Chapter (non-refereed)

Bunce, R.G.H.. 1981 British woodlands in an European context. In: Last, F.T.; Gardiner, A.S., (eds.) *Forest and woodland ecology: an account of research being done in ITE.* Cambridge, NERC/Institute of Terrestrial Ecology, 7-11. (ITE Symposium, 8).

Nature of tree and woodland resources

1. BRITISH WOODLANDS IN AN EUROPEAN CONTEXT

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Ecologists concerned with British and continental European woodlands have tended to go their own distinctive ways, although there are notable exceptions. Klotzli (1970), using the Braun-Blanquet system, made a comparative study of British and continental woodlands using published data, as did Rubner and Reinhold (1953) who included a chapter on British woodlands.

In general, one can only agree with Dierschke (1971) who indicated that British vegetation is amongst the least known in Europe. Although Braun-Blanquet and Tuxen used the former's system of phytosociological classification when describing woodlands in Ireland in 1952, British interest in this system owes most to a series of papers published by Poore in 1955 (*a, b* and *c*). Recently Birse and Robertson (1976) have made a study of plant communities in southern Scotland. Considerable difficulties are encountered when attempting to fit British woodlands into the system, in part because of inherent differences in species combinations, but also because of variations in interpretation of the classification by continental authors. For example, Kiellund-Lund (1973) describes associations in Scandinavia, Westhoff and Den Held (1969) in Holland, Hartman and Jahn (1967) in mountain areas north of the Alps, and Durin *et al.* (1968) in northern France, but the presentations differ markedly in the degree of separation of the classes. These variations appear to be largely in response to the particular vegetation present in the areas concerned—thus Kiellund-Lund divides the extensive Vaccinio-picetea forests of Scandinavia whereas Durin *et al.* divide the Quercetea roboripetrae forests of the Atlantic margins. Despite various attempts, notably that by Lohmeyer *et al.* (1962), the differences between the various associations proposed for woodlands need further study, not only by appropriate data collected from British woodlands but also to enable their vegetation to be accurately assessed using the system.

British and continental woodlands differ greatly in scale, the former, with complex management histories, invariably being fragmented. As a result many non-woodland plants are found within British woods. This effect has its greatest expression in the open woods of the north-west of Scotland, where the varied geology and heavy rainfall further complicate the situation. In contrast, in much of lowland Europe, habitats, with less variable geology, are more uniform, a comparable degree of complexity only being found in the Alps. This generalisation was confirmed when the variation within a small sample of continental and British woodlands was assessed. Nonetheless a few types of vegetation are more variable on the continent than in Britain.

1. General comparisons

When surveying native British woodlands, Bunce and Shaw (1972) developed a system of classification with 32 habitat types (Figure 2). At one extreme, in the level land of eastern England, the climate is markedly continental, soils are invariably deep and calcareous, and the woodlands are set in a matrix of arable agriculture. Canopy species are mainly *Fraxinus excelsior, Ulmus* spp and *Acer campestre* with *Mercurialis perennis* and *Rubus* spp forming the ground flora (types 1-8). In similar climatic conditions, but on soils with small amounts of calcium, *Quercus petraea* and *Betula* spp predominate in the usually dense canopy, *Mercurialis perennis* being replaced by *Pteridium aquilinum* in the ground layer (types 17-24). In contrast in very wet habitats, but still lowland, *Salix* spp and *Alnus glutinosa* are the predominant canopy species with *Iris pseudacorus* and *Phalaris arundinacea* in the ground flora (types 13-16). In habitats in northern Scotland with extremely small amounts of nutrients and a sub-boreal type of climate (types 27-28), *Pinus sylvestris* is the major species with *Calluna vulgaris* and *Vaccinium vitis-idaea* typically among ground flora species. In other less extreme situations still subject to a markedly oceanic climate and with shallow acidic and often rocky soils, woodlands are characterized by *Quercus petraea* and *Betula* spp with *Deschampsia flexuosa* and *Vaccinium myrtillis* occurring distinctively on the ground (types 25-26 and 29-32). These types have now been compared somewhat tentatively with the Braun-Blanquet system, mainly based on the associations described by Kiellund-Lund (1973) (Plates 4, 5 and 26).

