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THE NATURAL HISTORY OF SLAPTON LEY NATURE RESERVE
IV. LICHENS

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A description of the lichen flora and vegetation of Slapton Ley Nature Reserve, near Kingsbridge, Devonshire, Great Britain, is presented. Two hundred and fifty-five species are reported, the largest number yet known from anywhere of its size in England. *Arthonia exilis* (Flörke) Anzi is reported from the British Isles for the first time. Floristic and phytosociological data on the lichen communities of the Reserve are included as are notes and distribution maps of some of the critical and rarer species present. *Lecidella elaeochroma* f. *soralifera* (Erichs.) D. Hawksw., *Ramalina curnowii* var. *atlantica* (Culb.) D. Hawksw., *R. siliquosa* var. *crassa* (Del. ex Nyl.) D. Hawksw., *Usnea intexta* var. *constrictula* (Stirt.) D. Hawksw. & Chapman, and *U. subfloridana* var. *melanopoda* (Asah.) D. Hawksw. are new combinations. The Basidiomycete *Omphalina griseopallida* (Desm.) Quél. was found in association with *Botrydina vulgaris* Bréb. ex Meneghini.

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INTRODUCTION

THIS is the fourth of a series of papers dealing with the natural history of the Slapton Ley Nature Reserve. Previous papers have been concerned with the physical background (Mercer, 1966), freshwater algae (Benson-Evans, Fisk, Pickup and Davies, 1967) and the vascular plants (Brookes and Burns, 1969).

The Slapton Ley Nature Reserve, near Kingsbridge, South Devonshire (Vice-county 3) is located in Ordnance Survey National Grid 10 km. square 20 (SX)/84 and lies at latitudes 50°16′–50°18·5′ N. and longitudes 03°38′–03°40′ W. The Reserve occupies 463 acres lying between sea level and 98 m. (0–325 ft.). It consists (Fig. 2) of a freshwater lake, Slapton Ley, its margins and associated woodlands, and a shingle ridge, Slapton Sands, which separates the lake from the sea and carries the A379 road. The surrounding undulating agricultural land on Permo-Triassic breccias and Lower Devonian Meadfoot Bed slates slopes down to the margins of the Ley. The Lower Devonian Dartmouth slates underlie the northernmost part of the Slapton Wood area, and lacustrine deposits occur where streams enter the Ley. There are no extensive rock outcrops in the Reserve. Where true soils exist they are of the brown-earth type, shallow, and moderately acid (pH 5·0–6·5) originating from the Dartmouth slates, Meadfoot Beds or Permo-Triassic breccias.

The monthly mean maximum and minimum temperatures at the Slapton Ley

FIG. 1.
Location of the Slapton Ley Nature Reserve in southern England.

Field Centre for the years 1961–1965 are given by Brookes and Burns (1969, Table 1) and indicate a range of only 16·9 °C. (30 °F.) between the coldest (January; mean min. 2·4 °C.) and warmest (July; mean max. 19·3 °C.) months. Air frosts averaged only 21 nights p.a. and ground frosts 55 nights p.a. during the years 1961–1965. The frost-free summer period is about 7·5 months. The average rainfall at Slapton in this period was 99·4 cm. (39·16 inches) p.a., the wettest and driest months being December (monthly mean 13·1 cm.) and February (monthly mean 4·4 cm.) respectively. Snow rarely persists for more than one day even in winter and in many years snow does not lie at all. Westerly winds prevail (average 172 days p.a.) and are generally below Beaufort Force 5 in strength. No air pollution recording gauges are present in the area but the lichen vegetation belongs to "zone 10" of Hawksworth and Rose (1970) indicating that mean winter sulphur dioxide levels are below 30 μg./m.^{3} and the air can be considered "pure".

The Reserve is a site which was not previously known to be of great interest lichenologically and no published records from it have been traced in the major works on Devonshire lichens (Polwhele, 1797; Turner and Dillwyn, 1805; Jones, 1820; Jones and Kingston, 1829; Parfitt, 1883; Holmes, 1872, 1906; Swinscow, 1960) apart from mentions of two species by Watson (1937).

Field courses on or including lichens have been run at the Slapton Ley Field Centre of the Field Studies Council by Dr. K. L. Alvin (1961–1964, 1966), Dr. D. H. S. Richardson (1965, 1967–1968) and myself (1969, 1971). Whilst much valuable data were accumulated during these courses the bulk of that presented here was obtained during personal visits by myself accompanied by Dr. K. L. Alvin, Mr. P. W. James or my wife during 1970 and 1971. Specimens collected on courses and other occasional visits are distributed between the herbaria of the Field Centre, British Museum (Natural History), London (BM*), Commonwealth Mycological Institute, Kew (IMI) and the private herbaria of Dr. K. L. Alvin, Rev. G. G. Graham, Mr. R. Hill, Dr. T. D. V. Swinscow, Miss N. Wallace and others. Collections made by myself are preserved in IMI, with duplicates of some rarer species deposited in BM, and further duplicates incorporated into some other herbaria (e.g. DUKE, O, Herb. M. R. D. Seaward). Some material collected by Mr. James and myself has been distributed to principal herbaria throughout the world in Dr. A. Vězda's *Lichenes selecti exsiccati* (Fasc. XL, June 1971).

* Abbreviations of major institutional herbaria follow *Index Herbariorum*, Ed. 5 (Lanjouw and Stafleu, 1964).

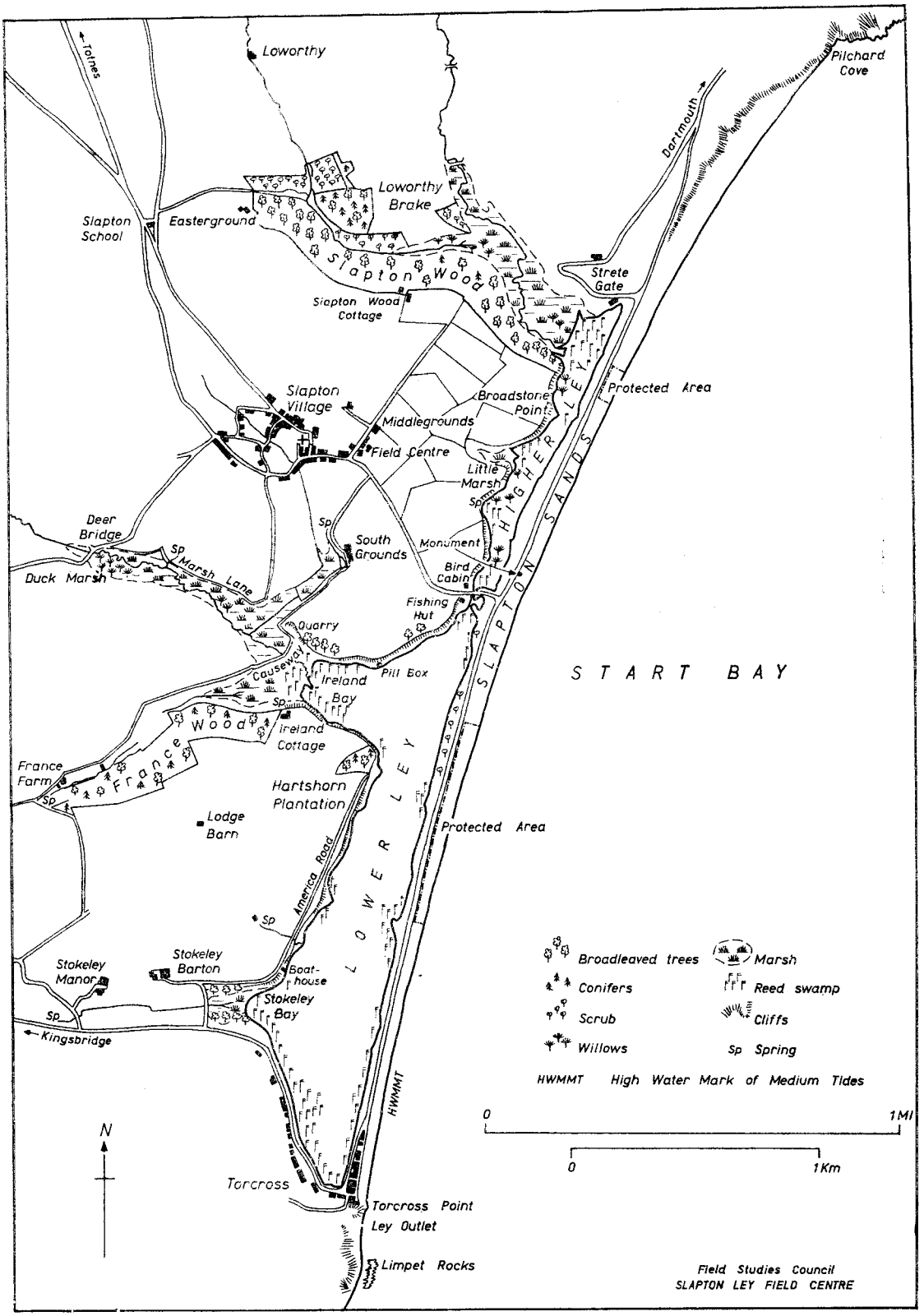

FIG. 2.
The Slapton Ley Nature Reserve.

Table I. *Phytosociological classification of the lichen communities recognized in the Slapton area*

Federation	Union
1. *Leprarion*	(a) *Arthonietum impolitae* Almb. (C) (b) *Leprarietum* Almb. (C, S, T) (c) *Leprarietum candelaris* (Mattick) Barkm. (C) (d) *Opegraphetum fuscellae* Almb. (C, L)
2. *Graphidion* (incl. *Arthonion*)	(a) *Graphinetum platycarpae* var. *graphinetum anguinae* D. Hawksw. (C) (b) *Pertusarietum amarae* Hilitz. em. Barkm. (C) (c) *Porinetum carpineae* Barkm. (d) *Pyrenuletum nitidae* Hilitz. (C)
3. *Xanthorion* (incl. *Buellion canescentis*)	(a) *Arthopyrenietum gemmatae* Barkm. (C) (b) *Caloplacetum heppianae* Du Rietz (S) (c) *Caloplacetum marinae* Du Rietz (S) (d) *Gyalectinetum carneoluteae* D. Hawksw. (C) (e) *Physcietum ascendentis* var. *physciosum griseae* Barkm. (C, S) (f) *Physcietum elaeinae* var. *buelliosum canescentis* Barkm. (C, L) (g) *Physcietum caesiae* Mot. (S) (h) *Ramalinetum fastigiatae* Duvign. (C) (i) *Ramalinetum scopularis* Klem. (S) (j) *Xanthorietum candelariae* Barkm. (C)
4. *Lecanorion carpineae* (incl. *Olivaceion*)	(a) *Lecanoretum subfuscae* Klem. (C, L)[1]
5. *Physodion* (incl. *Parmelion saxatilis* and *Trichoterion*)	(a) *Parmelietum conspersae* Klem. (S) (b) *Parmelietum revolutae* var. *caperatosum* Barkm. (C, L, S)
6. *Usneion*	(a) *Cladonieto-Usneetum tuberculatae* Barkm. (C) (b) *Usneetum articulato-floridae* var. *ceratinae* D. Hawksw. (C) (c) *Usneetum subfloridanae* D. Hawksw. (C, L)
7. *Cladonion*	(a) *Cladonietum alcicornis* Klem. (T) (b) *Cladonietum coniocraeae* Duvign. (C, L, S, T)[2]
8. *Lecanorion calcareae*	(a) *Lecanoretum calcareae* Alberts. (S)
9. *Lecanorion dispersae*	(a) *Lecanoretum dispersae* Beschel (S)

C = corticolous; L = lignicolous; S = saxicolous; T = terricolous.
[1] = *Lecanoretum carpineae atlanticum* Barkm. pro parte.
[2] I consider this distinct from the *Cladonietum cenoteae* Frey.

HABITATS AND COMMUNITIES

The Reserve has been divided into thirty-three working units by Mercer (1966) whose scheme was used in the study of its vascular plants by Brookes and Burns (1969) and this is also adopted here with the addition of five further units, three of which do not strictly constitute part of the Reserve: CH, Slapton church; CY, Causeway; DM, Duck Marsh; S, Southgrounds Farm; and SV, Slapton Village. These units are indicated on Fig. 3.

Lichen phytosociology has received little attention in Britain as compared with some other European countries and any attempt to give names to the communities present in the Reserve must consequently be largely based on studies conducted in other European countries. The phytosociological taxa which may be recognized in the Reserve are summarized in Table I but it must be emphasized that some stands in the Slapton area cannot be definitely stated to belong to any single one of these

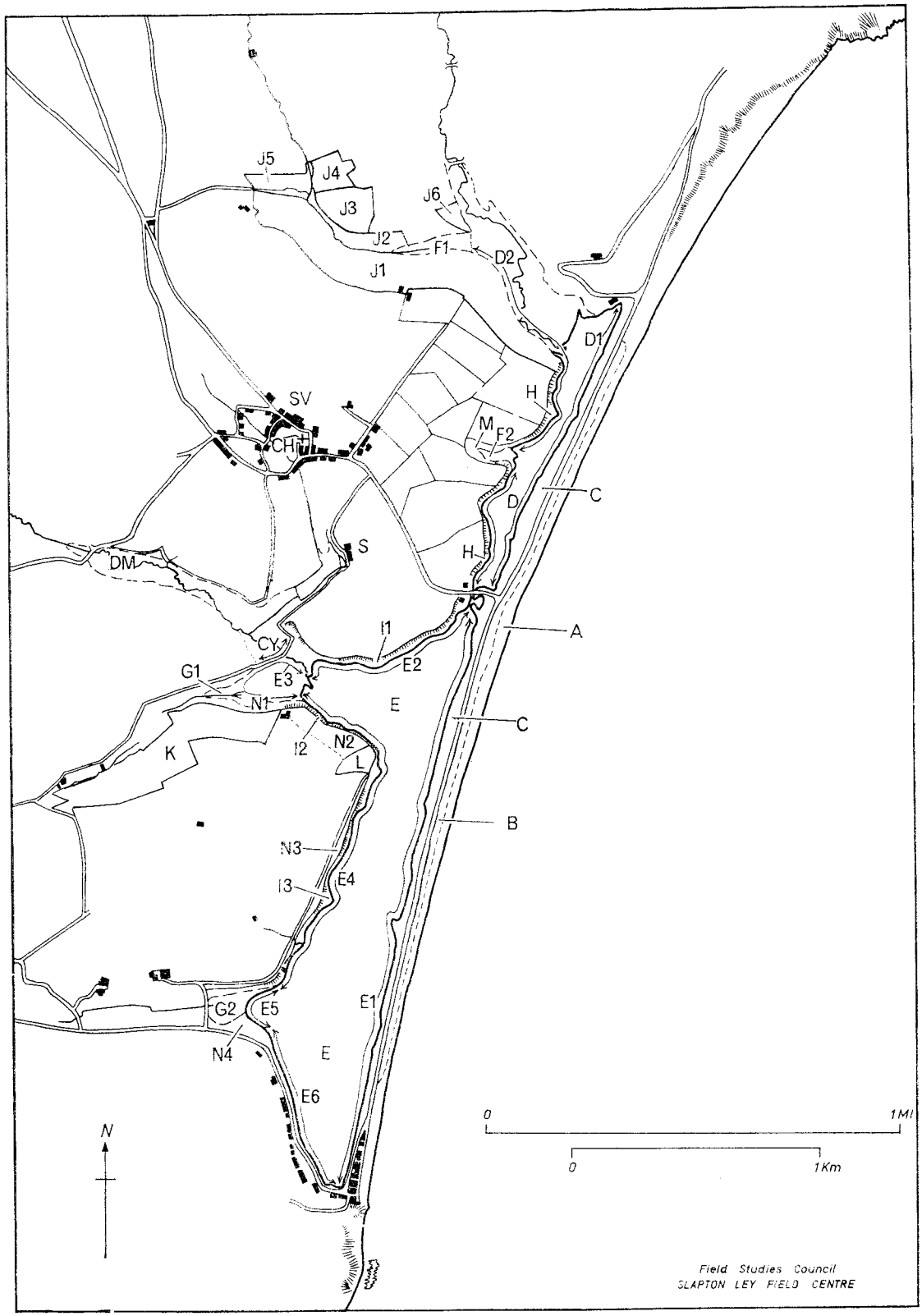

FIG. 3.
The Slapton Ley Nature Reserve showing location of the 38-units used in this study.

and that this Table is not to be treated as exhaustive. In all the ecological tables included frequency is expressed according to the 10-point Domin Scale (see Ainsworth, 1971, p. 178) and fidelity according to the I-V Braun-Blanquet scale (see Goodall, 1953, p. 434–435). The unions recognized reflect noda on continua controlled by habitat vectors and those on trees particularly appear to be related to bark acidity, bark texture and illumination. Fig. 4 illustrates suggested relationships between the epiphytic unions accepted here based on field observations.

I. SHINGLE RIDGE

The seaward face (A) consists of unstable shingle affected by wave action and contains no lichens. The crest of the shingle ridge (B) is slightly more stable where cars are excluded and a few lichens occur sporadically on the shingle pebbles (e.g. *Lecanora dispersa*, *Lecidea erratica*). Several decorticate driftwood logs are present on the crest (some were, however, removed in spring 1971 during the construction of a new car park), and reach 0·5–1 m. in diameter. These logs provide an excellent lichen habitat dominated by mosaics of *Lecanora chlarotera*, *L. confusa*, *L. expallens* and *Lecidella elaeochroma* forming the union *Lecanoretum subfuscae* Klem. (= *Lecanoretum carpineae atlanticum* Barkm.). *Buellia schaereri* is not infrequent on these logs.

Acarospora smaragdula occurs abundantly on the granite memorial in unit B. Concrete posts on both sides of the A379 bear the *Caloplacetum heppianae* and (or) *Lecanoretum dispersae* according to their age, as did the ruins of the hotel in unit B before they were removed in spring 1971.

The backslope of the crest to the west of the main road (C) is much more stable and has become largely colonized by scrub. One small area, however, does have well developed *Cladonietum alcicornis* Klem. (Table II) which is rich in species of *Cladonia* and *Peltigera* and is of a type characteristic of stabilized sand dunes in other parts of western Britain (Watson, 1918) and Brittany (Massé, 1966, p. 919). Some foliose and fruticose lichens occur directly on the shingle pebbles (e.g. *Hypogymnia physodes*, *Parmelia caperata*, *P. glabratula*, *P. perlata*, *Ramalina curnowii* var. *atlantica*) as do a few crustaceous species (e.g. *Buellia punctata*, *Lecanora dispersa*, *Lecidea erratica*, *Rhizocarpon obscuratum* var. *reductum*).

