THE DARTMOOR OAK COPSES: OBSERVATIONS AND SPECULATIONS

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"Though spells and litanies
The oak tops entangle"
Cad Goddeu*

Introduction

High in the valleys of the Moor, the three Dartmoor oak copses (Wistman's Wood, Black Tor Copse and Piles Copse) have for many years provoked comment and speculation. Antiquarian interest centred on a reputation as sacred Druidic oak-groves but to the naturalist their interest lay in the stunted form of the trees and the discovery that apart from a few shrubs all the trees were a single species, *Quercus robur*; curiosity has been heightened by the realization that *Quercus petraea* would be the expected tree in the climatic and edaphic situation of Dartmoor.

Serious work on the copses is represented by writers in the *Transactions* of the Devonshire Association (Christy and Worth, 1922; Harris, 1921, 1938), from which the account in Tansley (1949) is largely compiled and a more recent paper on the bryophytes by Proctor (1962). The low stunted growth of the trees, the luxuriant epiphytes and the bouldery substratum were all amply confirmed by the observations and measurements of these workers. Yet no ecologist has tried to view the woods in their regional setting by considering them in relation to surrounding woodlands: it is hoped that this paper will put them in a slightly different light, although it does not pretend to answer all the questions posed by the nature of the copses. The localities involved are plotted on Fig. 1 and Table 1 summarizes the chief features of the copses and woodlands considered.

The setting

The climatic environment of the copses can best be described as oceanic. No precise figures for their actual locations can be given but inspection of the maps in the *Climatological Atlas of the British Isles* (Meteorological Office, 1952) and of the figures for Princetown in the *Book of Normals* (Meteorological Office, 1924) shows that they lie in an area of high rainfall (the Princetown average 1881–1915 was 81·87 inches, the towns around the moor somewhat less, e.g. Ashburton, 51·72 inches, Okehampton, 46·56 inches, Plymouth, 36·72 inches) which occurs on many days in the year: in the 1901–30 period there were more than 200 raindays in the region (*Climatological Atlas*, 77). An impression of the cool summers can be gained from Manley's (1952, 183–5) tabulation of temperatures for Princetown and lowland Devon stations. The suggestion of

* "The Battle of the Trees" from the *Romance of Taliesin*, a Welsh myth of unknown date. Paraphrased by Robert Graves in *The White Goddess*, 1961.

