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Addendum

p. 108, add at end of Acknowledgments:
Fig. 1 was very kindly prepared for me by Mrs Margaret B. Brown.

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Prepared by A. S. Thorley

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The flora of Morvern and Ardnamurchan compared with that of Mull

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ABSTRACT

This paper compares and contrasts the flora of the island of Mull with that of Morvern and Ardnamurchan, the two nearest peninsulas of the Scottish mainland, and suggests some of the factors which may account for the differences. The basis of the paper is three different types of distribution patterns which are summarily discussed and exemplified in *The island of Mull: a survey of its flora and environment* (Jermy & Crabbe 1978). Although numerous hitherto unpublished records are included in the paper, particular species are selected more for illustrative purposes than as a contribution towards an exhaustive list of the vascular plants of the area concerned.

INTRODUCTION

The recent publication of *The island of Mull: a survey of its flora and environment* (Jermy & Crabbe 1978), the collaborative work of the Department of Botany of the British Museum (Natural History), has prompted me, by its occasional references to unpublished records from Morvern, to write a kind of appendix to the book on the similarities and differences between the flora of the island and that of the nearest parts of the mainland. Unfortunately, though I have fairly systematically covered the greater part of the peninsula of Morvern, there are still large areas between Ardgour to the east and the Point of Ardnamurchan to the west which, so far as I know, await a thorough botanical survey. But Ardnamurchan is floristically so rich and diverse that even a fragmentary knowledge of it is sufficient to reveal, particularly in relation to the flora of Mull, the presence of several plants which a botanist familiar with the vegetation of the Western Highlands would hardly expect to see there at all, let alone, as is often the case, in considerable quantity.

I have had some difficulty in deciding how best to determine the boundaries of the region to be included in this paper (Fig. 1). The peninsula as opposed to the parish of Morvern presents no difficulty: Loch Sunart, the Sound of Mull and Loch Linnhe between them make it almost an island, while the Carnoch and Tarbert Rivers complete in a most natural fashion the delimitation to the north-east. Similarly there is no problem about Ardnamurchan from the Point at the western end as far eastwards as the mouth of the River Shiel, and thence, following the county boundary between Argyll and Inverness-shire, eastwards again along the western bank of the river and the southern shore of the loch as far as Polloch. But from Polloch to Ardgour there is so much virtually untrodden hinterland that it seems best, particularly for mapping purposes, to be guided by the National Grid, to accept as the north-eastern corner of my area the 10 km squares 17/8.6 and 9.6, and to stress at the outset that only the more accessible southerly parts of these two squares have yet received any of the attention that they, and equally the two to the north of them, may well one day prove to deserve. There are thus 18 10km squares with which this paper is concerned (see Fig. 1); hereafter the prefix 17/ has been omitted for the sake of brevity. Where I record a plant from a square only a small part of which lies within my area (e.g. 5.4, 8.4, 4.7, 6.7), the record is for the part of the square which does actually fall in either Morvern or Ardnamurchan rather than in Mull, Lismore, Muck or Moidart.

Since my original objective was merely mapping on traditional lines, I have chosen to follow the example of the *Atlas of the British flora* (Perring & Walters 1962) in two respects. First, to facilitate cross-references, I have adopted its nomenclature even in the few instances when there is a strong case for altering it; and second, even when the result, as in square 4.7, is a strip of land only some 6 km long and of an average width of well under 1 km, I have adhered rigidly to the National Grid. The authors of *The island of Mull*, on the other hand, to avoid such absurdities as dividing both Ulva and the Treshnish

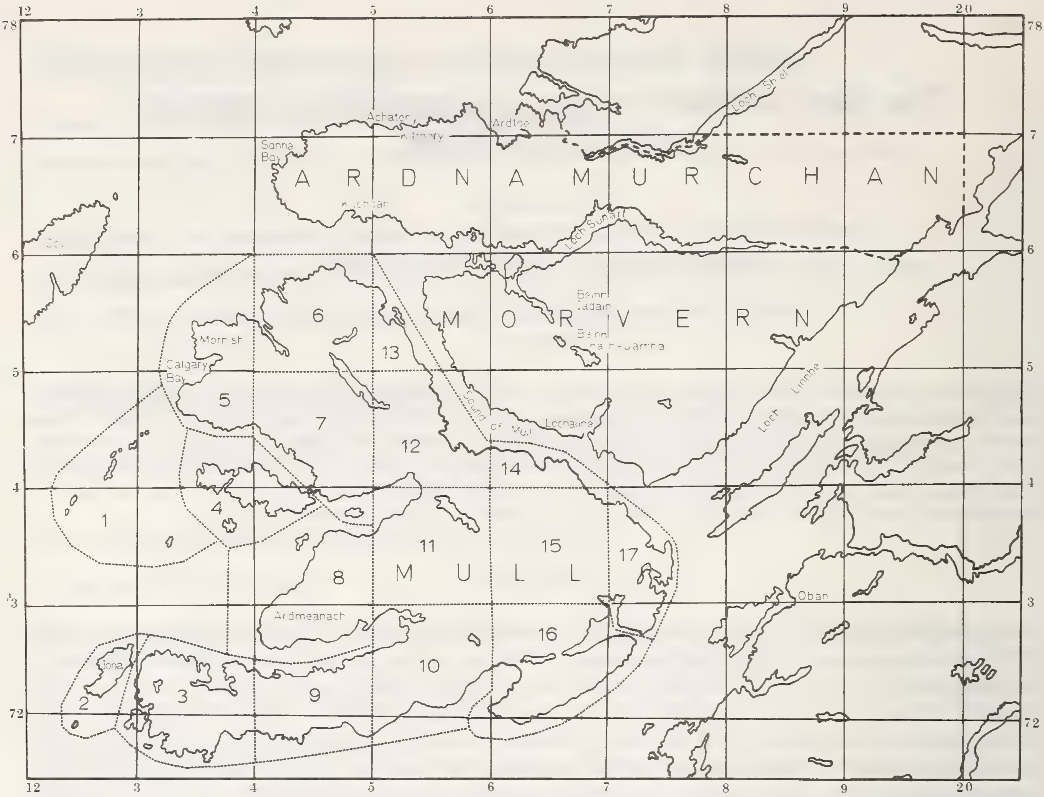

FIGURE 1. Map of the island of Mull and the Morvern and Ardnamurchan peninsulas, showing the boundaries of the areas discussed.

Islands between four squares each, the Laggan–Croggan peninsula into three and the Ardmeanach into two, sensibly made certain modifications, especially on the western side of the island, to comply with natural rather than conventional divisions (Fig. 1). It is inevitable that these modifications will, in some instances, as in the case of the calcicoles confined to the Ardmeanach, have reduced the number of squares in which certain plants mentioned in this paper are said to grow on Mull. This slight degree of distortion applies particularly of course to my comparative tables, especially that concerned with mountain species. I do not think, however, that it is sufficient to invalidate any of the tentative general conclusions to which my observations have sometimes led me.

Before going into detail it may be as well to state a few bald facts and figures. The number of non-critical species of vascular plants so far recorded from all 18 squares in Morvern and Ardnamurchan is 193, of which 128 are recorded also from all 17 divisions in Mull, as are an additional 13 which hitherto are unrecorded from at least one of the mainland squares. If square 1 on Mull, which consists only of the Treshnish Isles, is excluded from the calculation, the Mull total rises by 34 to 175. But similarly on the mainland there are no fewer than 42 plants recorded from every square except one, and in the great majority of cases the square where the last record is needed is one of the three which not only consist largely of sea but are also extremely remote (8.4, 4.7 and 5.7). The total number of new dots to be added to the first (1962) edition of the *Atlas of the British flora* for my 18 mainland squares is just over 2,000, an average comfortably in excess of 100 per square. I need hardly add that for a proportion of these, including some of the more important ones cited in this paper, I am indebted to a number of collaborators, both friends and strangers, to all of whom, though there are too many of them to name individually, I extend my warmest thanks.

TABLE 1. NUMBER OF SQUARES ON MULL AND ON THE MAINLAND IN WHICH FIVE COMMON SALTMARSH PLANTS ARE RECORDED

	Mull	Mainland
Spergularia media	10	14
S. marina	6	14
Suaeda maritima	7	11
Salicornia europaea	8	12
Carex extensa	9	13

TABLE 2. NUMBER OF SQUARES IN WHICH PLANTS OF SANDY PLACES ARE RECORDED

	Mull	Mainland
Honkenya peploides	7	5
Viola tricolor subsp. *curtisii*	5	1
Carex arenaria	6	4
Catapodium marinum	4	1
Ammophila arenaria	6	3

FLORISTIC COMPARISON

MARITIME DISTRIBUTIONS

Bangerter *et al.* (1978) state that, while the majority of distributional maps of Mull species would show no obvious general significance, there are three types of distribution, the western, the mountain and the maritime, each of which has a special and definable character. Since the most straightforward of the three, because it depends simply on the distribution of suitable habitats, is the maritime, I shall deal with this first.

Although an island the size and shape of Mull might be expected to have a larger number of maritime species recorded from more of its divisions than even as indented a mainland coastline as that with which I am concerned, the reverse proves in this case to be the truth. Only four maritime plants are recorded from all the 17 divisions in Mull, namely *Glaux maritima, Armeria maritima, Plantago maritima* and *P. coronopus.* These four are also recorded from all 18 squares in Morvern and Ardnamurchan, as are four other coastal plants in addition to these, namely *Atriplex glabriuscula, Triglochin maritima, Juncus gerardii* and *Puccinellia maritima.* The simplest explanation of this fact, the number and extent of the saltmarshes in Morvern and along the north side of Loch Sunart, is supported by the data in Table 1. On the other hand Table 2, listing five plants characteristic of sandy bays, dunes and machair, approximately reverses the proportions. Morvern has no sandy sea beaches; Ardnamurchan has Sanna and Achateny Bays, both of which are botanically rich, and between the mouth of the Shiel River and Ardtoe there are scattered potential localities for plants that require a sandy soil. But Table 2 suggests that with Iona, Calgary and several sites on the southern shore of the island, Mull has more suitable localities for such plants than has the adjacent mainland.

A few brief comments are also called for here on six strictly coastal plants which do not, however, fit naturally into the categories so far discussed. *Asplenium marinum, Ligusticum scoticum* and *Crithmum maritimum* are here as elsewhere characteristic of sea cliffs and coastal rocks, and the first two, with only one exception apiece, behave exactly as they are said to do on Mull. A very small isolated colony of the *Asplenium* on a low cliff at Fiunary Bay on the Sound (6.4) is exceptional in that it can be exposed to an appreciable amount of salt spray only when a very high tide coincides with a very strong north-westerly wind. And again, a stronger colony of the *Ligusticum* in the crevices of a large flat outcrop of rock at Bonnavoulin, a few miles further up the Sound (5.5), can escape the ravages of the cows that are sometimes to be seen there only because it can hardly be reached without a determined and painful battle with the dense thicket of briars and brambles which almost encircles it. And, as for the *Crithmum*, the only thing that can yet be said on that subject is that the independent discovery of a considerable quantity of it by two separate botanists in what seem to be two different stations on the same stretch of high sea cliff in square 4.6 constitutes one of the most unexpected and notable of recent additions to the exceptional diversity of that square's vegetation.