II. SLAPTON LEY

Slapton Ley itself is the poorest lichen habitat in the Reserve and no aquatic lichens have been discovered on pebbles in its margins. The Ley has periodic algal blooms indicative of eutrophication and this, together with its turbid muddy nature may render this habitat particularly unsuitable. Some lichens occur on rocks at the margins of the Ley which may be washed periodically by it when the water level is high but these are placed in units H and I1 and so are not discussed further here. The Higher Ley (D) is a *Phragmites* reed-swamp but there is a large area of *Typha angustifolia* towards its lower end. Willow scrub occurs in the reed-swamp, particularly towards the northern end of the Higher Ley, and bears communities similar to those of willow scrub in other parts of the Reserve but is largely rather poor in the total number of species present. The Lower Ley (E) is more open and *Phragmites* reed-swamp with willows is consequently more local and largely confined to its western side. The willows in the Lower Ley have similar communities to those in the Higher

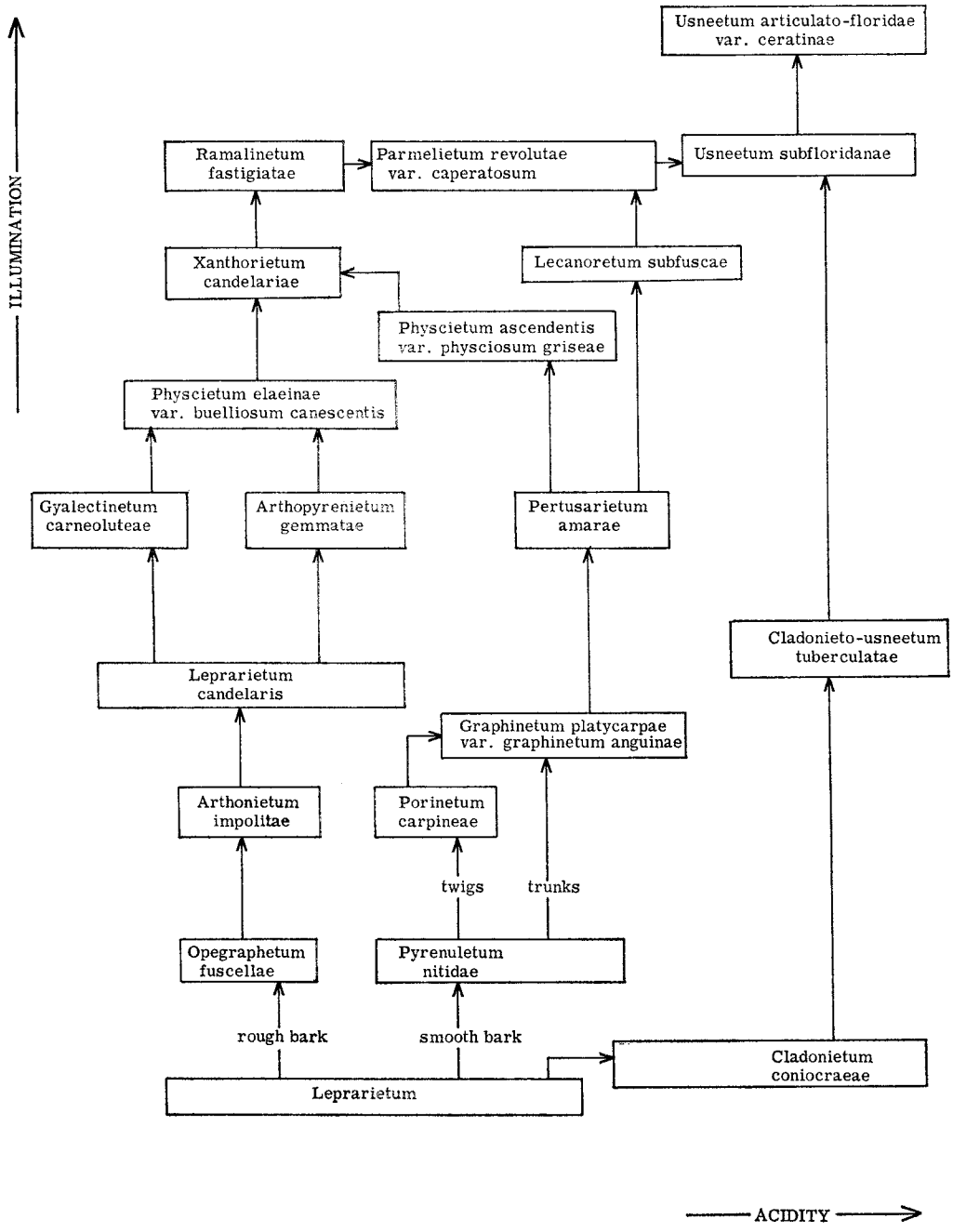

FIG. 4.

Suggested relationships between the epiphytic lichen communities recognized in the Reserve based on field observations.

Table II. Cladonietum alcicornis *Klem.*

Species	Stands 1	2	3	4	5	6	7	8	F
Cladonia foliacea	4	—	4	5	7	4	6	7	V
C. furcata	4	6	7	5	4	4	5	7	V
C. cervicornis	3	—	—	6	4	5	3	—	IV
Atriplex glabriuscula	3	—	—	3	3	3	4	4	IV
Festuca rubra	—	—	—	4	4	4	4	2	III
Polytrichum juniperinum	—	—	—	4	3	3	—	4	III
Cladonia rangiformis	—	4	—	—	—	—	5	—	II
Brachythecium rutabulum	—	—	3	—	—	—	3	1	II
Peltigera polydactyla	6	7	—	—	—	—	—	—	II
Pilosella officinarum	—	4	4	—	—	—	—	—	II
Sedum acre	—	4	—	—	—	4	—	1	II
Cladonia pityrea	—	2	—	—	—	—	—	—	I
Hypogymnia physodes	—	—	—	—	—	4	—	—	I
Lecidea erratica	3	—	—	—	—	—	—	—	I
Parmelia caperata	—	—	4	—	—	—	—	—	I
P. sulcata	—	—	—	—	—	4	—	—	I
Bare (%)	40	3	10	5	10	—	—	—	—

1–8 = C, on fixed shingle, 300 cm.^{2}.
F = Fidelity.

Ley but are generally less luxuriant and many individual trees were found to be extremely poor in lichens.

III. MARSHES

As noted by Brookes and Burns (1969, p. 134) the Slapton Wood Marsh and Carr (F1) willows ". . . carry a rich epiphytic flora of mosses and lichens". The marsh is sheltered by the steep valley sides and the marginal willows bear luxuriant *Ramalinetum fastigiatae* and *Usneetum subfloridanae* communities. In more sheltered parts where the willows are both more mature and abundant, *Lecanora jamesii*, *Opegrapha sorediifera*, *Phlyctis agelaea* and *Sticta* species are common; *Nephroma laevigatum* is locally abundant (Table III); and the extremely rare *Pannaria mediterranea* occurred on a single tree

Table III. Nephroma laevigatum *communities*

Species	Stands 1	2	3	Species	Stands 1	2	3
Cladonia coniocraea	1	—	—	*Pertusaria hymenea*	5	—	—
C. fimbriata	3	—	—	*P. leioplaca*	—	—	3
Lepraria incana	1	—	—	*P. pertusa*	4	—	—
Nephroma laevigatum	6	7	8	*Phlyctis agelaea*	1	—	—
Normandina pulchella	—	4	—	*Ramalina farinacea*	1	—	—
Opegrapha sorediifera	3	—	—	*Sticta limbata*	3	—	—
Parmelia caperata	1	3	—	*S. sylvatica*	3	—	—
P. perlata	3	3	4	*Usnea subfloridana*	1	—	—
P. subrudecta	1	—	—	Bryophytes	3	4	4
Pertusaria amara	1	—	—	Bare (%)	5	15	15

1 = F1, *Salix*, asp. 300°, incl. 46°, diam. 15 cm., 300 cm.^{2}.
2 = F1, *Ulmus*, asp. 295°, incl. 55°, diam. 16 cm., 300 cm.^{2}.
3 = F1, *Fraxinus*, asp. 350°, incl. 76°, diam. 13·5 cm., 300 cm.^{2}.

(see p. 565). *Melaspilea ochrothalamia* and *Micarea denigrata* were also discovered here. The Little Marsh (F2), like F1, enters the Higher Ley and bears rather similar communities except that fewer species are present.

The France Wood Marsh (G1) contains some willows in the reed-swamp but these were found to be inaccessible. Those of Stokeley Marsh (G2) were reached, however, but found to be rather disappointing and similar to those in F2.

One of the most interesting marshes in the area from the lichenological standpoint is the Duck Marsh (DM) where the willow carr bears extremely rich communities of the *Usneion* including the *Usneetum articulato-floridae* var. *ceratinae** and *Usneetum subfloridanae* (Table IV). These *Usneion* communities extend to the margins of the Causeway (CY) where suitable trees occur and are some of the most spectacular in the Reserve including specimens of *Usnea articulata* and *U. ceratina* pendent to 24·5 cm. and 42 cm., respectively. *Lecanora jamesii*, *Opegrapha sorediifera* and *Phlyctis agelaea* are frequent on willows in this marsh as they are in F1. Many of the willows in DM are dying and had deteriorated noticably between September 1969 and August 1971 due to waterlogging resulting from the increased level of water in the marsh. A line of ancient elm trees, many overgrown with ivy, extends along a footpath on the northern side of this marsh for about 250 m. from the road, and has the *Gyalectinetum carneoluteae* well developed.

Table IV. Usneetum subfloridanae *D. Hawksw.*, ***union nov.***

Species	Stands							F
	1	2	3	4	5	6	7	
Usnea subfloridana	7	8	8	8	7	8	10	V
Parmelia caperata	—	4	—	4	4	4	2	IV
P. perlata	—	4	—	4	4	4	—	III
Ramalina calicaris	2	—	3	4	—	—	—	III
Usnea fulvoreagens	4	—	3	—	4	4	—	III
Parmelia sulcata	—	—	1	—	—	—	1	II
Evernia prunastri	6	—	—	—	—	—	—	I
Hypnum cupressiforme	—	—	—	—	—	4	—	I
Hypogymnia physodes	—	—	—	—	3	—	—	I
Parmelia subaurifera	3	—	—	—	—	—	—	I
P. subrudecta	—	—	1	—	—	—	—	I
Bare (%)	5	10	10	10	—	—	—	

Stand 5 = type record.

1 = CY, *Salix* twigs, asp. 250°, incl. 85°, diam. 5 cm., 200 cm.².
2 = DM, *Salix* trunk, asp. 180°, incl. 60°, diam. 10 cm., 200 cm.².
3 = DM, *Salix* twigs, asp. 270°, incl. 75°, diam. 5 cm., 400 cm.².
4 = DM, *Salix* twigs, asp. 80°, incl. 90°, diam. 5 cm., 500 cm.².
5 = DM, *Salix* trunk, asp. 280°, incl. 74°, diam. 20 cm., 400 cm.².
6 = DM, *Salix* twigs, asp. 250°, incl. 169°, diam. 9·5 cm., 300 cm.².
7 = DM, *Salix* twigs, asp. 210°, incl. 72°, diam. 3·5 cm., 100 cm.².

* *Usneetum articulato-floridae* Barkm. var. **ceratinae** D. Hawksw. **variant nov.** Type record: S. Devon, Dart Gorge Woods (Nat. Grid Ref. 20/668719), *Quercus* branch, 15 cm. diam., asp. 200°, incl. 50°, 20 August 1971: *Usnea articulata* (7, pendent to 30 cm.), *U. ceratina* (7, pendent to 35 cm.), *U. glabrescens* (3), *U. subfloridana* (3), *Parmelia caperata* (2), *P. perlata* (1), *P. laevigata* (1), *Platismatia glauca* (1), Bryophytes (3), bare (10%).

IV. LEYSIDE FRINGES

These form the area of low "cliffs" (usually overgrown) between arable land and the Ley shores along the western margins of the Ley. *Prunus spinosus-Rubus-Sambucus nigra* scrub is characteristic of these margins but in many places mature trees (mainly *Acer pseudoplatanus, Fraxinus excelsior, Quercus robur* and *Ulmus* species) occur and have well developed photophilous lichen communities which contrast with the photophobous communities of the woodlands in the Reserve. Along Middlegrounds Cliff (H) the elms in its southern portion are particularly rich in *Bacidia* species (*B. acerina, B. naegeli, B. rubella*) and *Normandina pulchella* on their trunks and bear *Ramalinetum fastigiatae* on their smaller branches. This latter community is also well developed on *Sambucus* and includes abundant *Ramalina obtusata. Parmelia carporrhizans, P. reticulata* and *P. revoluta* are interesting components of the *Parmelietum revolutae* var. *caperatosum* (Table V) on *Salix* here. The northern portion of H has similar epiphytic communities to the southern but does contain a group of large siliceous slabs below Broadstone Point which are occupied by the maritime *Ramalinetum scopularis* Klem. (Table VI). These slabs face the sea and the occurrence of maritime species here is indicative of salt-laden onshore winds although, not surprisingly, many species present on natural outcrops in the form of rugged sea cliffs elsewhere in this part of Devonshire are absent here.

Table V. Parmelietum revolutae *var.* caperatosum *Barkm.*

Species	Stands							F
	1	2	3	4	5	6	7	
Parmelia caperata	7	7	7	7	4	7	4	V
P. perlata	6	5	5	6	4	7	—	IV
P. subrudecta	1	3	4	3	—	—	3	III
Lecanora chlarotera	1	4	—	—	—	—	—	II
Lecidella elaeochroma	1	3	—	—	—	—	—	II
Parmelia subaurifera	—	4	4	—	—	—	4	II
P. sulcata	—	—	4	3	—	—	—	II
Phlyctis argena	—	—	—	—	8	4	—	II
Pyrenula nitida	1	2	—	—	—	—	—	II
Usnea subfloridana	—	1	—	1	—	—	—	II
Enterographa crassa	—	—	—	—	3	—	—	I
Lecanora expallens	—	2	—	—	—	—	—	I
Lepraria candelaris	—	—	—	—	—	1	—	I
Parmelia carporrhizans	—	—	—	—	—	—	7	I
P. revoluta	—	—	—	—	—	—	6	I
Pertusaria hymenea	—	—	—	—	3	—	—	I
P. leioplaca	—	—	—	—	—	1	—	I
P. pertusa	1	—	—	—	—	—	—	I
Phaeographis dendritica	—	3	—	—	—	—	—	I
Ramalina farinacea	—	—	—	—	1	—	—	I
Rinodina roboris	1	—	—	—	—	—	—	I
Bare (%)	20	—	15	—	—	—	—	—

1 = I2, *Fraxinus*, asp. 180°, incl. 80°, diam. 75 cm., 400 cm.².
2 = L, *Castanea*, asp. 180°, incl. 80°, diam. 1 m., 1,500 cm.².
3 = CY, *Quercus*, asp. 100°, incl. 87°, diam. 44 cm., 400 cm.².
4 = CY, *Quercus*, asp. 170°, incl. 84°, diam. 35 cm., 400 cm.².
5 = N4, *Alnus*, asp. 180°, incl. 80°, diam. 22 cm., 150 cm.².
6 = I1, *Quercus*, asp. 120°, incl. 100°, diam. 40 cm., 500 cm.².
7 = CY, *Salix*, asp. 170°, incl. 120°, diam. 15 cm., 400 cm.².

Table VI. Ramalinetum scopularis *Klem.*

Species	Stand 1	Species	Stand 1
Acarospora fuscata	4	*Lecidella subincongrua*	3
Anaptychia fusca	6	*Parmelia caperata*	1
Buellia aethalea	2	*P. glabratula*	1
B. stellulata	2	*P. perlata*	1
Candelariella vitellina	4	*P. subrudecta*	1
Catillaria chalybeia	2	*P. sulcata*	1
Diploschistes caesioplumbeus	3	*Ramalina siliquosa* v. *crassa*	6
Lecanora atra	3	*Rhizocarpon constrictum*	2
L. gibbosa s.l.	1	*Rinodina atrocinerea*	1
L. leprosescens	1	*Verrucaria fusconigrescens*	1
Lecidea sulphurea	1	*Xanthoria parietina*	3
Lecidella scabra	1		
		Bare (%)	20

1 = H, siliceous slabs, asp. 110°, incl. 88°, 1 m.².

The Lower Ley Cliffs (I), particularly those below Southgrounds (I1), are extremely interesting lichenologically. Near the junction between I1 and the Causeway (CY) some old ash trees bear the *Gyalectinetum carneoluteae* (Table VII) which includes abundant material of the rare *Lithographa dendrographa* and also of *Bacidia phacodes* and *B. rubella.* The *Parmelietum revolutae* var. *caperatosum* is, however, the commonest community on well-lit trees here and often includes *Parmelia borreri* and *P. reddenda* in addition to the ubiquitous *P. subrudecta.* Towards the eastern end of I1 *P. reticulata* occurs abundantly on one sycamore and sparsely on another, and *P. carporrhizans* more rarely on branches (particularly ones recently broken off by the wind). Another interesting member of this community here is *P. soredians* which is abundant on a few ash and sycamore trees immediately by the Ley. *Xanthorion* communities are well developed on shrubs and trees adjoining the arable land on the

Table VII. Gyalectinetum carneoluteae *D. Hawksw.*, ***union nov.***

Species	Stands				F
	1	2	3	4	
Gyalectina carneolutea	9	7	8	8	V
Lepraria incana	4	4	—	—	III
Arthopyrenia gemmata	—	—	1	—	II
Bacidia rubella	—	—	4	—	II
Hypnum cupressiforme	—	—	4	—	II
Lithographa dendrographa	—	—	—	7	II
Metzgeria furcata	—	—	1	—	II
Opegrapha atra	—	3	—	—	II
Ulota crispa	—	—	4	—	II
Bare (%)	15	15	10	—	—

Stand 3 = type record.
1 = DM, *Ulmus* trunk, asp. 270°, incl. 85°, diam. 1 m., 400 cm.².
2 = DM, *Ulmus* trunk, asp. 290°, incl. 85°, diam. 1·5 m., 500 cm.².
3 = DM, *Ulmus* trunk, asp. 300°, incl. 85°, diam. 1 m., 100 cm.².
4 = I1, *Fraxinus* trunk, asp. 360°, incl. 85°, diam. 60 cm., 300 cm.².

northern side of I1 and are represented by the *Arthopyrenietum gemmatae*, *Physcietum ascendentis* var. *physciosum griseae*, *Physcietum elaeinae* var. *buelliosum canescentis* and *Ramalinetum fastigiatae*. In the *Physcietum ascendentis* many relatively rare species occur including *Arthonia exilis*, *Caloplaca cerina*, *C. cerinella*, *Physcia labrata*, *P. leptalea*, *P. tribacioides*, *Lecania cyrtella* and *Lecanora sambuci*. These *Physcietum* communities are optimally developed on *Sambucus nigra*. In more shaded parts of the margins all the *Leprarion* and *Graphidion* unions recognized in the Reserve occur but, with the exception of the *Leprarietum candelaris*, are less well developed than in many of the woodlands.

