, rising to 25,000-50,000 in the Middle Neolithic (5th-4th millennium BC), and 50,000-100,000 – or even 200,000-300,000 – by the end of the Neolithic (3rd millennium BC) (Note 1). In terms of distribution across the landscape, Giot writes of “embryons diffus de zones quasi-urbaines” in areas of dense activity such as the southern Morbihan, and elsewhere of “petites communautés de quelques dizaines d’habitants” (Giot in Giot *et al.* 1998, 451-2). Such estimates inevitably pose the question of evidence and its destruction. Taking Giot’s middle figure of 50,000 inhabitants, for example, and averaging it over the chronological span of the Neolithic in Brittany (some 2000 years), gives us a total number (assuming an average lifetime of 30 years) of well in

excess of 3 million people. The difficulty is to assess whether the pattern of evidence which survives is really testimony to such a large population, or whether, as will be argued below, we should think in terms of much smaller numbers.

Giot also discusses the distribution of monuments in relation to population, and the evidence of settlement scatters. Here he takes a more cautious line, pointing to the scale of destruction and the relative unsuitability of local material inland for the construction of megalithic tombs. He concludes “Lorsque l’on peut tenter d’y appliquer des tests statistiques, il semble qu’il soit exceptionnel de pouvoir obtenir des valeurs significatives montrant qu’une distribution spatiale n’est pas au hasard.” Yet he feels sufficiently confident to conclude in the next paragraph that during the first half of the Neolithic, “toutes les activités se sont certainement maintenues de préférence à proximité du littoral, et dans des zones de petites plaines et plateaux côtiers”; whereas in the Late Neolithic “il y a effectivement une occupation plus générale du pays avec beaucoup plus de petites communautés dispersées dans l’intérieur” (Giot in Giot *et al.* 1998, 453-4).

This is the classic interpretation of Neolithic settlement history in Brittany. It directly parallels the distribution of chambered tombs, where Middle Neolithic passage graves are largely confined to a zone within 30 kms of the coast; whereas Late Neolithic allées couvertes, though still heavily coastal in distribution, also indicate an expansion of population inland (Fig. 2). The point has been made and reinforced by a series of authors (Daniel 1960; Giot 1960, 1981; Le Roux 1984a).

One may question, however, whether the chambered tombs – monumental funerary monuments – can so readily be assumed to provide a reliable indicator of population distribution. They relate to particular social and ritual practices which need not have been shared equally by all communities. Furthermore, the patterns of monuments plotted on distribution maps must be recognised as a palimpsest of successive construction, use, abandonment and re-use. The distributions are the product of cumulative individual events whose historical reality is entirely masked by the division of the period into large

undifferentiated blocks such as ‘Middle Neolithic’ or ‘Late Neolithic’, each of them lasting around a millennium. Such considerations are all the more significant if we seek to understand the dynamics of the population. In that context, what might at first sight appear as a crude two-phase sequence (an initial coastal emphasis followed by expansion inland) could indeed conceal a historical sequence of multiple expansions and contractions of population from one or more ‘heartlands’ or reservoirs occupied on a more permanent basis.

To summarise, the issues behind this demographic enquiry may be broken down as follows:

- in the first place, the scale of the population, not in absolute numbers, but in terms of an order of magnitude
- secondly, whether the distribution of that population is well represented by the distribution of material evidence (in terms of sites, finds and monuments)
- and thirdly, the dynamics of that population, during a Neolithic which extends from the mid 5th millennium BC to the mid 3rd millennium BC, a period of 2000 years or some eighty generations.

The Finistère pattern

Traditional models of the Neolithic assumed that full-scale agriculture was quickly established and that population levels rose rapidly and significantly. The alternative model of a relatively mobile Neolithic suggests lower population levels, and opens the possibility of greater continuity with the preceding Mesolithic. On the other hand, the construction of substantial Neolithic monuments indicates if not a change in community scale then at least a change in social and ritual practice.

For many years, the study of the Breton Mesolithic was dominated by major coastal sites such as Téviec and Hoëdic, or the more recently excavated Beg an Dorchenn and Beg er Vil (Kayser 1992). Since 1989, however, a programme of systematic field-walking of

inland areas has revolutionised knowledge of Mesolithic settlement distribution, and has demonstrated that coastal sites form only one element of the pattern. In Finistère, the most important Mesolithic sites lie in a band some 20 kms from the present coast, and there are further significant sites some 40-50 kms from the present coast (Fig. 3) (Gouletquer *et al.* 1996). Thus the Finistère pattern – with the major Mesolithic sites inland – contrasts with the dominant position occupied by coastal sites in the Mesolithic settlement of regions such as Denmark. Particularly revealing has been the study of Mesolithic sites in the area south of Morlaix. While it is impossible to demonstrate which of these sites are strictly contemporary, movement of raw materials between them suggests Mesolithic territories occupying blocks of land between parallel river courses (Fig. 3).

The hierarchy of Mesolithic sites is consonant with a pattern of structured seasonal residential mobility (cf. Binford 1980; Kelly 1992). Each block of land, its edges defined by parallel river valleys and its northern limit by the coast, may have been occupied by small family-sized groups who came together for certain periods of the year at larger sites such as Le Clos or Mikaël (Fig. 3). The main axis of movement in these narrow elongated blocks of territory would have been north-south, between coast and uplands, and beyond the uplands down into the valley of the River Aulne to the south. Smaller sites such as Glaharé, Plourin-Bourg or Goabizien probably represent the remains of short-term encampments for individual family groups, as do sites on the coast. The latter was particularly important as the only source of flint, in the form of beach pebbles (Gouletquer *et al.* 1996). What binds these locations together into a single system is the evidence for the movement of lithic raw materials: notably ultramylonite from Mikaël and chalcedinous microquartzites from Le Clos, carried perhaps in the course of seasonal cycles to smaller settlements lying to north and south.

Thus Mesolithic groups moved regularly in mobile patterns of resource exploitation between coast and uplands. In this respect, the succeeding Neolithic period marks a significant break. Surface sites can reliably be assigned to period (Late Mesolithic, Final

Mesolithic, Neolithic) on the basis of the lithic types (notably the arrowheads) which they contain (Gouletquer *et al.* 1996, 12; see also Marchand 1999). Analysis of these assemblages reveals that there are no Final Mesolithic sites on the north coast of Finistère, and no Neolithic sites in the interior. The most prominent Neolithic presence is the chambered tomb of Barnenez constructed on a coastal promontory, and dated to the 5th millennium BC (Giot 1987). There are also Neolithic lithic scatters on this coast. It is indeed possible that the inland sites assigned to the Final Mesolithic were contemporary with the earliest Neolithic on the coast. If so, any such overlap must have been of relatively short duration. The Mesolithic communities would have found their territories truncated by the arrival of Neolithic colonists; ultimately, they may have been absorbed by Neolithic groups. There is nothing to support the model of an ongoing complementarity of land-use and lifestyle (as demonstrated for example by the Batak of the Philippines: Eder 1984) beyond, at most, the very earliest Neolithic. Inland, the settlement record appears to stop with the Final Mesolithic, to be resumed only with the general settlement of inland Brittany in the Late Neolithic and Bronze Age.