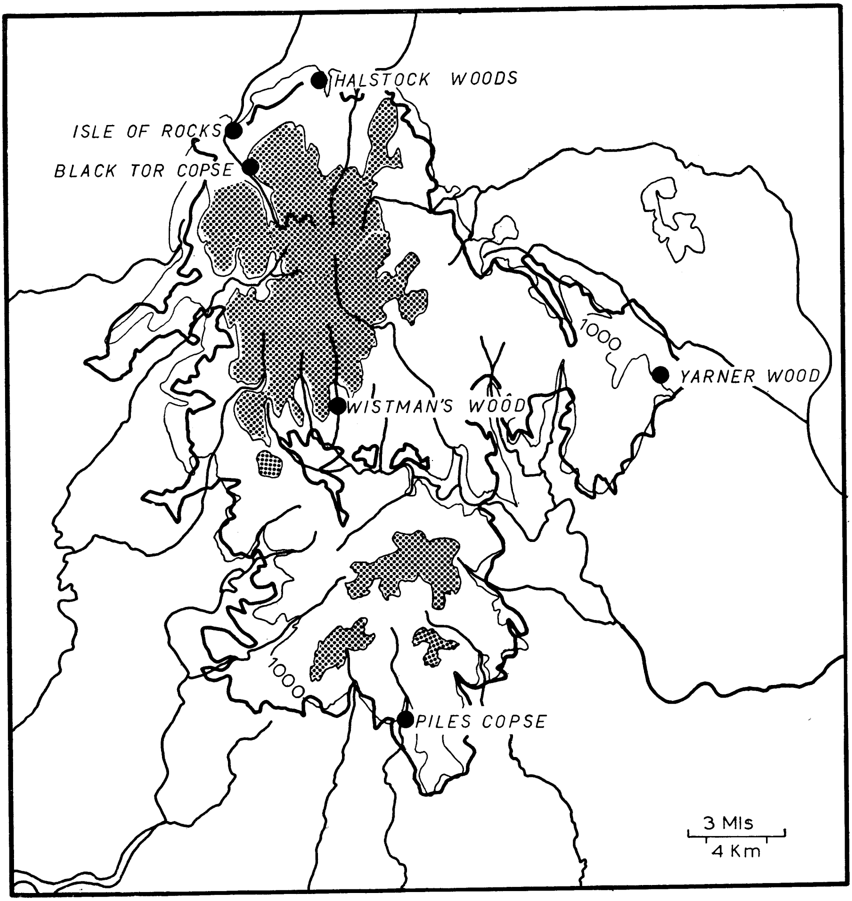

Fig. 1.

Dartmoor, showing location of places referred to in the text. Contours at 1,000 and 1,500 feet with the area above 1,500 feet shaded. The thick black line is the moorland edge on the 6th edition of the O.S. 1 inch map. *Crown Copyright reserved.*

oceanicity is reinforced by the map in Greig-Smith (1950) or Amann's Index of Hygrothermy which is an attempt to subsume the separate climatic readings into a single index of oceanicity of climate. Using the formula

$$H = \frac{PT}{t_h - t_c}$$

where P = annual precipitation in cm.
T = annual mean temperature in ° C.
t_h = mean temperature of hottest month in ° C.
t_c = mean temperature of coldest month in ° C.

Table 1. *Some features of the woodlands.*

	Wistman's Wood	*Black Tor Copse*	*Piles Copse*	*Isle of Rocks*	*Halstock*	*Yarner*
Height (feet)	1,275–1,450	1,200–1,450	850–1.025	1,000	500–950	200–1,050
Height (metres)	309–435	390–440	260–315	303	150–290	60–380
Rainfall, in. p.a.	80	70	60	60	55	52·5*
Rainfall, mm. p.a.	2,000	1,750	1,537	1,537	1,400	1,312
Rock	Granite	Granite	Granite	Granite/Metamorphics†	Culm and Devonian	Culm
Soil	Granite blocks +humus	Granite blocks +humus	Granite blocks +humus	Blocks+humus	Buried blocks	Forest soil
Dominant tree	Quercus robur	Quercus robur	Quercus robur	Quercus robur, Q. petraea and hybrids	Q. petraea	Q. petraea
Other trees	—	—	—	—	Quercus hybrids	—
Shrubs	S. aucuparia Ilex, Salix	S. aucuparia	S. aucuparia Ilex	Corylus, Salix, Betula, S. aucuparia	Corylus, Ilex, Sambucus, Betula, S. aucuparia	Variable, inc. Alnus, Betula, Ilex, Corylus
Low shrubs	V. myrtillus	V. myrtillus	—	V. myrtillus, Rub. frut.	Rub. frut.	Rub. frut., V. myrt., Calluna.
Epiphytic growth	Vascular climbers Bryophytes Pteridophytes Lichens	X X X X	X X Less luxuriant X X	X X X X	Epiphytic growth is found but only on main trunks and much less luxuriantly than in the copses	
Tree deformation	Great	Varies E>W	Upper edge only	Upstream end only	—	—
Tree distribution	5–6 frags	±cont., except upper edge	±cont., except upper edge	Continuous	Continuous	Continuous

Rainfall interpolated from the "Ten-mile" map of British rainfall.
Geology from the relevant 1/63,360 Geological Survey maps.
* Average 1957–59 (Moore, 1959).
† Dearman and Butcher (1959), Fig. 14.

values for the index of 74–114 are obtained for Devon, and Princetown has the value of 110. Indices of more than 100 are found elsewhere only in West Cornwall, the western third of Ireland and over the western coastal highlands of Scotland, thus confirming the impression that Dartmoor belongs to the climatically oceanic parts of the British Isles.

