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A consideration of Somerset's Holocene environments

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Introduction

Scientific techniques, including the analysis of biological remains and the sediments that preserve them, contribute greatly to the study of past landscapes and economies and, at the site-specific scale, the interpretation of contexts and features. In this paper a summary of the types of evidence that have been studied in Somerset is presented, followed by a brief overview of what they tell us about prehistoric vegetation change.

Preservation

Given suitable preservation conditions a wide range of biological remains can survive, but as Table 10.1 on page 61 and page 63 shows, most of the studies from Somerset have concentrated on pollen, plant macrofossil remains and animal bones. Figure 10.1 on the next page shows the location of past studies; site numbers (in square brackets) referred to in the text relate to those on this map and in Table 10.1. On dry-land sites, preservation can be restricted and plant remains survive usually because they became accidentally charred. Charred preservation is usually restricted to cereal grain, chaff and weed seeds, with rare examples of roofing material and animal fodder surviving in a burnt state. This was the case at Kenn Moor [2], where the only example of Roman hay from south west England was identified (Jones nd). Occasionally, seeds, fruits or arthropod remains are "mineral-replaced", a type of rapid fossilisation, which preserves in dry sediments a range of plants that would not necessarily have become accidentally charred. Rapid burial and decay of soft tissues and the presence of semi-waterlogged conditions may all be involved in the replacement of plant and animal tissue with calcium phosphate or calcium carbonate. Once replacement has occurred, subsequent drying out has little effect on the remains. In waterlogged sediments such as wet ditch fills, valley sediments or peat bogs, survival of non-charred organic remains is often good, so long as the waterlogging existed at the time or shortly after burial. The larger plant remains such as wood, fruits, seeds, leaves and stem fragments, often referred to as *plant macrofossils*, are useful sources of information on a range of diverse topics such as past diets, building materials, the use of plants for industrial processes such as dyeing, farming practice and local environments.

Water-lain deposits can preserve *diatoms* (unicellular algae, with frustules of silica) and *foraminifera* (brackish and marine protozoans, some of which secrete a test of calcium carbonate). Ostracods, small crustaceans principally found in freshwater conditions, survive where the sediments are neutral to alkaline. These three organisms are useful in the understanding of past water conditions, and diatoms and foraminifera are also important indicators of salinity levels and tidal regimes.

Pollen grains, with their resistant exine of sporopollenin can be preserved in a range of sediments. Pollen and spores survive best in anoxic, acid conditions where oxidation and attack by micro-