The other three coastal plants are *Blysmus rufus, Mertensia maritima* and *Scilla verna*. The *Blysmus* is equally widespread on both Mull and the mainland, in both cases recorded from all but three squares; *Mertensia*, though still surviving in six divisions in Mull, has lost its solitary foothold on Loch Linnhe; while *Scilla verna*, known in one station on the Ross of Mull and on several of the small islands off the western coast, has, as yet, despite the existence of several apparently suitable sites in Ardnamurchan, never been recorded in any of them.

PLANTS WITH A WESTERN DISTRIBUTION

Presumably because the western pattern of distribution is discussed and exemplified by Bangerter *et al.* (1978) before the maritime, a number of plants are included by them in the former category which I should prefer to group with the latter. Two plants of the type I have in mind are *Valerianella locusta* and *Sherardia arvensis*. Near the western tip of Ardnamurchan both grow on coastal sand, the former, for example, on the highest dune at Sanna (4.6), the latter on a small patch of machair behind Achateny Bay (5.7). Both in fact are hereabouts decidedly maritime, while they can only be regarded as western in the very limited context of North Argyll rather than in the wider context of the British Isles as a whole. And much the same is true of *Leontodon taraxacoides* at Kilmory (5.7), of *Carlina vulgaris* in many of its stations in square 4.6, of *Eupatorium cannabinum, Vicia orobus* and *Trifolium medium* at Kilchoan (4.6), of *Briza media* and *Koeleria cristata* at Sanna Bay, and finally of the very much more widespread *Anthyllis vulneraria*.

But besides these plants, which can only be properly regarded as western in a very limited and local context, there is a second group which may fairly be classed as predominantly western on the national as well as on the narrowly local scale. This second group comprises, among other and commoner plants, *Polystichum setiferum, Geranium sanguineum* and *Orobanche alba*, all three of which are excessively local in either peninsula, *Umbilicus rupestris*, which has only very lately been recorded from near Kilchoan as well as from western Mull and Iona, and three plants which occur either in Iona or in south-westernmost Mull or in both but which have yet to be recorded from the adjacent mainland, namely *Radiola linoides, Hypericum elodes* and *Scirpus cernuus*.

That leaves from among the plants classified by Bangerter *et al.* (1978) as western only five plants with the clearest and at the same time the most puzzling distributional patterns of all. The five plants are *Cakile maritima, Apium inundatum, Anagallis tenella, Veronica anagallis-aquatica* and *Catabrosa aquatica*; and to these five, from my point of view, may be added at least three more which are not mentioned by Bangerter *et al.* (1978) in this context, namely *Ophioglossum vulgatum*, very recently found at Ardtoe (6.7), and *Thalictrum minus*, which has several stations on Ardnamurchan, in one of which, Achateny Bay in square 5.7, it is accompanied by my third example of this group, *Agropyron junceiforme*.

Of this group of eight plants, to which several others such as *Centaurium erythraea* and *Scutellaria minor* might justifiably be added, only two are essentially coastal, namely *Cakile* and the *Agropyron*. Reference to the *Atlas* will immediately reveal how remarkably similar are their distributional patterns all round the coasts of this whole island. But for the remainder the similarity of pattern is discernible primarily, if not always exclusively, from Mull and Ardnamurchan northwards. All eight plants in the group are to be found either on Iona or in south-western Mull; all occur on Ardnamurchan at either Sanna or Achateny Bays or else in the Ardtoe area; both Coll and Tiree have more than one station for each of the eight; all grow in numerous places in the Outer Hebrides from Barra right up to Lewis; and, though the *Thalictrum*, the *Cakile* and the *Agropyron* are widespread along the northern coast of the Scottish mainland, none of the eight has more than a few scattered sites on the mainland or the Inner Hebrides between Coll, Tiree and Ardnamurchan to the south and the coast between Cape Wrath and John O'Groat's to the north. Bangerter *et al.* (1978) write of *Apium inundatum* that 'It is present on Coll and Tiree, but appears to be absent from Skye and its adjacent islands and the north-west mainland of Scotland'; and lower down the same page comes the sentence 'Calgary Bay probably enjoys a climate which, like that of Iona, is warmer, sunnier and drier than most other parts of Mull'. Although that alone can hardly be the whole explanation of the type of distribution just discussed, the fact that all the main areas mentioned in this paragraph have an appreciably lower rainfall than almost the whole of the Western Highlands strongly suggests that this may well be an important factor. Certainly on this particular issue it looks as if climate must play a larger part than geology.

MAINLAND PLANTS UNKNOWN ON MULL

Before turning to mountain plants, it will be as well to say something of the heterogeneous group of lowland plants which are recorded from either Morvern or Ardnamurchan but not at present known in Mull. To effect the transition, two essentially western species should come first, both of which, like the last group discussed, have long been known to have more than one station on the island of Coll. First comes *Eriocaulon septangulare*, which was recorded from Iona by Druce, but is evidently now extinct there. Though first detected on Ardnamurchan too late to be included in the first edition of the *Atlas*, it is now known to occur in seven different sites in square 4.6 (by the thousand in at least two of these sites) and two in 4.7. And second is *Spiranthes romanzoffiana*, which also I now know in several separate stations both in Ardnamurchan and in Morvern. I am sure that the latter, and suspect the same of the former also, eluded detection for so long because until it comes into flower around the middle of August it is exceptionally difficult to pick out, even if you know what you are looking for, from the surrounding herbage. From my one visit to that district, which was too early in the season to justify a search for it, I should be not in the least surprised if the *Spiranthes* were yet to be found in one of the damper parts of Mornish, in the north-western corner of Mull.

These mainland sites for *Spiranthes romanzoffiana* have nothing very obvious or distinctive in common. Indeed two of the three sites in Morvern, steep grassy slopes dotted with small outcrops of rock and with occasional flushes giving rise to little trickles between tussocks of *Molinia*, could be duplicated times beyond number in lowland situations throughout the entire peninsula, while even the third, a relatively level if hummocky pasture with close parallel depressions suggesting that it was once cultivated as a 'lazy-bed', is the kind of terrain which nothing but a lucky chance was likely to reveal as the habitat of an unusually strong colony of a plant with an exceptionally restricted European range. And in all three of these Morvern stations, unlike those in Ardnamurchan, the *Spiranthes* is the only plant of the slightest note.

In Ardnamurchan *Spiranthes romanzoffiana* occurs around the western end of Loch Shiel and the short but sinuous stretch of river between it and the sea. There are probably more sites for the plant in this area than I know, but the five I do know share a characteristic which I have seen mentioned in the literature but which applies to none of the Morvern sites, that they are liable to winter inundation. And that in itself is certainly part of the reason for another difference between these and the Morvern localities, that here the *Spiranthes* tends to grow in interesting company. In one station, for instance, it is associated with a small patch of *Rhynchospora fusca*, an abundant feature of Kentra Moss not far away but unknown on Mull, and with an exceptional quantity of *Lycopodium inundatum*, which too is unknown on Mull but here, intermingled with *Drosera anglica*, grows in an almost continuous zone some 100m long and of an average width of about 1m; a zone which, though I have more than once seen it well under water, presumably represents the high water mark of a normal Western Highlands spate. In another rather more remote station the association of which the *Spiranthes* is a relatively frequent member includes, as well as all three species of *Drosera*, the colony of *Apium inundatum* to which I have already referred and another species that is almost as infrequent in the two peninsulas as well as in Mull, *Alisma plantago-aquatica*. And between these first two stations there are at least two others within a stone's throw of which grow dense if excessively local patches of the little annual *Crassula aquatica*, accompanied at one point by a few plants of the even more diminutive *Elatine hexandra*.

The *Crassula*, apart from its unexplained occupation of the muddy margins of a pool near Leeds from 1921 to (at latest) 1945, is an addition to the British flora. Being a native of central and especially northern Europe, including Germany, Denmark, Finland, Sweden and Norway as well as Iceland, it is perhaps no less likely than that other tiny annual, *Koenigia islandica*, to be a genuine British native which, until a keen-eyed botanist eventually spotted and identified it, successfully survived undetected. Alternatively, since no normal human activity seems likely to have introduced it either deliberately or accidentally, it may well owe this extension to its known range to the Whooper Swans which regularly alight on exactly this area on their autumnal migration southwards. But, whichever of these or any other conceivable explanation may account for the facts, there is no obvious reason why this species should occur here alone in Britain. It seems much more likely that, as again in the case of the *Koenigia*, other comparable localities in the north of the British Isles still house the *Crassula* incognito.

Among the other plants just mentioned as occurring in this exceptional area two, *Lycopodium inundatum* and *Rhynchospora fusca*, besides being absent from Mull, have on Ardnamurchan their most westerly station in Britain, while the *Alisma*, despite its one station on Mull, and the *Elatine* despite its two, are here at the north-westerly limit of their British range. Several other lowland plants which have not been recorded from Mull are also, in either Ardnamurchan or Morvern, at or near the limit of their distribution. *Potentilla anglica* on the eastern side of Loch Aline (6.4), *Sedum telephium* subsp. *fabaria* at Drimnin (5.5), *Cruciata chersonensis* near Larachbeg (6.4)—both these last looking as native as they could—and even *Carex aquatilis* on the banks of both the Aline and the Rannoch Rivers (6.4, 7.4 and 6.5) all mark considerable extensions to the north or the west or to both. Though the same is not quite true also of the four grasses, *Festuca altissima, Catapodium marinum, Trisetum flavescens* and *Agrostis gigantea*, the discovery of the first in a steep narrow ravine in square 6.4, of the second on rocks at Sanna Bay in 4.6, of the third in sparse native woodland in 5.5 and 5.6, and of the last on a bare stony slope in 7.4 and at the top of shingle beaches in 7.6 and 8.6, in each case puts a dot on the map in an area where dots for the species concerned are few and far between. Other plants absent from Mull but known to occur either in Morvern or Ardnamurchan include *Jasione montana* (6.6 and 9.6), *Adoxa moschatellina* (9.5 and 9.6) and, as a widespread feature of roadsides and waste places, the freely hybridizing *Rumex longifolius*. In each of these three cases, however, the extension of the plant's range is of no great distance or significance. And if mere ruderals are postponed for consideration later, that leaves, in the present context of native plants occurring in lowland sites on the adjacent mainland but not on Mull, only four species, which have little in common except that all of them happen to grow in square 4.6.