Barnenez to Brasparts

The Neolithic occupation of northern Brittany was not only largely coastal in character but also locally discontinuous. Pollen from the palaeosol beneath the Barnenez cairn indicated land clearance at or before the time when the multiple passage grave was built. There is evidence for cultivation: Marguerie notes the presence in the Barnenez samples of “taxons typiques de milieu anthropisé” and, in one case, cereal-type pollen (Marguerie 1992, 119). Analysis of pollen from palaeosols beneath other early north-coast passage graves at Ile Carn and Ile Guennoc indicated that these monuments, too, had been built in already cleared landscapes, with some cereal pollen present in both cases. On the other hand, a short core from the coastal marsh at Le Guerzit just to the south of Barnenez went back to early 5th millennium BC (Gif-7614: 5950±110 bp = 5190-4540 BC) and was dominated by bracken spores (Marguerie 1992, 123) (Note 2). We should also note the three phases of clearance before 5000 BP (but no cereal pollen) established by Morzadec-

Kerfourn's analysis of coastal peat at Chardons Bleus (on the north coast of Finistère some 50 kms west of Barnenez) (Marguerie 1992; Morzadec-Kerfourn 1974). Thus along the north coast of Brittany, while evidence from palaeosols shows that monuments such as Barnenez and Guennoc were constructed in cleared landscapes with some local cereal cultivation, the nearby pollen cores indicate that uncleared landscape was still dominant, without any indication of widespread cultivation. Only in the 2nd millennium BC does the pollen record indicate extensive clearance of vegetation in northern Finistère, with the first evidence of cereal pollen in pollen cores (Marguerie 1992, 236).

Thus pollen evidence does not suggest that the clearance and cultivation episode represented by the Barnenez palaeosol was either very extensive or very long-lived. Whether this duration should be envisaged in terms of decades or centuries is open to question. The chronology within the Barnenez monument itself can be broken down into at least three stages: the first of them represented by the decorated menhir which was incorporated into the passage of passage grave J (L'Helgouach 1997); the second and third by the two principal phases of construction identified by Giot's excavation (Giot 1987). The whole sequence may indeed be considerably more complex than this, but it is possible that we are dealing with a period of at most a few centuries, somewhere in the 5th millennium BC. Activities at Barnenez may hence have lasted only a few generations, and been followed by a long period when this locality was effectively abandoned.

To the west of Barnenez, the settlement of Curnic may illustrate the nature of Neolithic occupation on this coast. Here eroding out of the beach a number of stone-built hearths were excavated, the associated material spanning a lengthy period (both Middle and Late Neolithic vessel forms and lithics) (Giot *et al.* 1965), with radiocarbon dates from the early 5th millennium BC to the later 4th millennium (Note 3). Rather than a continuously occupied settlement, however, the Curnic site is best interpreted as the product of a small number of successive short-lived occupations, in a location which at the time must have stood a little way back from the sea-edge.

Some 25 kms inland from Barnenez, the Montagnes d'Arrée form a natural barrier separating the coastal zone from the interior. In this inland region there is gap in archaeological evidence between the Final Mesolithic (sites including Presqu'île and Kerbizien: Gouletquer *et al.* 1996), and the Late Neolithic (V-shaped passage grave of Ty-ar-Boudiged; lateral entry grave of Creac'h Niver; allée couverte of Mougau-Bihan: L'Helgouach 1965). These Late Neolithic funerary monuments conform to the 'late settlement' model for the Breton interior. Yet it is hard to believe that the region was entirely unoccupied for a period of 1000 years from the end of the Mesolithic to the beginning of the Late Neolithic. A pollen core from the peat bog of Yeun Ellez, at the foot of Mont-Saint-Michel de Brasparts, did indeed yield a single cereal pollen grain (*Triticum*) from section 18 of the core, dated 5400±60 bp (GrN-198: 4360-4040 BC) (Van Zeist 1964). This may suggest limited, occasional cultivation as early as the 5th millennium BC, but there is no further cereal pollen in the Saint-Michel-de-Brasparts core until the 3rd millennium BC, and even then (only two grains of *Triticum* pollen) it does not mark the beginning of a continuous cultivation record.

In the absence of other evidence the single pollen grain cannot represent an agricultural revolution (cf. Monk 1993, 40). On the other hand, a pattern of occasional, short-term forays by small groups growing the occasional cereal crop, unaccompanied by widespread or lasting impact on the vegetation cover, is perfectly possible. It would confirm the marginal or ephemeral nature of this earlier Neolithic activity, and suggest that although people continued to pass through the area, their primary activities were centred elsewhere: perhaps on the north coast, though we have seen that there, also, the record of Neolithic occupation is discontinuous. It may be, therefore, that these patterns of exploitation can be understood only at a broader geographical scale, within the context of demographic fluctuation and movement across Neolithic Brittany as a whole.

The Plussulien axe quarry

Against this background the apparently prolonged and intensive activity at the axe quarry at Plussulien demands to be reassessed. This quarry is located in the south-western corner of the Côtes-d'Armor département deep within the interior of Brittany. Investigations from 1969 to 1976, coupled with radiocarbon dating, distinguished four phases of exploitation (Le Roux in Giot *et al.* 1998, 482-89; Le Roux 1984a; 1999a). The first of these was dated to the late 5th millennium, and hence belongs to an early phase of the Neolithic. During this preliminary exploitation, the groups who visited Plussulien exploited blocks of dolerite which had already split away from the parent material, and they dug pits into the clay matrix to extract fragments of dolerite. The technology, interestingly enough, was not dissimilar to that used in the shafts of the flint mines of northern France and the Low Countries. In the second phase at Plussulien, beginning around the third quarter of the 4th millennium BC, activity intensified with the use of mauls, picks and wedges to exploit the parent rock directly, breaking off blocks weighing up to a tonne. The third phase, in the Late Neolithic, saw the introduction of fire-setting against the outcrops to facilitate the fracturing of the rock. Finally, the axe quarry went into decline, and appears to have fallen out of use around 2000 BC (Le Roux 1984a; 1999a).