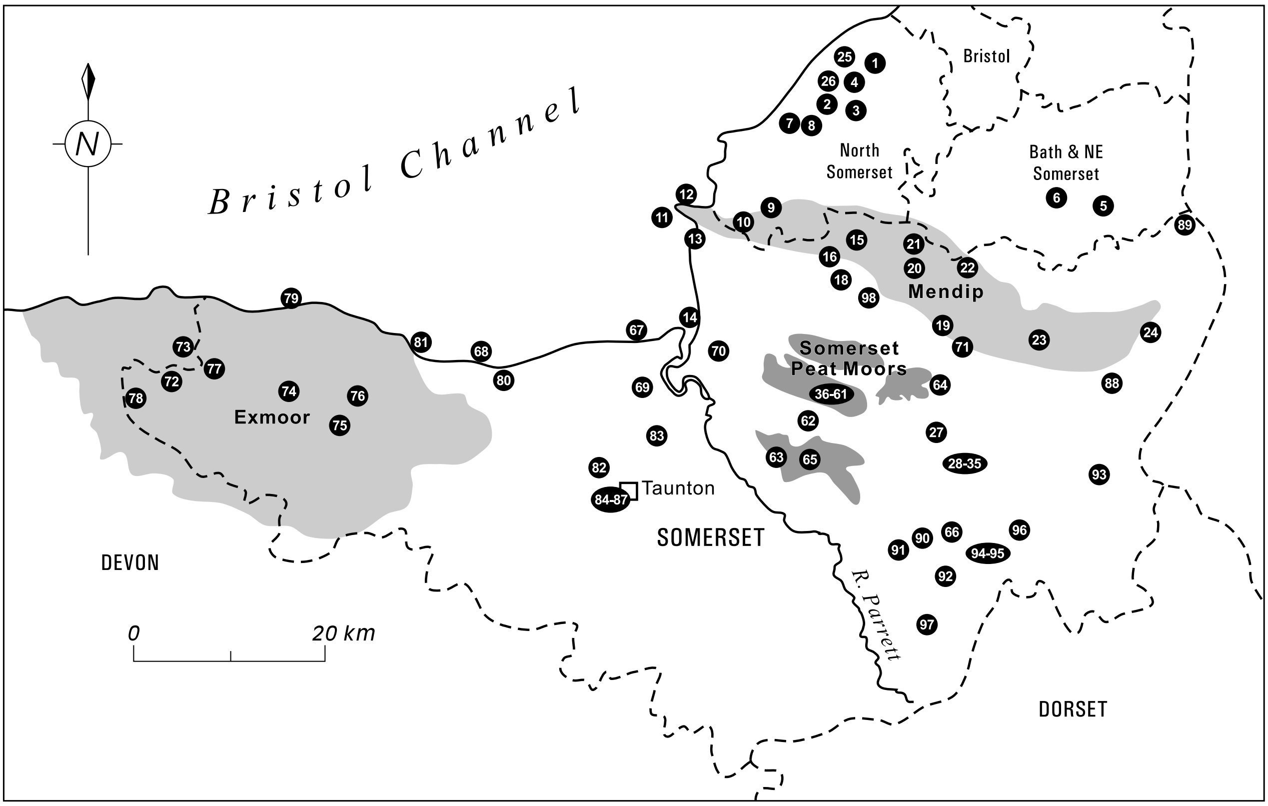

Figure 10.1: *Environmental studies from archaeological sites in Somerset*

organisms is reduced. As it usually survives well in peat, pollen has been well studied in parts of Somerset and has made the greatest contribution to our current knowledge of Somerset's past vegetation.

Insect remains also survive well in peat and organic silts, but not in dry sediments. They too have been well studied in the Somerset peat moors of the Brue valley where they have been used to infer ground surface conditions and vegetation. At Meare Village East [49] a degree of beetle infestation in celtic beans (*Vicia faba* var. *minor*) gave an idea of the condition of stored products (Caseldine 1988). The *Somerset Levels Papers* publish many reports of site-specific pollen and insect analyses.

Animal bones survive in parts of the county where the soils are not acidic such as in the limestone soils and sediments of Mendip and the Polden Hills, and in coastal sand dune sequences such as at Brean Down. Their principal contexts for recovery include caves and swallets, urban and rural settlements and castles. Animal bones include the remains of large mammals (eg cattle, pig, sheep, deer), small mammals (eg shrews, voles), birds and fish and amphibians. From the study of these remains, we can learn about past diets, and dietary preferences, farming practice, fishing and wildfowling and the former presence of animals and birds that are rare or extinct in the area today. The study of wild animals complements the information gained from pollen and plant macrofossil analysis on, for example, the former extent of woodland. Small mammals are useful indicators of local micro-environments.

Snails survive in similar conditions to bones as the shells are composed of calcium carbonate. Snails have specific habitat requirements and colonise terrestrial, freshwater or marine environments. Molluscs of economic significance include shellfish such as oysters, scallops and mussels.