Porina chlorotica is abundant on shaded siliceous rocks in I1, and some schists adjoining the Ley and facing seawards bear the maritime *Caloplacetum marinae* which is, however, rather poor in species as is the *Ramalinetum scopularis* on slabs in H. *Lecanorion dispersae* and the saxicolous *Xanthorion* communities occur on concrete posts, a disused pill-box, and the fishing-hut towards the eastern end of I1.

The Hartshorn (I2) and Inner shore Cliffs (I3) have similar lichen communities to I1 but contain fewer extremely rare species. *Arthonia impolita* and *Opegrapha gyrocarpa* were amongst the most interesting species in I3 but neither is rare in the Reserve.

The Causeway (CY) between I1, E3 and DM, has a line of mature *Populus*, *Quercus* and *Salix* trees on either side. Some of the trees, particularly towards the northern end of the Causeway are dead and decorticate or dying and many had died between 1961 when Dr. K. L. Alvin first studied these trees and when he revisited them with me in 1970. Communities similar to those described for I1 occur but the *Gyalectinetum carneoluteae* is absent as are many of the *Graphidion*, *Leprarion* and *Physcietum* communities. The ancient poplar trees towards the southern end of the Causeway have a flora which includes *Arthonia cinereopruinosa*, *Gyalecta flotowii*, *Normandina pulchella* (very abundant) and *Sticta sylvatica*. Younger willows bear *Ramalinetum fastigiatae* and *Usneetum subfloridanae* communities similar to those of Duck Marsh (DM) but less well developed. Stone calcareous gateposts at the northern end of the Causeway bear the *Lecanoretum calcareae* including many calcicolous species (e.g. *Caloplaca* spp., *Collema* spp., *Lecidella stigmatea*, *Opegrapha chevallieri*, *Toninia aromatica*, *Verrucaria glaucina*, *V. nigrescens*) and abundant *Lecania erysibe*. Remains of a slate bridge have a number of lichens characteristic of siliceous rock which are uncommon elsewhere in the Reserve and formally bore *Sphaerophorus fragilis* and *S. globosus* on a portion of the bridge which has since collapsed.

V. WOODLAND

The largest area of closed canopy woodland in the Reserve is Slapton Wood (J) different parts of which have been managed differently and are consequently treated as discrete units. The main wood (J1) occupies a steep north-facing slope and the predominant trees are very tall mature specimens of *Castanea sativa*, *Acer pseudoplatanus*, *Fagus sylvatica* and *Quercus robur*. Most of the trees have been planted and there is a great deal of fallen timber; many trees were extensively damaged by American shelling during exercises in World War II but the wood has lain undisturbed for many years. In the dense shade afforded by the tall close canopy and aspect the four unions of the *Graphidion* recognized in the Reserve are well developed. The *Pyrenuletum nitidae* (with abundant *Enterographa crassa*) predominates on the most shaded trunks whilst the *Graphinetum platycarpae* var. *graphinetum anguinae* and *Pertusarietum amarae* are

most frequent in slightly better lit areas, particularly towards the southern (upper) margin of the wood. *Arthonia* species (*A. punctiformis*, *A. radiata*, *A. spadicea*, *A. tumidula*) and *Opegrapha* species (*O. sorediifera*, *O. viridis*, *O. vulgata*) are abundantly developed, particularly on *Corylus* which also bears *Pachyphiale cornea*. *Graphina anguina* and *Phaeographis dendritica* are both common and *P. lyellii* occurs sporadically. In the lowest parts of the wood *Peltigera* and *Sticta* species occur, the latter less luxuriantly than in F1. *Bacidia pruinosa* was abundant on *Ilex* about 70 m. west of the footbridge near the stream which had *Verrucaria aquatilis*, *V. hydrela*, *V. kernstockii* and *V. praetermissa* on stones submerged in it and adjoining it.

While *Graphidion* and *Leprarion* (particularly the *Opegraphetum fuscellae*) communities predominate on the visible portions of the trees in Slapton Wood they are by no means characteristic of the upper, better-lit portions of the trees. A study of branches recently broken off by the wind and some recently felled trees showed that these were occupied by *Parmelietum revolutae* var. *caperatosum* and *Usneion* communities. The *Usneetum articulato-floridae* var. *ceratinae* must be particularly frequent in the crowns of the trees as it is not uncommon to discover pieces of *Usnea articulata* and *U. ceratina* (often to *c.* 20 cm. long) on the woodland floor which must have fallen from the uppermost parts of the trees.

The Valley Bottom Scrub (J2) is more open than the main wood (J1) and so *Parmelietum revolutae* var. *caperatosum* and *Usneion* communities are more in evidence. *Arthonia lurida*, *Opegrapha niveoatra*, *Pachyphiale cornea*, *Porina chlorotica* var. *carpinea*, *P. olivacea* and *Sticta limbata* occur on *Corylus* here; *Usnea intexta* was discovered in the *Usneetum subfloridanae* on *Castanea;* and *Stenocybe septata*, which is rare in the Reserve, was found on several trees of *Ilex*. Loworthy Brake (J3) is planted with *Pinus sylvestris*, more open, and south-facing and consequently poorer in *Graphidion* communities than J1 and J2, although these do occur in its lower parts. *Calicium viride* (fragmentary and sterile) and *Chaenotheca brunneola* (abundant) occurred on a single decorticate stump here; the only site in the Reserve where they were found. Square Brake (J4) and Eastergrounds Brake (J5) are largely occupied by dense scrub of *Prunus spinosa* and are poor in lichens, most of those recorded from these units being on mature trees along their margins.

The Gara Valley Triangle (J6) is a *Castanea-Quercus* wood on a steep north-facing slope and includes a great deal of young *Acer pseudoplatanus*. The wood is dense internally and *Graphidion* and *Leprarion* communities consequently predominate. The *Graphinetum platycarpae* var. *graphinetum anguinae* (Table VIII) is particularly well developed here on smooth-barked trees and contains abundant *Phaeographis lyellii*. *Arthonia* and *Opegrapha* species are frequent here as they are in the main wood (J1).

France Wood (K) is very mixed but more open than Slapton Wood (J1) and has a much poorer *Graphidion* flora. The *Opegraphetum fuscellae* and *Pyrenuletum nitidae* predominate in the inner parts of the wood. A few large field-grown beech trees are present one of which has large patches of *Phlyctis agelaea* and *P. argena*.

The Hartshorn Plantation (L) is largely occupied by *Acer pseudoplatanus*, *Fagus sylvatica* and *Quercus* but some *Pinus sylvestris* is planted in its uppermost parts. *Leprarion* is particularly well developed here together with some *Physodion* and *Usneion* communities in its upper parts. *Opegrapha chevallieri*, *O. confluens* and the *Caloplacetum heppianae* occur on the walls of a ruined building here. *Lepraria* sp., *Porina chlorotica* and *Trapelia coarctata* form a characteristic assemblage on some sheltered siliceous rocks in a shaded central portion of the wood.

Table VIII. Graphinetum platycarpae *Barkm. var.* graphinetum anguinae *D. Hawksw.*, ***variant nov.***

Species	Stands					F
	1	2	3	4	5	
Phaeographis dendritica	—	6	5	6	5	IV
Pyrenula nitida	4	7	5	—	5	IV
Enterographa crassa	7	7	—	8	—	III
Graphina anguina	—	4	2	2	—	III
Phaeographis lyellii	5	—	5	—	5	III
Pyrenula nitidella	—	—	4	—	5	II
Arthonia tumidula	5	—	—	—	—	I
Lecanora chlarotera	—	—	3	—	—	I
Opegrapha sorediifera	—	—	—	—	5	I
Pertusaria leioplaca	—	—	4	—	—	I
Bare (%)	—	10	—	—	—	—

Stand 3 = type record.
1 = J1, *Ilex* trunk, asp. 180°, incl. 80°, diam. 45 cm., 400 cm.².
2 = J1, *Acer pseudoplatanus* trunk, asp. 160°, incl. 72°, diam. 10 cm., 300 cm.².
3 = J1, *Castanea* trunk, asp. 10°, incl. 80°, diam. 15 cm., 200 cm.².
4 = J1, *Acer pseudoplatanus* trunk, asp. 160°, incl. 90°, diam. 31 cm., 400 cm.².
5 = J1, *Castanea* trunk, asp. 170°, incl. 110°, diam. 15 cm., 100 cm.².

VI. GRASSLAND AND ARABLE

Little Marsh Field (M) and Stokeley Fields (N), the latter comprising Ireland Field (N1), Hartshorn Fields (N2), America Road and Fields (N3), and Peasdish (N4), are arable land. Lichen communities are consequently largely restricted to marginal scrub and trees; often in the form of hedgerows. On these the photophilous *Parmelietum revolutae* var. *caperatosum* and *Xanthorion* predominate although they are often poor in species. The narrow zone between Peasdish (N4) and Stokeley Marsh (G2), which is regarded as part of N4 here, has many old *Quercus* and *Ulmus* trees which, in addition to the *Gyalectinetum carneoluteae* have many interesting species including *Bacidia phacodes*, *B. umbrina*, *Collema furfuraceum*, *C. nigrescens*, *C. subfurvum*, *Lithographa dendrographa* and *Parmelia carporrhizans*.

VII. SOUTHGROUNDS FARM

Southgrounds Farm (S) is mentioned here as the calcareous walls of the farmyard and old barns have some species which are very rare or unknown elsewhere in the Reserve. *Physcia tribacia*, *Ramalina pollinaria* and *Xanthoria aureola* occur on the barn walls, and *Dermatocarpon hepaticum*, *Peltigera spuria* and several *Cladonia* species on wall tops. *Lecidea albocaerulescens* and the normally corticolous *Physciopsis adglutinata* were found on schistose rocks by the drive leading from the farm to Slapton village.

VIII. SLAPTON VILLAGE

A number of interesting species occur on walls in Slapton Village (SV) including *Arthopyrenia salweyi*, *Leptogium lichenoides*, *Placynthium nigrum*, *Protoblastenia monticola* and *Rhizocarpon petraeum*. *Collema* species are luxuriantly developed on shaded calcareous walls by the roadside. The grounds of the Field Centre (included in SV) have also been investigated and here *Gyalecta flotowii* was discovered on *Ulmus* and *Lecanora conizaeoides* on cherry. *Lecanora conizaeoides* was represented by a single plant

and its occurrence here is of particular interest as this has often been regarded as a toxitolerant or toxiphilous species. Mr. P. W. James noted *Caloplaca erythrocarpa* on tiles on the roof of the Main Building (Refectory) of the Field Centre.

IX. SLAPTON CHURCH

Gravestones in Slapton Churchyard (CH) include some siliceous memorials on which the *Parmelietum conspersae*, unknown elsewhere in the area, occurs. This includes *Parmelia conspersa*, *P. glabratula* subsp. *fuliginosa*, *P. isidiotyla* and *P. mougeotii;* species common on the granite of Dartmoor but infrequent elsewhere in Devonshire. The walls bounding the church yielded *Catillaria chalybeia*, *Buellia stellulata*, *B. verruculosa* and *Verrucaria hochstetteri*. Planks of an old outbuilding in SV opposite the entrance to the Church bore *Lecidea symmicta*, and *Parmelia soredians*.

Lichen Flora

This list enumerates all records of lichens from the Reserve and adjacent localities with reference to the thirty-eight units used in recording (see p. 538 and Fig. 3). Lichenicolous fungi are omitted and will be treated in an account of the non-lichenized fungi of the Reserve which is being prepared. All records made or confirmed between September 1969 and September 1971 are undated; earlier reports unconfirmed in this period are included with fuller information. Location of pertinent herbarium material is indicated in parenthesis and an asterisk (*) following a name indicates that it is discussed in the following section (pp. 558-573). Records which are for any reason considered to be erroneous have been placed in square brackets.

All species have been arranged alphabetically for ease of reference and the nomenclature mainly follows James (1965, 1966) with later modifications. Synonyms of accepted names are generally omitted except that where the name used differs from that in James (1965, 1966) the one used by James is placed in parenthesis (except for those species discussed in further detail in the following section).

Acarospora fuscata (Nyl.) Arnold
H.
On siliceous slabs; rare.

A. smaragdula (Wahlenb. ex Ach.) Massal.*
B (IMI 152818).
On granite memorial; abundant.

Anaptychia fusca (Huds.) Vain.
H (IMI 152819); unlocalized, 1936, *W. Watson* (Watson, 1937, p. 14).
On siliceous slabs and an adjoining *Ulmus*; locally frequent.

Arthonia cinereopruinosa Schaer.*
CY (BM; IMI 153137).
On *Populus;* very rare.

A. exilis (Flörke) Anzi*
I1 (BM; IMI 153134); N4 (IMI 155421*a*).
On *Salix* and *Sambucus* twigs; very rare.

A. impolita (Hoffm.) Borr.
I3 (IMI 152822); K (IMI 127617); L.
On *Fraxinus*, *Quercus* and *Ulmus;* occasional.

A. lurida Ach.
J2 (BM; IMI 153141).
On smooth barked trees; very rare.

A. punctiformis Ach.
F1; I1 (IMI 153136), 3; J1, 6 (IMI 152824); K.
On smooth barked twigs; frequent.

A. radiata (Pers.) Ach. (incl. var. *swartziana* (Ach.) Almq.).
CY (IMI 152825); DM; H; I1; J1, 2.
On smooth barked trees; frequent.

A. spadicea Leight.
J1 (BM; IMI 153179, 153180, 159872).
On shaded *Castanea* and *Corylus*; rare.

A. tumidula (Ach.) Ach.*
F1; I1 (IMI 152820); J1, 2, 3, 6 (IMI 152821, 159816).
On smooth barked trees in shade; frequent.

Arthopyrenia biformis (Borr.) Massal.
I1, 3 (IMI 152827); K (IMI 152826); L; N4.
On *Acer pseudoplatanus*, *Fraxinus*, *Quercus* and *Ulmus;* frequent.

A. fallax (Nyl.) Arnold
J1.
On felled *Castanea;* rare.

A. gemmata (Ach.) Massal. (= *A. alba* auct. angl., non (Schrad.) Zahlbr.)
CY; I1, 3; J1 (IMI 152823, 153182), 2, 6: N4.
On rough barked trees; frequent.

A. punctiformis (Pers.) Massal.
I3; J1.
On smooth barked trees; occasional.

A. salweyi (Leight. ex Nyl.) Zahlbr.
SV (IMI 153160).
On calcareous walls near Field Centre; rare.

Bacidia acerina (Ach.) Arnold (? = *B. endoleuca* (Nyl.) Kickx).
F1; H (IMI 153691, 159871); I1 (IMI 153692, 153690, 159811), 3 (IMI 153688); J2 (IMI 153689*a*).
On rough barked trees; locally abundant.

B. muscorum (Ach.) Mudd
CY (IMI 152829, 152830); SV, 1962, *K. L. Alvin.*
On mosses on calcareous gatepost and walls; rare.

B. naegelii Hepp ex Müll. Arg.
H (IMI 153694); I1 (IMI 153693).
On *Sambucus* and *Ulmus;* rare.

B. phacodes Körb.
I1 (BM; IMI 152828, 153132, 153695*a*); N4 (IMI 153171, 153696*a*).
On *Fraxinus*, *Hedera* and *Ulmus* in moderate shade; rare.

B. pruinosa P. James
J1 (BM; IMI 153144; Vězda, Lich. Sel. Exs. no. 986; James, 1971).
On *Ilex* in shade near stream; very rare.

B. rubella (Hoffm.) Massal.
CY (IMI 152831); H; I1; N4; SV (BM).
On rough barked trees, particularly *Fraxinus* and *Ulmus*, in moderate shade; frequent.

B. sabuletorum (Schreb.) Lett.
S, 1962, *K. L. Alvin;* SV.
On mosses on calcareous walls; rare.

B. umbrina (Ach.) Bausch
N4 (IMI 155421*b*).
On *Salix;* very rare.

Baeomyces rufus (Huds.) Rebent.
J6.
On schistose rocks in shade; rare.

Botrydina vulgaris Bréb. ex Meneghini*
C (K).
In association with *Omphalina griseopallida* (Desm.) Quél. in short turf; very rare.

Buellia aethalea (Ach.) Th. Fr.
H.
On siliceous slabs; rare.

B. alboatra (Hoffm.) Deichm. Br. & Rostr.
CH; CY (IMI 152978).
On calcareous walls and gatepost; rare.

B. canescens (Dicks.) de Not.
C; CH; CY; DM; E6; F2; H; I1 (DUKE; Herb. Field Centre), 2, 3; J1; K; L; N2, 3, 4; S; SV.
On trees and basic rocks; very common.

B. disciformis (Fr.) Mudd
B (IMI 153151).
On decorticate log; very rare.

B. punctata (Hoffm.) Massal.
C (IMI 159849*b*); D; I1; J3.
On rough barked trees, rare; on shingle pebbles in C, very rare.

B. schaereri de Not.*
B (BM; IMI 152832, 153142; Vězda, Lich. Sel. Exs. no. 997).
On decorticate logs; locally abundant.

B. stellulata (Tayl.) Mudd
CH; H (IMI 152833).
On siliceous slabs and walls; rare.

B. verruculosa (Sm.) Mudd
CH.
On siliceous wall; rare.

Calicium viride Pers.
J3 (IMI 153178*b*).
On decorticate stump; very rare.

Caloplaca aurantia (Pers.) Hellb.
CH; SV.
On calcareous walls; rare.

C. aurantiaca (Lightf.) Th. Fr.
CH; N4 (IMI 152834); SV.
On *Ulmus* and calcareous walls; rare.

C. caesiorufa (Wibel) Flag.
CY (IMI 152838); H; I1 (IMI 152835*a*, 152975*c*).
On siliceous rocks; occasional around the Ley.

C. cerina (Ehrh. ex Hedw.) Th. Fr.
H (IMI 152836); I1.
On twigs of *Sambucus* and *Ulmus*; rare.

C. cerinella (Nyl.) Flag.
I1 (IMI 153149).
On small twigs of *Sambucus;* very rare.

C. citrina (Hoffm.) Th. Fr.
C; CH; CY (IMI 152962*a*); H; I1, 3 (IMI 152837); N4.
On concrete and calcareous walls; frequent.

C. citrina f. *phlogina* (Ach.) D. Hawksw.
N4 (IMI 153146).
On *Ulmus;* very rare.

C. erythrocarpa (Pers.) Zwach. (= *C. lallavei* (R. Clem. ex Ach.) Flag.).
SV.
On tiles of Field Centre roof; rare.

C. heppiana (Müll. Arg.) Zahlbr.
B; C; CH; CY (IMI 152973); H; L; N3, 4; S; SV.
On concrete and calcareous memorials and walls; frequent.