The evidence from Plussulien poses a number of questions about the settlement of central Brittany. From the amount of flaking debris which survived, Le Roux estimated that 6 million axes had been produced at the site. Le Roux argued that the production of axes led to the establishment of a permanent specialist community at Plussulien from an early date, turning out between 300 and 3000 axes per year over a 2000-year period. This level of productivity would in his view have required a permanent community of 30 specialist workers, which corresponds to a community size of 2000-3000 (Le Roux 1999a). (Note 4)

This scenario is difficult to reconcile with the known incidence of Neolithic sites and monuments in the Plussulien area (Fig. 4). The quarry site is located in a basin around the headwaters of the Rivers Blavet and Oust. The higher ground around the edge of this

basin is marked by a series of menhirs and chambered tombs. To the north, near Saint-Nicolas-du-Pélem, there are surface scatters of Neolithic material thought to represent the remains of settlement sites, notably on the Collédic plateau, but the majority of the material is Late Neolithic, and only in one case (at Kergoubleau) were possible Middle Neolithic sherds recovered. The promontory settlement of Toul-Goulic at Tremargat, to the west of Saint-Nicolas-du-Pélem, also has only Late Neolithic occupation (Le Roux 1984a; 1999a; Le Provost *et al.* 1972; Le Carduner *et al.* 1992; Briard *et al.* 1997).

This pattern of Late Neolithic activity is supported by the chambered tombs of the Plussulien area. These fall within Late Neolithic categories (notably allées couvertes and lateral entry graves), and are dated to the 3rd or early 2nd millennium by radiocarbon dates from Liscuis II and III and Kerivoelen (Le Roux 1984a; 1999a). Indeed, apart from the Plussulien quarry itself and the Middle Neolithic sherds from Kergoubleau, the only evidence of earlier Neolithic presence in the area is a charcoal concentration in front of Liscuis I which gave a late 5th/early 4th millennium radiocarbon date (Le Roux 1984a) (Note 5).

In sum, what we appear to have at Plussulien is an axe quarry extensively worked since the 5th millennium BC, with virtually no evidence of contemporary burial monuments or settlements for at least another thousand years. The absence of settlement evidence (Le Roux 1999a, 206: see Note 6) strongly suggests that the quarry was worked not by a permanent specialist community, but by groups travelling from more permanently settled regions. In terms of access, it should be noted that the two principal rivers of the Plussulien basin – the Blavet and the Oust – flow southwards towards the Morbihan coast. The Blavet, indeed, leaves the basin through a steep-sided gorge, and it is on either side of this that the late Neolithic communities built the Liscuis and Kerivoelen chambered tombs. The cluster of tombs may indicate that this gorge had particular significance to the Neolithic communities, and we may speculate that this significance derived in part from its character as the beginning of the route leading to the settled areas of the south coast.

A parallel may be drawn with the early phase of exploitation at the Neolithic axe quarries of Plancher-les-Mines in the Vosges, where occasional expeditions by groups from villages some 30-40 kms away are envisaged (Pétrequin & Jeunesse 1995). This may be compared with the distance of 30 kms from Plussulien to the south coast of the Morbihan. Only in the Late Neolithic period do settlements appear close to the Plussulien quarries, perhaps associated with the fire-setting operations of phase 3 (Le Roux 1999a). Here again there is a parallel with Plancher-les-Mines, where around the turn of the 5th/4th millennium BC new villages were established much closer to the quarries, at a distance of 18-20 kms. For the greater part of its active use, however, Plussulien is most likely to have been exploited by special task groups periodically making the two- or three-day journey from their settlements to restock their supplies of axe material.

Distributional evidence

The evidence from north Finistère and from the Plussulien area provides a provisional basis for modelling the character and distribution of Neolithic settlement in Brittany. To ascertain whether this model may be applied across the whole of the peninsula, however, it is necessary to consider other categories of evidence. These fall under three heads: artefacts (notably polished stone axes), palynology, and monuments. Systematic field surveys of surface materials would provide a fourth strand, but have yet to be undertaken in many areas of Brittany. Those surveys which have been published focus exclusively on the coastal zone (Le Page 1993) or are concerned primarily with material of other periods and make only passing reference to prehistoric evidence (e.g. Tanguy 1988; Davies & Astill 1994).

1. Polished stone axes

Polished stone axes are the most numerous category of Neolithic artefact in Brittany and come from both chance finds and excavations. Plussulien dolerite provides the majority of the material but a number of other sources are represented. The distribution of axe

finds is sufficiently widespread to be of considerable significance in defining the pattern and nature of Neolithic activity. Le Roux has studied the sourcing and distribution of 3257 non-flint polished stone axes (Le Roux 1999a). The average density of distribution is 0.11 axe per km² but a high proportion of the finds come from coastal districts, with many areas of the interior virtually devoid of axes. A study of the distribution maps for each of the Breton départements illustrates the coastal emphasis of the distribution, an emphasis which continues east and south into Loire-Atlantique and Vendée (Le Roux 1996, figs. 162-167; here combined in Fig. 5). This recent work reaffirms and complements earlier observations that the highest frequency of polished axe finds was in the southern coastal districts, most notably the southern Morbihan and the south-western peninsula of Cornouaille. So striking was the distribution that in some coastal districts, almost every field has yielded polished stone axes (Cogné & Giot 1952).

Two exceptions to the predominately coastal emphasis of axe distribution should be noted. The first is in southern Côtes-d'Armor, at and around the quarry site of Plussulien. Since over half of the Breton polished stone axes are of type A dolerite from Plussulien, such a concentration is not surprising and relates to exploitation of the quarry rather than to permanent Neolithic settlement of this region.

The second inland concentration lies to the west of Rennes, and here a different explanation must be sought. It is indeed likely that the Rennes area was a significant inland population centre during at least the later stages of the Neolithic. To the polished axe distribution may be added the enclosure sites in the valleys to the east of Rennes such as La Trappe at Boistrudan and La Charronnière at Saint-Aubin-des-Landes (Leroux 1992). The evidence suggests, however, that these enclosures are of Late Neolithic date, and some of the axe material may also be Late Neolithic (the exploitation of the Plussulien quarries, for example, continuing as we have noted down to c.2000 BC: Le Roux 1999a). The poor chronological resolution of the polished axe distributions is one of their principle limitations; while each findspot represents either chance loss (Giot in Giot *et al.* 1998, 452) or intentional deposition (cf. Bradley 2000, 120), and hence a single

short-term event, the overall distribution is by nature a palimpsest in which chronological processes are largely indistinguishable.

2. Pollen and vegetation

Pollen evidence provides further information on the character of Neolithic occupation and human activity across Brittany. Dominique Marguerie has combined new analyses with older studies to provide an overview of the impact of human communities on the Breton vegetation from the Neolithic to the historical period. The information comes from two principal sources: first, pollen cores from peat bogs, both around the coast and in the interior; and second, pollen from the palaeosol preserved beneath Neolithic and later monuments (Marguerie 1992).

This evidence shows that large-scale forest clearance in most areas of Brittany was relatively late in date, falling within the late 2nd or 1st millennium BC (Late Bronze Age/Iron Age). The patterning, however, is especially revealing for the nature and spread of Neolithic occupation. The one exception to late clearance is the area of the southern Morbihan, where both pollen cores and palaeosols indicate intentional burning and partial deforestation as early as the Middle Neolithic. There is also frequent pollen evidence for cereal cultivation. At coastal sites such as Petit-Mont at Arzon, beside the entrance to the Golfe du Morbihan, pollen and soil micromorphology both imply clearance and probably cultivation for a substantial period before the construction of the Middle Neolithic passage graves (Marguerie 1987; 1989; 1992; Gebhardt 1993; for Petit-Mont see also Scarre 2000).