History of environmental studies

Sir William Boyd Dawkins drew attention to the presence of a "submarine forest" at Porlock as long ago as 1890 but Clement Reid, who worked for the geological survey, was as far as the writer is aware, the first person to study remains of plants found on excavations in Somerset. Sometime between 1910 and 1920, he was asked to examine remains

No	Site name	Period	Dendro	Pollen	Plant	Diatoms	Ostracods	Forams	Snails	Insects	Animal	Soils
1	Birdcombe	Mesolithic										•
2	Kenn Moor	Roman			•							
3	Henley Wood, Yatton	Roman							•		•	
4	Court Hill cairn, Tickenham	Bronze Age							•			
5	Chew Down	? Iron Age										•
6	Chew Park	Roman			•						•	•
7	Waterloo Farm, Banwell Moor	Iron Age, Roman		•	•							
8	Banwell Villa	Roman									•	
9	Star Villa	Roman			•				•		•	
10	Bleadon	Bronze Age/ Iron Age			•						•	•
11	Brean Down peat	Mesolithic		•	•	•						
12	Brean Down settlement	Bronze Age		•	•		•		•		•	•
13	Brean sea defence	Bronze Age, Roman			•				•			
14	Burnham-on-sea	Prehistoric (Meso, Neo)		•	•			•				
15	Charterhouse Warren Farm	Bronze Age									•	
16	Cheddar Palaces	Saxon/Medieval							•		•	
17	Cheddar: Goughs	Upper Palaeolithic									•	
18	Cheddar: Soldiers Hole	?									•	
19	Cheddar: Wookey Hole	Roman			•							
20	Bracelet Cave	Prehistoric, Roman									•	
21	East Twin	Post Medieval		•								
22	Badger Hole	Post glacial									•	
23	Priddy	Prehistoric		•								
24	Tom Tivey's Hole	Prehistoric and later							•		•	
25	Gordano Valley	Prehistoric (inc. Late Glacial)		•								
26	Cadbury Congresbury	Roman, Post Roman									•	
27	Glastonbury Lake Village and environs	Iron Age, prehistoric (pollen)	•	•	•							
28	Glastonbury Tor	Saxon, Medieval									•	
29	Glastonbury Wirral Park Farm	Medieval									•	
30	Glastonbury, The Mound	?									•	
31	Glastonbury: Beckery Chapel	Saxon									•	
32	Glastonbury: Benedict Street	Prehistoric-Roman	•	•	•					•		
33	Glastonbury: Silver Street	Medieval							•		•	
34	Glastonbury: Wells Road	Prehistoric-Post Roman		•	•	•			•			
35	Glastonbury; Abbey	Saxon	•						•			
36	Abbots Way	Neolithic	•	•						•		
37	Baker	Neolithic	•	•								
38	Brushwood	Neolithic	•		•							
39	Decoy Pool cover	Neolithic	•									
40	Diffords ground	Prehistoric	•	•	•					•		
41	East Moors	Prehistoric	•									
42	Eclipse	Bronze Age	•	•								
43	Franks ground	Neolithic	•	•	•							
44	Garvins	Neolithic	•	•								
45	Godwins	Bronze Age	•	•								
46	Ham Walls	Prehistoric (Meso, Neo)		•	•	•		•		•		
47	Honeygore	Prehistoric		•								
48	Meare Heath	Bronze Age		•	•					•		
49	Meare Village East	Iron Age		•	•		•		•		•	
50	Meare Village West	Iron Age	•	•	•				•	•	•	

Table 10.1: *Environmental studies from archaeological sites in Somerset (continued on page 63)*

from the Glastonbury and Meare lake villages, which included “cakes” or “buns”. In one example from Glastonbury he noted “whole unbroken wheat grains with a noticeable proportion of glumes and fragments of awn” and speculated that the mixture had been kneaded out of a mixture of wheat and “something sticky, probably honey”. He also observed that “it does not appear to have been much baked, as there is no sign of crust or of burning” (Bulleid 1926, 68–9). Later study of these by Hans Helbaek showed that they comprised not only wheat and barley, but also seeds of field weeds too (Helbaek 1952).

The foundation for the study of past landscapes in Somerset was laid by the remarkable work of Sir Harry Godwin, starting in the 1930s. He developed the studies of pollen analysis and peat stratigraphy which have been invaluable in providing a picture of landscape development in the wetlands of Somerset, and an environmental context for the finds of wooden trackways which were starting to be recognised. His work was built upon by the Somerset Levels Project where the inclusion of an environmental archaeologist as a permanent member of the project team set the example for British archaeology.