Types 25, 26, 27-30 with *Quercus petraea* and *Betula* spp have their counterparts in Scandinavia and western Europe, the woodlands often having similar structures. Most of the species in northern continental woodlands occur in Britain, although

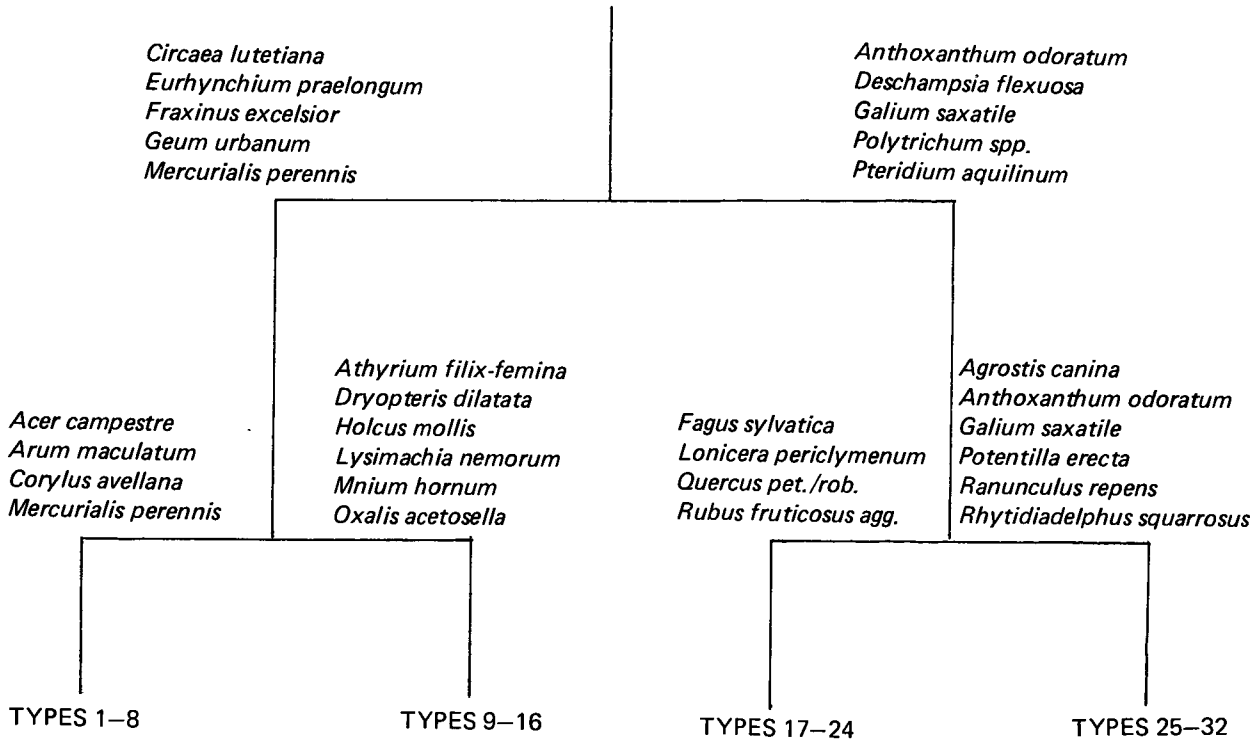

Fig. 2 *The first two dichotomies of an indicator species analysis (Hill* et al., *1975) of British woodland vegetation. The species at each dichotomy are identified by the computer as the most useful to separate the samples into 2 groups. The data were obtained from 1648 plots, each 200 m², sited at random at 16 locations in each of 103 sites taken as representative of the range of variation within British woodland vegetation.*