On the north coast, by contrast, while palaeosols show that monuments such as Barnenez and Ile Guennoc were constructed in cleared landscapes with some cereal evidence, pollen cores from adjacent peat bogs indicate that uncleared landscape was still dominant, with no trace of cultivation. The conclusion must be that the north coast clearances were limited in scale, and perhaps temporary. Only in the southern Morbihan was forest cover

cleared on a significant scale. Finally, evidence from the Breton interior shows that dense forest cover prevailed (Fig. 6).

By the 3rd millennium BC, settlement of the interior is reflected in both monuments and vegetation. Good evidence comes from palaeosols beneath a series of Late Neolithic and Early Bronze Age burial mounds in the Forêt de Brocéliande (Marguerie 1989). Here the pollen evidence suggests that the Neolithic monuments were established within a semi-cleared forest landscape, with little evidence of intense human activity. By the Bronze Age, the forest cover had been further cut back, but more significant is the evidence for larger areas of grassland and weeds of cultivation. Indeed, in inland Brittany, a true agrarian landscape does not develop until the Late Bronze Age or later (Marguerie 1992).

Thus the pollen evidence suggests that earlier Neolithic population was concentrated in the southern Morbihan. We can perhaps be even more precise, and confine this to Carnac, Locmariaquer and the Golfe du Morbihan; certainly pollen evidence from the Vilaine estuary suggests that significant clearance did not begin there until the Middle Bronze Age (Marguerie 1992). Earlier Neolithic settlement of the interior appears to have been at best only slight in scale, whereas along the north coast it was confined to pockets around a few major monuments. The Late Neolithic expansion into the interior does not appear to have been heavily dependent on crop cultivation but did involve some clearance of vegetation. It may represent mobile, forest-farming communities exploiting extensive territories focused on the *allées couvertes*. Evidence from the Paris basin and north-eastern France also suggests a spread of settlement at this period associated with mobility and dispersal, the tombs forming a fixed point in the landscape and incorporating human remains of a series of distinct kin groups (Scarre 1983, 1984; Masset 1997; Masset & Valentin 1999).

3. Monuments

The final category of evidence is that of the Neolithic monuments, including both chambered tombs and standing stones. The former have already been discussed, the

predominantly coastal distribution of the Middle Neolithic passage graves (5th/4th millennium BC) succeeded by the more general distribution of the allées couvertes and other Late Neolithic (4th/3rd millennium) tomb-types (Fig. 2). The standing stones take the form of arcs and alignments (notably the famous alignments of Carnac in southern Morbihan), and of single stones known as ‘menhirs’.

The widespread distribution of menhirs contrasts with that of earlier Neolithic passage graves, menhirs being present in almost every region of Brittany, coastal or inland, often of substantial size or in some abundance. Giot (in Giot *et al.* 1998, 531-2) estimates the surviving number of menhirs at between 1100 and 1200, with the greatest frequency in the three western départements of Morbihan, Finistère and Côtes-d’Armor.

It was long believed that many of the Breton menhirs should be dated to the Late Neolithic or the Bronze Age (3rd/2nd millennium BC). In recent years, however, the evidence for incorporation of decorated menhirs in passage graves has indicated an earlier origin for some at least of these standing stones (Le Roux 1984b; L’Helgouach 1983; 1997). At Locmariaquer, five radiocarbon dates for the occupation horizon associated with the Grand Menhir Brisé and with a dismantled alignment of menhirs fall within the range 4350-3390 BC (L’Helgouach 1997). We may conclude that these decorated menhirs belong to the period before 3500 BC, when many of them were systematically uprooted and incorporated in passage graves.

There is evidence that undecorated menhirs were also being erected as early as the fifth millennium BC. This is suggested by radiocarbon dates from Saint-Just (Briard *et al.* 1995, 54-56; Le Roux *et al.* 1989), and by the relation of certain coastal menhirs to lower sea-levels (Giot 1990). Equally, it is clear that undecorated menhirs continued to be erected during the 4th and 3rd millennia BC, and probably later (e.g. radiocarbon date from Monteneuf: Lecerf 1999; menhirs associated with tin sources: Le Roux 1999b).

Thus the decorated menhirs appear to share the coastal emphasis of the passage graves. The undecorated menhirs, by contrast, are also found in inland Brittany and appear to contradict the archaeological and palynological evidence indicating low levels of human activity inland during this period. The inland menhirs may however represent the sacralisation of an uncleared landscape, beyond the limits of cultivation or of regular, sustained frequentation. At Saint-Just, the stone settings on and around the Grée de Cojoux are associated with a series of surface scatters marking Neolithic occupation sites. These occupations were probably transitory in nature and could be the product of pilgrimage-type events; material found at Saint-Just indicates strong and repeated links with the south coast of the Morbihan (Scarre 2001b). The menhirs may hence be illustration of another aspect of Neolithic population mobility, serving as the focus of occasional ritual attention by communities coming together from adjacent areas, including the coast; they do not necessarily betoken dense, permanent settlement of these inland locales.

Estimating populations from monument size

From the evidence presented above it could be argued that the Neolithic population of Brittany was smaller than has hitherto been supposed, and may largely have been clustered around the coast. Estimates of population size, however, must also take account of the labour demands posed by major structures such as the Carnac stone rows or the Grand Menhir Brisé. Here we need at once to distinguish between the cumulative product of a monument constructed of relatively small elements – such as a stone cairn, however large – and the erection of massive stones which might individually weigh several tens or even hundreds of tonnes. A large mound such as the Tumulus de Saint-Michel at Carnac, measuring some 120m by 60m at the base, and still standing 10m high, represents an enormous undertaking by any reckoning. In theory, however, it could have been constructed by a small group of people working over many years. It is clear, indeed, that monuments of this kind attained their final shape only as the result of multiple phases of building and remodelling. There is nothing to demonstrate unequivocally that the size of

the workforce need at any point have been greater than the number needed to move and erect the largest slab.

The manipulation of massive individual stones, by contrast, does impose a minimum size of workforce. Modern estimates are however subject to considerable uncertainty. A 32-tonne replica capstone that required a team of some 200 local people (170 pulling, and 30 more operating levers) to move in a 1979 experiment (Mohen 1989, 176ff) has recently been moved by a mere 10 people using socketed levers (Poissonnier 1998). We cannot determine that socketed levers were ever actually employed by Neolithic communities, but the contrast in size of workforce indicates that the communities responsible for these megalithic monuments may have been very much smaller than has often been supposed.