Virtually all of the environmental studies in Somerset have been done in the last 30 years, and most in the last twenty. The location of these studies is shown in Figure 10.1 on page 60, and it is immediately clear that some areas have received rather better coverage than others. This is largely because the work has been driven by “rescue” or development-led archaeology, to record sites threatened by peat cutting, as for example in the Brue valley, urban development as in Taunton and Shepton Mallet, or road schemes. More recent studies at Minehead, Porlock and Brean Down have responded to coastal erosion and sea defence schemes. The dearth of sites in the south western part of the county reflects the lack of archaeological work in the Blackdown Hills area.

Of the 98 “sites” referred to, most are small-scale studies of one or a few types of evidence only. The sites included are those for which there is a published report or an easily accessible archive report. The writer acknowledges that there will inevitably be unpublished and published reports which have been inadvertently omitted. Sites where tree-ring studies or dendrochronology have been carried out are included, though some recent results from buildings may be missing. Little dendrochronology has been successfully carried out in South West England, and most of that has been from Somerset, principally from the wooden trackways of the Brue Valley, but also from “bog” oaks (eg Glastonbury [32] and at Stolford [67] in Bridgwater Bay. The recent expansion of development-led projects has meant that there is now an extensive “grey” literature of unpublished archaeological reports, which may be slow to publication. Full references to all the specialist reports cannot be presented here, and the reader is referred to Bell (1984) which reviews much of the evidence prior to that date and the *Environmental Archaeology Bibliography* which is available through the English Heritage website (http://www.eng-h.gov.uk/EAB/).

Figure 10.2 on page 65 gives a chronological breakdown of the most frequent types of palaeoenvironmental study (pollen, plant macrofossils, animal bones, snails and insects) but some of the data is difficult to present graphically. Many of the pollen analyses associated with the trackways of the Brue Valley, for example, concentrate on the periods associated with the tracks, but may also investigate in part the sequences pre- and post- dating them. The longer environmental sequences, which relate principally to pollen and plant macrofossil analyses are included in the “Prehistoric”, “Prehistoric to Roman” and “Prehistoric to post Roman” columns.

Pollen and waterlogged plant macrofossil analyses account for most of the prehistoric studies as the prehistoric sites are mainly associated with wetlands. Exceptions include hillforts such as Ham Hill [97], and the bronze-age coastal settlements at Brean Down [12]. What is known about neolithic agriculture comes mainly from indirect sources, such as the vegetation clearances noted in pollen diagrams. Much of this from the Brue Valley is tentatively assigned to pastoral agriculture rather than arable (Caseldine 1988). The recovery of plant and animal remains from neolithic sites is, as for Britain as a whole, still an urgent priority.

For the later periods, animal bones and to some extent charred plant macrofossils provide a lot more information. This is patchy however, and mainly useful at the site interpretation level. There is not enough information from iron-age and Roman sites to establish whether there are variations within the region or specialisation between sites, or to examine any effects that the introduction of Roman farming methods may have had. The evidence for later