progressively, as one moves away from the Atlantic influence towards central and eastern Europe, species such as *Sambucus racemosa* and *Hepatica nobilis* with continental distributions appear at the expense of Atlantic species such as *Endymion non-scriptus* and *Galium saxatile.* It is not until the Alps are reached that the main canopy species alter with extensive forests of *Picea abies,* although *Fagus sylvatica* and *Ulmus glabra* are still important dominants locally. There are, however, species-assemblages present in continental alpine woodland that have no direct parallel with those in Britain, eg the species associated with *Alnus incana* on talus slopes. Similarly the majority of species in the Mediterranean zone—eg *Fraxinus ornus, Quercus pubescens* and *Cistus* spp.—are not represented in Britain nor are *Acer tartaricum* and *Fagus orientalis* and many other species which are found in the eastern Mediterranean. In eastern Europe, the main link with assemblages found in Britain is lost in eastern Poland with the disappearance of *Fagus sylvatica.*

In general, the woodlands of much of Scandinavia and of mainland western Europe have much in common with those in Britain. There is a progressive replacement of species to the south and east, but some similarities can be discerned until the Alps and the Mediterranean are reached. As in Britain, large scale differences are determined by climate, with local differences being mainly attributable to soil type.

2. Numerical comparisons

In 1974 a visit was made to Belgium and northern France and data were collected from 75 woodland plots (Figure 3) using the method described by Bunce and Shaw (1972). These were added to data from 3 plots drawn at random from each of the 32 woodland types in Britain, so that detailed comparisons could be made by (1) indicator species analysis (Hill *et al.,* 1975) and (2) reciprocal averaging ordination (Hill, 1973).

Accepting that the range of types was probably incompletely recorded, it is nevertheless of interest to find that 17 of the 32 classes identified in Britain were represented in the sample from Belgium and northern France. There were several notable absentees including the western acid oakwood (types 25 and 16), the assemblages in extremely wet situations and those typical of extreme upland situations (28 and 29). The absence of lowland calcareous woodland types is attributed to defective sampling but even so Belgium clearly has a greater frequency of basiphilous types. The major separations in the indicator species analysis of data (Figure 4) from Belgian and northern French woodlands are, in all but one instance, dependent upon the same species as in the comparable analysis of British woodlands. Some groups are predominantly British eg Group 1, whereas others are mainly composed of continental plots eg Group 6, reflecting differences in

Fig. 3 *Geographical location of sample woodland sites.*

the balance between the species combinations in the 2 areas.

The same picture emerges from the reciprocal averaging ordination (Figure 5) where data from the Belgian and French woodlands overlap to a very considerable extent with those from British woodlands. To the extreme right of Figure 5 are 2 groups of plots, one from the Ardennes and the other from northern Scotland, the 2 being separated by the proportion of moisture loving species. There is a considerable concentration of continental woodlands in the bottom centre of Figure 5 emphasizing the frequency of dry acidic sample plots covered and so contrasting with the absence of Belgian and French woodlands in very wet locations (see top of Figure 5).

3. Discussion

The analyses made up to this time, albeit on a restricted number of continental samples, serve to stress affinities with British counterparts, and