We are still left with the problem of truly enormous Breton monoliths such as the 280-tonne Grand Menhir Brisé (Fig. 7). This may have been quarried at an exposure of orthogneiss at Treulen, some 10-12 kms north of Locmariaquer, and probably travelled most of the distance by water, strapped within a massive timber raft (Le Roux 1997). Large forces would still have been needed to pull the menhir from quarry to water's edge and again from water's edge to erection site; one estimate suggests a minimum of 500 people pulling on ropes. Raising it into a vertical position would have been exceedingly difficult and may have required still greater resources of human muscle-power. Furthermore, while the Grand Menhir Brisé is the largest of the south Morbihan menhirs, there are nine more that weigh between an estimated 30 and 100 tonnes (Le Roux 1997).

The moving of massive monoliths such as these would require the gathering together of large numbers of people. The southern Morbihan, however, is the one area of Brittany where there is evidence of a relatively substantial and continuous Neolithic population. The 500 people needed to drag the Grand Menhir Brisé to and from the water's edge may not all, of course, have lived in the Golfe du Morbihan area on a year-round basis. This massive feat of prehistoric engineering may represent the result of several seasonal gatherings, drawing people to this important ritual centre from across southern Brittany.

A radical view might even suggest that these 500 people – multiplied perhaps by two, three or four to include children, the infirm and others who did not participate in the work – may have represented the greater part of the regional population during the Neolithic period. The analogy of the Nuer prophet's mound, described by Evans-Pritchard, may be appropriate here; built by a vast gathering of people over a period of three years, it became a cult centre attracting people from a distance of over 300 kms (Whittle 1997a, 149).

The special importance of the southern Morbihan is demonstrated by both the number of monuments and their size, including the massive Carnac mounds, the long rows of standing stones (the Carnac alignments), and the heaviest and tallest of all Breton standing stones: the Grand Menhir Brisé. This importance may have been based on the region's sanctity and ritual associations. The trade of salt from the shallow and shelving edge of the Golfe du Morbihan could have been an alternative or additional source of local power (Cassen & Pétrequin 1999). Numerous as they are, the monuments of the region represent discrete and discontinuous constructional events; there is no reason to believe that every generation engaged in major projects. Yet at the same time it is hard to believe that the occupation of this region was discontinuous. Even if salt and sacrality have been over-emphasised, the proximity of the sea, the evidence for early cereal agriculture (from the 5th millennium BC; the 7th millennium dates quoted by Visset *et al.* 1996 must be regarded with caution), the long-horned cattle engraved on the Gavrinis capstone (Le Roux 1984b) and the cattle buried beneath the Er-Grah long mound (Le Roux 1998) suggest a diverse range of local resources, sufficient for a significant permanent population. The evidence from the southern Morbihan stands apart from that for the remainder of Brittany in its continuity.

Ethnographic parallels

The evidence assembled here allows us to propose a new understanding of the nature and history of prehistoric occupation in Brittany during the Neolithic period. The new picture

results not so much from new information as from the insights provided by considering the various categories of information together. The essential basis is the attempt to quantify, to achieve an understanding of scale. This is difficult enough, given the nature of the evidence available. Labour estimates may suggest the minimum number of people required to construct a substantial stone monument, but that does not indicate the actual number of individuals who were involved in the work, nor the size or composition of the social group responsible for the undertaking. Yet the impression provided by such a bottom-up approach, focusing on individual sites and monuments, begins to gain credibility when combined with a top-down approach which reviews the broad-scale evidence for human occupation, in terms of palynology and axe, tomb and menhir distributions across the peninsula as a whole.

The twin keys to understanding the demography of Neolithic Brittany are mobility and fluctuation. Mobility must be invoked to explain the pattern of non-intensive activity across much of the peninsula during these millennia; fluctuation explains the breaks in occupation of many areas.

Settlement mobility has long been recognised as a feature of hunter-gatherer societies, especially those where foraging rather than collecting was the basis of subsistence (Binford 1980; Kelly 1992). Intensification through competition for resources has been argued to explain the shift to sedentism in some societies (Rafferty 1985). In the case of Brittany, however, continuity from the Mesolithic to the Neolithic is problematic; arguments for such continuity in the artefact record have found little support in recent studies (Marchand 1999). This applies even to the Gulf of Morbihan, where shell middens with formal burial structures have been cited as possible prototypes for the monumental megalithic tombs of the following Neolithic (Case 1976; Scarre 1992). The lithics, on the other hand, indicate a clear break between Mesolithic and Neolithic, and the survey evidence shows abandonment of the Mesolithic settlement pattern in western Brittany and its replacement by a new, coastally-focused Neolithic pattern (Marchand 1999; Gouletquer *et al.* 1996). It is tempting to argue that the change in settlement pattern

is directly connected with new subsistence practices introduced at the beginning of the Neolithic period, associated with cultivation and animal husbandry. Cattle early take on a symbolic importance in the Breton Neolithic, as demonstrated by the cattle burials at Er Grah in Brittany and the carvings at Gavrinis and Locmariaquer referred to above.

To place this in anthropological context, we may perhaps consider the kinds of mobility suggested by the archaeological evidence. Kelly (1992) and Whittle (1997b) have both emphasised that neither sedentism nor mobility is a simple concept; each covers a range of behaviours. Whittle distinguishes six variants along a spectrum from residential or circulating mobility characterised by short-stay camps, through logistical or radiating mobility (with seasonal movement and base camps) and various kinds of short-term sedentism, finally to 'embedded sedentism' with generation-on-generation residential continuity (Whittle 1997b, 21). Kelly evokes a mosaic-type pattern of varying degrees of mobility among groups or individuals within a society, coupled with change over time: "As some people reduce their residential mobility, others may continue to be residentially mobile, perhaps developing a mutualistic relationship with sedentary villages" (Kelly 1992, 50). Kelly further points out that sedentism is not always an irreversible threshold, but that societies may fluctuate between more and less sedentary behaviours (Kelly 1992, 49-50).

Both Whittle's and Kelly's perspectives suggest appropriate ways of modelling the Breton settlement evidence. As we have seen, pollen evidence demonstrates that even in the 'marginal' areas such as the north Finistère coast and the inland basin of Saint-Michel-de-Brasparts, cereal cultivation was practised during the earlier Neolithic. The difficulty of assessing such evidence for early cultivation (Monk 1993) should not lead to dismissal of the likelihood that Neolithic communities throughout Brittany were conversant with agricultural practices. That agriculture in itself does not imply sedentism is amply illustrated by the ethnographic examples of the Rarámuri of Mexico, many of whom move seasonally to farm scattered fields some distance from their primary residence (Hard & Merrill 1992); or the Batak of the Phillipines who combine agriculture

with the collection of wild resources and with trade (Eder 1984). Agriculture and mobility are hence not mutually exclusive, and some degree of mobility may explain the scarcity of house plans or evidence of widespread forest clearance in Brittany during the earlier Neolithic.