High wind velocities are frequent and this is doubtless one of the factors restricting tree growth to the valley sides where the copses are found, although the leached soils and blanket bog of much of the upland (Clayden and Manley, 1964; Simmons, 1963) are inimical to tree growth and the incidence of sheep grazing is high.

THE NATURE OF THE WOODLANDS

(1) *The Copses*

The most obvious features are summarized in Table 1. The diagnostic feature of them is the dominance of *Q. robur* and the lack of any other forest tree species. Gaps in the canopy are filled most commonly with *Sorbus aucuparia* but also thus found are individuals of *Salix* sp., and *Ilex*. Common to all of them is the substratum of boulder scree ("clitter"), which is covered by humus only towards the riverside part of each of the woods, except in Wistman's Wood where the boulders are never covered; similarly all the copses have a *Pteridium* fringe of varying size and where the woodland is discontinuous it occupies the gaps. It extends some distance from either end of the woods, and across the river at Black Tor Copse (Fig. 2). The distortion of the trees is variable: there is a distinct progression from Wistman's Wood, which is all scrub-like, through Black Tor Copse where distortion is pronounced at the upstream end but almost non-existent at the downstream part, to Piles Copse where distortion is found only at the upper edge of the copse below Sharp Tor. The distorted trees are generally about 9 feet tall, the undistorted trees at Black Tor Copse *c.* 27 feet and higher still at Piles Copse. The less extreme nature of Piles Copse is reflected in the diminished luxuriance of epiphyte growth compared with the other copses. Bryophyte species lists are given by Proctor (1962). The ground flora appears to depend largely on the disposition of the boulders but is usually grassy or heathy, with conspicuous *Luzula sylvatica*, *Vaccinium myrtillus*, *Pteridium* (in gaps), *Blechnum* and *Dryopteris* spp. A list for the various sub-habitats at Black Tor Copse is given in the Appendix.

(2) *The marginal woodlands*

In the present context the Isle of Rocks (SX 566927), Halstock Woods (SX 606940) and Yarner Wood (SX 780785) are the most interesting. The first-named is a small fragment of mixed woodland in a gorge of the West Okement less than a mile below Black Tor Copse, straddling the boundary between the granite and the metamorphic rocks (Dearman and Butcher, 1959). The trees and shrubs are undeformed and are dominated by *Quercus* spp. (*Corylus*, *Salix* spp., *Crataegus monogyna*, *Sorbus aucuparia*, *Prunus spinosa* and *Betula pubescens* are also found, see lists in Appendix), samples of which were sent to Dr. E. W. Jones. From the upstream end, on the granite,