C. holocarpa (Hoffm.) Wade
CH; N4 (IMI 153139); SV.
On walls and *Ulmus*; rare.

C. marina (Wedd.) Zahlbr.
I1 (IMI 152835*b*, 152975*b*).
On siliceous rocks; locally abundant.

C. murorum (Ach.) Th. Fr.
B (IMI 152839); CH; I3; M; N3; S; SV.
On concrete and calcareous memorials and walls; frequent.

Candelaria concolor (Dicks.) Arnold
H; SV, 1962, *K. L. Alvin* (Herb. Field Centre).
On *Fraxinus* and *Ulmus* boles; very rare.

Candelariella aurella (Hoffm.) Zahlbr.
B; C; CH; S; SV.
On concrete; occasional.

C. reflexa (Nyl.) Lett.
H; N4.
On *Sambucus* and *Ulmus;* rare.

C. vitellina (Hoffm.) Müll. Arg.
B; C; CH; G2; H (IMI 159876*a*); I1, 3; M; N3, 4; S; SV.
On rocks and walls, frequent; on trees, rare.

Catillaria chalybeia (Borr.) Massal.
CH; H (IMI 152979); J1.
On slightly basic rocks and walls; occasional.

C. griffithii (Sm.) Malme
CY (IMI 152840); DM; E6; H (IMI 152841, 152842); I1, 3; J3; L; M.
On trees; common and often fertile.

C. lightfootii (Sm.) Oliv.
DM (IMI 159845*a*); F1 (IMI 159882); J2 (IMI 153189).
On *Fraxinus* and particularly *Salix;* locally abundant; often fertile.

Chaenotheca brunneola (Ach.) Müll. Arg.
J3 (BM; IMI 153178*a*; Vězda, Lich. Sel. Exs. no. 980).
On decorticate stump; abundant on one stump.

Cladonia arbuscula (Wallr.) Rabenh.
C, 1960, *N. Wallace* (Herb. N. Wallace).
Fumarprotocetraric acid present race.
On fixed shingle; very rare or extinct.

C. cervicornis (Ach.) Flot.
C (Herb. Field Centre).
On fixed shingle; locally abundant.

C. chlorophaea (Flörke ex Sommerf.) Spreng.
CY; DM; F1; I1; J1 (IMI 159888); SV.
On the ground, and on mosses on trees and walls; occasional.

C. coniocraea (Flörke) Spreng.
B; CY; DM; F1; H; I1; J1, 2, 4, 6; K; L; S; SV.
On the ground, and on mosses on trees and walls; common.

C. conista (Ach.) Robb. sensu Dahl (non Evans).
C (Herb. Field Centre; IMI 152989).
Atranorin and fumarprotocetraric acid present.
On fixed shingle; rare.

C. fimbriata (L.) Fr.
CY (IMI 152843); DM; H; I1; S (Herb. Field Centre); SV (Herb. N. Wallace).
On the ground, trees and walls; occasional.

C. foliacea (Huds.) Willd.
C (Herb. Field Centre).
On fixed shingle; locally abundant.

C. furcata (Huds.) Schrad.
C (Herb. Field Centre).
On fixed shingle; locally abundant.

C. gracilis (L.) Willd.
C, 1960, *N. Wallace* (Herb. N. Wallace).
On fixed shingle; very rare or extinct.

C. ochrochlora Flörke
F1 (BM); J1 (Herb. N. Wallace).
On mosses on trees and tree stumps; rare.

C. pityrea (Flörke) Fr.
C (BM; Herb. Field Centre; IMI 152844, 153166).
On fixed shingle; locally abundant.

C. pyxidata (L.) Hoffm.
C (Herb. Field Centre); J1, 1966, *D. H. S. Richardson*, 2.
On fixed shingle and tree stumps; rare.

C. rangiformis Hoffm.
C (Herb. Field Centre; IMI 159830).
On fixed shingle; locally abundant.

C. squamosa (Scop.) Hoffm.
DM.
On mosses on *Salix;* rare.

C. verticillata (Hoffm.) Schaer.
C.
On fixed shingle; occasional.

Collema auriculatum Hoffm.
CH; SV.
On calcareous walls and memorials; locally abundant and fertile.

C. crispum (Huds.) Web.
CY (IMI 152845); DM; M; SV.
On calcareous gateposts and walls; rare.

C. cristatum (L.) Web.
CH; SV.
On calcareous walls; rare.

C. furfuraceum (Arnold) DR.
N4 (IMI 153173).
On mosses on *Ulmus;* very rare.

C. nigrescens (Huds.) DC.
I1, 1961, *K. L. Alvin;* N4 (BM; IMI 153174).
Amongst mosses on *Fraxinus* and *Ulmus*; rare.

C. subfurvum (Müll. Arg.) Degel.
I1; N4 (BM; IMI 153172).
Amongst mosses on *Fraxinus*, *Quercus* and *Ulmus;* rare.

C. tenax (Sw.) Ach.
CH; CY; S; SV.
On calcareous walls and gateposts; frequent.

Cornicularia aculeata (Schreb.) Ach.
C (IMI 152846).
On fixed shingle; locally frequent.

Dermatocarpon hepaticum (Ach.) Th. Fr. (? = *D. lachneum* (Ach.) A. L. Sm.).
S; SV, 1962, *K. L. Alvin.*
On tops of calcareous walls; rare.

Dimerella lutea (Dicks.) Trevis.
J3; K (IMI 152847).
On *Castanea* and *Quercus* in the shade; very rare.

Diploschistes caesioplumbeus (Nyl.) Vain.
H (IMI 152848).
On siliceous slabs; locally abundant.

Enterographa crassa (DC.) Fée
CY; DM; E6; F1; H; I1, 3; J1, 2, 3, 6; K; L; M; N4.
On smooth barked trees in the shade; very common.

Evernia prunastri (L.) Ach.*
B; C (Herb. Field Centre); CY; D; DM; E6; F1, 2; G2; H; I1, 2, 3; J1, 2, 3, 4, 6; K; L; M; N3, 4; SV.
On trees, decorticate wood and shingle; very common; fronds to 12 cm. long in F1.

Graphina anguina (Mont.) Müll. Arg.
DM; F1; H (IMI 152852); I1; J1 (Herb. N. Wallace), 2, 6 (IMI 152851); K (IMI 152849, 152850); L.
On smooth barked trees in moderate shade; frequent to locally abundant.

Graphis elegans (Borr. ex Sm.) Ach.
F1 (IMI 159890); I3; J1, 2.
On trees; occasional.

G. scripta (L.) Ach.
H; I1, 3; J1 (IMI 152853), 2, 3, 4; K.
On trees; frequent.

Gyalecta flotowii Körb.
CY (IMI 153156); DM (IMI 159842); I1 (IMI 153183); SV (BM).
On *Fraxinus*, *Populus* and *Ulmus;* rare.

Gyalectina carneolutea (Turn.) Vězda*
DM; I1 (BM; DUKE; IMI 152856, 152855; Vězda, Lich. Sel. Exs. no. 981); N4 (IMI 153165, 153696*b*).
On trunks of mature trees of *Fraxinus* and *Ulmus* in moderate shade; locally abundant.

Hypogymnia physodes (L.) Nyl. (≡ *Parmelia physodes* (L.) Ach.).
C; CY; D; DM; F1; H; I1; J1, 2, 3, 6; M; N4.
On trees in well lit situations; common but rarely abundant.

H. tubulosa (Schaer.) Hav. (≡ *Parmelia tubulosa* (Schaer.) Bitt.).
C; CY; D; F1, 2; G2; H; I1; J1, 2, 3, 6; N4 (IMI 153170).
On trees in well lit situations; common but rarely abundant.

[*Lecanactis abietina* (Ach.) Körb.
K, 1962, *K. L. Alvin.*
Almost certainly an error for *Opegrapha vermicellifera.*]

L. premnea (Ach.) Arnold
I1 (IMI 153185); J6.
On bases of mature *Quercus;* rare.

Lecania cyrtella (Ach.) Th. Fr.
F1 (IMI 153187); H; I1 (IMI 153184, 153695*b*).
On *Hedera* and *Sambucus;* rare.

L. erysibe (Ach.) Mudd
CY (IMI 152857, 152973); I1 (IMI 152975); N4.
On basic rocks and walls; occasional.

Lecanora atra (Huds.) Ach.
CH; CY; DM; H; I1; J2 (IMI 153190); M; SV.
On siliceous walls and trees; occasional.

L. calcarea (L.) Sommerf.
CY; S.
On calcareous gatepost and walls; rare.

L. campestris (Schaer.) Hue
CH; CY; H; I1, 3; M; S; SV (Herb. Field Centre).
On concrete, basic rocks and walls; frequent.

L. chlarotera Nyl.
B (IMI 152860); C; CY; D; DM; G2; H; I1, 2, 3 (IMI 152858); J1, 3, 6; K (IMI 152859); L; M; N3, 4; SV.
On decorticate wood and trees; very common.

L. confusa Almb.
B; C; CY; D; DM; F1; G2; H; I1, 2; J2, 6; K; N3, 4; SV.
On decorticate wood and trees; common.

L. conizaeoides Nyl. ex Cromb.
SV.
A single plant on cherry at the Field Centre; very rare.

[*L. crenulata* (Dicks.) Hook.
B, on shingle pebbles, 1966,
D. H. S. Richardson.
This is a species of hard calcareous rocks and this record is almost certainly an error, possibly for an atypical specimen of *L. dispersa*.]

L. dispersa (Pers.) Sommerf. (incl. *L. hagenii* auct. angl.).
B; C (IMI 159849*b*); CH; CY; G2 (IMI 152862); H (IMI 152861, 152863, 159876*b*, 159883); I1, 2, 3; L; M; N4; S; SV.
On concrete, basic rocks, shingle pebbles, walls, trees, etc.; very common.

L. expallens Ach.
B; C; CH; CY (IMI 152864); D; DM; E6; F1, 2; G2; H; I1, 3; J1, 3 (IMI 152865), 6; K; L; N3, 4; SV.
On decorticate wood and trees; very common.

[*L. fugiens* Nyl.
B, on shingle pebbles, 1966,
D. H. S. Richardson.
This is not a species of unstable habitats and this record is certainly an error for some other species. No C+ *Lecanora* has been found by me in this habitat.]

L. gibbosa (Ach.) Nyl. sens. lat.
H (IMI 159874).
On siliceous slabs; very rare and immature.

L. jamesii Laund.
DM (IMI 145855); F1 (BM; IMI 159881; Herb. M. R. D. Seaward).
On *Fraxinus* and *Salix* in marshes; locally abundant.

L. leprosescens Sandst.
H.
On siliceous slabs; very rare.

L. polytropa (Hoffm.) Rabenh.
C (IMI 159848*b*); CH.
On slate pebble and wall; very rare.

L. rupicola (L.) Zahlbr.
CH; H.
On siliceous slabs and walls; rare.

L. sambuci (Pers.) Nyl.
C (IMI 153155); I1 (IMI 153145).
On twigs of *Sambucus;* very rare.

Lecidea albocaerulescens (Wulf.) Ach.
S.
On shaded siliceous rock; very rare.

L. cyathoides (Ach.) Ach.
CH; H.
On siliceous slab and walls; rare.

L. erratica Körb.
B; C (IMI 152866, 159848*c*).
On shingle pebbles; locally abundant.

L. granulosa (Hoffm.) Ach.
B; I1; J1, 3.
On decorticate wood; occasional.

L. lucida (Ach.) Ach.
J1 (IMI 159875).
On *Larix;* very rare.

L. quernea (Dicks.) Ach. (≡ *Protoblastenia quernea* (Dicks.) Clauz.).
I1, 3; J6; L.
On trees; locally abundant and usually fertile.

L. sulphurea (Hoffm.) Wahlenb.
CH; H.
On siliceous slabs and tombstone; rare.

L. sylvicola Flot.
J1 (IMI 159879).
On siliceous pebbles in shade; very rare.

L. symmicta (Ach.) Ach.
B (IMI 153168); SV.
On decorticate wood and planks; very rare.

L. uliginosa (Schrad.) Ach.
B; C (Herb. Field Centre); F1; I1; J3.
On decorticate wood, *Pinus* and the ground; occasional.

Lecidella elaeochroma (Ach.) Hasz.*
B; C; D; DM; E6; F1, 2; G2; H; I1, 2, 3; J1, 3, 6; K; L; M; N3, 4; SV.
On decorticate wood and trees; very common.

L. elaeochroma f. *soralifera* (Erichs.) D. Hawksw.*
B; C; DM; F1; G2; H; I1, 3; N3 (IMI 152867), 4; SV.
On decorticate wood and trees; common.

L. scabra (Tayl.) Hertel & Leuckert (≡ *Lecidea scabra* Tayl.).
CH; D/E bridge; H; SV.
On siliceous rocks; locally frequent.

L. stigmatea (Ach.) Hertel & Leuckert (≡ *Lecidea stigmatea* Ach.).
CY; DM; SV.
On slightly basic walls; occasional.

L. subincongrua (Nyl.) Hertel & Leuckert (≡ *Lecidea subincongrua* Nyl.).
H (IMI 152868).
On siliceous slabs; very rare.

Lepraria candelaris (L.) Fr.
CY; DM; F1; H; I1, 3; J1, 3, 6; K; L; N3, 4; SV.
On rough barked trees in moderate shade; common.

L. incana (L.) Ach.
CH; CY; DM; E6; F1; I1 (IMI 152987*b*), 2, 3; J1, 2, 3. 4, 6; K; L; M; N3, 4; S; SV.
On trees and siliceous rocks in the shade; very common.

L. membranacea (Dicks.) Vain.
S; SV.
On calcareous walls; rare.

L. sp.
L.
On shaded siliceous rocks; rare.

Leptogium burgessii (L.) Mont.
F1, 1966, *D. H. S. Richardson.*
On mosses on tree; very rare or extinct.

L. lichenoides (L.) Zahlbr.
CY, 1961, *K. L. Alvin;* SV.
On mortar of old bridge and on calcareous walls; very rare.

L. teretiusculum (Wallr.) Arnold
H (IMI 159877); I1.
On siliceous slabs and *Fraxinus*; locally abundant.

Lithographa dendrographa Nyl.*
I1 (BM; IMI 153175, 153193; Vězda, Lich. Sel. Exs. no. 978); nr. N3 (BM; Herb. T. D. V. Swinscow); N4 (BM; IMI 153164).
On mature *Fraxinus* and *Ulmus* in moderate shade; locally abundant.

Melaspilia ochrothalamia Nyl.
F1 (BM; IMI 159887).
On *Salix;* very rare.

Micarea denigrata (Fr.) Hedl. (≡ *Catillaria denigrata* (Fr.) Hedl.).
F1.
On *Salix;* very rare.

M. prasina Fr. (≡ *Catillaria prasina* (Fr.) Th. Fr.).
J1 (IMI 159873).
On decorticate wood of *Castanea;* very rare or overlooked.

Microthelia micula Körb. (≡ *Didymosphaeria micula* (Körb.) Vain.).
K (IMI 152971*a*).
On *Quercus* twig; very rare.

Nephroma laevigatum Ach. (= *N. lusitanicum* (Schaer.) Nyl.).
F1 (BM; IMI 159891; Herb. M. R. D. Seaward).
On *Fraxinus, Salix* and *Ulmus* in marsh; locally abundant.

Normandina pulchella (Borr.) Nyl.
CY; DM; F1; H; I1, 2; J1, 2, 3, 6; K; L; N4; SV.
On rough barked trees amongst mosses; common.

Ochrolechia androgyna (Hoffm.) Arnold
CH.
On siliceous memorial; rare.

O. parella (L.) Massal.
CH; CY; DM; H; I1, 2, 3; J6; N4; S; SV.
On rough barked trees, and siliceous rocks and walls; frequent.

O. turneri (Sm.) Hasselr.
CY; I1, 3; N3, 4.
On trees; occasional.

O. yasudae Vain. auct. angl. (= *O. subviridis* (Høeg) Erichs.).
CY (IMI 152872); I1.
On *Populus* and *Quercus;* rare.

Opegrapha atra Pers.
CY; DM; E6; F1; G2; H; I1 (IMI 152873), 2, 3; J1, 2, 6; K; L; M; N3, 4; SV.
On trees; very common.

O. chevallieri Leight.
CY (IMI 152875); L.
On calcareous gateposts and walls; rare.

O. confluens (Ach.) Stiz.
L.
On siliceous rocks in wall; very rare.

O. gyrocarpa Flot.
I1 (IMI 153161); J6 (BM; IMI 153143); nr. N3 (Herb. Swinscow); N4.
On *Fraxinus, Quercus* and *Ulmus* in moderate shade; locally abundant.

O. herbarum Mont. (= *O. betulina* Sm., non Pers.).
DM (IMI 159843); I1, 1961, *K. L. Alvin.*
On *Hedera* and *Ulmus;* rare.

O. lichenoides Pers.
CY (IMI 153157).
On *Populus;* very rare.

O. niveoatra (Borr.) Laund. (= *O. subsiderella* (Nyl.) Arnold).
J2 (IMI 153177).
On *Corylus;* very rare.

O. ochrocheila Nyl.
I1 (IMI 153148).
On *Hedera* and *Fraxinus;* rare.

O. sorediifera P. James
DM (BM); F1 (BM; IMI 159868); J1 (IMI 153181), 3, 6 (IMI 153158).
On trees in the shade, particularly *Corylus* and *Salix;* locally abundant; with apothecia in F1.

O. vermicellifera (Kunze) Laund. (= *O. fuscella* (Fr.) Almb.).
DM; H; I1 (BM; Vězda, Lich. Sel. Exs. no. 977), 2; J1 (IMI 152876), 2, 3, 6; K (Herb. K. L. Alvin; Laundon, 1963, p. 140).
On rough barked trees in shade; common.

O. viridis (Ach.) Nyl.
J1, 2, 6.
On smooth barked trees in shade; rare.

O. vulgata (Ach.)Ach.
CY; DM; F1; H; I1; J1 (IMI 153131), 3, 6; N4; SV.
On trees; frequent.

Pachyphiale cornea (With.) Poetsch
J1, 2 (IMI 153191, 153689*b*).
On *Corylus;* very rare.

Pannaria mediterranea C. Tav.*
F1 (BM; IMI 159884).
On a single *Salix;* very rare.

Parmelia borreri (Sm.) Turn.*
H (IMI 152877); I1 (BM; IMI 152878; Herb. K. L. Alvin); J1 (IMI 152879); N4 (BM; IMI 153128); SV, 1961, *K. L. Alvin* (Herb. Field Centre).
On trees, particularly the upper branches; frequent.

P. caperata (L.) Ach.*
B; C (Herb. Field Centre); CH; CY; D; DM; E6; F1, 2; G2; H; I1 (IMI 160399), 2, 3 (Herb. G. G. Graham); J1, 2, 3, 4, 6; K; L; M; N3, 4; S; SV.
On trees, decorticate wood, wall tops and shingle; very common; with apothecia in CY, DM and L.