At the same time, the degree of mobility involved may be questioned. Timescales for the Breton Neolithic are generally approximate in character and what appears as a short-term event – cereal pollen in a lake core, or the construction of a monument – may have extended over several generations. Major multi-phase monuments such as the Barnenez cairn most likely span several generations, and may have stood at the centre of a settlement pattern of frequent residential relocations – seasonal movement encompassing both agricultural activity and some exploitation of marine resources. Alongside these short-term cycles should be placed the evidence for longer-term cycles, including the apparent cessation of agricultural activity in many of these areas after a period of years or decades. That must imply the contraction of settlement in certain periods to more restricted areas of permanent settlement, notably on the southern edge of the peninsula.

Thus the seasonal movement or short-term sedentism characterising most of Brittany in the earlier Neolithic must be inscribed within a longer-term cycle of population dispersal and aggregation. It is clear from North American examples such as the burial mound (dated to c.7500 bp) at L'Anse Amour on the Strait of Belle Isle in southern Labrador that monument-building is not the exclusive preserve of agricultural communities (McGhee & Tuck 1975, 85-94; Tuck 1976, 36-44). The number and size of Breton Neolithic monuments should not therefore lead to assumptions of settled and populous communities save where other evidence is available to support such a contention. Such a condition may hold for the southern Morbihan. The Rarámuri case is interesting in this regard in that some families – those with sufficient farmland close at hand – avoid the need for seasonal movement and are also able to draw on a larger labour pool (Hard & Merrill 1992). This confirms the view that more sedentary populations will have greater

ability to engage in large communal endeavours. In the Brittany context, the implication would be that sedentary populations along the south coast were most capable of building large monuments, a point consistent with the exceptional work-effort needed to raise the largest Breton monoliths such as the Grand Menhir Brisé.

We may thus reconstruct the picture as follows. During the course of the 5th millennium BC (if not during the preceding millennium), new technologies of food production (both cultivation and animal husbandry) made their appearance in Brittany. Their adoption brings disruption to pre-existing Late Mesolithic settlement patterns in at least some areas, with a new concentration of activity around the coast. The southern Morbihan becomes a primary demographic and ritual focus, and resident populations undertake major projects such as the raising of huge monoliths (some bearing images of the symbolically-important domestic cattle) and (perhaps a little later) the construction of enormous Carnac mounds. The size of these mounds and the richness of their contents (in terms of axes and beads) has led to the proposal of 'south coast chiefdoms' in this context (Bender 1985). Axes and beads of Alpine jadeite and Pyrenean variscite testify to the long-distance connections of these high-status communities (Cassen & Pétrequin 1999; Villalba *et al.* 1986), though in the absence of preserved skeletal remains the number and status of individuals buried within these tombs is open to more than one interpretation.

Alongside the import of exotic materials went the exploitation of indigenous Breton resources, notably the dolerite of Plussulien. The Plussulien area is devoid of settlement or burial evidence from the earlier Neolithic, but the quarry itself was exploited from as early as the last quarter of the 5th millennium BC. Theories of a specialist axe-producing community manufacturing and exporting dolerite axes at Plussulien are not borne out by the evidence which instead suggests that this was a focus of visits by task groups from other areas. Here again mobility is underlined. The quantity of dolerite axes in the southern coastal zone suggests that small groups from that zone may regularly have made the journey north, entering the Plussulien area via the dramatic Daoulas gorge before making their way across to the quarry site. The long-established quarry site would have

been immediately and abundantly evident from the massive quantities of quarrying debris littering the slopes around the dolerite outcrop (Le Roux 1999a).

For the remainder of Brittany, comprising the greater part of the peninsula, the evidence is concordant with a pattern of nested cycles of mobility at different temporal scales. The permanent nature of the major monuments does not imply large populations or continuous exploitation over hundreds or thousands of years. Nor does evidence of agriculture (itself only scattered) indicate invariant sedentism. Ethnography and archaeology combine to support a model of settlement that incorporated a significant measure of mobility. On the coast, intermittent settlement of particular locales was associated with cereal cultivation and tomb construction. Inland, axe finds and menhirs testify to occasional visits or journeys. In sum, limited mobility associated with greater sedentism along the south coast compares with short-term settlement events in other favoured (mainly coastal) zones, and contrasts with much greater mobility – and a more fleeting cultural signature – in the interior. Alternating episodes of occupation and semi-abandonment complete the picture.

A final element in this pattern is suggested by the scale and number of the monuments in certain areas, above all the kilometre-long multiple stone rows and Carnac mounds of the southern Morbihan. Such monuments may have been intended to serve more than simply local concerns, and it is possible that they served as aggregation centres for populations dispersed through large areas of the Brittany peninsula. Aggregations of this kind – perhaps seasonal, or once every several years – fit readily with the pattern of high mobility outlined above. Indeed, if we regard southern Brittany as a reservoir for Neolithic populations, then many of the groups inhabiting other parts of the peninsula may have traced their origins back to the southern coastlands.

Comparative perspectives

For comparison with the Breton evidence we may consider two regions of western Europe for which detailed evidence of Neolithic settlement is available. Though much smaller in scale than the Brittany peninsula, they do provide snapshots of Neolithic settlement in contrasting environmental and cultural settings.

The first of these is the Combe d'Ain in the Jura département of eastern France. This enclosed alluvial valley in the Alpine foothills is occupied by two lakes (Chalain and Clairvaux) around whose shores a series of Neolithic and Bronze Age villages were established. Waterlogged preservation of buried timbers and systematic excavation over three decades have provided an unparalleled view of the development of these small village settlements. Particularly well-studied is the period 3200-2900 BC, which has been divided on dendrochronological evidence into a sequence of 20-year phases. Clusters of villages were built during this period at west end of Lake Chalain and the north end of Lake Clairvaux, rising from a single village on each lakeshore in 3180 BC to a maximum of nine in 2980 BC. "During this time span, the size of the small villages was nearly constant . . . with, on average, a dozen rectangular houses, of 8 to 10 metres long and 4 metres wide and as many little cereal granaries." (Pétrequin *et al.* 1998, 184). From 2980 BC the development went into reverse, and the number of villages declined once again, until the area was largely abandoned once again by around 2900 BC. Short-term climatic changes appear to be a major driving force in this sequence (Arbogast *et al.* 1996).

Within this short cycle of colonisation and abandonment, study of cereal pollen and of the timber used for house construction has allowed a reconstruction of the human impact on the environment. Pétrequin and his colleagues divide the sequence into two parts: before 3000 BC, when slash-and-burn agriculture in a forest environment was practised; and after 3000 BC, when denser settlement led to increased pressure and clearance of the forest, and permanent fields and grazing areas were established in an open environment (Pétrequin *et al.* 1998). This change is accompanied by faunal evidence indicating a sharp drop in hunting c.2980 BC, as population pressure intensified (Pétrequin *et al.* 1998, 189). In the next cycle of settlement, between 2800 and 2600 BC, human impact on the

forest cover stabilised, and the length of occupation of the villages increased. This leads to the conclusion that the agro-pastoral system had become much more stable, with much larger cleared areas (Pétrequin 1996, 15).