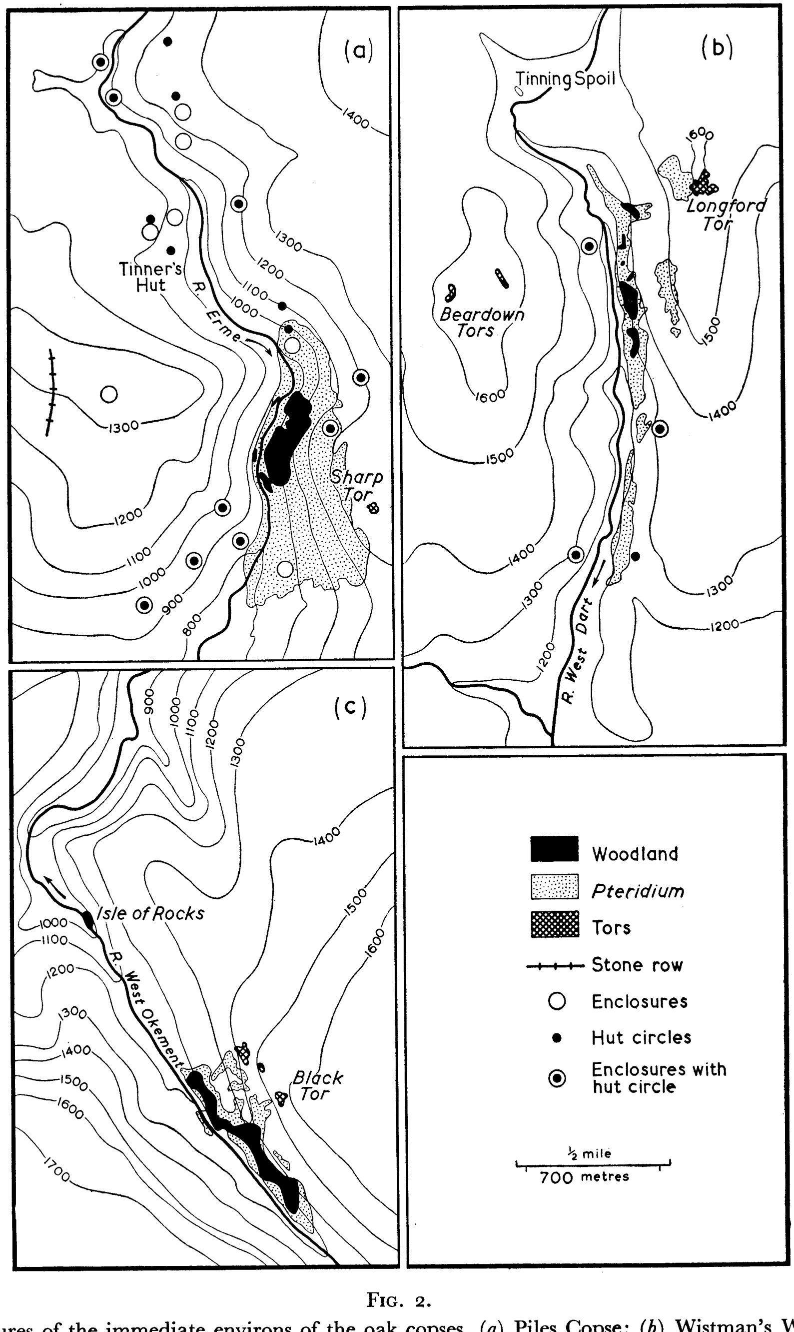

FIG. 2.

Features of the immediate environs of the oak copses. (*a*) Piles Copse; (*b*) Wistman's Wood; (*c*) Black Tor Copse. *Crown Copyright reserved*.

the examples were diagnosed as *Q. robur*+hybrids, whereas at the downstream end of the metamorphic rocks *Q. petraea* was identified. Thus both species of oak are present, but they do not grow together (Fig. 3).

Halstock and Yarner Woods are both off the granite and are mixed woodlands dominated by *Q. petraea*. Coppiced undershrubs such as *Corylus* are common in both.

Comparison of the copses and the marginal woodlands reveals two important differences. Firstly, *Q. petraea* appears not to grow on the granite at the present time and secondly, the copses' single-species nature contrasts with the mixed nature of the marginal woodland.