P. carporrhizans Tayl.*
CY (DUKE; O); H (IMI 153194); I1 (Herb. Field Centre; Herb. G. G. Graham); J1, 1960, *N. Wallace* (Herb. N. Wallace); nr. K; N4 (BM; IMI 153147).
On trees, particularly the upper branches; frequent.

P. conspersa (Ehrh. ex Ach.) Ach.
CH.
On siliceous memorials; frequent.

P. exasperata de Not. (= *P. aspera* Massal.).
CY; DM; H; I1, 2, 3; N3.
On twigs, particularly of *Salix;* occasional.

P. glabratula (Lamy) Nyl.
B; C; DM; E6; F1; H; I1, 2, 3; J1, 3, 4; K; L; N3, 4; SV.
On trees, and shingle; frequent.

P. glabratula subsp. *fuliginosa* (Fr. ex Duby) Laund.
CH.
On siliceous memorials; locally abundant.

P. isidiotyla Nyl. (= *P. glomellifera* (Nyl.)Nyl.).
CH (IMI 145857).
On siliceous memorials; locally abundant.

P. mougeotii Schaer.
CH.
On a siliceous memorial; very rare.

P. omphalodes (L.) Ach.
C, 1960, *N. Wallace* (Herb. N. Wallace).
On fixed shingle; very rare or extinct.

P. perlata (Huds.) Ach.*
C; CH; CY; DM (DUKE); E6; F1, 2; G2; H; I1 (DUKE), 2, 3; J1, 2, 3, 4, 6; K; L; M; N3, 4; S; SV.
On trees and shingle; very common; with apothecia in DM.

P. reddenda Stirt.
I1 (IMI 153787), 3; J1.
On trunks of mature trees; occasional.

P. reticulata Tayl.
H; I1 (BM; IMI 153154).
On *Acer pseudoplatanus* and *Salix;* rare.

P. revoluta Flörke
CH; CY; DM (IMI 159845*b*); F1; H (IMI 152880); I1.
On trees in slight shade, particularly *Salix,* and wall top; occasional.

P. saxatilis (L.) Ach.
B; G2; I3.
On decorticate wood and trees; rare.

P. soredians Nyl.*
CY, 1967, *T. D. V. Swinscow* (Herb. T. D. V. Swinscow); I1 (BM; IMI 145858); SV.
On trees and decorticate wood in well lit situations; locally abundant.

P. subaurifera Nyl.
B; CY; DM; F1 (BM), 2; G2; H; I1, 2, 3; J2, 6; L; N3, 4; SV.
On trees, decorticate wood and schists; common.

P. subrudecta Nyl.
CY; DM; E6; F1; G2; H; I1 (DUKE; IMI 152881, 153906), 2, 3; J1, 2, 3, 4, 6; K; L; N3, 4; S; SV.
On trees, particularly the trunks; common.

P. sulcata Tayl.
B; C; CH; CY; D; DM; E6; F1, 2; G2; H; I1, 2, 3 (Herb. G. G. Graham); J1, 2, 4, 6; K; L; N3, 4; S; SV.
On trees and fixed shingle; common.

Parmeliopsis ambigua (Wulf.) Nyl.
nr. I1, 1962, *K. L. Alvin.*
On dead *Fraxinus;* very rare or extinct.

Peltigera canina (L.) Willd.
C (Herb. Field Centre); F1; J1, 2; S; SV.
Amongst mosses on fixed shingle, wall tops and trees; locally abundant.

P. polydactyla (Neck.) Hoffm.
C (BM; Herb. Field Centre); F1; J1.
Amongst mosses on fixed shingle and trees; occasional.

P. praetextata (Flörke ex Sommerf.) Zopf
F1 (BM); J1.
On mosses on trees; locally abundant.

P. spuria (Ach.) DC.
C (Herb. Field Centre); S; SV.
Amongst mosses on fixed shingle and wall tops; occasional.

Pertusaria albescens (Huds.) Choisy & Wern.
CY; I1; J1.
On trees in well lit situations; occasional.

P. amara (Ach.) Nyl.
CY; F1; I1, 3; J1, 3, 6; L; N4; SV.
On trees; occasional.

P. hymenea (Ach.) Schaer.
CY; DM; F1, 2 (IMI 152882); H (IMI 153133); I1, 2; J1, 6; K; L; M; N3, 4.
On trees; common.

P. leioplaca (Ach.) DC.
CY; DM; F1; H (IMI 153153); I1, 3; J1, 2, 3, 6; K; L; N4.
On smooth barked trees in shade; frequent.

P. mulipuncta (Turn.) Nyl.
N4.
On upper branches of fallen *Fraxinus;* very rare.

P. pertusa (L.) Tuck.
CY; DM; F1; H; I1, 2, 3 (IMI 152883); J1, 3, 6; K; L; M; N4.
On trees; frequent.

Phaeographis dendritica (Ach.) Müll. Arg.
DM; F1; I1; J1 (IMI 152884, 152885), 2, 3 (IMI 152886), 6; K; L.
On trees in moderate shade; locally abundant.

P. lyellii (Sm.) Zahlbr.*
J1, 2 (IMI 159813), 3, 6 (BM; IMI 153192).
On smooth barked trees, particularly *Acer pseudoplatanus* and *Castanea,* in shade; locally frequent.

Phlyctis agelaea (Ach.) Flot.
DM (BM; IMI 159844); F1 (BM; IMI 159885); K (BM; IMI 152893).
On *Salix* and *Fraxinus;* locally frequent.

P. argena (Ach.) Flot.
CY; DM; E6; F1; H; I1; J1, 6; N4.
On trees; frequent.

Physcia ascendens (Th. Fr.) Oliv. em. Bitt. ("*adscendens*").
B; C; CH; CY; D; DM; E6; G2; H; I1, 3; J3; M; N3, 4; S; SV.
On trees, decorticate wood, concrete and basic rocks and walls; common.

P. aipolia (Ehrh. ex Humb.) Hampe
C; CY; DM; E6; F1 (BM); H; I1, 2, 3 (IMI 152983, 152982); J1 (IMI 152897), 2, 3, 6; M; N3, 4; SV.
On trees, particularly the twigs; common.

P. caesia (Hoffm.) Hampe
CH.
On tops of basic memorials; locally frequent.

P. labrata Mereschk.
I1 (IMI 153169).
On twigs of *Acer pseudoplatanus;* rare.

P. leptalea (Ach.) DC.
CY; I1 (Herb. Field Centre), 2, 3; J2; N4.
On twigs in well lit situations; occasional.

P. orbicularis (Neck.) Poetsch
C; CY; G2; H; I1, 3; N3, 4; S; SV.
On trees and rocks; occasional.

P. tenella (Scop.) DC. em. Bitt.
CY; D; F2; H; I1 (Herb. Field Centre), 3; N3, 4.
On trees in well lit situations; occasional.

P. tribacia (Ach.) Nyl.
B; S (IMI 154939; Herb. Field Centre).
On decorticate wood and calcareous wall of barn; rare.

P. tribacioides Nyl.*
H; I1 (IMI 153195).
On twigs of *Quercus* and *Ulmus;* very rare.

Physciopsis adglutinata (Flörke) Choisy (= *Physcia elaeina* auct. angl., non (Sm.) A.L.Sm.).
DM; H; I1 (IMI 153162); N4; S; SV (BM).
On trees and siliceous rock; locally abundant.

Physconia grisea (Lam.) Poelt (≡ *Physcia grisea* (Lam.) Zahlbr.).
H; I1, 3.
On twigs in well lit situations; rare.

P. pulverulenta (Schreb.) Poelt (≡ *Physcia pulverulenta* (Schreb.) Hampe).
CY; D; DM; E6; F1; H; I1, 2, 3; N3, 4 (BM).
On trees in slightly shaded situations; locally abundant.

Placynthium nigrum (Huds.) Gray
CH; CY; S; SV.
On calcareous memorials and walls; occasional; with apothecia in CH.

Porina chlorotica (Ach.) Müll. Arg.
CH; CY (IMI 152962*b*); DM; I1 (IMI 152987, 152986, 152985, 152898); J1, 2, 6; L (IMI 153167); SV.
On shaded siliceous rocks, particularly schists; locally abundant.

P. chlorotica var. *carpinea* (Pers.) Keissl.
J1 (BM), 2 (IMI 153176).
On *Corylus* and *Ilex* in the shade; rare.

P. leptalea (Dur. & Mont.) A.L.Sm.
J1 (IMI 153138); K (IMI 152971*b*).
On *Ilex* and *Quercus* in the shade; rare.

P. olivacea (Pers.) A.L.Sm.
J2 (BM).
On *Corylus;* very rare.

Protoblastenia monticola (Ach.) Steiner
SV.
On calcareous walls; occasional.

P. rupestris (Scop.) Steiner
CH; CY; G1; I1; N4; S; SV.
On concrete and calcareous walls; occasional.

Pyrenula nitida (Weig.) Ach.
CY; DM; E6; F1; H; I1, 2, 3; J1, 2, 3, 4, 6; K; L; M; N3, 4.
On smooth barked trees in the shade; common.

P. nitidella (Flörke) Müll. Arg.*
CY; DM; F1; H; I1, 2, 3; J1, 2, 3, 4, 6; K; L; M; N3, 4.
On smooth barked trees in the shade; common.

Ramalina calicaris (L.) Fr.
CY (IMI 152900); D; DM; H; I1.
On trees, particularly *Salix* and *Sambucus* twigs, in well lit situations; locally abundant.

R. curnowii var. *atlantica* (Culb.) D. Hawksw.*
C (IMI 152899).
On shingle pebble; very rare.

R. farinacea (L.) Ach.
B; C, 1961, *K. L. Alvin;* CY (DUKE); DM; E6; F1, 2; H (IMI 152902); I1; L; SV.
On decorticate wood, shingle and trees; common.

R. farinacea var. *hypoprotocetrarica* (Culb.) D. Hawksw.
DM (DUKE); G2 (IMI 152903); I1; N4.
On trees in well lit situations; frequent.

R. fastigiata (Pers.) Ach.
CY; D; DM; E6; F1, 2; G2; H; I1, 3; J1, 6; K; L; M; N3, 4; SV.
On trees in well lit situations; very common; apothecia to 1 cm. diam. in I1.

R. fraxinea (L.) Ach.
CY; D; DM; F1; H (IMI 152904); I1, 3; L; N4; SV.
On trees in well lit situations; common.

R. fraxinea subsp. *calicariformis* (Nyl.) B. de Lesd.
CY; H; I1.
On trees in well lit situations; occasional.

R. obtusata (Arnold) Bitt.
C; CY; H (BM; IMI 152905); I1 (BM; DUKE; IMI 160091; Herb. Field Centre); N4.
On trees, particularly twigs of *Sambucus* and *Ulmus*, in well lit situations; locally abundant.

R. pollinaria (Westr.) Ach.
B, 1966, *D. H. S. Richardson;* S (IMI 153150).
On shingle pebbles and wall of barn; very rare.

R. siliquosa var. *crassa* (Del. ex Nyl.) D. Hawksw.*
H (IMI 152901).
On siliceous slabs; locally abundant.

R. subfarinacea var. *reagens* (B. de Lesd.) D. Hawksw. (≡ *R. farinacea* var. *reagens* B. de Lesd.).
B (IMI 152907); I3 (IMI 152906).
On decorticate wood and trees; occasional.

Rhizocarpon constrictum Malme
H.
On siliceous slabs; very rare.

R. obscuratum var. *reductum* (Th. Fr) Eitner
C (IMI 159848*a*).
On shingle pebble; very rare.

R. petraeum (Wulf.) Massal.
SV.
On basic wall; rare.

Rinodina atrocinerea (Dicks.) Körb.
H.
On siliceous slabs; very rare.

R. roboris (Duf. ex Nyl.) Arnold
DM; E6; F2 (IMI 152958); H; I1 (Vězda, Lich. Sel. Exs. no. 999), 2, 3 (IMI 152908); L.
On trees; locally abundant.

R. sophodes (Ach.) Massal.
N4 (IMI 153135).
On *Salix* twigs; very rare.

R. subexigua (Nyl.) Oliv. (= *R. salina* Degel.).
G2; I1; N3.
On concrete and basic rocks; occasional.

Sarcogyne regularis Körb.
N4.
On concrete posts; very rare.

Schismatomma decolorans (Turn. & Borr. ex Sm.) Clauz. & Vězda
DM; I1; J3 (IMI 152909); K; N4.
On *Acer pseudoplatanus*, *Fagus* and *Ulmus;* rare.

Sphaerophorus fragilis (L.) Pers.
CY, 1966, *R. Hill* (Herb. R. Hill).
On siliceous wall of bridge; extinct.

S. globosus (Huds.) Vain.
CY, 1966, *R. Hill* (Herb. R. Hill).
On siliceous wall of bridge; extinct.

Stenocybe septata (Leight.) Massal.
J2 (BM), 3.
On *Castanea* and *Ilex* in the shade; rare.

Sticta fuliginosa (Dicks.) Ach.
F1 (BM; IMI 159880); J1.
Amongst mosses on *Fraxinus* and *Salix;* very rare.

S. limbata (Sm.) Ach.
F1 (BM); J2.
On *Corylus* and *Salix;* locally frequent.

S. sylvatica (Huds.) Ach.
CY (IMI 152910); F1; J1, 2.
Amongst mosses on *Corylus*, *Fraxinus*, *Populus* and *Salix;* locally abundant.

Toninia aromatica (Sm.) Massal.
CH; CY; S; SV.
On mortar and calcareous gateposts and walls; occasional.

Trapelia coarctata (Sm.) Choisy (≡ *Lecidea coarctata* (Sm.) Nyl.).
L; SV.
On siliceous rocks; occasional.

Usnea articulata (L.) Hoffm.*
DM (IMI 152955, 152952); J1.
On branches in well lit situations; occasional.

U. ceratina Ach. (incl. var. *incurvescens* (Arnold) Oliv.)*.
CY; DM (DUKE; IMI 152950, 160165, 160172); F1; G2; J1 (IMI 152957), 3; L.
On branches in well lit situations; frequent.

U. florida (L.) Web.
DM.
On *Salix* twigs; very rare.

U. fragilescens Stirt. (= *U. mollis* Stirt.).
CY; DM (IMI 152951*a*); F1; J1, 1960, *N. Wallace* (Herb. N. Wallace), 3 (IMI 152963).
On twigs in well lit situations; occasional.

U. fulvoreagens (Räs.) Räs.*
DM (DUKE; IMI 159846).
On *Salix;* locally abundant.

U. glabrescens (Nyl. ex Vain.) Vain.
CY; DM; F1; L.
On twigs in well lit situations; occasional.

U. intexta Stirt.*
J2 (IMI 153188).
On branches of *Quercus;* very rare.

U. intexta var. *constrictula* (Stirt.) D. Hawksw. & Chapman.*
DM (IMI 152956).
On *Salix;* rare.

U. rubiginea (Michaux) Massal. (= *U. sublurida* Stirt.).
DM; F1 (IMI 159889); I1, 1961, *K. L. Alvin.*
On trees in well lit situations; occasional.

U. subfloridana Stirt.*
C (IMI 152965); CY (IMI 152968); D (IMI 152966); DM (DUKE; IMI 152951*b*, 152954, 160092, 160094); F1, 2 (IMI 152959); G2; H (IMI 152953); I1, 3; J1 (IMI 152964), 2, 6 (IMI 152967); K; L; M; N3, 4; SV.
On trees in well lit situations; very common; frequently with apothecia 0·5–1·5 cm. in diameter.

U. subfloridana var. *melanopoda* (Asah.) D. Hawksw.*
CY (IMI 152969, 152970); DM (DUKE; IMI 160093); J1 (IMI 152960).
On trees in well lit situations; occasional.

Verrucaria aquatilis Mudd
F1 (IMI 159878); J1 (BM; IMI 153163).
On siliceous rocks in streams; occasional.

V. fusconigrescens Nyl.
H.
On siliceous slabs; very rare.

V. glaucina Ach.
CH; CY; S; SV.
On calcareous gateposts, memorials and walls; occasional.

V. hochstetteri Fr.
CH; CY (IMI 152973*c*); SV.
On calcareous gateposts and walls; occasional.

V. hydrela Ach.
J1 (BM; IMI 159870).
On siliceous rocks in stream; locally abundant.

V. kernstockii Zsch.
F1; J1 (BM; IMI 153159*a*).
On siliceous rocks by and in streams; occasional.

V. maura Wahlenb. ex Ach.
Unlocalized, 1936, *W. Watson* (Watson, 1937, p. 14).
On siliceous rocks; very rare or extinct.

V. muralis Ach.
CY; S; SV.
On basic rocks in walls; occasional.

V. nigrescens Pers.
CH; CY; I1, 3; N3, 4; S; SV.
On calcareous rocks, mortar, walls and concrete; frequent.

V. praetermissa (Trevis.) Anzi (= *V. laevata* Körb., non Ach.).
J1 (IMI 153159*b*).
On siliceous shaded rocks by stream; very rare.

V. viridula (Schrad.) Ach.
CY; I1 (IMI 153152).
On gatepost and siliceous rocks; occasional.

Xanthoria aureola (Ach.) Erichs.
S; SV.
On concrete posts and wall of barn; occasional.

X. candelaria (L.) Th. Fr.
N3.
On decorticate *Ulmus;* rare.

X. parietina (L.) Th. Fr. (incl. var. *ectanea* (Ach.) Kickx).
B; C; CH; CY; DM; E6; G2; H; I1, 2, 3; J3; K; L; M; N3, 4; S; SV.
On trees, decorticate wood, rocks, walls and shingle in well lit situations; very common.

X. polycarpa (Hoffm.) Oliv.
B; E6; I1, 3.
On twigs of *Crataegus*, *Fraxinus* and *Sambucus*, and on decorticate wood; occasional.

NOTES ON PARTICULAR SPECIES

This section provides further information on particularly interesting or critical taxa which occur in the Reserve. Determinations of chemical components by myself were made by thin-layer chromatography (TLC) using Eastman Chromagram

Sheet No. 6060 and a solvent system of benzene (90): dioxane (25): acetic acid (4) and spraying with either 10 per cent H_2SO_4 (with heating) or Steiner's Stable *p*-phenylenediamine solution after observation under ultra-violet (UV) light; those by Dr. C. F. Culberson were made according to the method of Culberson and Kristinsson (1970). Where determinations of chemical components have also involved the use of microcrystal tests this is indicated.

Acarospora smaragdula (Wahlenb. ex Ach.) Massal., Ric. Aut. Lich.: 29 (1852).