A striking feature of the evidence is the pulse-like nature of Neolithic occupation around the Lakes Chalain and Clairvaux, as Pétrequin and colleagues (Pétrequin 1996; Arbogast *et al.* 1996; Pétrequin *et al.* 1998) have emphasised:

“Twenty years of multidisciplinary research . . . have shown that the flattest shores of Lakes Chalain and Clairvaux were occupied , though not with real permanence, by small communities of farmers and stockherders during the 5th-3rd millennia BC . . . The Combe d’Ain experienced periods of direct colonization, coming alternately from western Switzerland and the Rhône Corridor, and periods of partial or complete abandonment. . . . [T]his region of low mountains . . . probably served as a zone of welcome for communities coming from rich agricultural zones, who were trying to regulate momentary problems of overpopulation by reproducing the same social organization and technology, as long as new lands were still available.” (Pétrequin 1996)

The Combe-d’Ain, in the Alpine foothills, is in many ways a marginal area in the establishment of cereal farming communities in western Europe, as demonstrated by the late arrival of farming settlement in the valley. By contrast, the middle/lower Rhine, and more specifically the Bandkeramik occupation of the Merzbach Valley on the Aldenhovener Plateau, is a key region for understanding the development of early farming societies in western Europe. Systematic excavations have revealed evidence of 160 house plans from eight distinct settlement sites, plus three enclosures and a cemetery, belonging to the period 5300-4900 BC. Each settlement comprises one or more longhouses, these being massive timber structures upto 70m in length. Successive longhouses were built to replace each other in the same location, each such sequence forming a settlement module termed a *Wohnplatz* or *Hofplatz*. Langweiler 8, the longest-lived of these settlements, spanned 14 successive house generations, representing an

uninterrupted occupation of some 400 years (Lüning 1998). Langweiler 8 is also the largest of the Merzbach settlements, with 11 contemporary longhouses at its greatest extent. The Bandkeramik settlement of the Merzbach Valley as a whole grows from three houses in the first phase to a total of sixteen or seventeen houses in phases VII and XII, then falls away rapidly to only three houses in phase XIV and none in phase XV (Stehli 1989).

The agricultural basis for these Bandkeramik settlements is reconstructed as small-scale cereal cultivation in fixed plots close to the settlements (Stehli 1989; Lüning & Kalis 1993). This follows on from work by Modderman (1971), Kruk (1980) and Rowley-Conwy (1981) which demonstrated the weaknesses of the earlier model of Bandkeramik shifting slash-and-burn agriculture (e.g. Clark 1952, 96-97; Soudsky & Pavlu 1972). Land may have been cleared for agriculture by burning off the vegetation, but the abundance of weed seeds suggests that fields were in use for sufficiently long periods that persistent weed communities could become established (Bogucki & Grygiel 1993, 312). Bandkeramik faunal assemblages are dominated by domestic cattle (Bogucki & Grygiel 1993, 409). For the Merzbach valley, Stehli paints a picture of limited cultivation around the settlements, with relatively little clearance of the forested hinterland (Stehli 1989). The substantial nature of the houses, the evidence for long-term continuity and replacement of houses in the same locations, the arguments for fixed-plot farming and the low incidence of hunted animals together imply both low residential and low logistical mobility. The importance of cattle in the faunal record, however, has been used to argue alternative models of greater mobility, on the grounds that viable herds would require more extensive pastures and therefore demand higher levels of movement. This may indeed have been the case in certain regions, as for example the Polish lowlands (Bogucki 1987), where Bandkeramik residential mobility may have been the norm. Arguments that such residential mobility would have characterised Bandkeramik settlement in other areas (Whittle 1996, 160ff; Thomas 1996a, 100ff) demand serious consideration, but have yet to win general acceptance. We may for the present characterise the pattern as one of low

residential mobility and low logistical mobility, with cultivation of cereals in small plots adjacent to the long house clusters (Fig. 8).

Conclusion

This analysis indicates that the pattern of Neolithic settlement proposed above for Brittany is paralleled in certain respects, and to different degrees, in other areas of western Europe. Perhaps most striking is the discontinuous nature of occupation, consonant with the hypothesis of low population levels, subject to cyclical fluctuations on a scale of two to four centuries. Cycles of colonisation and abandonment might have been expected in agriculturally marginal zones such as the French lakes, and perhaps even Brittany with its relatively poor soils, but it is more surprising to find them a feature even of 'core' areas of early Neolithic settlement such as the Aldenhovener Plateau. Such cycles may have been relatively common throughout prehistoric western Europe, and will undoubtedly have had major impact on patterns of cultural transmission (Shennan 2000).

An emphasis on residential stability is suggested by the visibility and durability of the settlements discovered in the Combe d'Ain and on the Aldenhovener Plateau, though the Aldenhovener evidence may be interpreted in other ways. What is very clear is that the settlement evidence from Brittany is much weaker, with only a single substantial house plan (from Le Haut Mée: Cassen *et al.* 1998) currently attested for the earlier Neolithic period. The Brittany evidence bears closer comparison with that from southern Britain, where there are few well-documented earlier Neolithic house plans, and those structures that have been found may be interpreted in other than purely domestic terms (Darvill 1996; Thomas 1996b; Whittle 1997b; but see also Cooney 1997).

The model proposed for Brittany hence differs more in degree than in kind from that for other areas of western Europe during the earlier Neolithic. The distribution of passage graves and other prominent Neolithic monuments does not indicate a pattern of settlement which remained fixed and stable over hundreds of years. Instead they should be

recognised as representing a palimpsest of individual historical events, and any attempt to ‘average’ these patterns will inevitably obscure the short-term fluctuations in both scale and distribution of population which must lie behind them.

The model of Neolithic demography developed in this study is necessarily an extrapolation from evidence both partial and incomplete. It has been necessary to generalise from specific examples and contexts to construct an interpretation relevant at the level of the region as a whole. In this way the information available from surface surveys – around the Plussulien axe factory, for example, or the Rade de Morlaix and its hinterland – has been applied in the guise of a general model. It is important to recognise the limitations and potential inaccuracies of this approach.

In the first place, it is always possible that future fieldwork will bring new information to modify or negate the interpretation presented here. This we might label the *research state* error. Second, it is already clear that within this region of Brittany, individual areas depart significantly from the general configuration proposed. Some of these variations, such as the density of sites in the southern Morbihan, may indeed be considered parts of the model itself; others, such as the number of inland sites in the Rennes basin, fit less easily. This may be termed the *geographical variability* error: the tendency for general models derived from incomplete evidence to ignore or under-emphasise the significance of localised patterns that fall below a certain spatial scale.