The first of the four, which, when I first found it, caused me the greatest surprise, is *Asplenium septentrionale*, a plant whose requirements I have never understood. In 1948 there were four tufts of it in a narrow crack on the side of a single boulder, one of many that looked very much alike, which outcropped from the steep south-facing side of one of the narrow valleys on the west side of Meall Sanna. The same four tufts are still there 30 years later, and what is more, R. W. David, searching for my colony in 1976 but in the valley next to mine to the north, discovered a different colony which also comprised four tufts. It is a plant which, in Scotland at least, has two peculiarities. First, as the *Atlas* shows, its stations are widely separated, and secondly, in the few places where it occurs, it is often in very small quantity. This second peculiarity it shares too with the second of my four plants, *Ajuga pyramidalis*, which so far I know in only two stations in the vicinity, one to the north of Sanna, the other west of Loch Caorach, but which, unlike the *Asplenium*, I fully expect to be found in other places near the Point of Ardnamurchan than those I happen to know. My third plant is *Gentianella amarella*, which grows in sandy turf in square 4.7 as well as at Sanna Bay in 4.6, but only in the latter site, so far as I know, poses a problem for the taxonomist by confronting him not only with subsp. *septentrionalis* as well as subsp. *amarella* but also with forms, presumably of hybrid origin, which have been accepted by N. M. Pritchard as intermediate between the two. And finally there is *Eriophorum latifolium*, whose total absence from Mull I find the most surprising of all. It is recorded from no less than seven of the 18 squares which are my concern, three in Ardnamurchan and four in Morvern, and it is locally so frequent, especially in square 6.5, that in as many as seven quite separate stations I have actually spotted it while driving my car. Nor, I suspect, does it require quite such basic conditions as is often supposed. Not only does it grow very healthily, mixed with about the same quantity of *E. angustifolium*, on the slope above the eastern shore of Loch Doire nam Mart, where the steep side of Beinn na h-Uamha above it is acid enough to support a colony of *Cryptogramma crispa*, but there is even a small boggy flush beside the track up the notoriously acid Gleann Dubh (7.5) where *E. vaginatum, E. angustifolium* and *E. latifolium* all grow together in an area of, at most, 20 m^2. A. C. Jermy tells me that Ardmeanach, the home of the calcicoles on Mull, lacks the right kind of flush for *E. latifolium*; but even so, it is hard to understand why a plant that flourishes in the westernmost parts of both Ardnamurchan and Morvern (6.5, 4.6 and 5.6) should not occur at all on the other side of the Sound.

MOUNTAIN SPECIES

The section on the distribution of mountain species by Bangerter *et al.* (1978), though it occupies less than a page, still mentions 17 species, of which no fewer than 14 are mapped on the pages which immediately follow. Table 3 lists those mountain species which occur both on Mull and on the adjacent peninsulas. *Sedum rosea*, which is recorded from 14 of Mull's 17 squares and 16 of the 18 that cover Ardnamurchan and Morvern, is omitted from Table 3 since in both cases under discussion, and particularly on the western coast of Mull and the northern one of Ardnamurchan, it is a plant of maritime as well as of mountain cliffs.

Nothing of much significance emerges from Table 3 except perhaps that in the mountainous areas of

TABLE 3. THE RELATIVE FREQUENCY ON MULL AND ON THE ADJACENT MAINLAND OF THOSE MOUNTAIN SPECIES WHICH OCCUR ON BOTH

	Mull	Mainland
Lycopodium alpinum	6	10
Cryptogramma crispa	2	4
Polystichum lonchitis	2	1
Thalictrum alpinum	7	9
Cardaminopsis petraea	2	2
Silene acaulis	3	2
Dryas octopetala	1	1
Alchemilla alpina	6	11
Sedum villosum	1	1
Saxifraga stellaris	5	9
S. hypnoides	3	6
S. aizoides	3	13
S. oppositifolia	1	7
Epilobium anagallidifolium	1	2
E. alsinifolium	3	3
Polygonum viviparum	4	4
Oxyria digyna	5	8
Salix herbacea	6	10
Arctostaphylos uva-ursi	9	10
Empetrum hermaphroditum	2	4
Saussurea alpina	5	8
Juncus triglumis	1	2
Luzula spicata	3	2
Carex bigelowii	4	7
Deschampsia alpina	1	2

Mull there is relatively little basic rock. The two most striking contrasts between Mull and the adjacent peninsulas are the figures for *Saxifraga aizoides* and *S. oppositifolia*, which clearly point towards that deduction, as does the fact that calcicoles such as *Dryas octopetala* and *Sedum villosum* are confined to the Ardmeanach. The list of the six mountain plants which occur on Mull but have not yet been recorded from the adjacent mainland is not very illuminating either. Much the most interesting of them, *Koenigia islandica*, like the last two plants mentioned, is confined to the Ardmeanach, where it occupies a very unusual type of habitat. Another of the six, *Draba incana*, is evidently on Mull, as also on Tiree and elsewhere, a coastal rather than a montane species. And as for the remaining four, *Lycopodium annotinum* (which I am perhaps wrong in regarding as a mountain species), *Cerastium arcticum*, *Cherleria sedoides* and *Minuartia verna*, never having seen any of them in their Mull stations, I can think of no compelling reason why they should grow just where they do and not on the other side of the Sound. But then, since that does seem to be the case, I can equally think of no compelling reason why, with the emphatic exception of the *Minuartia*, which seems quite unaccountable, they should not do just that.

Under the heading of 'mountain species' the most interesting and important list in the present context is clearly that of the plants which grow in Morvern or Ardnamurchan but not on Mull. This list, for purposes of convenience, I shall divide into two. As has been clearly recognized by their relatively recent acquisition as a Nature Reserve, there are two hills in Morvern, Beinn Iadain and Beinn na h-Uamha (6.5), the respective heights of which are only 571 and 464 m, which between them support a richer arctic-alpine flora than all the rest of the hills of Morvern and Ardnamurchan put together. The richest areas, the long north-facing cliff of Beinn na h-Uamha and the west-facing cliffs and the stony patches on the summit plateau of Beinn Iadain, consist of a base-rich basalt which produces ledges reminiscent of the mica-schist of Ben Lawers and Ben Lui but tends to crumble into steep and unstable screes of strikingly red soil. The flora accords with the pH; a sample from above the western end of the northern cliff of Beinn na h-Uamha had a pH of 7.2 and there are several places on or just below the foot of the cliffs where it might well prove to be higher than that. Both hills can boast, among other things, *Dryas*, *Silene acaulis* and all four species of *Saxifraga* that occur on both Mull and the mainland, and both also carry *Poa alpina* and *P. glauca*, neither of which is found either on Mull or on Ardnamurchan. Besides *Asplenium viride* and *Polystichum lonchitis*, the latter of which is not known elsewhere in either peninsula, Beinn na h-Uamha supports a very few plants of *Saxifraga nivalis*, for which again no other station is at present known in either area, and the same claim can be made for *Sagina normaniana, Arenaria norvegica, Potentilla crantzii* and *Galium sterneri* on Beinn Iadain. When *Sedum villosum, Juncus triglumis* and *Luzula spicata* are added to the latter hill's list of local rarities, and the remarkable fact is also noted that in block scree on the southern side of Beinn na h-Uamha and again at the foot of the northern cliffs of Beinn Iadain there are flourishing colonies of that arch-calcifuge *Cryptogramma crispa*, the reasons for treating these two hills separately from the rest should be apparent.

The higher hills in the east of the peninsula, Beinn Mheadhoin (739 m), Fuar Bheinn (765 m) and Creach Bheinn (853 m), are at first sight as different as could be from the two just discussed. The rock of the last two of these is a hard, barren, quartz-rich gneiss belonging to the Moine series and the flora is typical, for the most part, of an acid hill of only moderate height. Even so, between them they yield seven species characteristic of such hills in Scotland, plants indeed whose presence on these hills is less surprising than their absence from Ben More, which is 966 m high, and all the other hills to the east of it on Mull. And moreover Beinn Mheadhoin at least, which consists instead of Strontian granite, is here and there considerably richer floristically than a first rapid ascent might suggest. A number of little burns rise from the extensive and desolate summit plateau to flow in every direction, and several of them, following faults and intrusive dykes, have formed ravines, of varying length and depth, on the sides and bottom of which grow a number of plants, notably *Saxifraga oppositifolia*, indicative of more basic conditions. In a north-facing ravine near the summit, among plentiful *Silene acaulis* in its only local station outside square 6.5, grow *Cerastium alpinum*, unknown elsewhere in either peninsula, and *Cochlearia alpina*, whose only other station in the area is in another ravine barely 1 km away. On the banks of a tiny burn on the northern slope of Meall na Greine, this time accompanied by an abundance of *Thalictrum alpinum* and *Saxifraga oppositifolia, Tofieldia pusilla*, again unknown elsewhere in either peninsula, is locally quite frequent. The deepest of the ravines facing east has, among other things, several fine clumps of *Saussurea alpina* and a single small patch of *Epilobium anagallidifolium*. On top of the vertical rocky bank of the burn flowing south is one of the only two colonies yet known in the area of *Chamaepericlymenum suecicum*, the other and stronger being some 2 km north of the north-western spur of Beinn Iadain. Even the desolate summit plateau itself can boast another plant, *Vaccinium uliginosum*, whose absence from Mull is the more remarkable in that on the adjacent mainland it occurs on Creach Bheinn and Maol Odhar in square 8.5 and Garbh-Bheinn in 9.6 as well as here on Beinn Mheadhoin in 7.5. And, finally, on lower cliffs in more than one miniature ravine near the foot of the mountain there are flourishing patches and even sizable colonies of *Orthilia secunda*.

The two mountain masses mentioned in the last paragraph, Garbh Bheinn and Beinn Bheag to the north of Glen Tarbert and Creach Bheinn and Maol Odhar to the south, provide the only records in the two peninsulas for two of the only three mountain species still to be mentioned, *Loiseleuria procumbens* and *Juncus trifidus*. The similarity of the distributional patterns of these two in the *Atlas* is no accident; demanding exactly the same conditions, the barest rocky tops of the most exposed mountain ridges, they repeatedly grow in one another's company. That is the case on these mountains, where, however, both are decidedly sporadic rather than frequent, and where the *Juncus*, on the Creach Bheinn range at any rate, shows an apparent preference for even more inhospitable sites at slightly higher altitudes than the *Loiseleuria*.