No	Site name	Period	Dendro	Pollen	Plant	Diatoms	Ostracods	Forams	Snails	Insects	Animal	Soils
51	Rowlands	Neolithic	•							•		
52	Shapwick Station	Iron Age		•								
53	Signal Pole	Prehistoric	•									
54	Skinners Wood	Bronze Age	•									
55	Stileway	Prehistoric	•							•		
56	Sweet	Neolithic	•	•	•					•		
57	Tinneys	Bronze Age	•	•	•					•		
58	Tollgate House	Prehistoric		•								
59	Vipers	Prehistoric		•								
60	Walton Heath	Neolithic	•	•								
61	Withy Bed Copse	Bronze Age		•								
62	Shapwick	Roman, Saxon, Medieval			•						•	
63	Greylake	Bronze Age		•	•					•		
64	Harters Hill	Bronze Age	•	•	•							
65	Sedgemoor	Prehistoric		•	•							
66	Somerton, Bradley Hill	Roman									•	
67	Stolford	Mesolithic	•	•								
68	Blue Anchor Bay	Mesolithic		•					•			
69	Cannington	Saxon							•		•	
70	East Huntspill	Roman			•							
71	Wells Cathedral	Medieval			•							
72	Exmoor Chains	Prehistoric–Post Roman		•								
73	Exmoor Brendon Common	Prehistoric		•								
74	Exmoor Aldermans Barrow	Prehistoric		•								
75	Exmoor Codsend Moor	Prehistoric–Post Roman		•								
76	Exmoor Hoar Moor	Prehistoric–Post Roman		•								
77	Exmoor Hoar Tor	Prehistoric–Post Roman		•								
78	Exmoor Pinkery	Post Medieval		•								•
79	Exmoor Porlock	Prehistoric–Post Roman		•	•	•		•				
80	Cleeve Abbey	Medieval									•	
81	Minehead	Mesolithic		•	•	•		•		•		
82	Norton Fitzwarren	Iron Age									•	
83	North Pertherton	Saxon/Medieval									•	
84	Taunton Fore Street	Medieval		•	•				•		•	
85	Taunton Priory Barn/Benhams Garages	Medieval		•	•					•	•	
86	Taunton Priory	Medieval									•	
87	Taunton: Kennedy's Yard and 1 High St	Medieval									•	
88	Shepton Mallet, Fosse Lane	Roman			•							
89	Farleigh Hungerford Castle	Medieval									•	
90	Low Ham	Roman			•							
91	Langport: Coombe Pond	Neolithic			•				•			
92	Lancin, Wambrook	Post Roman–Post Medieval	•									
93	Lamyatt Beacon	Roman									•	
94	Ilchester 74–5	Roman									•	
95	Ilchester by pass	Roman			•							•
96	Catsgore	Roman			•				•	•	•	
97	Ham Hill	Iron Age			•						•	
98	Nyland Hill	Prehistoric		•		•		•				

Table 10.1: *(continued from page 61) Environmental studies from archaeological sites in Somerset*

prehistoric and early historic crop husbandry, for example, comes mainly from the iron-age sites of Ham Hill [97] and the Meare Lake villages [49–50], and Roman settlements of Catsgore [96], Ilchester [94–5], Shepton Mallet [88] and Kenn Moor [2]. At all these sites, the dominant cereal crop appears to have been spelt wheat, a tall-strawed hardy cereal that was popular through the iron-age and Roman periods. Hulled barley was also grown and oats are seen mainly as a field weed. The lake villages also produced evidence for the use of celtic beans, but oats and rye may have grown as weeds of wheat and barley.

There is as yet little environmental evidence for the nature and regional patterns of Saxon and medieval farming in Somerset, but current work from Shapwick [62] and to a lesser extent Bleadon [10] is starting to remedy this.

The aspect of Somerset's environmental history for which most data has been accrued is Somerset's Holocene vegetation history.

Somerset's Holocene vegetation history (from c.9500 cal BC)

Most evidence for this comes from pollen analysis, supplemented by plant macrofossils, insects and occasionally snails. Radiocarbon and/or tree-ring dating (dendrochronology) have been essential to interpreting the data. The record is biased towards Somerset's upland and lowland wetlands, where these types of biological evidence survive well.

The longest sequence is from the Gordano Valley [25], in North Somerset (Gilbertson *et al.* 1990), with an earliest radiocarbon date of 11,020 $\pm$ 190 BP (SRR 3203). This calibrates at 2 sigma (95% confidence) to 11,600 – 10,600 BC (calibration by V. Straker using OxCal v.3.3 (Bronk Ramsay 1999) and the Intcal98 data set with a resolution of 4). This age range and the pollen flora of sub-arctic herb vegetation confirm a Late Glacial date for the sediments. Above this a further c.3.5 metres of Holocene silts and biogenic deposits chart vegetation change and the silting up of a freshwater lake (Gilbertson *et al.* 1990).

