PALAEO-ENVIRONMENTAL HISTORY OF THE STRATHNAVER AREA OF SUTHERLAND: 0-12,000 BP

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INTRODUCTION

The area under discussion, although centred upon Strathnaver in Sutherland, includes material from both the east and west coasts of northern Scotland. The vegetation of the whole area of the extreme north of Scotland today relates to the physiognomy of the land [Fig. 11.1], and consists of three broad categories. Inland there are extensive tracts of heathland and moorland on essentially upland blanket peat; on the coast are nutrient-rich shell loams used for cultivation and grazing; and on the sides of some more sheltered valleys, a generally stunted birch woodland has developed. There is considerably more agriculture in the east, in Caithness, where the extensive flat land on the Caithness flags is particularly suitable for cultivation.

From the wide and varied archaeological sites and monuments present throughout the region, it is clear that people have been living here for many millennia. This paper seeks to discuss the different landscapes in which people have found themselves since the last Ice-Age, and to look at how their economies have been adapted to suit a particular environment.

That the plant communities seen today have developed as a result of both changing climate and human impact can be demonstrated using the techniques of pollen and macrofossil analyses. Pollen is produced by all plants as part of the reproductive process, and the pollen grains consist of complex proteins which are highly resistant to decay under anaerobic conditions. Thus, if they fall into a lake or on to the surface of a bog, they will be incorporated into the sediments and be preserved. In time these sediments build up, thus preserving the pollen evidence in the form of 'time capsules'. By taking a series of samples from different depths within these deposits, and identifying and analysing the pollen grains within them, a picture may be built up of the changing vegetation through time. It is fortunate that many plants produce pollen which can be identified to at least genus, if not species, although this is not true in all cases. A similar situation can occur with macrofossils such as fruits, seeds, leaves and even flowers. With the use of radiocarbon dating of the sediments or, indeed, individual seeds, 'real time' can be assigned to those sediments. The changes in composition of pollen types can then be discussed in years and related to, for example, archaeological sites with their typological dating.

Many plants have specific requirements for growth in terms of soil and climate, and many have climatic limits beyond which they will not grow. If

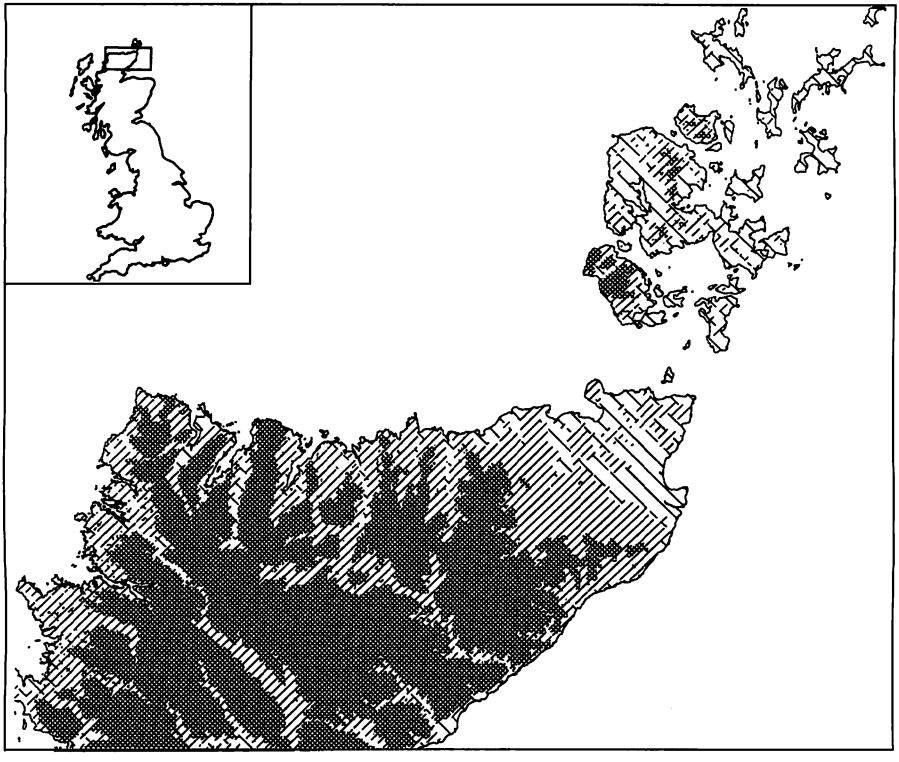

Fig. 11.1 Topography of northern Scotland: 0-50 m, 50-150 m and >150m OD shaded.