Information on the status of *Q. petraea* on other granite areas of the south-

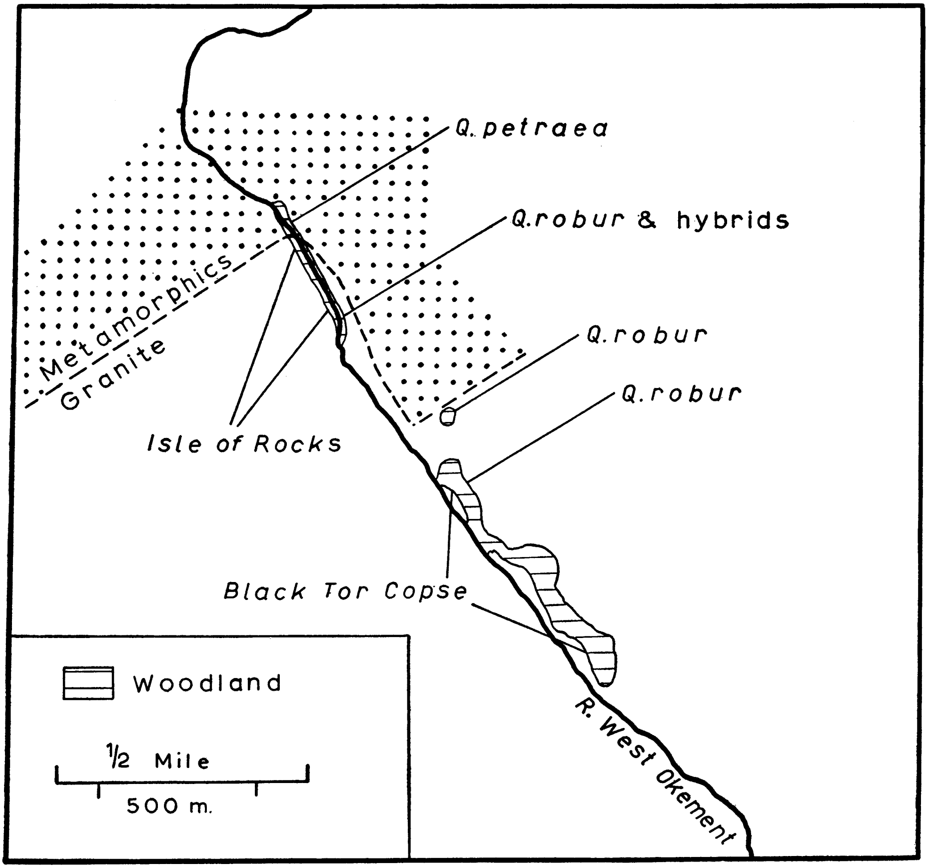

Fig. 3.

The West Okement valley: distribution of woodland fragments and *Quercus* spp. The geological boundary is taken from Dearman and Butcher (1959).

west is lacking. The relevant map in Perring and Walters (1962) portrays a less even distribution than *Q. robur* but the scale is too small for accurate relation to the geology.

Phytogeographical evidence

(1) *Comparisons with other areas*

Tansley (1949) gives numerous examples of *Q. petraea* copses and scrub throughout Highland Britain, as at Birkrigg and Keskadale in the Lake District, the Quantocks and Killarney. Mixed-oak woodland on acid soils is shown to exist in Sherwood Forest, for example. *Q. robur* on acid soil in the absence of *Q. petraea* is less common but is quoted by Tansley to be found at Craigendarroch on Deeside. Allorge (1941) writes of the presence of only *Q. robur* on acid soils in the Pays Basque and postulates that this is an Atlantic type of woodland extending from Portugal to the British Isles. From this limited evidence there seems to be no edaphic reason why *Q. robur* should not be found on the granite particularly if it is a relict distribution from times when the soils were more base-rich than at present, which Clayden and Manley (1964) show to be likely.

(2) *Quaternary ecology*

Pollen analysis of Post-glacial peats shows that *Quercus* was an early immigrant into the Dartmoor region (Simmons, 1964a, b). It was the first forest tree to arrive after *Corylus*, and before *Ulmus*, which is unusual in Britain. From the pollen diagrams it appears that *Quercus* colonized the upland, and since the preceding *Corylus* remained a prolific contributor to the pollen rain it is likely that it was an understorey tree in the oak forest. Regrettably, it is not possible to distinguish between the sub-fossil pollen of *Q. robur* and *Q. petraea*, in spite of the efforts of Van Campo and Elhai (1950). From pollen analysis it is not therefore possible to determine the relative times of immigration of the two species, which will probably have depended upon the distance of their glacial refugia from south-west England. Since *Q. robur* is found today in the Pays Basque and *Quercus* pollen was found in zone II (Allerød) in northern Spain (Florschutz and Amor, 1961) it is perhaps possible that *Q. robur* may have arrived first. Inspection of the present day distribution of *Q. robur* in Europe (Jones, 1959) suggests that it is more hardy than *Q. petraea* and it is tempting to air the possibility of periglacial survival of *Q. robur* in south Cornwall or a currently off-shore area of the south-west. (Manley (1952) outlines the ameliorative effect of oceanicity in Cornwall when the climate elsewhere in Britain is very cold.) This would account for the early arrival of *Quercus* in the Dartmoor region: it is present in zone IV on Bodmin Moor (Conolly *et al.*, 1950). In south-west Sweden, von Post (1924) postulated that *Q. petraea* migrated south-westwards during sub-atlantic time (i.e. zone VIII in Britain) in response to an increase in oceanicity of climate but the separation of the *Quercus* pollen which provides the evidence seems not to rest on truly objective criteria. Should a synchronous migration have happened in Britain the effect of human interference would complicate the immigration.