Other early Holocene environmental sequences comprise intercalated peats, silts and sands and remains of palaeosols and of former forests which colonised the valley of the Severn, extending into the present-day Somerset Levels and Moors. The early levels are deeply buried and thus accessible with difficulty inland. They are more easily studied in the intertidal coastal zone, where they are exposed between high spring tide (HST) and low spring tide (LST). Environmental evidence from these drowned landscapes is usually well preserved and as well as informing us about past landscapes and land use, it also provides important data on sea level change. Sea level change is the result, in broad terms, of a combination of changes in the regional eustatic sea level and the rate of crustal subsidence or uplift. The sea level has risen c.55m over the last 11,500 years, the greater part of the rise having been completed by around 5–6000 years ago. This rapid rise resulted in the drowning of coastal woodlands and early prehistoric sites, the deposition of clays and sands, and from time to time the accumulation of peats. The work of Heyworth and Kidson (eg 1982) and Hawkins (1971) contributed greatly to the growth of sea level studies. Their work has been built on in recent years as sea level studies now assume a high profile in view of the concern over global warming and increased sea level rise. A common method of studying sea level change is to analyse sediments (mainly peats, silts, clays and sands) for evidence of marine to terrestrial transitions (or vice-versa) as these may relate to environmental changes due to sea-level fluctuations. The analysis of plant macrofossils and insects, but more particularly diatoms and foraminifera, helps to establish whether the sediments are freshwater or marine in origin. Radiocarbon dates at relevant points such as peat/clay interfaces are used to construct graphs of sea level tendency at different periods in the past.

Studies employing some or all of these techniques have been carried out at Porlock [79] (Jennings *et al.* 1998), Minehead [81] (Jones *et al.* nd), Burnham-on-sea [14] (Druce 1998), Nyland Hill (Haslett *et al.* 1997) [98], Brean Down [11] (papers by Crabtree and Straker in Bell, M 1990), Stolford [67] (Heyworth 1985).

At Porlock, the combined results of studies in the Marsh and intertidal zone identify up to six periods of peat formation, alternating with mineral sedimentation of silts and clays. Using the 95% confidence limits of the calibrated age ranges of radiocarbon dates, we can say that the peat-forming episodes took place between, at the earliest, c.6693