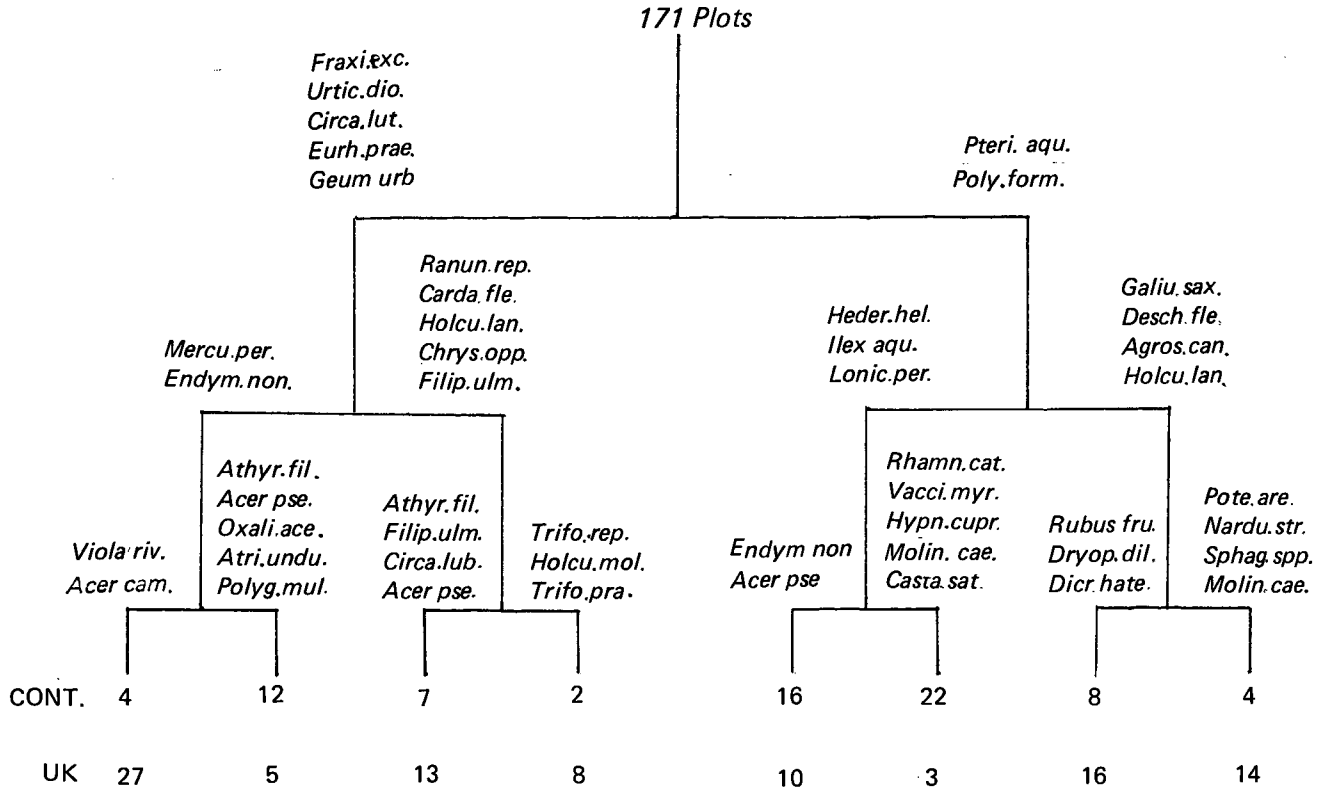

Fig. 4 *Hierarchy of an indicator species analysis (Hill* et al., *1975) of combined data from 75 plots recorded in Belgium and northern France and from 3 plots drawn at random from each of 32 woodland types in Britain. The numbers at the base of the hierarchy refer to the continental or British origin of the plots of each group.*

suggest that it would be profitable to obtain an extended range of data. Within Britain the analysis has highlighted the existence of 32 types of woodlands, whose existence should be recognised when selecting a typical range for ecological studies.

The selection of sites for nature conservation is to some considerable extent based on "representativeness' which, in the Nature Conservation Review, is essentially concerned with vegetation assemblages. If the relation of British to continental European woodlands were known, it is possible that conservation priorities within Britain would be changed.

The classification of vegetation should be regarded as a means to an end and not an end in itself. It highlights affinities and suggests assemblages for synecological studies. Perhaps at the present time when attention is being switched to woody perennials, trees, as renewable energy crops, the classification can point to areas in Britain where satisfactory energy crops might be grown.