The last plant of all to be considered in this category, *Gnaphalium supinum*, may possibly point to the answer to the question under discussion—why should none of these regular inhabitants of Scotland's acid and floristically monotonous mountains grow on Ben More or any other of the higher hills of Mull? The party who, at my earnest request, first explored the hills around Glen Galmadale and in the process first found there all these three last plants was under the leadership of S. M. Walters and P. D. Sell. The former's field note on *Gnaphalium supinum* ran: 'V. local on snow-cornice edge of steep N-facing corries under ridge of Meall Odhar'. Jermy (1978) writes 'Whatever amount of snow falls on Mull, it is only on the higher hills in the Ben More Massif and the Torosay hills that snow persists for more than the single day or two . . . There are no areas of characteristic snow-bed vegetation as may be found on the Scottish mainland . . . For the most part the relatively clement climate is against prolonged snow-lie and the few species requiring it which would otherwise find the right conditions are therefore absent.'

Although that quotation should perhaps be the last word on this topic, I would add one final argument to reinforce it. It concerns the genus *Hieracium* and its various sections. Of the very distinctive section *Alpina* only two species have so far been recorded from the area with which I am concerned, the relatively common and widespread *H. holosericeum* and the very much scarcer *H. alpinum* itself; both these were reported from Garbh Bheinn by Kenneth and Stirling (1970). On the other hand, thanks not least to P. D. Sell's presence on the excursion around Glen Galmadale, no fewer than seven species of section *Subalpina* have been authoritatively recorded from Morvern alone, namely *H. senescens*, *H. marshallii*, *H. centripetale*, *H. callistophyllum*, *H. dasythrix*, *H. petrocharis* and *H. pseudanglicum*. The significant fact here is succinctly stated by Kenneth & Stirling (1970) in the following summary sentences—'The hawkweed flora of Mull, so far as we have been able to judge, is remarkably poor. No species of the Section Alpina has been found and only one named species of the Section Subalpina.' Bangerter & Cannon (1978) do nothing to gainsay the latter half of this summary, the explanation of which would again seem, with virtual certainty, to be climatic rather than geological.

RUDERALS

Thanks largely to Iona's poppies and fumitories, Mull and its satellite islands can produce a longer and more interesting list of ruderals (Jermy, James & Eddy 1978) than any area of the adjacent mainland except possibly the arable strips between road and sea on the western side of Kilchoan Bay (4.6). In the present context precedence should be given to those species whose existence on Mull either rests on doubtful evidence or else is not recorded at all. The first of these is *Coronopus squamatus*, for which my original note, dated 1973, runs: 'Several plants on bare trodden earth ... at Bonnavoulin' (5.5), where it has persisted every year since then. Next comes *Thlaspi arvense*, of which I wrote in 1977, 'A colony of several plants in the S.W. corner of a field of potatoes on the N. side of the private road to Kingainloch' (8.5), and I later added, as I could not of the single plant of *Silene noctiflora* which had accompanied it in 1977, 'Still there in '78'. *Rorippa islandica*, unknown on Mull, is abundantly and ineradicably established in and around the farmyard at Achranich (7.4), while in the walled kitchen garden nearby, though quite a large colony of *Barbarea vulgaris* was successfuly exterminated by chemical warfare, *Veronica peregrina*, along with *Stachys arvensis*, keeps germinating so persistently and unobtrusively that its future here, as also in two gardens near Arisaig, seems secure. Of the annual species of *Lamium*, *L. hybridum*, which is recorded for Mull only from Iona and even there with some reservation, is in Morvern almost as common and widespread as *L. purpureum* itself and is locally plentiful also in squares 6.6 and 9.6. *L. amplexicaule* is abundant in two widely separated gardens near Drimnin (5.5) but to me at least is unknown elsewhere in either peninsula. Though I have often, and especially late in the season, found misleadingly abnormal forms of *L. purpureum*, I have yet to hear of an unquestionable record of *L. molucellifolium* from either Morvern or Ardnamurchan. And finally two members of the *Compositae* which hitherto are unknown in Mull have in recent years been recorded from Morvern. Unfortunately *Centaurea cyanus*, which some ten years ago appeared in quantity in a field of oats by the River Aline, disappeared, almost certainly for ever, when the field was permanently sowed down for silage. But happily *Mycelis muralis*, which somehow found its way to the solitary stone chimney which is the greater part of what remains of the original Killundine House (5.4), is gradually extending its footing on the neighbouring stone walls and foundations in what, according to the *Atlas*, is one of its only four stations in the whole of the Western Highlands and Islands.

MULL PLANTS UNKNOWN ON THE ADJACENT MAINLAND

Since the primary concern of this paper has been with those plants which occur on the nearest parts of the mainland but not on Mull, it may have conveyed a false impression of prejudice in favour of the former. In this brief concluding section I shall merely suggest that, though they are none of my present business, there are numerous native plants on Mull, in addition to the many I have already mentioned, whose apparent absence from the adjacent peninsulas is as interesting and probably also as significant as the absence from Mull of the plants which have been my concern. I shall do no more than list them (Table 4) in the order in which they are given by Bangerter & Cannon (1978) and, apart from hazarding a guess that one or two of the smaller, such as *Vicia lathyroides* or *Saxifraga tridactylites*, might yet be found at Sanna or Achateny and any of the aquatics in almost any of the countless lochs or lochans in the western half of Ardnamurchan, I shall leave the reader to draw his own conclusions concerning the factors determining the presence or absence of the rest.

TABLE 4. PLANTS KNOWN ON MULL BUT NOT ON MORVERN OR ARDNAMURCHAN

Teesdalia nudicaulis	*Potamogeton lucens*
Beta vulgaris subsp. *maritima*	*P. pectinatus*
Vicia lathyroides	*Naias flexilis*
Sorbus rupicola	*Corallorhiza trifida*
Saxifraga tridactylites	*Carex pendula*
Pimpinella saxifraga	*C. paupercula*
Vaccinium oxycoccus	*C. hirta*
Erigeron acer	*Poa compressa*

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Variation in *Silene dioica* (L.) Clairv.: numerical analysis of populations from Scotland

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ABSTRACT

Numerical analyses (multidimensional scaling and B_k non-hierarchic cluster analysis) of wild populations of *Silene dioica* (L.) Clairv. from Scotland showed a complex pattern of variation, related partly to habitat and partly to geographic location. Subsets of characters—flower/capsule, seed, and vegetative characters—showed discordance, *i.e.* imperfectly correlated patterns of variation.

Material from Shetland, v.c. 112, has previously been treated as a variety (*Melandryum dioicum* Schinz & Thellung var. *zetlandicum* Compton) and, later, as a subspecies (*Melandrium dioicum* (L. emend.) Coss. & Germ. subsp. *zetlandicum* (Compton) Baker), but few individuals from Shetland possess all the character-states that define these taxa. Analyses based on 47 morphological characters from 29 populations showed that Shetland populations form a separate group. The differences between these and many mainland populations were, however, found to be marginal and some mainland populations (especially from sea-cliffs and woodlands) are more distinctive.

INTRODUCTION

Compton (1920) described material of *Silene dioica* (L.) Clairv. from Shetland, v.c. 112, that had large, strikingly deep magenta flowers and robust, densely hairy stems. He treated such plants as a variety, *Melandryum dioicum* Schinz & Thellung var. *zetlandicum*, which Baker (1947) later elevated to the rank of subspecies (as *Melandrium dioicum* (L. emend.) Coss. & Germ. subsp. *zetlandicum*). Clapham (1962) published the new combination *S. dioica* subsp. *zetlandica* for Baker's taxon. Baker (1947, 1948a) amplified Compton's original description, and recognized some features not mentioned by Compton, such as the variability in flower colour (from white to deep magenta) previously noticed in Shetland *S. dioica* by Druce (1922). Pale-flowered Scottish *S. dioica* (Gardiner 1848, Druce 1922, Baker 1948a) may have caused confusion with *S. alba* (Mill.) Krause and with the hybrid *S. alba* × *S. dioica*.

Although Baker (1948a, 1948b) regarded the Shetland subspecies as the British representative of Turesson's coastal ecotype (Turesson 1925), coastal material from elsewhere in Britain (Wright 1933, Murray 1974) possesses only some of the supposedly distinctive features of Shetland material. My own observations in Scotland and elsewhere also suggested that variation in *S. dioica* might be more complex than previously thought, and in particular that striking, atypical variants are misleadingly over-represented in herbaria (e.g. **BM**, **CGE**, **SLBI**).

This paper describes a numerical study of the pattern of morphological variation among populations of *S. dioica* from Scotland. The numerical analyses were based on 29 wild populations from various habitats and locations in Scotland (including seven populations from Shetland), plus six extra seed samples, and eight wild populations from elsewhere in Britain and Europe, for comparison. Special attention is given to the taxonomic status of Shetland material.

MATERIALS AND METHODS

VARIATION IN SCOTTISH *S. DIOICA*

Character selection, sampling and scoring

Forty-seven flower, capsule, seed and vegetative characters (Table 1) were selected. The same list of

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TABLE 1. LIST OF CHARACTERS AND CHARACTER-STATES

	Character	Character-states
1*	pedicel length	
2*	calyx length	
3	calyx shape	cylindrical/constricted-cylindrical/conical/spherical/oval
4	calyx-nerves (anastomosis)	anastomosing/not anastomosing
5	red calyx pigment	present/absent
6	calyx glandular hairs	absent or very sparse/present
7	calyx-hairs (straightness)	straight/flexuous/crispate
8	calyx-hairs (stiffness)	soft[1]
9	calyx-tooth shape	acute/subacute/obtuse
10*	corolla diameter	
11	corolla colour	(18 colour-depth categories, ranging from white to a deep magenta, were distinguished on a home-made colour chart)
12	petal dissection	indented to less than half-way/ indented to half-way or more
13	additional petal-lobes	present/absent
14	coronal scale colour	as petals, pink/not as petals, pink/not as petals, white
15*	petal-claw length	
16*	capsule length	
17	capsule shape	globose/ovoid/pyriform/long-pyriform
18	capsule-tooth orientation	erect/ascending/deflexed/ curled back
19	pedicel orientation[2]	erect[1]
20*	seed length	
21*	seed length/breadth ratio	
22	seed-back shape	convex/flat/concave/rounded
23*	seed-back width	
24	seed-face type	very convex/convex/flat/concavo-convex/concave
25	seed colour	(from Rayner's (1970) colour chart)
26	tubercle-tip colour	black/dark-brown/brown/ginger/chestnut/grey
27*	seed-plate length	
28*	seed-plate length/breadth ratio	
29*	number of suture points per plate	
30*	tubercle length	
31	hylar zone type	prominent/level/recessed
32	seed-surface granulation	coarse/medium/fine/absent
33	suture width	very narrow/narrow/medium/wide
34	suture outline	sinuous/sharply-sinuous/serrate/lobate/stellate/digitate
35	tubercle shape	conical/tall-conical/cylindrical/tall-cylindrical
36*	plant height	
37	stem glandular hairs	absent or very sparse/scattered/dense
38	stem clothing[3]	shortly hairy/with long hairs
39	stem-hairs (straightness)[3]	straight/flexuous/crispate
40	stem-hairs (orientation)[3]	patent/deflexed
41	stem-hairs (softness)[3]	rather stiff/soft
42*	number of internodes below inflorescence[4]	
43*	length of lowest cauline leaf	
44	shape of lowest cauline leaf	lanceolate/ovate-acute/ovate-obtuse/rounded
45	leaf glandular hairs (above)	absent or very sparse/present
46	leaf glandular hairs (below)	absent or very sparse/present
47	proportion of shoot with flowers	less than half/half or more/nearly all