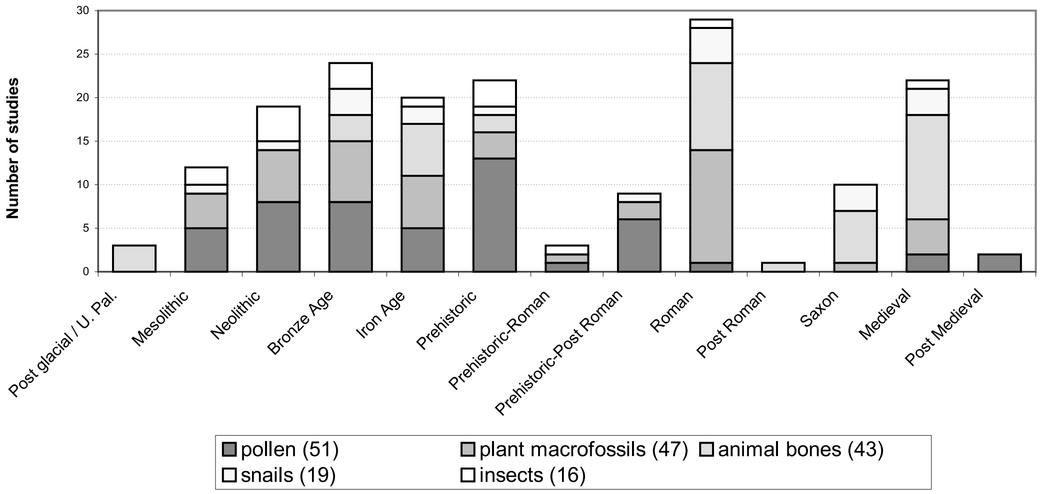

Figure 10.2: *Types of palaeoenvironmental study by period*

cal BC and at the latest c.3550 cal BC. The biological evidence retrieved from the peats shows that they represent non-marine wet alder or willow woodland, with initial growth of sedge swamp in places. The silts and clays are mainly related to salt marsh environments, but in the top 3–4 metres of the Marsh silts, there were episodes of increased freshwater input (Canti *et al.* 1995; Jennings *et al.* 1998). It was suggested that the deep Holocene sequence at Porlock may have accumulated behind a barrier. Heyworth and Kidson (1982) postulated the movement of a storm beach up and over the forest beds at Stolford and it is possible that the central Somerset Levels may have been protected at times by a coastal barrier. Sand dunes and shingle bars are examples of natural barriers that could have protected the inland areas from the sea in times past.

The work of Godwin, the Somerset Levels Project and other specialists, has built up a detailed picture of the development of the wetland and surrounding dry land vegetation of the Brue valley from the very late Mesolithic until the Roman period. On Shapwick and Ashcott Heaths the influence of the sea spanning much of the Mesolithic period led to the development of a very extensive saltmarsh. This extended inland as far as Glastonbury island, as indicated by the blue/grey silty clays revealed beneath the surface peat. With reduced marine influence when the rise in sea level started to slow down, the succession from saltmarsh to reed swamp and then fen woodland and raised bog has been clearly demonstrated on Shapwick and Ashcott Heaths for example, by pollen, plant macrofossil and insect analyses. There are now many radiocarbon dates available for the major transition from salt marsh to reed swamp, which centres on c.4500 cal BC. Elsewhere, such as on Godney Moor and near Glastonbury, the raised bog did not develop, instead sedge mire and extensive wet alder woodland grew as a response to the wet conditions (Housley 1988).

In the Brue valley during the Neolithic and Bronze Age, a picture of mixed deciduous woodland on the surrounding hills accompanies the wetland record. The woodlands were cleared in places at times for the grazing of animals and growth of crops (Caseldine 1988). The main clearance on the dry land did not take place however, until the towards the end of the first millennium BC, around the time increased flooding probably associated with sea level rise, was affecting the valley floor.

The lowland prehistoric record is complemented by studies, based on pollen analysis, from Exmoor. As yet, there are no published studies from the Quantocks or Blackdown Hills. The upland Exmoor record starts sometime between 4000 and 4470 cal BC (Hoar Moor, Francis and Slater 1990; Straker and Crabtree 1995) and documents the decline of a deciduous woodland, which included oak, hazel, pine alder elm and particularly birch. At the Chains, the onset of peat growth was probably c.1000 or so years later (Merryfield and Moore 1974). The influence of birch was less, though the other trees were still a dominant feature of the vegetation. Direct evidence for the former forest cover is not confined to the submerged coastal woodlands. At Halscombe Allotment, the trunk of a large oak tree eroding out of the base of a wet flush peat, has proved to be Early Neolithic. After the failure to get a tree ring match, its outer rings were radiocarbon dated to 4690 $\pm$ 50 BP (GU-8220), or 3635–3360 cal BC (2 sigma). On Exmoor, the growth of the blanket mire meant that the woodland was replaced in many areas by an open landscape dominated by fluctuating episodes of grass-dominated and heather-dominated heathland. The woodland must have survived on sheltered valley slopes probably until the late prehistoric period (Straker and Crabtree 1995). In places, the upland pollen record from Exmoor continues until the present day. This provides a valuable palaeoenvironmental resource contrasting with that of the lowlands, where except in rare instances the environmental record for the vegetation change of the last 2000 years has been removed by peat cutting and drainage.

Comments

The use of scientific methods is standard on most archaeological projects. As wide a range of biological evidence as possible should be assessed for its potential to contribute to the to research aims of each project and the understanding of past landscapes and settlements. As with most research, the results usually raise new questions for future studies. The importance of scientific analyses to archaeology is reflected increasingly in development-led projects, as well as those funded by English Heritage. It is vital that research projects also make use of them to maximise our understanding of Somerset's past.

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