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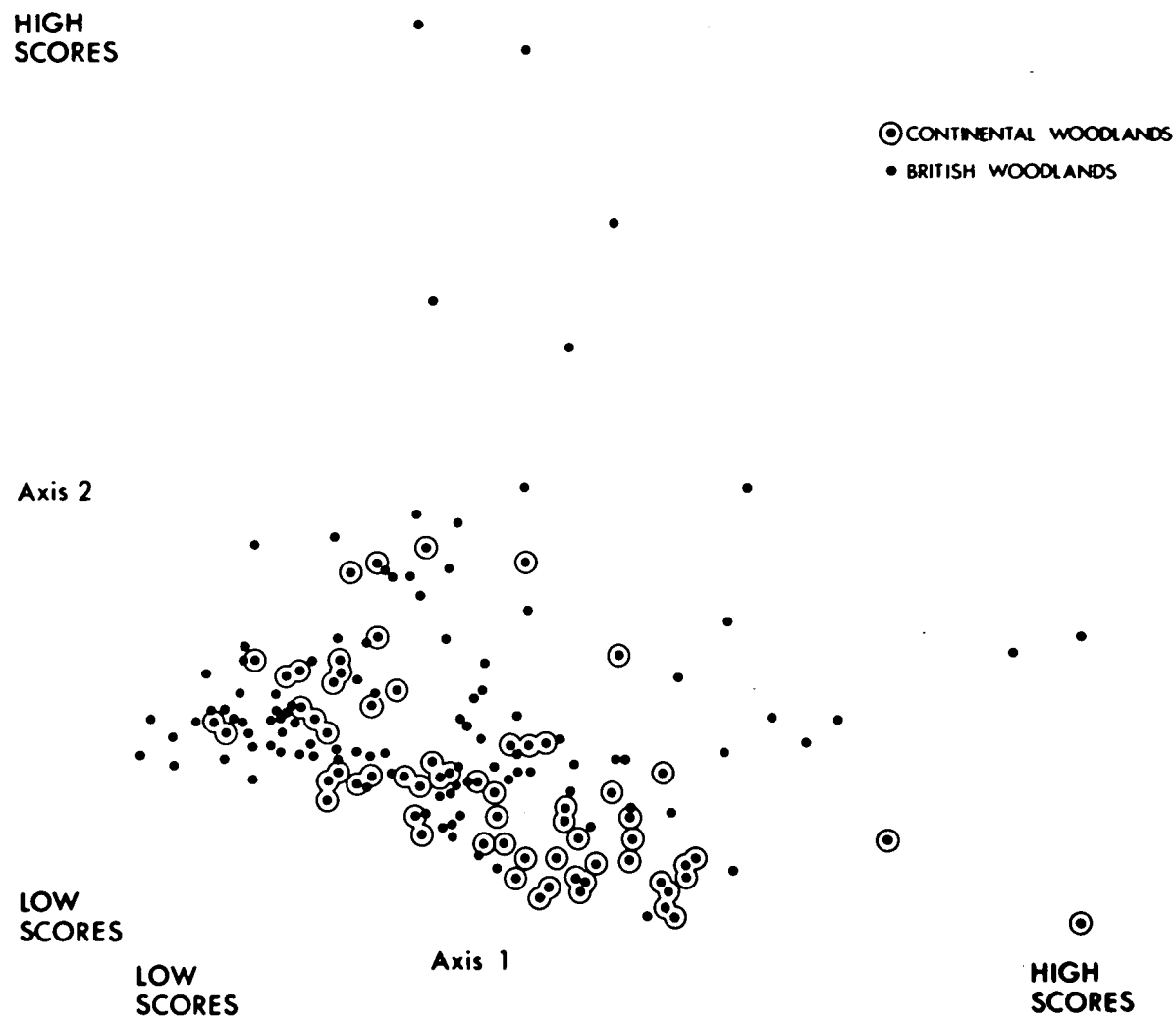

Fig. 5 *Scatter diagram of each reciprocal averaging ordination (Hill, 1973) showing the overlap between continental and British woodlands, reflecting the overall relationships of their composition.*

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