Pollen analysis suggests that most, if not all, of Dartmoor has been covered in forest during Post-glacial times, and that human influence is responsible for the removal of the trees. Clearance of woodland was especially active during the Bronze and Iron Ages and the enshrinement of burning and grazing practices in medieval common rights would have ensured the fragmentation of the original woodland. The period of intensive tin exploitation beginning in the 12th century A.D. was responsible for the final depletion of forest. Not only was wood used for charcoal to smelt the ore but in the process of extracting the tin ore from alluvial gravels the riverain woodland was probably destroyed and a sharp decline in alder is seen in one pollen diagram (Simmons, 1964a; fig. 5). To provide wood, coppicing was doubtless employed and oak would have been among the trees thus affected, as it was in Cornwall in the 18th century (Worgan, 1811). The ecological effect might have been to eliminate some trees unable to withstand coppicing or the deliberate removal of species other than the coppice-tree, thus producing a single-species stand in which grazing would prevent regeneration of any random seed dispersed from a parent at some distance. It is suggested therefore that the copses represent the remnants of more extensive coppices which provided some of the wood needed for smelting tin ore.

Estimates of former extensions of the copses are difficult to make. The *Pteridium* fringe of each copse suggests a former woodland soil and there are records, dating from 1587, 1608 and the early 17th century, of illegal wood cutting from a Black Tor Copse which must have extended upstream from its present position (quoted by Christy and Worth, 1922, 326–7). For earlier times the relation of the copses to prehistoric remains is of interest (Fig. 2): if it is assumed that the prehistoric settlements were in clearings, Piles Copse at least may not then have been much larger than at present.

Discussion

Perhaps little objection can be put forward to the suggestion that the relict nature of the copses is due to a long history of human interference with the vegetation of Dartmoor. Why they have survived in their particular localities seems to admit to no orderly explanation: if it was not chance then possibly the aura of mystery surrounding Wistman's Wood at least ("Wistman" may be derived from "Whisht man", meaning spooky, and there is much folk-lore along similar lines), may have ensured their survival.

More contentious is the question of the single-species dominance. It would seem that there is enough evidence for the presence of *Q. robur* on acid soils, even though not the typical habitats of that tree, to regard its presence as unexceptional. What is more surprising is the absence of *Q. petraea*. There are two possibilities here—(1) That when *Q. petraea* immigrated into the region it could compete with the established forest (probably dominated by *Q. robur*) on the extra-granite soils but not on the granite. No reason can be put forward for this but the current edaphic separation of the two species might be adduced as supporting evidence for this suggestion. (2) That *Q. petraea* has been present over the whole upland but has been removed as a result of human interference. In that case why is there an edaphic separation today in the West Okement valley? Some experimental planting in enclosures would be of value.

Another possibility envisages the copses as plantations. M. L. Anderson

(1950) thought that *Q. robur* was an introduced tree and adoption of his theory would obviate much of the speculation indulged in above. There is no local evidence for or against this eventuality. If wood for smelting was in short supply then planting of a useful tree would be an obvious course. Christy and Worth (1922, 308–09) discuss ring-counts which had been made from trees in Wistman's Wood: the most reliable estimate appears to be from a 9 in. diameter branch with 163 rings. Other apparently less reliable counts show 250+ rings (known to be incomplete), 120 rings, and 90 rings (outer 5 inches of 19·5 in. stem uncountable). In view of the general order of magnitude of these counts it is interesting to note that Jones (1959) says, "towards 1800 a strong prejudice against *Q. petraea* grew up".

It is clear that insufficient knowledge of the detailed history and ecology of the oak on Dartmoor is available for definite statements to be made; it is, however, certain that whereas features of the contemporary ecology of the copses, such as their deformation and epiphytic growth, can be attributed to climate and relief, their ancestry is unlikely to be unravelled without recourse to the vagaries of human history and prehistory.