these are known from modern ecological work, as for example for *Tilia cordata* (Pigott & Huntley 1981), and assuming that they have not changed for the individual taxa over the millennia, then some inference of the climate may be gained by looking at the pollen spectra from specific deposits (eg Huntley & Prentice 1988). Inevitably, people also have had an effect upon the vegetation, and the traditional method of evaluating this in a pollen diagram has been to look at the so-called 'cultivation indicators' (Turner 1964; Behre 1981). These, however, include taxa growing naturally on coastal ground, such as shingle and sandy places, and therefore are not always reliable where such communities naturally occur, for example as at Freswick Bay, Caithness (Huntley 1995). Conclusive evidence of human impact includes the presence of cereal pollen grains, but unfortunately these rarely travel far from the site of growth/processing and therefore only occur

in very low numbers in most pollen diagrams – which are generally prepared from peats/lake deposits at some distance from cultivated ground. Where the two are in close proximity, useful interpretations may be offered (Huntley *op. cit.*).

As has been mentioned, independent dating of the pollen-bearing sediments is important and radiocarbon is, perhaps, the most familiar. A relatively new method which is relevant to the northern Scottish material is that of tephrochronology – identifying tephra or volcanic ash layers in deposits, characterising their mineral composition and relating that to known volcanoes and dates of eruptions. For example, Hekla, on Iceland, produces such characteristic tephra that its ash has been identified in deposits from Altnabreac in Caithness (Dugmore 1989; Dugmore et al. 1992).

One of the interpretative problems with pollen is that of dispersal – by nature the grains are generally small and light and easily blown by the wind; wind pollination, therefore, is an important mechanism in the reproductive cycle of many taxa. Thus pollen grains may be found in a deposit, but the plants which produced those grains may be many miles away and from different plant communities altogether. By looking at macrofossils this problem can be alleviated somewhat, in that they are generally larger and fall close to the parent plant. In addition, material may be present on excavated archaeological sites that can be definitely attributed to human activity – cereal grains for instance.

These, then, are some of the lines of evidence used to reconstruct past vegetation and landuse. The following section applies those available to a discussion based upon the Strathnaver area.

THE EVIDENCE

Pollen diagrams are available for a series of sites in northern Scotland, from the east to the west coasts [Fig. 11.2]. Most have been used for the interpretation of vegetation generally rather than related to specific archaeological sites, although the Hill of Harley site in Caithness is an exception (Huntley 1995). Not all of the diagrams have independent dating associated with them, the authors rather infer dating from other, local, dated diagrams.

For each dated diagram, pollen values of selected taxa were extrapolated at 1,000 year intervals, calculated assuming a uniform sedimentation rate between radiocarbon dates. The cereal pollen curve was always used when present. Data for *Plantago lanceolata* (ribwort plantain), *P. major/media* (other plantains), *Chenopodiaceae* (oraches and fat hen), *Compositae* (daisy family), *Rumex acetosella* (sheep's sorrel), *R. acetosa* (sorrel), *Polygonum spp.* (knotweeds) and *Pteridium* (bracken) were defined as representing agriculture, although interpreted with caution (see above). The summary curve of trees/shrubs/herbs was used in the broad discussion of vegetational changes.