* treated as quantitative. See Prentice (1979) for details of character-handling

[1] invariant in the present data set

[2] when capsule ripe

[3] on an internode in mid-stem

[4] from the ground to the lowest side-shoot bearing visible flower-buds

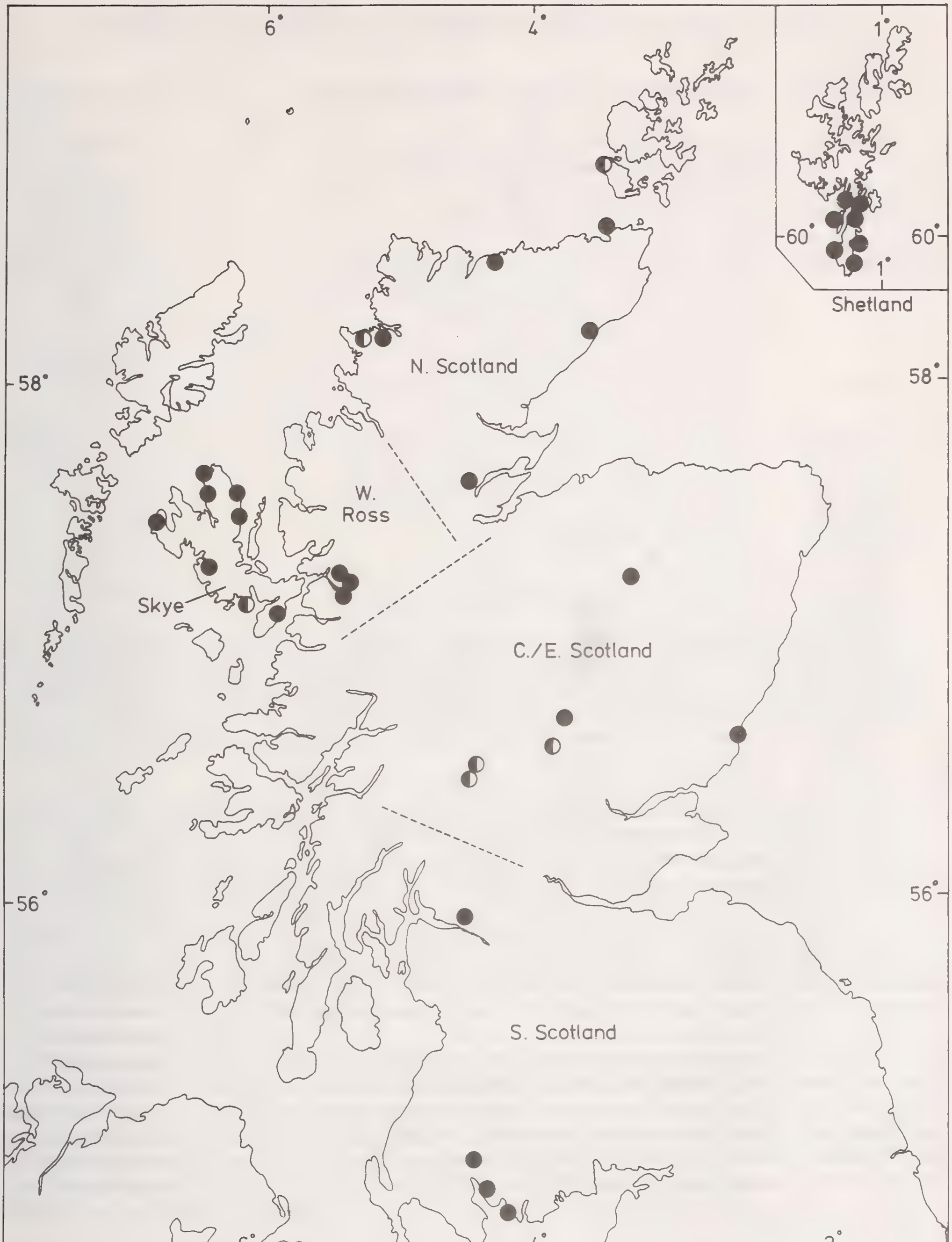

FIGURE 1. Map showing localities of Scottish *S. dioica* populations used for numerical analysis. Half-open circles (◑) represent populations from which only seeds were scored; closed circles (●) represent fully scored populations.

TABLE 2. LOCALITIES AND HABITAT-TYPES FOR POPULATIONS

No.	GR (British populations)	Locality (and vice-county for British populations)	Habitat type
59	41/037.080	Heythorne, Dorset (v.c. 9)	woodland
140	—	Rébénacq, Pyrénées-Atlantiques (France)	woodland
151	28/560.601	Dingwall, E. Ross (v.c. 106)	woodland
153	39/202.768	Dunnet Head, Caithness (v.c. 109)	coastal cliff
154	41/035.037	Whitesheet, Dorset (v.c. 9)	hedgerow
155[1]	57/233.021	Howes of Quoyawa, Hoy, Orkney (v.c. 111)	montane cliff
156	—	Saana, Kilpisjärvi, Enontekiö (Finland)	woodland
157	—	Stokkedalen, Finnmark (Norway)	woodland
158	—	Storfjord, Finnmark (Norway)	woodland
165	—	St Samson-la-Poterie, Oise (France)	woodland
226	25/633.457	Brighouse Bay, Kirkcudbrights. (v.c. 73)	woodland
234	—	Tammisaari (Finland)	woodland
235[1]	27/593.396	Meall nan Tarmachan, Killin, Mid Perth (v.c. 88)	montane cliff
236[1]	27/590.410	Creagan Lochain, Killin, Mid Perth (v.c. 88)	montane cliff
237[1]	27/852.477	Birks o'Aberfeldy, Mid Perth (v.c. 88)	woodland
238	27/916.625	Pass of Killiecrankie, E. Perth (v.c. 89)	woodland
239	18/935.187	Sheil Bridge, W. Ross (v.c. 105)	hedgerow
241	18/915.225	Inverinate, W. Ross (v.c. 105)	woodland
242	18/881.276	Conchra, Dornie, W. Ross (v.c. 105)	saltmarsh
243[1]	18/522.154	Carn Mòr. Elgol, Skye, N. Ebudes (v.c. 104)	coastal cliff
244	18/668.090	Teangue, Sleat, Skye, N. Ebudes (v.c. 104)	hedgerow
245	18/370.331	Fernilea, Carbost, Skye, N. Ebudes (v.c. 104)	woodland
246	18/519.517	Holm, east of Loch Leathan, Skye, N. Ebudes (v.c. 104)	coastal cliff
247	18/468.715	Kildorais, Flodigarry, Skye, N. Ebudes (v.c. 104)	saltmarsh
248	18/368.707	Camas Mòr, Kilmuir, Skye, N. Ebudes (v.c. 104)	coastal cliff
249	18/398.638	Uig, Skye, N. Ebudes (v.c. 104)	woodland
250	18/153.507	Meanish, near Dunvegan Head, Skye, N. Ebudes (v.c. 104)	coastal cliff
251[1]	29/115.327	Drumbe, W. Sutherland (v.c. 108)	hedgerow
252	29/136.320	Nedd, Drumbeg, W. Sutherland (v.c. 108)	woodland
253	29/716.621	Bettyhill, W. Sutherland (v.c 108)	hedgerow
254	39/153.289	Dunbeath, Caithness (v.c. 109)	woodland
256	38/150.197	Tomintoul, Banffs. (v.c. 94)	woodland
257	37/695.488	Ethie Haven, Lunan Bay, Angus (v.c. 90)	coastal cliff
258	68/432.353	East Voe of Quarff, Mainland, Shetland (v.c. 112)	saltmarsh
259	68/369.313	Papil, West Burra, Shetland (v.c. 112)	saltmarsh
260	68/408.396	East Voe of Scalloway, Mainland, Shetland (v.c. 112)	saltmarsh
261	68/397.155	Voe, Mainland, Shetland (v.c. 112)	saltmarsh
262	68/376.185	Bay of Scousburgh, Mainland, Shetland (v.c. 112)	coastal cliff
263	68/435.249	Sand Lodge, Mainland, Shetland (v.c. 112)	saltmarsh
264	68/434.325	Fladdabister, Mainland, Shetland (v.c. 112)	roadside bank
265	26/400.745	Dumbarton Rock, Dunbarton (v.c. 99)	coastal cliff
266	25/430.657	Newton Stewart, Kirkcudbrights. (v.c. 73)	roadside bank
267	25/471.582	Creetown, Kirkcudbrights. (v.c. 73)	saltmarsh

[1] seed sample only

flower, capsule and seed characters was used in the survey of European *S. alba* and *S. dioica* by Prentice (1979); 12 vegetative characters were added for the present survey.

Twenty-nine populations (see Fig. 1 and Table 2 for localities) were scored in August 1975 for all 47 characters. The sampling procedure was as follows. A marker was placed at an arbitrary point within the wild population. I selected for scoring the six flowering males and the six flowering females nearest

FIGURE 2. Multidimensional scaling of 29 Scottish populations of *S. dioica* with the full character set (characters 1–47 in Table 1). Selected outliers are indicated by arrows. Symbols indicate geographic areas (see Fig. 1): closed squares (■) S. Scotland, closed triangles (▲) W. Ross, closed circles (●) Skye, open squares (□) Shetland, open triangles (△) N. Scotland, open circles (○) C./E. Scotland. Numbers indicate habitat types: 1 woodland, 2 hedgerow or roadside bank, 3 coastal cliff, 4 saltmarsh. Percentage stress = 18·5.

to the marker; then further fruiting females, if necessary, to bring the total of plants with ripe capsules to six. I took one capsule from each of the six fruiting plants; the seed in the capsules was pooled and a random subsample of twelve seeds taken for microscopic examination. For the purposes of analysis, therefore, each of the 29 populations was represented by six observations (one per plant) on males and six on females for the flower and vegetative characters (1–15 and 36–47 in Table 1), six observations for the capsule characters (16–19), and twelve observations for the seed characters (20–35).

I visited a further six populations (Fig. 1, Table 2) that were past flowering (three of them montane); these were scored for seed characters only. A set of eight populations from England, France, Norway and Finland, scored for all 47 characters in 1974-1975 (Table 2), was added to the 29 Scottish populations for analysis.