Material of this species from the granite memorial in unit B persistently failed to give the characteristic K+ red reaction used in the determination of this species (cf. Duncan, 1970, p. 103). On examination by TLC it was, however, found to contain minute amounts of norstictic acid which is presumed to be the cause of the K+ red reaction in normal material of this species. It is therefore clear that the use of this reaction for the determination of this species is not a reliable character. Usnic acid, which has been reported for this species by Mitchell (1965), was not noted in the Slapton collection.

Arthonia cinereopruinosa Schaer., Enum. Crit. Lich. Eur.: 243 (1850).

This species was only discovered on a single tree (*Populus*) in the Reserve. In the British Isles *A. cinereopruinosa* was first reported from Kirkudbrightshire (James, 1966, p. 242) but has since been collected in Argyllshire and Caernarvonshire. It appears to be extremely rare or overlooked in England but in Europe it extends from northern Italy into southern Scandinavia (Poelt, 1969, p. 120).

Arthonia exilis (Flörke) Anzi, Cat. Lich. Sondr.: 94 (1860).

≡*Allarthonia exilis* (Flörke) Sandst., Abh. Naturw. Verein Bremen, **21**: 46 (1912).

At Slapton this species is not uncommon on a small group of mature *Sambucus nigra* shrubs in I1, and occurs sparingly on *Salix* in N4. In both sites it is restricted to small twigs. *Arthonia exilis* is unknown elsewhere in the British Isles and has not previously been published as a British species (except in the list of Hawksworth, 1971). It appears to have a scattered distribution in temperate areas of Europe (Poelt, 1969, p. 112) but its distribution is incompletely known. This species will be discussed in further detail in a paper by Mr. P. W. James currently in preparation.

Arthonia tumidula (Ach.) Ach., Neues J. Bot. (Erfurt) **1** (3): 11 (1806).

≡ *Spiloma tumidula* Ach., Meth. Lich.: 11 (1803).

= *Spiloma tumidula* var. *rubrum* (Pers.) Ach., Lich. Univ.: 137 (1810).

= *Arthonia cinnabarina* (DC.) Wallr., Fl. Crypt. Germ. **1**: 320 (1831).

≡ *Coniocarpon cinnabarinum* DC., *in* Lam. & DC., Fl. Franç., ed. 3, **2**: 323 (1805).

Vězda (1970, no. 878) pointed out that *A. tumidula* is the correct name for the species previously called *A. cinnabarina* by most European authors. Examination of authentic material (presumably type) of *Spiloma tumidula* in Acharius' herbaria in BM (Ach. sheet no. 1) and Helsinki (H) by Mr. P. W. James and myself confirms that Vězda's interpretation of this species is correct. Material of var. *rubrum* on the same sheet in BM is also this species.

In the British Isles *A. tumidula* is a characteristic but polymorphic species of smooth barked trees growing in moderately to very sheltered situations in damp upland and western areas. It appears to occur frequently throughout Devonshire in suitable habitats.

Botrydina vulgaris Bréb. ex Meneghini, Mem. Acad. Torino, ser. 2, **5**: 98 (1844).

This "lichen" is a combination of the hyphae of a Basidiomycete fungus with algae of the genus *Coccomyxa* Schmidle to form glomeruloid structures. *Myxomphalia maura* (Fr.) Hora, *Omphalina ericetorum* (Pers. ex Fr.) M. Lange, *O. grisella* (Weinm.) Moser, and *O. luteovitellina* (Pilát & Nannf.) M. Lange have been recorded as forming "*Botrydina*-type" associations (James, 1965, p. 105; Oberwinkler, 1970, p. 159).

In short turf in area C at Slapton *Omphalina griseopallida* (Desm.) Quél. (determined by Dr. D. A. Reid) formed a *Botrydina*-like association. This species has not previously been reported as occurring in a lichenized state.

Buellia schaereri de Not., Giorn. bot. Ital., ann. 2, **1** (1): 199 (1846).

Buellia schaereri is characteristically a species of old coniferous trees and decorticate wood in upland areas of central and northern Europe. In southern Britain it is known from scattered localities but has not previously been discovered in Devonshire. It is possible that it has been overlooked for small specimens of *B. punctata* from which it can be readily separated by its distinctively shaped smaller ascospores. The spores of *B. punctata* are 8·5–20·0 × 4·5–10·5 μm., whilst those of *B. schaereri* measure 5·5 –11·5 × 2·5–5·0 μm. The spores of these two species are compared in Fig. 5.

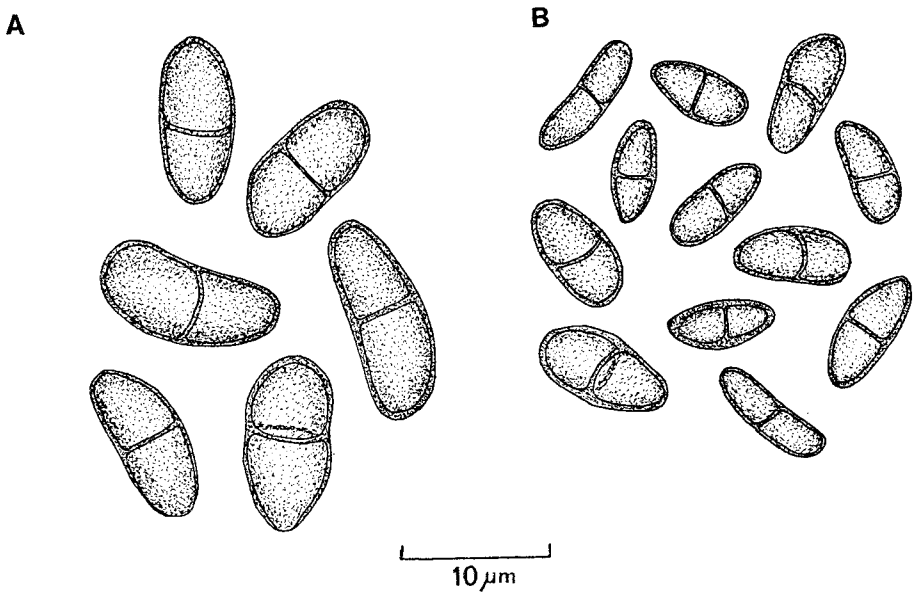

FIG. 5.
Ascospores of (A) *Buellia punctata* (IMI 145835), and (B) *B. schaereri* (IMI 153142).

Evernia prunastri (L.) Ach., Lich. Univ.: 442 (1810).

= *E. herinii* Duvign., Bull. Soc. r. Bot. Belg. **72**: 153 (1940).

≡ *E. prunastri* var. *herinii* (Duvign.) Maas Geest., Blumea **7**: 582 (1954).

Specimens of this species which appear to lack usnic acid and consequently have a grey instead of a yellowish-green thallus have been described as a distinct species, *E. herinii*. The failure to detect usnic acid may well be largely due to the

insensitivity of the microchemical methods that have been used to study this species as Culberson (1963, p. 337) correctly states. The discovery of grey and yellowish-green plants growing adjacent to each other on decorticate logs in area B at Slapton, however, clearly indicates that some genetic factor must be involved. This case parallels closely that of the usnic acid present and absent chemotypes in *Haematomma ventosum* (L.) Massal. where both races exist side by side in nature but in which the race able to produce this acid appears to produce different amounts under different conditions of illumination (Hawksworth, 1970). I therefore consider that the race of *E. prunastri* which appears to lack usnic acid and which is able to maintain its identity when growing adjacent to plants which contain significant amounts of this acid should also be considered as a chemotype and not recognized taxonomically.

Gyalectina carneolutea (Turn.) Vězda, Folia geobot. phytotax. **4**: 444 (1969).
≡ *Gyalecta carneolutea* (Turn.) Oliv., Fl. Lich. Orne **2**: 187 (1884).
≡ *Parmelia carneolutea* Turn., Trans. Linn. Soc. Lond. **9**: 145 (1808); as "*carneo-lutea*".

In the British Isles this is a local species occurring predominantly in localities with a southerly aspect, and has a pronounced southern distribution (Fig. 6). It is mainly restricted to old deciduous trees, particularly *Ulmus* species, but there are also two collections from rocks in Somerset (BM). *Gyalectina carneolutea* is restricted to Europe and apart from its British stations it is only known from France (Finistère and Normandy) and Portugal (Estremadura region). The known world distribution, based on records kindly made available by Dr. A. Vězda, is summarized in Fig. 8A. No other species of this genus occur in Europe.

At Slapton this species is locally abundant on moderately shaded *Fraxinus* and *Ulmus* forming the characteristic union *Gyalectinetum carneoluteae* (Table 7). Dr. C. F. Culberson detected an unidentified substance, possibly a depside, in material of this species from *Fraxinus* in I1 by TLC.

Zahlbruckner (1924, p. 706–707) included *Cryptolechia* Massal. (Massalongo, 1855, p. 13) in the synonymy of this species but this genus was based on *Lecanora carneolutea* Ach. which Dr. Vězda (*in litt.*) considers to be identical to *Pertusaria carneopallida* (Nyl.) Anzi in Nyl. (= *P. protuberans* (Sommerf. ex Th. Fr.) Th. Fr.). *Cryptolechia* is consequently correctly interpreted as a synonym of *Pertusaria* DC. (Vězda, in Ainsworth, 1971, p. 631).

Lecidella elaeochroma (Ach.) Hasz., Magy. Birod. Zuzmó-Fl.: 197 (1884).
≡ *Lecidea parasema* var. *elaeochroma* Ach., Meth. Lich.: 36 (1803).
= *Lecidella elaeochroma* var. *flavicans* (Ach.) Hasz., Magy. Birod. Zuzmó-Fl.: 197 (1884).

f. ***soralifera*** (Erichs.) D. Hawksw. ***comb. nov.***
≡ *Lecidea elaeochroma* var. *soralifera* Erichs., Ver. bot. Ver. Prov. Brandenb. **71**: 86 (1929)—basionym. Type: Germany, Schleswig Holstein, Kreisgrenzen Pinneberg, an Eschen bei Wissenbergen, 19 October 1902, *C. F. E. Erichsen* (HBG—lectotype).
≡ *Lecidea olivacea* var. *soralifera* (Erichs.) Erichs., Annls mycol. **40**: 144 (1942).
≡ *Lecidea limitata* var. *soralifera* (Erichs.) Laund., Lichenologist **1**: 162 (1960).

This species has been called "*Lecidea limitata* (Scop.) Gray" by British authors since the paper of Laundon (1960) but this name has not been accepted by most

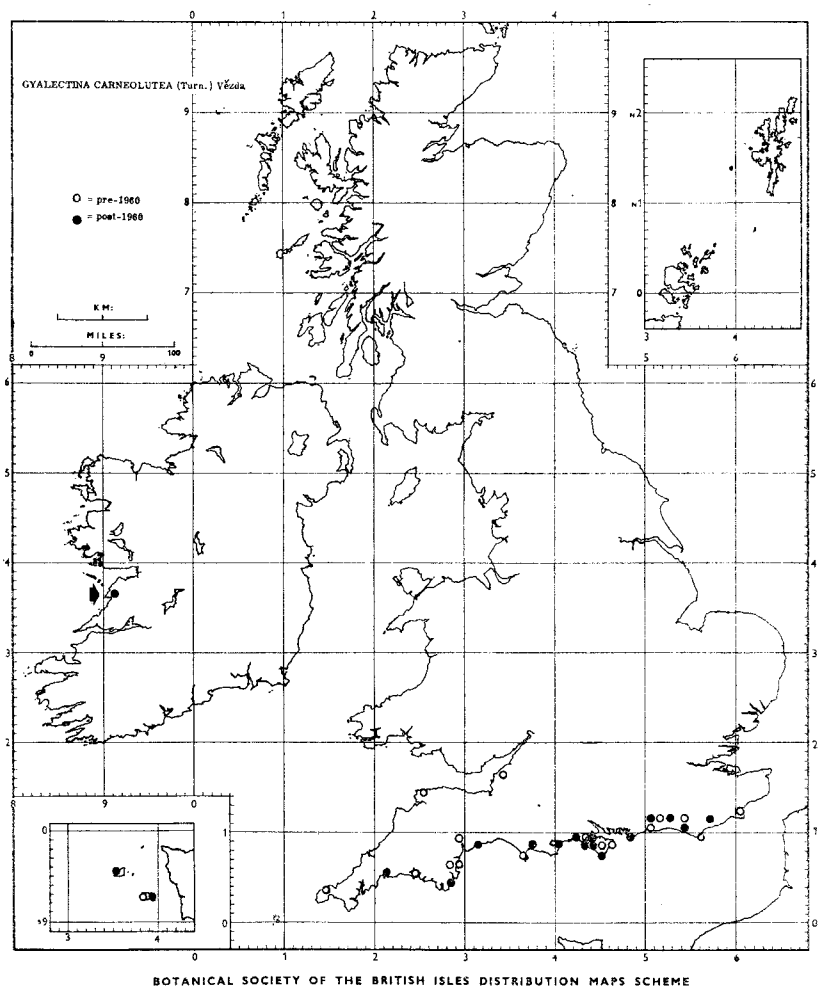

FIG. 6.
British distribution of *Gyalectina carneolutea*.

recent non-British authors (e.g. Degelius, 1964, p. 45; Poelt, 1969, p. 360; Hertel and Leuckert, 1969, p. 374). At the moment the name *Lichen limitatus* Scop., the basionym of *Lecidea limitata* (Scop.) Gray, cannot be satisfactorily typified and so it cannot be definitely applied to this species. Scopoli (1771, p. 363) refers to two polynomials of Micheli (1729, p. 98) authentic material of one of which (no. 35) is preserved in Micheli's herbarium in Florence (FI) and is *Lecidella elaeochroma*. Micheli in turn based his polynomial on one of Dillenius (in Ray, 1724, p. 71) and although material of this taxon in the Sherard herbarium in Oxford (OXF) is composite it includes *L. elaeochroma*. However, neither the Dillenian nor the Micheli material can be used to typify Scopoli's name as Scopoli did not list Micheli's name as a definite synonym but stated "*huic proximi*". For these reasons the name *L. elaeochroma* must be adopted for this species until such time as authentic material of Scopoli's can be traced.

The taxon "*soralifera*" is treated here in the rank of "forma" rather than "varietas" as it appears to be scattered through the range of the species and differs only in the

production of characteristic large, yellowish, clearly delimited soralia. In the British Isles in mosaics of predominantly esorediate thalli single thalli frequently bear one or more soralia. This type of variation, which clearly has some genetic basis, is most appropriately treated as a form according to the principles of Davis and Heywood (1963, p. 101). In the British Isles the var. *flavicans* does not appear to have any taxonomic significance as the brighter yellowish-green colour of the thallus which characterizes this taxon appears to be an environmental phenotypic response to growth in particularly well lit situations, and this type intergrades with the more usual greenish-grey thalli.

Laundon (1960, p. 162) considered that *Lecidea parasema* f. *pachythallina* subf. *granulato-areolata* subsubf. *conspurcato-sorediosa* Harm. (≡ *L. parasema* f. *conspurcato-sorediosa* (Harm.) B. de Lesd.) might be identical to "*soralifera*". An examination of the material of this taxon in Harmand's herbarium (France, Gare de Marbache, Erable, 1898, *J. Harmand*, Lich. Loth. no. 923, 1B(b), DUKE—lectotype), however, showed it to be an abnormally developed specimen of f. *elaeochroma* lacking the type of soralia characteristic of f. *soralifera*. Erichsen (1929, p. 86) pointed out that Harmand's taxon was not to be confused with his "*soralifera*". Klement (1963, p. 51) and Poelt (Lich. Alp. Exs. no. 184; 1969, p. 359) treated *Lecidella flavisorediata* (Vězda) Hertel & Leuckert as identical with "*soralifera*" but a study of authentic material of *Lecidea flavisorediata* Vězda (as "*flavosorediata*") in BM (Vězda, Lich. Sel. Exs. no. 112) revealed that it has diffuse and not clearly delimited soralia. I consider *L. flavisorediata*, which has not been recorded for the British Isles, to be a distinct species from *L. elaeochroma*.

Lithographa dendrographa Nyl., Flora (Regensburg) **47**: 488 (1864).

There were no recent British records of this species until Dr. T. D. V. Swinscow and Dr. F. Rose found it on old *Fraxinus*, north-west of Ford, Chivelstone Parish (20/786409), South Devon, in 1969 and Mr. P. W. James discovered it on *Ulmus*, near Calgary Bay, Island of Mull, Argyllshire, in the same year. Subsequently Dr. F. Rose and Mr. B. J. Coppins collected it in the New Forest, Hampshire (1½ miles west of Stoney Cross, valley of Highland Water south of Ocknell Arch) in July 1971, and Dr. Rose has found it in two sites in East Cornwall (Lostwithiel, Boconnoc Deer Park (20/15 & 20/16), on *Fraxinus* and *Ulmus*) in September 1971. The known British Distribution of this species is summarized in Fig. 7.

At Slapton *Lithographa dendrographa* occurs on *Fraxinus* and *Ulmus* trunks in moderately shaded situations, often in association with *Gyalectina carneolutea*. This species is only known from western Europe and appears to be exceedingly rare although it may often have been overlooked for some of the larger species of the *Opegrapha varia* Pers. complex with which it has some superficial resemblance.

Dr. C. F. Culberson detected an unidentified substance, possibly a xanthone, in material of this species from *Fraxinus* in I1.

Pannaria mediterranea C. Tav., Portug. Acta Biol., B, **8**: 5 (1965).

Pannaria mediterranea was originally described from Portugal where it occurs in several provinces, and is also known from France, Israel, Morocco, Madeira, the Azores, and probably the Canary Islands (Tavares, 1965, p. 7; Galun, 1970, p. 23). In the British Isles it was first discovered in the New Forest in 1968 (James, 1971)

and found in Slapton in August 1971. At Slapton it occurs on *Salix* in the F1 marsh forming a colony about 200 cm.^{2} on a single tree. The composition of this stand is given in Table IX.