Acknowledgements

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APPENDIX

Species lists from Black Tor Copse and the Isle of Rocks
(Compiled by the author and Dr. P. J. Newbould in June, 1961)

Black Tor Copse

(*a*) *Trees and shrubs*

Quercus robur
Ilex aquifolium
Crataegus sp.

(*b*) *On boulders*

Galium saxatile
Oxalis acetosella
Vaccinium myrtillus
Corydalis claviculata

Poa annua
Holcus mollis

Cladonia spp.

Rhytidiadelphus loreus
Pseudoscleropodium purum
Polytrichum sp.
Mnium hornum
Isothecium myosuroides
Plagiothecium undulatum
Dicranum scoparium
Pleurozium schreberi

(*c*) *Between boulders*

Oxalis acetosella
Potentilla erecta
Vaccinium myrtillus
Rubus fruticosus agg.
Galium saxatile

Dryopteris borreri
D. dilatata
Pteridium aquilinum

Juncus effusus
Holcus mollis
Agrostis canina
Anthoxanthum odoratum

Rhytidiadelphus loreus
Pleurozium schreberi
Plagiothecium undulatum
Polytrichum sp.

(*d*) *Flush*

Viola palustris
Drosera rotundifolia
Dryopteris dilatata

Molinia coerulea

Sphagnum palustre
S. plumulosum
S. subsecundum

Isle of Rocks

(*a*) *Trees and shrubs*

Quercus robur } and
Q. petraea } hybrids

Sorbus aucuparia
Salix cinerea
S. atrocinerea

Corylus avellana
Ilex aquifolium
Betula pubescens
Prunus spinosa
Crataegus monogyna

(*b*) *On boulders*

Sedum anglicum
Teucrium scorodonia
Hedera helix
Hypericum pulchrum

Hypnum cupressiforme
Rhacomitrium lanuginosum
Thuidium tamariscinum
Rhytidiadelphus loreus
Plagiothecium undulatum

Dryopteris borreri
Polypodium vulgare

Frullania tamarisci
Peltigera canina

Polytrichum sp.
Sphagnum sp.

Cladonia fimbriata

(*c*) *Where very damp*

Hedera helix
Cerastium sp.
Veronica sp.

Anthoxanthum odoratum

Athyrium felix-femina

(*d*) *Between boulders*

Lonicera periclymenum
Rubus fruticosus agg.
Teucrium scorodonia
Digitalis purpurea
Geranium robertianum
Solidago virgaurea
Lotus corniculatus

Dryopteris dilatata
D. borreri
Athyrium felix-femina

Deschampsia flexuosa

Mnium hornum

(*e*) *Apparently ungrazed small island*

Solidago virgaurea
Vaccinium myrtillus
Lotus corniculatus
Potentilla erecta
Hedera helix
Cirsium sp.

Deschampsia flexuosa
Luzula sylvatica

(*f*) *On flats*

Potentilla erecta
Oxalis acetosella
Galium saxatile
Viola sp.
Digitalis purpurea
Vaccinium myrtillus
Lysimachia nemorum

Pseudoscleropodium purum
Rhytidiadelphus loreus

Pteridium aquilinum
Blechnum spicant
Thelypteris oreopteris

Luzula pilosa
Festuca ovina
Agrostis canina
Holcus mollis
Anthoxanthum odoratum
Polytrichum sp.

(*g*) *On trees*

Lonicera periclymenum
Hedera helix

Usnea sp.
Ulota crispa

Frullania tamarisci

Isothecium myosuriodes
Dicranum scoparium
Hypnum cupressiforme

(*h*) *Riparian*

Hedera helix
Oxalis acetosella
Cirsium vulgare

Mnium punctatum
Hypnum cupressiforme

Deschampsia flexuosa

Blechnum spicant
Dryopteris dilatata

Pellia epiphylla

(*i*) *Flush*

Anagallis tenella
Cirsium palustre

Sphagnum subsecundum

Juncus effusus
Luzula campestris
Carex echinata
C. pallescens