Populations varied in size from less than ten individuals on a montane ledge in Mid Perth, v.c. 88, to over 1,000 individuals on an upper saltmarsh in Shetland. I included populations from a wide range of localities and habitats: woodlands, hedgerows and roadside banks, upper saltmarshes, sea cliffs and montane cliff ledges in mainland Scotland, Skye (N. Ebudes, v.c. 104), Orkney (v.c. 111) and Shetland (Fig. 1). Skye provided a particularly good range of habitats in a small area (see Birks 1973).

Specimens from each population have been deposited in **CGE**. The complete data on character-state frequencies are available on request.

Numerical analyses of differentiation between populations

Analyses were carried out on the main group of 29 populations with the full set of 47 characters. Variation in separate character subsets—flower and capsule characters (1–19 in Table 1), seed characters (20–35) and vegetative characters (36–47)—was also examined, in case of there being discordance, i.e. differences in the variation patterns shown by different functional groups of characters. Further analyses based on seed characters alone were carried out on an expanded group of

35 populations, i.e. the main group plus the six seed samples. Finally, the relationships of some non-Scottish populations to the Scottish ones were investigated by joint analysis, with all 47 characters, of the main group plus the eight non-Scottish populations.

A résumé of the numerical methods follows. For more details and notes on computation see Prentice (1979).

Each 'block' of populations and characters was used for separate computation of a matrix of dissimilarity coefficient (DC) values between populations. (One block consists of the main group of 29 populations and the full set of 47 characters, another of the same 29 populations and the 19 flower/capsule characters, and so on.) Each DC value expresses the net dissimilarity between two populations, on the basis of all the characters in the block; there is a DC value for every pair of populations in the block. K-dissimilarity (Jardine & Sibson 1971) was used as the DC. This DC works on populations rather than individuals as the operational taxonomic units (OTUs), and can be used with both qualitative and quantitative characters. It automatically gives a high weighting to characters that vary between populations but are constant within populations, and a low weighting to characters that are highly variable within populations. Observations on males and females form separate contributions to the K-dissimilarity values (i.e. the flower and vegetative characters were each treated as two units). Subsequent analysis of the pattern contained in the dissimilarity matrices was by two methods, non-metric multidimensional scaling (MDS) and B_k clustering. Non-metric MDS (Kruskal 1964a, 1964b, Jardine 1971, Sibson 1972, Jardine & Edmonds 1974) represents OTUs as points in a scatter diagram in which the distances between points are related monotonically, or nearly so, to the DC values between the OTUs. B_k clustering (Jardine & Sibson 1968, 1971, Jardine & Edmonds 1974) is a method for non-hierarchic cluster analysis and finds overlapping clusters of OTUs. The maximum number of OTUs permitted to be shared by any two clusters (one less than the value of the parameter k in B_k) can be set as required. B_2 and B_3 can give a better representation of some semi-continuous variation patterns than single-link (hierarchic) cluster analysis, which is equivalent to B_1.

The extent to which the methods succeed in producing undistorted representations of the information held in the dissimilarity matrices, and therefore the confidence with which the representations can be interpreted, is measured by distortion statistics. For MDS, percentage stress quantifies the deviation of interpoint distances from the ideal of monotonicity with the DC values. $\hat{\Delta}_{\frac{1}{2}}$ (Jardine & Sibson 1971) is used to measure the distortion that B_k clustering imposes on the DC values; $\hat{\Delta}_{\frac{1}{2}}$ ranges from zero to one. These distortion statistics can reasonably be compared among analyses of similar data types and with similar numbers of OTUs.

The possibility of discordance between character subsets was investigated for the main group of 29 populations by calculating Δ (Jardine 1971, Jardine & Edmonds 1974) between dissimilarity matrices based on character subsets, and between these and the dissimilarity matrix based on the full character set. Δ ranges from zero to two, a zero Δ value signifying perfect concordance.

MDS diagrams were inspected first for association between MDS-placing and habitat-type for populations from the same general area, then for association between MDS-placing and area for populations from the same habitat type, in order to assess the extent of ecological and geographic components of variation, respectively. I adopted this approach rather than a simple search for relationship with area or habitat, because not all habitats were represented in each area and a simple search would have been biased. B_k diagrams, drawn up at a few convenient clustering levels, were likewise examined for clustering by habitats in populations from the same area and for clustering by areas in populations from similar habitats. (High clustering levels, like the upper levels of a dendrogram in hierarchic cluster analysis, depict broader relationships than lower levels). The MDS diagram derived from joint analysis of Scottish and non-Scottish populations was examined for association between MDS-placings and geographic regions of origin.

THE STATUS OF SHETLAND POPULATIONS

Comparison with mainland populations

The Shetland group of seven populations was compared with a 'standard group', including most of the 'mainland' (including Skye) populations but excluding 'outliers' found by numerical analysis (Fig. 2). Data were not available on all the characters mentioned by Baker (1948a: table 2), but I compared histograms based on pooled character-state frequencies in the two groups for a series of characters related to Baker's: stem-hair stiffness, stem-hair straightness, leaf shape, number of internodes below inflorescence, proportion of shoot with flowers, calyx-hair straightness, corolla diameter, corolla colour, capsule shape, capsule length, and seed length.

Investigation of variation within a Shetland population

I selected a large population (>1,000 individuals) of *S. dioica* at East Voe of Quarff, Mainland, Shetland (GR 68/432.353) for an investigation of within-population variation. This population is typical of the numerous upper saltmarsh *S. dioica* populations in Shetland. The object was to find out whether the various distinctive character-states of Compton's Shetland variety and Baker's Shetland subspecies (Compton 1920, Baker 1947, 1948a) tend to occur together or independently, i.e. to investigate the extent of statistical (within-population) correlation among the relevant characters. Twenty-five plants of each sex were scored for a new set of characters closely related to those given by Baker (1948a) as differentiating the Shetland subspecies. These characters were:

ratio of inflorescence length to plant height
stem diameter (mm, lowest internode)
leaf length/breadth ratio (on median stem-leaf)
corolla diameter (mm)
corolla colour (see Table 1)
capsule length (mm, females only)
mean seed weight (mg for 20 seeds, females only)

The results were (a) represented for immediate visual comparison as polygraphs, and (b) subjected to correspondence analysis (Hill 1974), a numerical technique that summarizes the correlations between characters; males and females were treated separately. Correspondence analysis is closely related to principal components analysis, but takes into account non-linear correlations. The percentage contribution of successive eigenvalues to the total variance depends on the amount of correlation between characters. If all the characters were independent, the eigenvalues would be approximately equal, but if all the characters were highly correlated with one another the first eigenvalue would be much larger than the rest.

RESULTS

ALL-CHARACTER ANALYSES OF DIFFERENTIATION BETWEEN SCOTTISH POPULATIONS

The result of MDS applied to the main group of 29 populations, with the full character set, is shown in Fig. 2. There is no perceptible clumping by habitat in populations from each area, although most of the outliers are from woodlands or coastal cliffs, but there is clumping by area: saltmarsh populations divide into Shetland, Skye/W. Ross, and (with one member) S. Scottish groups; the Shetland populations form a group, irrespective of habitat.

Fig. 3 shows the result of B_2 clustering, pictured at two clustering levels. B_3 is not shown because its $\hat{\Delta}_{\frac{1}{2}}$ value was not appreciably better than that of B_2 (see Table 3). Fig. 3 shows some clustering related to geographic distribution: most Skye populations are interrelated at a low clustering level, regardless of habitat; at the higher clustering level Shetland populations form a loosely linked group consisting of several overlapping two-membered clusters, but some of the Shetland populations are also linked to populations from other parts of Scotland at this level. Fig. 3 also emphasizes that some populations are true outliers, as distinct from one another as from the residue.

ANALYSES BASED ON SUBSETS OF CHARACTERS

Dissimilarity matrices derived from the main group of 29 populations with three subsets of characters (flower/capsule, seed, vegetative) were subjected to MDS and to B_1 (single-link), B_2 and B_3 clustering. Table 3 compares percentage stress and $\hat{\Delta}_{\frac{1}{2}}$ values for analyses based on all 47 characters and on the subsets. B_k clustering gave higher $\hat{\Delta}_{\frac{1}{2}}$ values with each of the subsets than with the full character set. MDS stress values were also higher, except for the vegetative subset. Among the three subsets there was an inverse relationship between B_k and MDS performance. Thus the subset that was most aptly described by a system of overlapping clusters proved least amenable to two-dimensional representation, and *vice versa*.

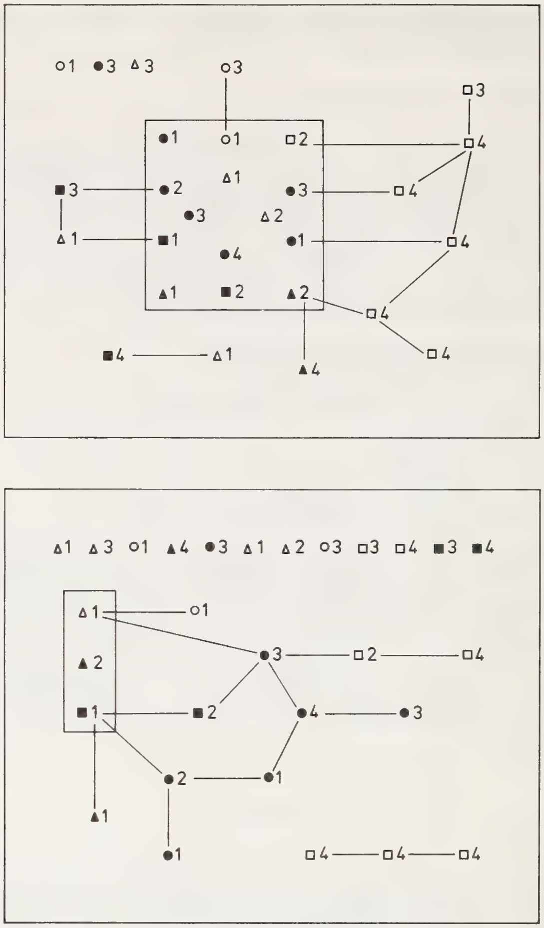

FIGURE 3. B_2 clustering of 29 Scottish populations of *S. dioica* with the full character set (characters 1–47 in Table 1). Symbols indicate geographic areas (see Fig. 1): closed squares (■) S. Scotland, closed triangles (▲) W. Ross, closed circles (●) Skye, open squares (□) Shetland, open triangles (△) N. Scotland, open circles (○) C./E. Scotland. Numbers indicate habitat types: 1 woodland, 2 hedgerow or roadside bank, 3 coastal cliff, 4 saltmarsh. The diagrams show the overlapping clusters formed at two levels. Clusters containing more than two populations are enclosed by solid lines, clusters containing two populations are indicated by a line joining the pair, and single-membered clusters are shown at the top of each diagram. $\hat{\Delta}_{\frac{1}{2}} = 0{\cdot}22$.