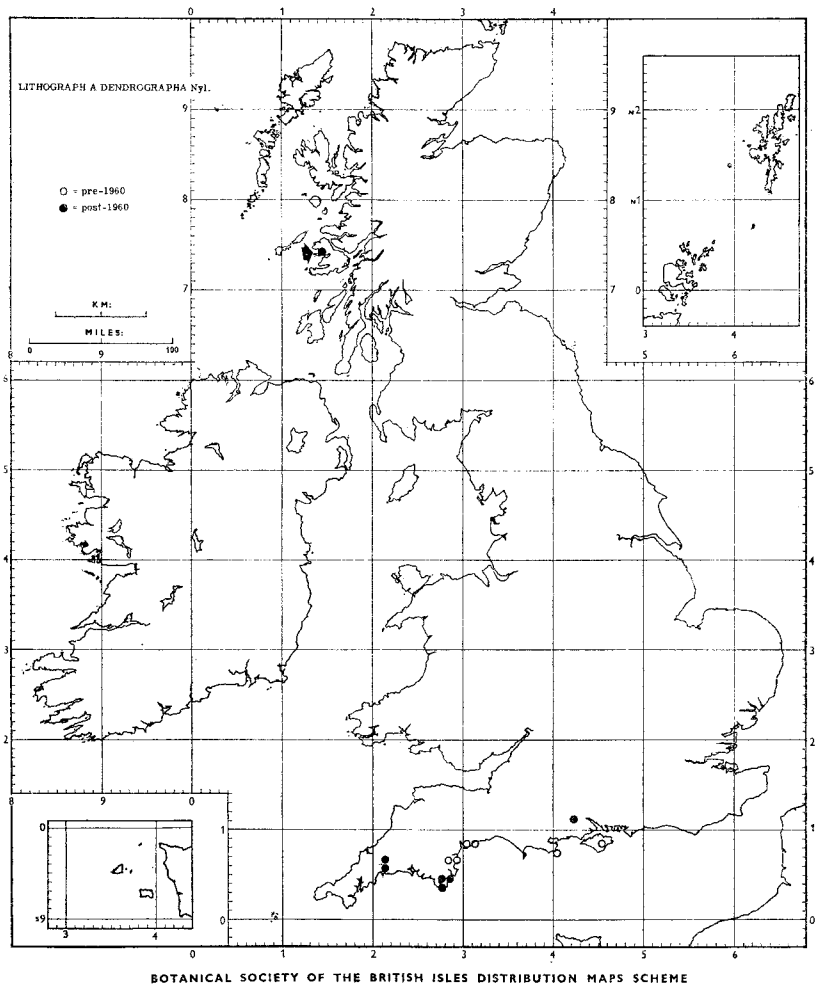

FIG. 7.
British distribution of *Lithographa dendrographa*.

More recently Mr. B. J. Coppins and Dr. F. Rose have discovered this species in a further locality in South Devonshire, on *Quercus* in woods East of Vixen Tor (20/54–74–) on 15 September 1971.

Parmelia borreri (Sm.) Turn., Trans. Linn. Soc. Lond. **9**: 148 (1808).
= *Parmelia pseudoborreri* Asah., J. Jap. Bot. **26**: 259 (1951).

This species, which has a black underside to the thallus and contains gyrophoric acid in its medulla, has been overlooked by many British authors for the much commoner *P. subrudecta* which has a pale tan underside and contains lecanoric acid

FIG. 8.
World distribution of *Gyalectina carneolutea* (A) and *Phaeographis lyellii* (B), and European distribution of *Parmelia borreri* (C).

Table IX. Pannaria mediterranea *community*

Species	Stand 1	Species	Stand 1
Hypnum cupressiforme	4	*Ulota crispa*	4
Pannaria mediterranea	6	*Usnea fragilescens*	3
Parmelia caperata	4	*U. subfloridana*	3
P. perlata	4		
Sticta sylvatica	1	Bare (%)	10

1 = F1, *Salix* trunk, asp. 350°, incl. 61°, diam. 18 cm., 300 cm.².

in its medulla. The majority of published records of *P. borreri* by older British authors are now known to refer to *P. subrudecta*. The true *P. borreri* was noted by Hale (1965, Fig. 1) from only three British stations, all based on material collected last century. Two specimens collected by Dr. K. L. Alvin at Slapton in 1962 have been found to contain gyrophoric acid and this species has since been discovered at many sites in the Slapton area and in other parts of southern Britain (mainly by Mr. B. J. Coppins, Dr. F. Rose and myself). From Fig. 9 it will be seen that this is a local British species with a marked broad southerly distribution. All specimens used in the preparation of Fig. 9 were studied by microcrystal tests in G.E. and G.A.W. solutions. Both *P. borreri* and *P. subrudecta* contain atranorin in the cortex.

In Europe *P. borreri* has a pronounced southern-oceanic distribution (Fig. 8C) and is unknown in Scandinavia. Fig. 8C includes data from Hale (1965) and Targé and Lambinon (1965).

Parmelia caperata (L.) Ach., Meth. Lich.: 216 (1803).

Dr. C. F. Culberson detected caperatic, protocetraric and usnic acids together with traces of unidentified substances in material from I1 (IMI 160399) by TLC.

Parmelia carporrhizans Tayl., Hook. Lond. J. Bot. **6**: 163 (1847).

In the British Isles this is a very rare species with a very pronounced southern distribution (Fig. 10). Dahl (1968, p. 36) suggested that it was approaching extinction

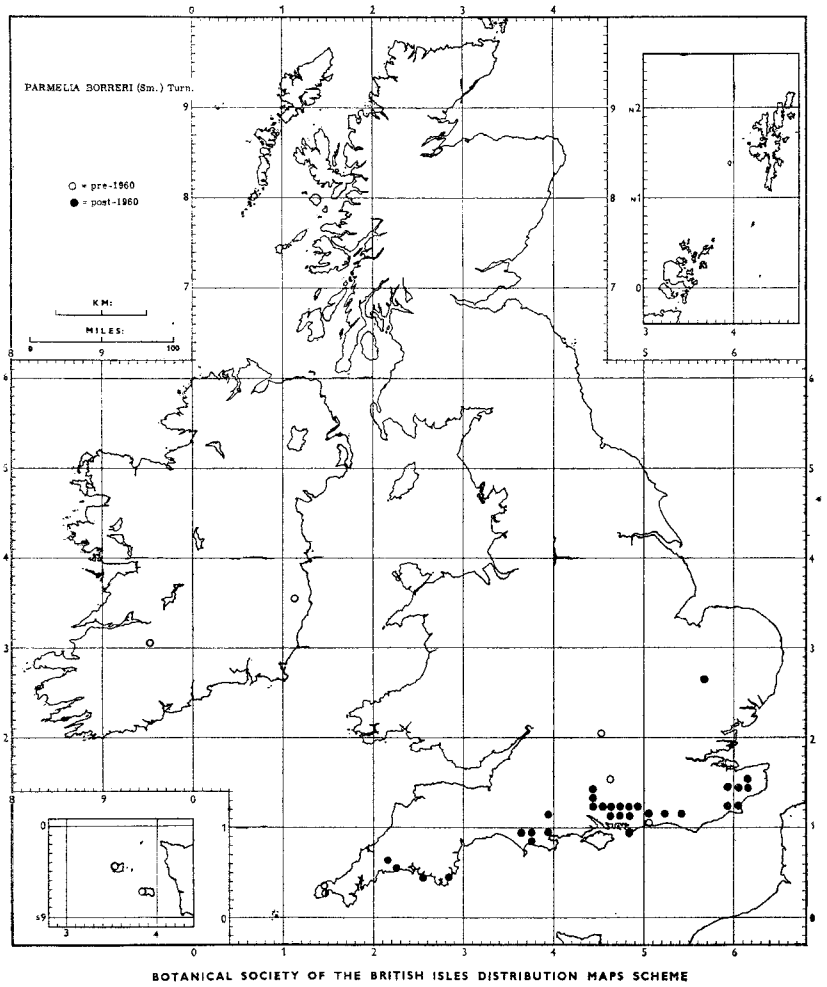

FIG. 9.
British distribution of *Parmelia borreri*.

in the British Isles and while this appears to be true of its stations outside the south-west peninsula, in the Slapton area it is vigorous and able to colonize new substrates. In the Reserve it is not infrequent and prefers well lit situations such as those afforded by the upper and downhanging branches of mature trees, and it is often discovered on twigs broken off recently by the wind which have fallen to the ground. At Slapton it most commonly occurs on *Acer pseudoplatanus*, *Fraxinus*, *Salix* and *Ulmus*.

Parmelia carporrhizans, although first described from the Canary Islands, is essentially a European species with a broadly mediterranean distribution extending into the Alps (Poelt, 1969, p. 446), the southern U.S.S.R. (Kopaczevskaja *et al.*, 1971, p. 339), and central and western France (Ozenda and Clauzade, 1970, p. 624). It has recently been collected in Brittany (Coppins, 1971) where it is also rare.

There appears to be some confusion between the identity of this species and *P. quercina* (Willd.) Vain. in the British herbaria and many specimens determined as "*P. quercina*" have been found to be *P. carporrhizans*. The occurrence of rhizinae on

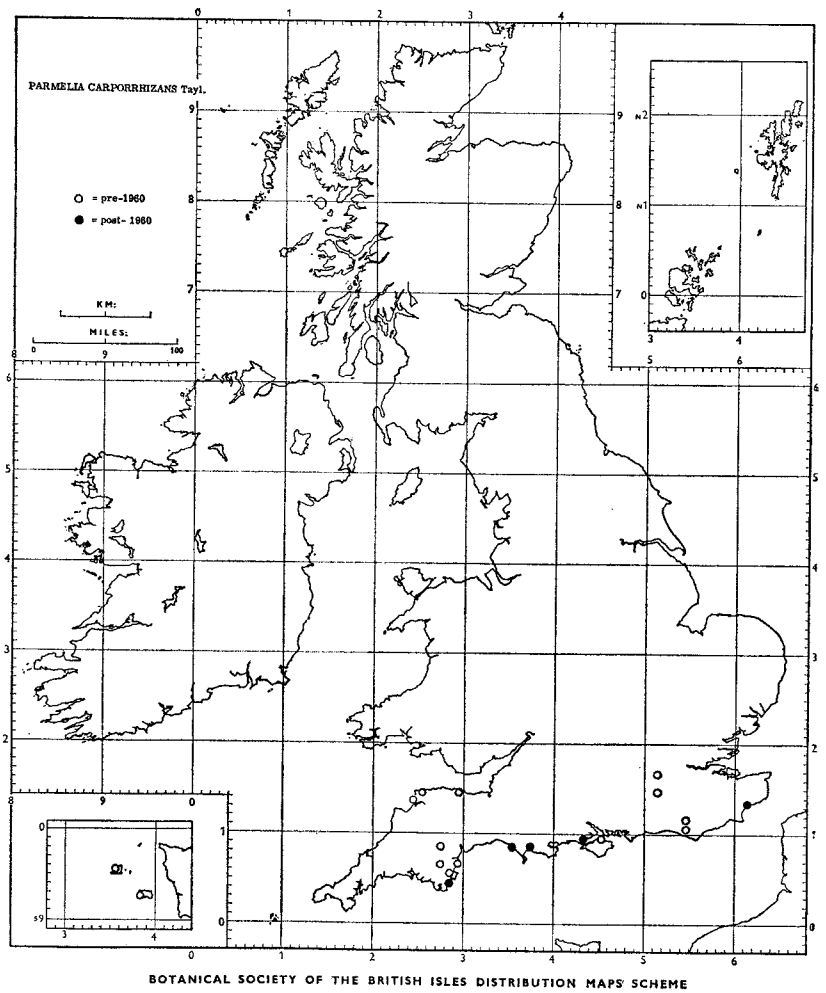

FIG. 10.
British distribution of *Parmelia carporrhizans*.

the lower surface of the excipulum thallinum which project downwards towards the upper cortex cannot be used as a reliable character for the separation of these two species as apothecia with and without these hairs often occur on the same thallus in the Slapton area. Thus all the British material may represent the single species *P. carporrhizans* and the status of *P. quercina* needs a critical investigation.

Dr. C. F. Culberson detected atranorin and lecanoric acid in material of this species from *Salix* in CY (DUKE) by TLC.

Parmelia perlata (Huds.) Ach., Meth. Lich.: 216 (1803).

Dr. C. F. Culberson detected atranorin, constictic, norstictic (trace) and stictic acids together with four unidentified substances in material of this species from *Salix* in DM and *Sambucus* in I1 by TLC.

Parmelia soredians Nyl., Bull. Soc. Linn. Normand., sér. 2, **6**: 259 (1872).

Parmelia soredians is a not uncommon species of the *Parmelietum revolutae* var. *caperatosum* in south-east England but becomes much rarer in the south-west. In 1970 the Slapton stations constituted the most westerly localities for this species in England but it has subsequently been discovered in two further sites west of Slapton in Devonshire (South Devon: Newton Ferrers, on *Fagus*, 26 August 1971, *D. L. Hawksworth;* North Devon: Clovelly, car park above village, on fence-post, 2 September 1971, *P. W. James*). It is, however, extremely rare in Devonshire and mainly restricted to low-rainfall areas although this cannot be the sole factor affecting its rarity as the species occurs in high-rainfall areas in Killarny, Eire and in Anglesey. Dr. F. Rose is preparing a map of the British distribution of this species to be published shortly.

Phaeographis lyellii (Sm.) Zahlbr., Nat. Pflanzenfam. **1** (1*): 99 (1905).

This species was originally described from the New Forest, Hampshire, where it is now extremely rare and known only from a single site (Ringwood, Red Shoot Wood, nr. entrance to Roe Inclosure (41/19-08-), 22 February 1971, *B. J. Coppins & F. Rose*, BM). *Phaeographis lyellii* is an exclusively European species (Fig. 8B) known only from the British Isles, France, Madeira and Portugal (Mitchell, 1961, p. 187). In Brittany it appears to occur fairly frequently, particularly on young *Castanea* (Coppins, 1971). In the British Isles it was formerly known to be frequent only in south-west Ireland but has since been discovered in Jersey, Merionethshire, and several sites in Dorset and Devonshire indicating that it has a scattered distribution in south-west Britain. In the Slapton Reserve it occurs not infrequently on smooth-barked trees, particularly *Acer pseudoplatanus* and *Castanea*, growing in moderate to deep shade forming a very characteristic community, the *Graphinetum platycarpae* var. *graphinetum anguinae* (Table VIII). Barkman (1958, p. 384) regarded the *Graphinetum platycarpae* as "hyperatlantic" and the newly described variant of this differs in the replacement of *Graphina platycarpa* (not a British species) by *G. anguina* and the abundance of *Phaeographis lyellii.*

The Slapton populations are vigorous in their ability to colonize new substrates and occur on young trees of *Acer pseudoplatanus* only 5–10 cm. in diameter as well as on older, larger trees.

Physcia tribacioides Nyl., Flora (Regensburg) **57**: 307 (1874).

This is an extremely rare species in the British Isles (Fig. 11) with a pronounced south-western distribution. In Europe it is only otherwise known from western France to southern Spain (Poelt, 1969, p. 509) but appears to be not uncommon in Brittany (Coppins, 1971).

This specific epithet was given the spelling "*tribacoides*" by Nylander in the original description of this species and this spelling has been adopted by several European authors. James (1965, p. 139) used the spelling "*tribacioides*" and as this is orthographically more correct this form should be adopted.

Pyrenula nitidella (Flörke) Müll. Arg., Bot. Jahrb. **6**: 414 (1885).

≡ *Pyrenula nitida* var. *nitidella* (Flörke) Schaer., Enum. Crit. Lich. Eur.: 212 (1850).

The taxon has generally been treated as a variety of *P. nitida* by British authors, distinguished from var. *nitida* by the smaller size of the perithecia: 0·2–0·4 mm. diameter in *nitidella*, and 0.5– *c.* 1.0 in *nitida*. As a result of a detailed study of

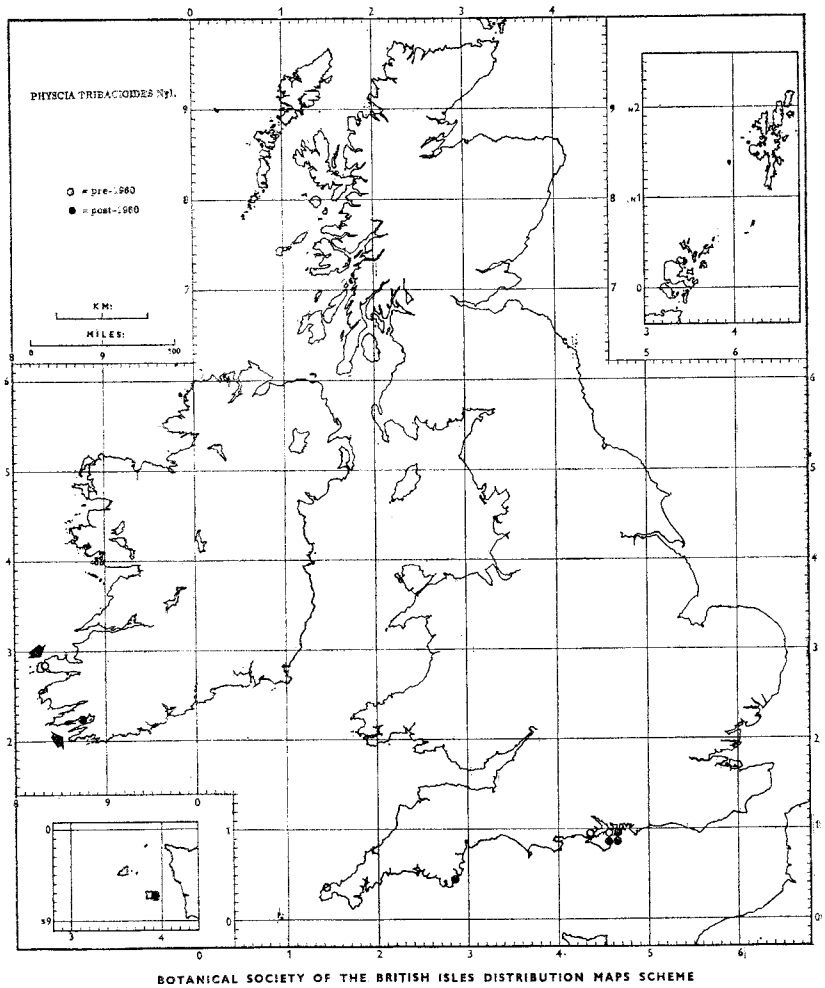

FIG. 11.
British distribution of *Physcia tribacioides*.

Scandinavian material Almborn (1948, p. 106) concluded that the rank of variety was most appropriate as he found a few specimens which could not be reliably placed in either taxon. Poelt (1969, p. 548), however, has treated them as distinct species. In the British Isles (including the Slapton populations) both frequently occur together forming mosaics and maintaining their identities and so it is clear that the difference in the size ranges of the perithecia has some genetic basis. As intermediates are either completely absent or exceptionally rare in Britain they behave as distinct species and I consequently consider that they should be treated as such until it is proved that true intermediates occur which are not merely young or poorly developed material of *P. nitida*.

Ramalina curnowii var. ***atlantica*** (Culb.) D. Hawksw. ***comb. nov.***
≡ *Ramalina atlantica* Culb., Brittonia **19**: 350 (1967)—basionym. Contains usnic acid only.

Ramalina siliquosa var. ***crassa*** (Del. ex Nyl.) D. Hawksw. ***comb. nov.***

≡ *Ramalina cuspidata* var. *crassa* Del. ex Nyl., Bull. Soc. Linn. Normand., sér. 2, **4**: 159 (1870)—basionym.

≡ *Ramalina crassa* (Del. ex Nyl.) Mot., Fragm. Florist. Geobot. **6**: 969 (1961). Contains salazinic and usnic acids.