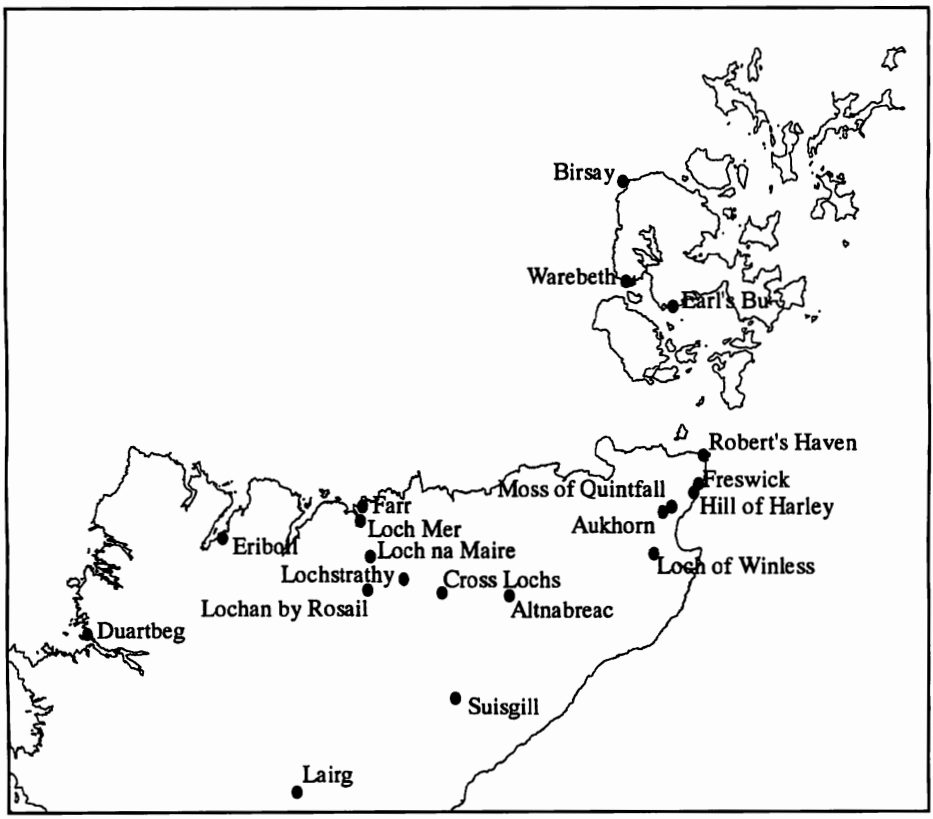

Fig. 11.2 Palynological and macrofossil sites in northern Scotland.

GENERAL DISCUSSION

Late-Glacial & Early Post-Glacial Vegetation (12,000-10,000 Years Ago)

The area was deglaciated by ca 12,500 years ago (Sissons 1974), although there was a further cold period ca 10,300 years ago during the Loch Lomond re-advance. Pollen evidence from two sites – Loch of Winless (Peglar 1979) and Sionascaig (Pennington 1972) – indicates a tundra-like vegetation; a predominantly treeless landscape with patches of *Salix* and *Juniperus* scrub. Interestingly, many of the taxa extracted as cultivation indicators are present throughout this period, although they simply indicate an open vegetation at this time. They reiterate the difficulties in interpretation of pollen data.

Holocene (10,000 Years Ago - Present)

Pollen & Charcoal

Essentially, the north-west was dominated by birch followed by birch-hazel woodland (Birks 1977) by ca 8,000 years ago. It is during this general period that several diagrams present peaks in charcoal fragments. These may reflect either natural fires, or fires started by humans in order either to clear ground for use or to drive animals towards a hunting trap.

Cross Lochs, Caithness (Charman 1992) has evidence of initial fire clearance of birch woodland at 7,500 BP. Subsequent to this, although increased values of *Sphagnum* spores indicate wetter conditions, further peaks in charcoal do occur and this would suggest human influence. There are, however, no clear indications of human activity. The difficulty here is envisaging what might indicate human activity, other than cereal pollen (eg Edwards, in Birks *et al.* 1988; Edwards & Ralston 1984). There is no evidence for early cultivation of cereals. Archaeological evidence is largely restricted to coastal sites which produce secure evidence for Mesolithic people (Edwards, in Bonsall 1990) and where marine resources of shellfish were exploited. However, remains of reindeer carcasses from the Inchnadamph Caves, dated to 8,300 BP, indicate that hunting parties travelled inland and on to the hills to procure meat. (For a review of the status of reindeer in Scotland, see Clutton-Brock & MacGregor 1988).

Throughout the mid-Holocene there was a general expansion in values of alder. This is a tree of wet ground, and would imply that the climate was becoming wetter; increased values of *Sphagnum* spores at several sites reinforce this. *Alnus* expanded in the west at places such as Eriboll (Birks 1977) and in the east at Loch of Winless (Peglar 1979) some 6,500 years or so ago, although birch-hazel woodland remained dominant in the central part at Loch Mer and Lochan by Rosail (Gear 1989). The alder expansion was then followed by steady deforestation, with the development of bog from 5,000 years ago. Values for sedge pollen and associated herbs rise drastically as a result.

This late-Holocene period is the one during which agricultural indicators appear in most dated diagrams for the region. *Plantago lanceolata* appears about 4,000 years ago at Sionascaig (Pennington 1972), Loch Mer (Gear 1989) and Hill of Harley, but not until about 3,000 years ago at Loch of Winless (Peglar 1979). Although plantain pollen grains become constant in occurrence at these time, their values always remain very low; *Chenopodiaceae* grains, also possibly representing agricultural clearances, appear at about same time, although occurrences remain sporadic. Cereal pollen is first recorded at ca 2,700 years ago at both Loch Mer and Loch of Winless. Individual cereal (barley-type) grains were recorded at Hill of Harley from about 5,000 years ago, with a continuous curve from about 2,000 to 1,200 years ago.

The pollen evidence thus shows essentially natural modifications due to

changing climatic and edaphic conditions, from woodland to moorland, through the early and middle Holocene, with human effects showing for certain only in the last 5,000 years.