TABLE 3. DISTORTION VALUES FOR ANALYSES BASED ON DIFFERENT SETS OF CHARACTERS

	all	flower/capsule	seed	vegetative
$\hat{\Delta}_{\frac{1}{2}}$ (B_1)	0·27	0·33	0·42	0·59
$\hat{\Delta}_{\frac{1}{2}}$ (B_2)	0·22	0·28	0·35	0·55
$\hat{\Delta}_{\frac{1}{2}}$ (B_3)	0·19	0·24	0·32	0·53
percentage stress (MDS)	18·5	20·5	18·8	14·8

TABLE 4. DISCORDANCE VALUES BETWEEN DIFFERENT SETS OF CHARACTERS

flower/capsule	seed	all	
0·35	0·37	0·24	vegetative
	0·29	0·13	flower/capsule
		0·21	seed

Δ values revealed discordance among character subsets and between these and the full character set (Table 4). Values for the comparisons all:vegetative and all:seed at this geographic scale are high compared with those quoted by Prentice (1979) for flower/capsule/seed:seed in studies of variation in *S. alba* and *S. dioica* on a European scale, where seed characters were found to be a reliable guide to the major variation patterns.

MDS results for separate subsets of characters (Figs. 4, 5, 6) differ from Fig. 2 and differ markedly from one another. The patterns in each case can be related in different ways and in differing degrees to geography and ecology.

MDS for flower/capsule characters (Fig. 4) shows slight geographic differentiation, grouping some of the Skye populations, some of the Shetland populations, and all three populations from W. Ross. MDS for seed characters (Fig. 5) shows some habitat-related features, for example within Skye, where sea-cliff populations are separated from woodland populations; the woodland population from Kirkcudbrights. (v.c. 73), S. Scotland, is placed with two other woodland populations (from Skye and N. Scotland), while the Kirkcudbright saltmarsh population is next to one of the saltmarsh populations from Shetland. Geographic features of variation are also detectable: for example, some Shetland populations are adjacent irrespective of habitat, and west-coast populations (Skye, W. Ross, S.

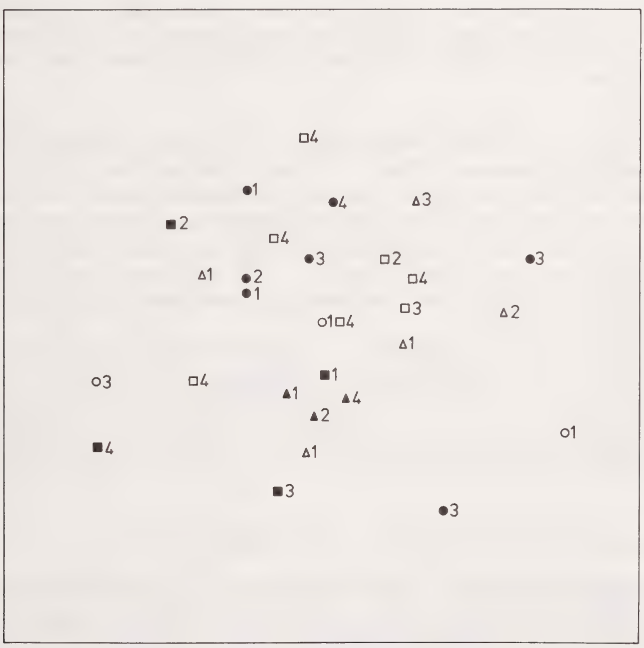

FIGURE 4. Multidimensional scaling of 29 Scottish *S. dioica* populations with flower/capsule characters only (characters 1–19 in Table 1). Symbols indicate geographic areas (see Fig. 1): closed squares (■) S. Scotland, closed triangles (▲) W. Ross, closed circles (●) Skye, open squares (□) Shetland, open triangles (△) N. Scotland, open circles (○) C. & E. Scotland. Numbers indicate habitat types: 1 woodland, 2 hedgerow or roadside bank, 3 coastal cliff, 4 saltmarsh. Percentage stress = 20·5.

FIGURE 5. Multidimensional scaling of 29 Scottish *S. dioica* populations with seed characters only (characters 20–35 in Table 1). Symbols indicate geographic areas (see Fig. 1): closed squares (■) S. Scotland, closed triangles (▲) W. Ross, closed circles (●) Skye, open squares (□) Shetland, open triangles (△) N. Scotland, open circles (○) C. & E. Scotland. Numbers indicate habitat types: 1 woodland, 2 hedgerow or roadside bank, 3 coastal cliff, 4 saltmarsh. Percentage stress = 18·8.

Scotland) mostly fall in the lower half of the diagram. The influence of habitat type is most obvious in the MDS for vegetative characters (Fig. 6), although this too has a mixture of geographic and ecological features. Skye populations are clumped; woodland populations from outside Skye all fall into one part of the diagram; most of the Shetland populations (those from saltmarshes and coastal cliffs) are placed together, but the single inland roadside bank population from Shetland is placed next to a hedgerow population from W. Sutherland (v.c. 108), well away from its compatriots. The three Kirkcudbright populations are clumped. Hedgerow and bank populations appear in a horizontal band across the centre of the diagram.

Seed-character analysis of the expanded group of 35 OTUs gave distortion values close to those for the former 29 OTUs, as follows: MDS stress 20·6%; $\hat{\Delta}_{\frac{1}{2}}$ values of 0·42, 0·36 and 0·34 respectively for B_1, B_2 and B_3. MDS largely repeated the result for the 29 populations; the three new montane seed samples were placed in the same part of the plot as most of the sea-cliff populations. B_2 showed a relationship (though at a high clustering level) between the montane samples and some sea-cliff populations.

ALL- CHARACTER ANALYSIS OF SCOTTISH AND NON-SCOTTISH POPULATIONS

Fig. 7 shows the result of MDS based on all 47 characters for the 29 Scottish populations plus the eight from elsewhere in Britain and Europe. Stress is low and there is clear geographic grouping, although no overall north-south trend. The Shetland populations form a subgroup of the Scottish group.

STATUS OF SHETLAND POPULATIONS

Comparison with mainland populations

Numerical analysis shows that Shetland populations of *S. dioica* form a local race that is just

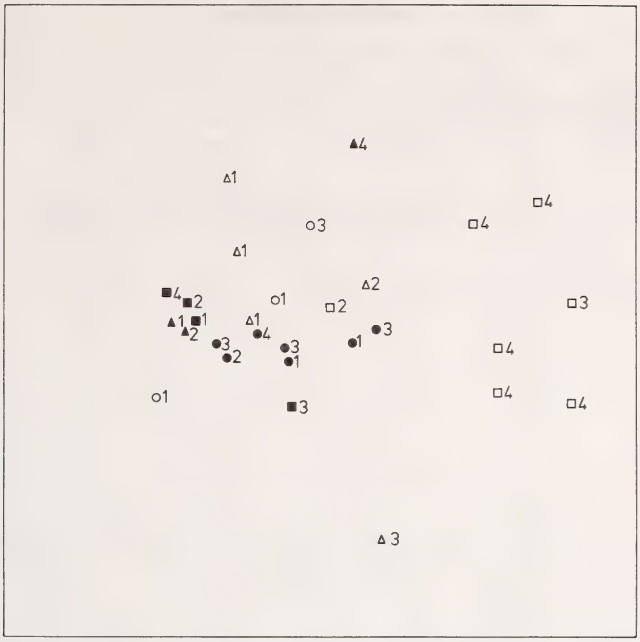

FIGURE 6. Multidimensional scaling of 29 Scottish *S. dioica* populations with vegetative characters only (characters 36–47 in Table 1). Symbols indicate geographic areas (see Fig. 1): closed squares (■) S. Scotland, closed triangles (▲) W. Ross, closed circles (●) Skye, open squares (□) Shetland, open triangles (△) N. Scotland, open circles (○) C. & E. Scotland. Numbers indicate habitat types: 1 woodland, 2 hedgerow or roadside bank, 3 coastal cliff, 4 saltmarsh. Percentage stress = 14·8.

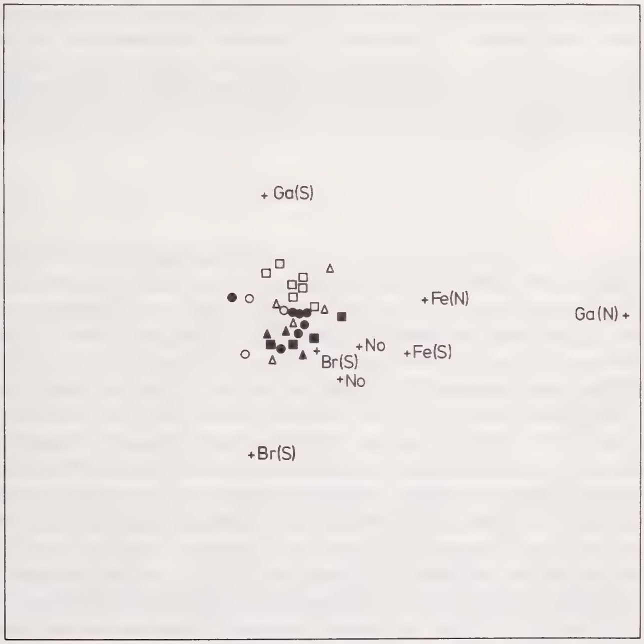

FIGURE 7. Multidimensional scaling of 37 European populations of *S. dioica* with the full character set (characters 1–47 in Table 1). Symbols indicate geographic areas (see Fig. 1): closed squares (■) S. Scotland, closed triangles (▲) W. Ross, closed circles (●) Skye, open squares (□) Shetland, open triangles (△) N. Scotland, open circles (○) C. & E. Scotland, crosses (+): other areas, i.e. Br(S) southern Britain, Ga(N) northern France, Ga(S) southern France, Fe(S) southern Finland, Fe(N) northern Finland, No northern Norway. Percentage stress = 12·4.