These are two of the chemical races of the *R. siliquosa* (Huds.) A. L. Sm. complex which were treated as distinct species by Culberson (1967). The chemical races show distinct ecological preferences (Culberson and Culberson, 1967; Culberson, 1969) and there is some indication that at least some of them have slight geographical distribution differences within Europe. It is therefore clear that these races have some taxonomic significance but the ecological and geographical differences are of a minor, local, nature and the chemical constituents involved biogenetically closely related (Culberson, 1967).

I agree with Krog (1969) that *R. curnowii* Cromb. ex Nyl. (incl. *R. atlantica*) should be regarded as a species distinct from *R. siliquosa* on morphological grounds as it is able to grow with *R. siliquosa* and maintain its identity and because it has a more westerly distribution in Europe. The type of chemical variation is not of the random type which I have not recognized taxonomically but treated as "chemotypes" (Hawksworth, 1970) but parallel to the types of chemical variation which I have regarded as constituting "varieties" (Hawksworth, 1968, 1969; Hawksworth and Chapman, 1971) in that there are ecological (and also possibly geographical) correlations and that the compounds involved are biogenetically closely related. The two chemical races which occur in Slapton are consequently treated as varieties here.

Usnea articulata (L.) Hoffm., Deutsch. Fl. **2**: 133 (1796).

This species has generally been considered to contain barbatic, salazinic and usnic acids with races with atranorin and "articulatic" acid (Culberson, 1969, p. 534) but recently Follmann and Huneck (1970, p. 31) reported fumarprotocetraric acid in material determined as "subsp. *mediterranea* Mot.".

Two specimens from *Salix* in DM (IMI 152952, 152955) gave the medullary reactions K— and PD+ bright orange-red and were found to contain fumarprotocetraric and usnic acids by TLC. The subsp. *mediterranea* has been distinguished from subsp. *articulata* in that the stems are less swollen and material does not become reddish-brown when it has been in the herbarium for a considerable time. This type of discoloration in the herbarium is not uncommon in species containing large amounts of salazinic acid and closely allied compounds.

It is therefore clear that *U. articulata* represents a species with several chemical races and possibly a well defined morphological race and that the group requires a detailed taxonomic revision.

Usnea ceratina Ach., Lich. Univ.: 619 (1810).

Barbatic and diffractaic acids and traces of two unidentified substances (including an acetone-soluble red pigment) were detected by Dr. C. F. Culberson in a fragment of this species from *Salix* in DM (DUKE; IMI 160172) by TLC. Usnic acid may also have been present in too low a concentration to detect by TLC.

The discovery of barbatic acid is of particular interest as although it was reported from this species by Zopf (1907, p. 423) this report has generally been regarded as an error (cf. Culberson, 1969, p. 536).

Usnea fulvoreagens (Räs.) Räs., Lich. Fenn. Exs. no. 13 (1935).

Salazinic and usnic acids and an unidentified compound (possibly constictic acid) were detected in material of this species from *Salix* in DM (DUKE) by Dr. C. F. Culberson by TLC. Hale (1969, p. 185) has found races of this species with norstictic acid and with stictic acid in addition to the salazinic acid race in North American material of this species.

The author citation of this species is incorrectly given as "(Räs.) Mot." by James (1965, p. 151). Räsänen's combination was published prior to that of Motyka.

Usnea intexta Stirt., Scott. Nat. **6**: 102 (1881).

Type: Scotland, Argyllshire, Crinan Canal, *J. McAndrew* (BM—holotype).

= *Usnea subpectinata* Stirt., Scott. Nat. **6**: 108 (1881). Type: Scotland, Kirkudbrightshire, New Galloway, 1880, *J. McAndrew* (BM—lectotype). Contains constictic, norstictic (±), stictic and usnic acids.

var. ***constrictula*** (Stirt.) D. Hawksw. & Chapman ***comb. nov.***

≡ *Usnea constrictula* Stirt., Scott. Nat. **6**: 109 (1881)—basionym. Type: Scotland, Argyllshire, Connel Ferry, Herb. Stirton (BM—lectotype). Contains salazinic and usnic acids.

Usnea intexta and *U. subpectinata* were separated by Motyka (1936–1938) in that the branches of *U. intexta* were considered to be more strongly papillate than those of *U. subpectinata*. Motyka placed *U. constrictula* as a synonym of *U. intexta*. James (1965, p. 151) suggested that *U. intexta* and *U. subpectinata* might be conspecific and Poelt (1969, p. 690) has also treated them as doubtfully distinct. Mr. D. S. Chapman and myself have investigated this problem and consider these species conspecific on morphological grounds as the degree of prominance of the papillae was found to be an inconsistent and variable character. Studies by microcrystal tests in G.A.*o*-T. solution and by TLC revealed two distinct chemical races (Fig. 13).

In the British Isles *U. intexta* is a southern and western species (Fig. 12) with the two chemical races scattered throughout its range. The chemical races are recognized taxonomically here in the rank of variety because of the biogenetic difference between salazinic and stictic acids (cf. Culberson, 1967, p. 340) and the absence of any intermediates.

Duvigneaud (1947, p. 145) had previously reported norstictic and stictic acids from material of *U. intexta* collected in Brittany. The report of atranorin in this species by Ramaut (1967, p. 581) appears to be an error in view of our data. Neither Duvigneaud nor Ramaut studied the type material of the species.

Usnea subfloridana Stirt., Scott. Nat. **6**: 294 (1882).

Type: Scotland, Perthshire, Killin, 19 July 1881, *J. Stirton* (BM—holotype).

= *Usnea comosa* subsp. *colorans* Asah., Lich. Jap. **3**: 94 (1956). Contains decarboxythamnolic (±), thamnolic and usnic acids.

var. ***melanopoda*** (Asah.) D. Hawksw. ***comb. nov.***

≡ *Usnea comosa* subsp. *melanopoda* Asah., Lich. Jap. **3**: 94 (1956)—basionym. Contains salazinic, usnic and possibly constictic (±) acid.

The type collection of this species in BM is represented by two specimens on different sheets and both were found to contain thamnolic and usnic acids by TLC. This species, usually as "*U. comosa* (Ach.) Vain.", has generally been considered to

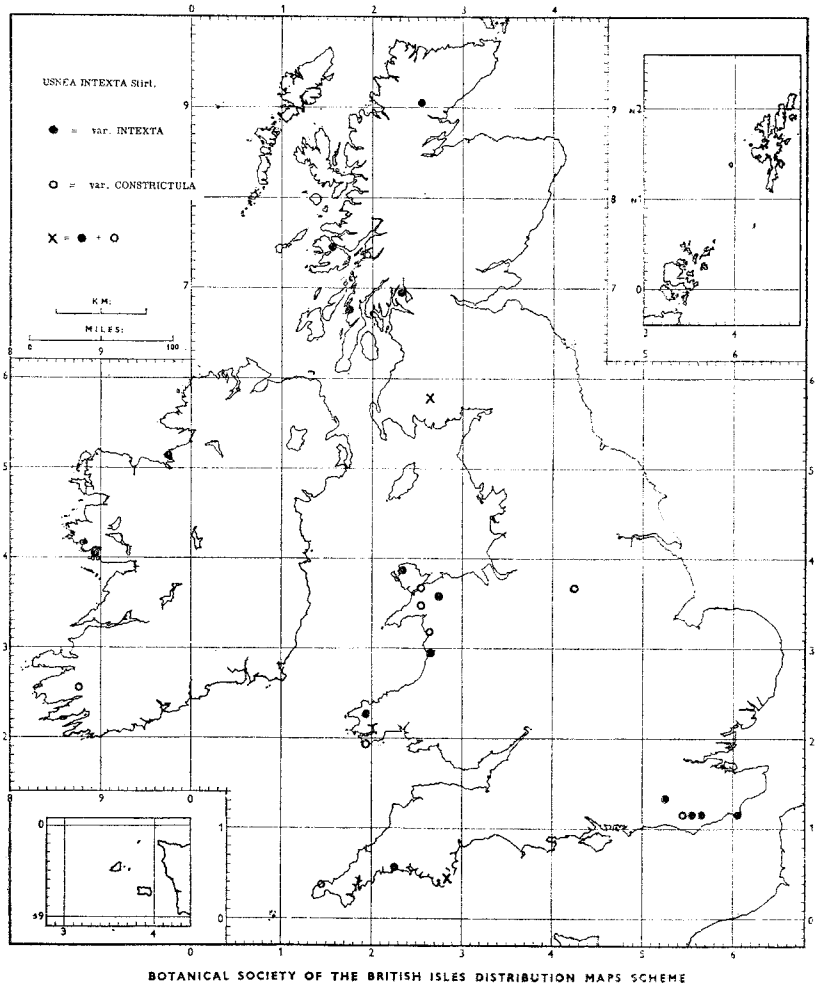

FIG. 12.
British distribution of *Usnea intexta*.

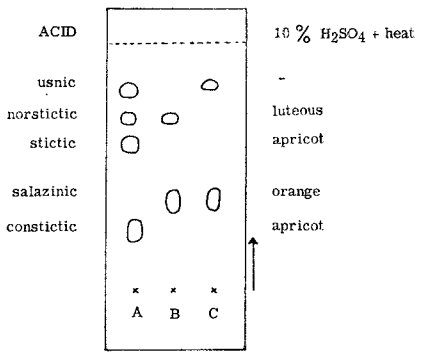

FIG. 13.
TLC chromatogram of (A) *Usnea intexta* var. *intexta* (IMI 153188), and (C) *U. intexta* var. *constrictula* (IMI 152956) with (B) *Ramalina subfarinacea* var. *reagens* (IMI 152906) as control. For method used see p. 558–9.

contain squamatic and usnic acids (Culberson, 1969, p. 537; 1970, p. 357) with several distinct chemical races of which three were described as subspecies by Asahina (1956, p. 94–95): subsp. *colorans* Asah. (thamnolic and usnic acids), subsp. *melanopoda* Asah. (salazinic and usnic acids), and subsp. *praetervisa* Asah. (norstictic and usnic acids). The salazinic and thamnolic acid races occur in the Slapton Reserve and of twelve specimens studied by TLC eight belonged to the thamnolic and four to the salazinic acid race. A compound, possibly constictic acid, occurred in some specimens of the salazinic acid race, and decarboxythamnolic acid in some specimens of the thamnolic acid race (see Asahina and Nuno, 1964, p. 313). Dr. C. F. Culberson also detected two unidentified substances in the apothecia of material of the thamnolic acid race from DM (DUKE) by TLC. In accordance with the principles for the taxonomic treatment of chemical races employed by me in this paper and elsewhere the salazinic acid race is recognized taxonomically in the rank of variety.

No norstictic, protocetraric, squamatic or stictic acid containing plants were present amongst the Slapton material although all these have been reported in races of this species by different authors (cf. Culberson, 1969, 1970) and it is therefore clear that this species requires a more detailed chemical and morphological investigation before the taxonomic significance of these other races can be assessed. Reasons why the name "*U. comosa*" must be replaced by *U. subfloridana* are given by Laundon (1965, p. 71).

Discussion

The total number of species reported here, 255, is the largest number recorded from an area of its size in recent times in England and Wales. The number of corticolous species, 167, is less than that of the New Forest, Hampshire (which has about 220 corticolous species), and Melbury Park, Dorset (which has about 171 corticolous species) but they are vastly larger areas with many ancient trees. Only about twelve other sites in England and Wales are known which have over 100 corticolous species. The lichen flora of Devonshire is, however, the richest of any English county: 666 species have been reported from it, of which 531 have been seen since 1960 (Hawksworth, 1971, and unpublished data). The Slapton area therefore contains 38 per cent of all species recorded from Devonshire and 48 per cent of those seen in the county since 1960. Surprisingly, in view of the number of species present, the Reserve lacks both extensive rock outcrops and ancient woodlands and its

Table X. *Life-form and habitat analysis of the Slapton lichen flora*

Life-forms	Habitats			
	Corticolous+ lignicolous	Saxicolous	Terricolous	All
Fruticose	23	13	14	40
Foliose	44	23	3	54
Squamulose	3	7	1	10
Crustose+leprose	97	62	4	151
Total	167	105	22	255

richness appears to result from a combination of five factors: (1) little anthropogenic disturbance in the last fifty years, (2) the range of variation of woodland type and composition, (3) the presence of several fragmentary microhabitats, (4) the absence of any significant air pollution, and (5) its geographical location.

Six phytogeographical elements have been recognized within the Devonshire lichen flora by Hawksworth (1971) and the Slapton lichen flora is interpreted with reference to these here. It is important to note that the terms "widespread", "pollution sensitive", "eastern", "western", "southern", and "northern" as employed here refer to the distribution of species only within the British Isles and not in Europe as a whole.

Widespread

Much of the lichen flora falls into the category of species widespread throughout the British Isles and includes species which are fairly tolerant of sulphur dioxide air pollution and which are able to thrive on man-made substrates such as concrete. Examples of Slapton species which fall into this category are *Buellia punctata*, *Caloplaca citrina*, *C. heppiana*, *Candelariella aurella*, *C. vitellina*, *Catillaria griffithii*, *Evernia prunastri*, *Hypogymnia physodes*, *Lecanora campestris*, *L. chlarotera*, *L. dispersa*, *Lecidea granulosa*, *Parmelia saxatilis*, *P. sulcata*, *Physcia ascendens*, *P. orbicularis*, *Ramalina farinacea*, *Verrucaria muralis* and *Xanthoria parietina*.

Pollution sensitive

Many species which are known to have been widespread in the British Isles before the effects of sulphur dioxide air pollution became a limiting factor grow luxuriently in the Slapton area as in other areas of England and Wales which are still relatively unaffected (see Hawksworth and Rose, 1970). Among the more notable of these at Slapton are *Caloplaca cerina*, *Dimerella lutea*, *Normandina pulchella*, *Pachyphiale cornea*, *Parmelia caperata*, *P. perlata*, *Ramalina calicaris*, *R. obtusata*, *R. pollinaria*, *Sticta limbata*, *Usnea articulata*, *U. ceratina*, *U. glabrescens* and *U. subfloridana*.

Eastern

The mild temperatures, moderate rainfall and onshore winds (presumably giving rise to a low P/E ratio) provide a climate where one would not expect eastern species for most species in this element in the British lichen flora are essentially "continental". Those species which do belong to this element which are present at Slapton are ones which are broadly eastern (e.g. *Caloplaca erythrocarpa*, *Schismatomma decolorans*, *Xanthoria aureola*.). Some species which have more pronounced easterly distributions in Britain are known further to the east in Devonshire (e.g. *Anaptychia ciliaris*, *Opegrapha lyncea*, *O. prosodea*, *Pertusaria hemisphaerica*) but do not extend as far west as Slapton in the southern coastal low-rainfall part of the county.

Southern

The climate at Slapton is not unlike some areas of south-eastern Britain and it is consequently not surprising that many strictly southern species are represented. The species which occur in this element in Britain are often ones which are "lusitanian" or "mediterranean" when their whole European distribution is considered. The more interesting of these extreme southern species which occur at Slapton are *Gyalectina carneolutea* (Fig. 6 and Fig. 10A), *Pannaria mediterranea*, *Parmelia borreri* (Fig. 11 and

Fig. 10C), *P. carporrhizans* (Fig. 12), *P. reticulata*, *P. soredians*, *Phaeographis lyellii* (Fig. 10B) and *Physcia tribacioides* (Fig. 8). Further members of this element which are unknown from Slapton occur in the Prawle Point and Start Point areas 5-8 km. to the south of the southern tip of the Reserve (e.g. *Lecanactis monstrosa*, *Roccella fuciformis*, *R. phycopsis*, *Teloschistes chrysophthalmus*).

In addition to this strictly southern element, species which are southern when the British Isles are considered as a whole (i.e. which become very rare in northern England and Scotland but which are widespread in many other parts of England, Ireland and Wales) are present at Slapton. Examples of this type are *Buellia canescens*, *Lecidia quernea*, *Rinodina roboris* and *Usnea florida*.

Western

The rainfall at Slapton is very low when compared with that of central Dartmoor which has up to 218 cm. (87 inches) p.a. and so it is not surprising to find that many of the western species which occur in the wooded valleys in the Dartmoor National Park are not found at Slapton (e.g. *Arthothelium ilicinum*, *A. ruanum*, *Catillaria pulverea*, *Pannaria pityrea*, *Parmelia arnoldii*, *P. laevigata*, *P. sinuosa*, *Peltigera collina*, *Menegazzia terebrata*, *Ochrolechia inversa*, *Sphaerophorus melanocarpus*, *Sticta dufourii*). Some western species do, nevertheless, occur at Slapton in the closed-canopy woodlands and marshes and of these *Lecanora jamesii*, *Nephroma laevigatum*, *Opegrapha sorediifera*, *Sticta fuliginosa* and *S. sylvatica* are perhaps the best examples.

Northern

Although many northern species occur on Dartmoor (see Hawksworth, 1971) none have been found in the Slapton area. A few species which are commonest in Devonshire on granite in the Dartmoor area do, however, occur on siliceous memorials in CH (e.g. *Parmelia conspersa*, *P. isidiotyla*, *P. mougeotii*.).

An element which is conspicuously absent from Slapton is that of "old-forest" indicator species; species which seem to be restricted in the British Isles to areas which have been continuously forested and relatively undisturbed over many centuries. The most characteristic of these "old-forest" indicator species in Devonshire are *Haematomma elatinum*, *Lobaria laetevirens*, *L. pulmonaria*, *Thelopsis rubella* and *Thelotrema lepadinum*. This suggests that the woodlands of the Reserve are all secondary in origin and that the lichen communities which are now present are to be interpreted as of "post-climax" origin, as indeed must those of many wooded areas of Devonshire.

Because of the large number of species represented and the abundance of many of them the Slapton Ley Nature Reserve is ideally suited to Field Courses on lichens. It is also, however, of great scientific importance because of the many rare species it contains and the structure of the lichen communities. For these reasons the Reserve merits careful management in order to preserve its existing lichen vegetation. Particular attention should be paid to (1) lowering the water level in DM to prevent the death of trees here and along CY, (2) the thinning of young *Acer pseudoplatanus* in J6, (3) the removal of *Hedera* from mature trees of *Fraxinus* and *Ulmus* in I1 and N4, (4) leaving F1, J1 and J2 completely undisturbed, (5) limiting tourist pressure in B and C, (6) leaving the decorticate logs present in C, and (7) limiting the growth of scrub in C. Such measures will, however, be of little avail if the sulphur dioxide levels in the area begin to rise; as they now appear to be doing in the

Dartmoor area. As Crombie (1885, p. 75) stated with reference to Epping Forest "It will therefore be very interesting to the lichenist of the future—some fifty or a hundred years hence—to compare the above list of lichens with those that the Forest may then present." It is to be hoped that the lichens of the Slapton area will not suffer the fate of those formerly present in Epping Forest.

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