A third type of error is intrinsic to the use of information combined from different sources: *evidential incompatibility*. In the case outlined above the most notable incompatibility lies between the palynological evidence for widespread and long-lived forest cover, and the distribution inland of certain categories of material culture, such as undecorated menhirs or polished stone axes. If the menhirs indicate the sacralisation of marginal landscapes, the polished stone axes could represent intentional votive deposits in forested areas, but it could also be argued that the palynological evidence has been over-emphasised at their expense. A final source of error is presented by what we may

call the *palimpsest effect*, that we are looking at distributions which are cumulative in character and for which in general we have poor chronological control. The patterns available for analysis are the product of many small-scale events and human actions – whether it be the group-based construction of a megalithic tomb, or the more episodic loss or deposition of a polished stone axe in wooded terrain.

Finally we must return to consider what light this study throws on the nature of Neolithic communities in western Europe. It was observed earlier that these communities were at least partially dependent on domesticated plants and animals, but had not yet (save in certain limited areas) developed fixed field systems or permanent settlements. The evidence presented above suggests that cyclicity was a crucial element of the pattern. We may envisage small-scale communities comprised of perhaps a single household or a group of households settling in one location for a generation or more. There they cultivated cereals and raised domestic livestock in what remained, throughout the Neolithic period, a largely forested environment.

We may conclude that the landscapes of Neolithic western Europe were not densely populated. Concentrations of population may well have been present in certain areas, though it is difficult from the available evidence to determine whether these were stable features of the demographic pattern or whether they too fluctuated in density according to a cyclical pattern. One possibility is a succession of episodes of contraction and expansion: periods when population was dispersed throughout the region alternating with periods when settlement was concentrated within ‘core’ zones (cf. Shennan 2000). Such a pattern would open new perspectives on the significance of durable cultural markers such as monuments. Such monuments might in this context have served as permanent reminders of areas once settled but now abandoned. The particular nature of the demographic pattern may thus be at the basis of the west European monumental tradition.

This is an unashamedly minimalist interpretation of the evidence. Large and impressive monuments do not automatically equate with substantial and prolific populations. The

localised evidence for Neolithic cultivation should not lead to assumptions of dramatic growth in population levels during the early Neolithic. The impressive Neolithic monuments may be misleading, in their size, as pointers to the nature of the societies that built them, which were perhaps dispersed, small-scale and impermanent. The monuments belong not to a landscape of fixed farming communities but to an earlier phase of transitory, mobile cultivation. Here Neolithic Brittany may be an example of the general character of early farming societies in western Europe as a whole.

Notes

- (1) The Neolithic of Brittany is conventionally divided into three stages – Early, Middle and Late – of which the Early Neolithic is represented by very few sites or finds and is generally absent over the greater part of the peninsula (the site of Le Haut Mée in the north-east being a notable exception). The Middle Neolithic may be dated to the period 4500-3500 BC, and the Late Neolithic to 3500-2500 BC.
- (2) All radiocarbon dates are calibrated to the 2 sigma range; calibration figures taken where possible from the BANADORA database (Base Nationale des Données Radiocarbone) established by the Centre de Datation RadioCarbone, Université de Lyon.
- (3) Stone-built hearth 5980±145 bp (Gsy-47B: 5250-4505 BC); charcoal from upper layers of the buried soil produced dates as late as 4600±200 bp (Gsy-47A: 3780-2710 BC).
- (4) Le Roux (1999a) estimates that the Plussulien quarries must have produced between 1 million and 2 million usable rough-outs during 2000 years of use, at a rate varying perhaps between 300 and 3000 axes per year. Assuming that each

axe took between 1 and 3 days to complete, Le Roux calculates that the exploiting population must have been of the order of 2000 to 3000 (30 people involved in producing axes full-time; food surplus limited to maximum of 5%, indicating a total adult population of 500; converts to 2000-3000 if one includes infants and children).

| | | | |
|-----|--------------|-------------------------|--------------|
| (5) | Liscuis II: | Gif-3585: 4170±110 bp = | 3020-2460 BC |
| | Liscuis III: | Gif-4076: 4200±110 bp = | 3040-2470 BC |
| | | Gif-4075: 3680±110 bp = | 2450-1745 BC |
| | Kerivoelen: | Gif-3586: 3680±110 bp = | 2450-1750 BC |
| | | Gif-3587: 3640±110 bp = | 2320-1690 BC |
| | Liscuis I: | Gif-3099: 5140±100 bp = | 4220-3705 BC |

(6) Le Roux argues the opposite, that there must have been such a settlement and that the absence of surviving traces much be explained by erosion and the effects of cultivation. “A la différence de carrières situées en zone montagneuse . . . il était possible de travailler en permanence à Plussulien tout en résidant au voisinage immédiat. L’absence apparente de traces d’habitats importantes au voisinage n’est pas un argument décisif, en terrain mamelonné et cultivé de longue date, l’érosion a fort bien pu faire son oeuvre” (Le Roux 1999a, 206).

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Figures

1. The Brittany peninsula showing location of the principal sites referred to in the text. Southern Morbihan core area outlined by a broken line. Key to sites:

1: Curnic; 2: Barnenez; 3: Brasparts; 4: Beg an Dorchenn; 5: Plussulien; 6: Tévéc; 7: Carnac; 8: Grand Menhir Brisé & Er Grah; 9: Petit-Mont; 10: Hoëdic; 11: Brocéliande; 12: Saint-Just; 13: Pléchéâtel; 14: Boistrudan; 15: Le Haut Mée

2. Distribution of (above) early passage graves and (below) allées couvertes in Brittany. (After Giot *et al.* 1998, with additions)

3. Mesolithic sites in Finistère:

(left) distribution of Middle and Final Mesolithic sites. Broken lines indicate zones of major sites some 15-20kms from the northern and southern coasts.

(right) Final Mesolithic sites of the Mikaël-Le Clos group, showing those which have yielded artefacts of ultramylonite from the source at Mikaël. The location of the Neolithic cairn of Barnenez is also indicated. (After Gouletquer *et al.* 1996)

4. The Plussulien area, indicating the distribution of surface scatters, menhirs and chambered tombs. (After Le Roux 1999a) The settlement area adjacent to the Plussulien quarry (here qualified by a question mark) is hypothetical and derives from Le Roux's model of a permanent local workforce.

5. Findspots of Neolithic polished stone axes in Brittany, the Loire estuary and the northern Vendée. (After Le Roux 1996)

6. The development of vegetation in Brittany from the Early Neolithic to the Iron Age. (After Marguerie 1992)

7. Reconstruction of the Grand Menhir Brisé, largest of the Breton Neolithic standing stones, which is now fallen and fractured in four parts at Locmariaquer, Morbihan. The central section carries a shallow carved motif which may depict a hafted axe. (After Bailloud *et al.* 1995)

8. Neolithic settlement in Brittany, the French lakes (Chalain and Clairvaux) and the Rhineland (Aldenhovener Plateau).