Macrofossils: Seeds, Fruits, Cereal Chaff Remains

Although pollen analytical work can give indications of the vegetation at both broad and narrow scales (ie regional and local to the sampled sites), it is appropriate macrofossils that can be directly tied to human activity. For example, evidence of diet has been obtained through studying fruits and seeds from several sites on Orkney, as at Warebeth Broch, Stromness (Bell & Dickson 1989), Brough of Birsay (Donaldson & Nye 1989) and Earl's Bu at Orphir (Huntley (a) *in prep.*).

At Warebeth, Dickson identified barley and linseed fragments from a coprolite, and suggested that they had been cooked for a long time, probably simmering with meat. Dating of a cattle bone from this site indicated an Iron Age occupation. Brough of Birsay and Earl's Bu produced large numbers of burnt hulled barley and oat grains, as well as linseed. Both of these sites are broadly Norse to early Medieval. On the Scottish mainland, very few sites in the north have been sampled for carbonised or, indeed, other plant remains. Freswick Links (Huntley 1992, 1995) produced large numbers of hulled barley and oats, and a small amount of wheat and flax. The material was dated from the Pictish to early Medieval periods, but there were no significant differences in the proportions of grain between these times. Pollen analytical work was also carried out near to this site and demonstrated little evidence for the cultivation of cereals, other than a small peak of barley-type pollen dated to the Pictish period. It was suggested that limited cultivation had taken place at the earlier periods of occupation, but that the site was served mainly by trading with other areas during the Norse period. Macrofossil analysis of material from Robert's Haven (Huntley (b) *in prep.*) is producing similar evidence.

Flax seeds have been reported from a number of sites on the Orkney Islands, and it has been suggested that these seeds do, in fact, represent local cultivation (Bond & Hunter 1987). Such a crop could have been used for production of fibre (linen) or oil (linseed), or indeed both.

There is very limited evidence for legumes – Celtic bean and pea – but this may be under-represented since these crops do not require contact with fire at any stage of processing, unlike many cereals which need to be dried before storing.

The earlier site at Suisgill, Helmsdale – dated from early to mid first millennium BC – produced predominantly naked 6-row barley, a little hulled 6-row oats and hexaploid wheat (van der Veen, in Barclay 1985). Little or no chaff, the straw or ear fragments, were recovered and she therefore considered that the site was possibly a consumer site, although the sampling was not extensive and this could have led to biased results. Pollen data from nearby suggest an essentially open birch-pine woodland with

heathland. Cultivation in small fields may not, therefore, be represented in the pollen record.

For the medieval and later periods there may be documentary evidence – for example of the clearances – but, to the author's knowledge, no palynological nor macrobotanical work has been carried out upon material from these periods with the express intention of looking at human impact upon the landscape.

SUMMARY

After the retreat of the ice, most of the area of northern Scotland was covered by a tundra-like vegetation consisting of an essentially treeless landscape, perhaps with small patches of juniper and willow scrub developing with time.

Archaeological evidence for Mesolithic activity is restricted largely to coastal sites where marine resources of shellfish were exploited and with parties moving inland to hunt the larger mammals. There is no evidence for early cultivation of cereals. As the climate became warmer, birch and hazel scrub woodland developed, as did pine woodland in suitable places. In the central and eastern part of the region the pine woodland was a short-lived episode, with the trees declining for edaphic (probably climatically-induced) reasons since there seems to have been a general increase in wetness – possibly as a result, at least in part, of ash clouds. Peats developed over much of the area, and these were too wet and too acidic to cultivate. The coastal strips, therefore, were further exploited. The soils derived from glacial drift and coastal sands were most suitable for cultivating cereals and other crops, as well as for pasturage; and the people remained close to the sea for fishing.

It is interesting that Loch Mer, Loch of Winless and Hill of Harley are the only sites with cereal pollen. This is considered a genuine lack of cereal pollen and not an artefact of either choice of pollen site (being too far from the cereal pollen source) or interest of analyst (not separating cereal pollen from other *Gramineae* types). These two sites reinforce the notion that the east of the region, and the northern coastal strip, remained best suited for arable cultivation. The hills remained primarily as hunting grounds. Finally, in modern times, there were massive clearances of agricultural communities from inland areas in order that sheep could be raised on the hills and, as a consequence, people were restricted even more to the coast.

People have exploited the landscape as and when they could, but the area has always been marginal with respect to cereals. To study the landscape and people in more detail requires that archaeologists and palaeobotanists work more closely together, as at Freswick and Lairg (McCullagh & Tipping 1998). Such work is producing a framework for the east of northern Scotland, but the west remains enigmatic. In addition to the two disciplines working together, fine spatial and temporal resolution palynological work is essential to fine-tune what are, at the moment, simply broad hints as to changing agricultural practices.

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