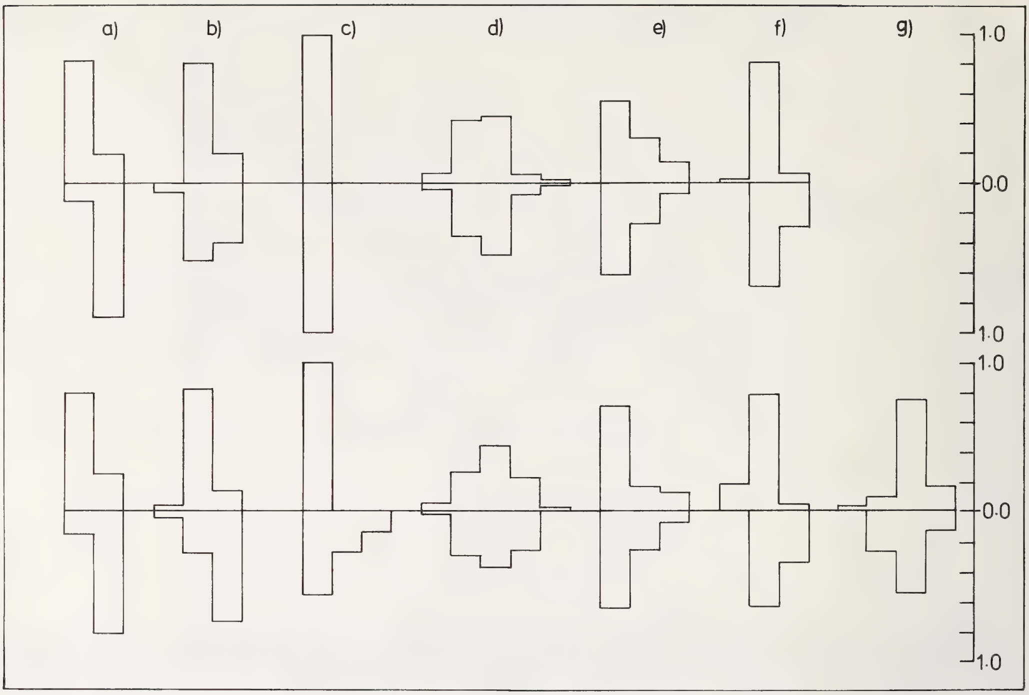

FIGURE 8. Histograms of seven qualitative characters for Shetland populations and a standard group of Scottish populations of *S. dioica*. The lower, inverted histograms are for Shetland populations; the upper pairs of histograms represent males, the lower pairs, females. Characters: (a) stem-hair stiffness (rather stiff/soft), (b) stem-hair straightness (straight/flexuous/crispate), (c) leaf shape (ovate-acute/ovate-obtuse/rounded), (d) number of internodes below inflorescence (1–2/3–4/5–6/7–8/9–10), (e) proportion of shoot with flowers (less than half/half or more/nearly all), (f) calyx-hair straightness (straight/flexuous/crispate), (g) capsule shape (globose/ovoid/pyriform/long-pyriform). Vertical scale: frequency.

distinguishable from others when all characters are examined together. This race is not similar to other coastal populations. Individual subsets of characters fail to separate a definite Shetland race.

Histograms of critical characters (Figs. 8-10)* showed that the differences between Shetland populations and more typical Scottish ones are slight. (The 'standard group' of mainland Scottish populations chosen for these comparisons excludes seven outliers: numbers 151, 153, 238, 248, 252, 257 and 267 in Table 2. These were selected by eye as the outliers from the main group of mainland populations in Fig. 2; they also appear among the outliers at a low level, and some also at a high level, in Fig. 3. All seven were noted as distinctive in the field.) Shetland populations have on average larger flowers, deeper magenta petals and larger seeds (as also observed by Baker (1948a) and Palmer & Scott (1969)), soft, crispate stem-hairs and crispate calyx-hairs. However, no appreciable differences were found between Shetland and non-Shetland populations in capsule size and shape, nor in compactness of the inflorescence (judged from 'proportion of shoot with flowers' and 'number of internodes below inflorescence'), all characters also regarded by Baker as definitive of the Shetland subspecies. The Shetland populations were not found to have the narrow cauline leaves of Baker's material (Baker 1946, 1947, 1948a); on the contrary, some females had unusually rounded leaves, as was also observed by Compton (1920).

* Bimodality in capsule size (Fig. 10) results from an artefact of sampling: the basal capsule is normally the largest, the others appreciably smaller.

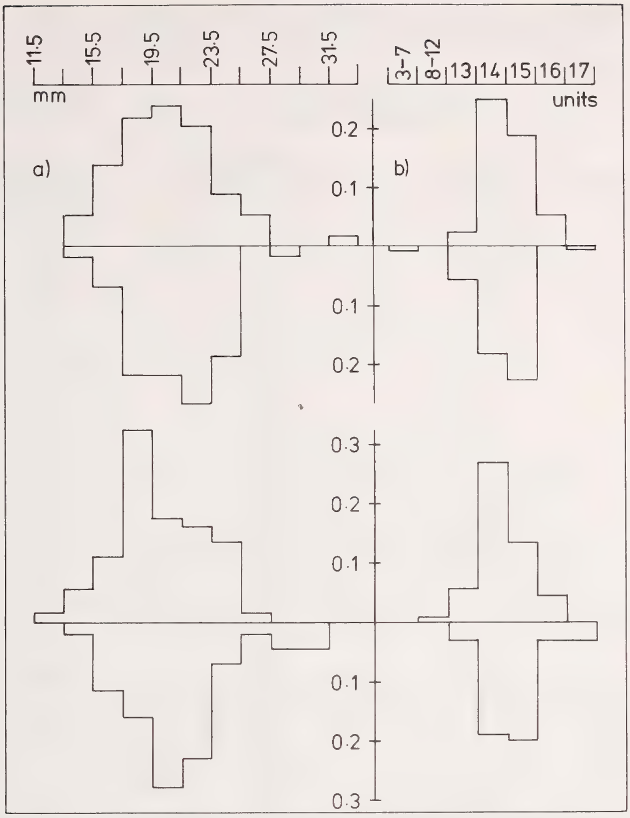

FIGURE 9. Histograms of corolla diameter (a) and colour (b) for Shetland populations and a standard group of Scottish populations of *S. dioica*. The lower, inverted histograms are for Shetland populations; the upper pairs of histograms represent males, the lower pairs, females. Corolla colour is in colour chart units (see Table 1). Vertical scale: frequency.

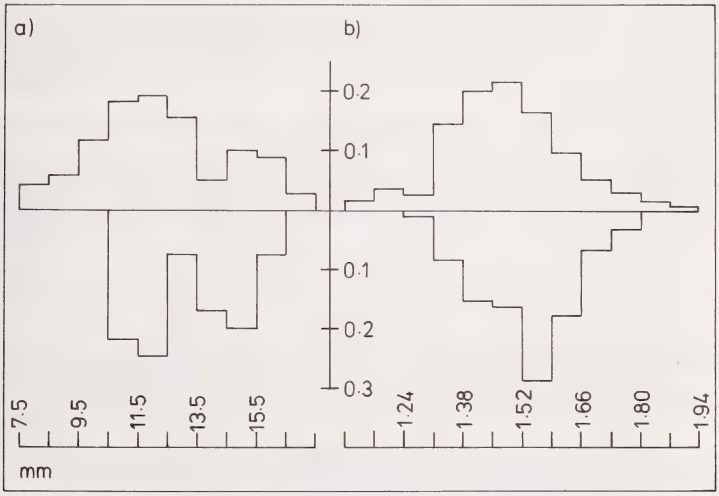

FIGURE 10. Histograms of capsule length (a) and seed length (b) for Shetland populations and a standard group of Scottish populations of *S. dioica*. The lower, inverted histograms are for Shetland populations. Vertical scale: frequency.

TABLE 5. CORRESPONDENCE ANALYSIS OF VARIATION WITHIN THE *S. DIOICA* POPULATION AT EAST VOE OF QUARFF, SHETLAND: TABLE OF EIGENVALUES

	females (25 individuals, 21 character-states):		males (25 individuals, 16 character-states):	
eigen value number	contribution to total variance, %	cumulative contribution, %	contribution to total variance, %	cumulative contribution, %
1	11·6	11·6	13·9	13·9
2	10·5	22·1	12·2	26·1
3	9·4	31·5	11·1	37·2
4	8·9	40·4	10·2	47·4
5	7·6	48·0	8·4	55·8
6	7·0	55·0	6·6	62·3
7	6·5	61·5	6·4	68·8
8	5·4	66·8	5·7	74·5
9	5·0	71·8	5·3	79·7
10	4·6	76·4	4·8	84·5
11	4·3	80·7	4·0	88·5
12	3·4	84·1	3·1	91·6
13	2·9	87·0	2·7	94·3
14	2·7	89·7	2·4	96·6
15	2·1	91·8	1·6	98·2
16	2·0	93·8	1·0	99·2[1]
17	1·7	95·5		
18	1·3	96·8		
19	1·2	98·0		
20	0·9	98·8		
21	0·5	99·3[1]		

[1] 100% not reached because of rounding errors during computation

Variation within a Shetland population

Plants fitting Compton's (1920) varietal description—squat, stout-stemmed and hairy individuals with showy dark magenta flowers—do occur in Shetland populations; I have not seen such plants elsewhere. I estimated from rough counts that such individuals occur only about once in a thousand plants. Most individuals are less spectacular.

Initial examination of polygraphs showed little correlation within the East Voe of Quarff population between the characters that define Compton's variety. Female plants appeared to be more variable than males, more often possessing extreme character-states such as exceptionally large or deeply-coloured flowers. Poor correlation between characters was confirmed by correspondence analysis (Table 5).

DISCUSSION

In another paper (Prentice 1979) I have shown that in Europe *S. dioica* has local, weakly differentiated ecogeographic races, defined at least by seed characters (which were found to vary concordantly with flower/capsule characters). *S. alba* in contrast has a clinal pattern of variation. Analyses described in the present paper gave results that are consistent with the idea of combined ecological and geographic differentiation, but within Scotland different subsets of characters—flower/capsule, seed, vegetative—are discordant. Variation in all characters, and in flower/capsule characters (the subset most concordant with 'all characters'), was found to have a geographic component but no relation to habitat, whereas seed characters and vegetative characters showed a mixture of both types of variation.

Analyses based on seed characters by Prentice (1979) do not substantiate the concepts of homogeneous alpine and subalpine ecotypes in the montane areas of Europe (Turesson 1925, Baker 1948a) but suggest the existence of different races in, for example, the French Alps, N. Fennoscandia and the mountains of Scotland. The present work has also provided some evidence that montane *S. dioica* populations in Scotland are distinctive, at least in seed characters. Shetland populations are not adequately differentiated by seed characters alone.

Baker (1947, 1948a) adopted an approach to variation in *S. dioica* that emphasized vegetative features, and combined an 'ecotype' classification with ordinary taxonomy. My results show that the vegetative subset of characters is the most discordant with others, and MDS based on vegetative characters provided evidence for ecological differentiation. In this MDS an inland population from Shetland was separated from the grouped coastal ones. However, the coastal Shetland populations were not placed with other coastal populations and cannot therefore be regarded as representatives of a coastal ecotype. When the full set of characters was used it became clear that the Shetland populations constitute a local race, including coastal and inland members. B_2 clustering showed that the majority of mainland populations most like the Shetland ones were, in fact, not coastal.

The Shetland populations are not unique in being distinctive. In Fig. 2 seven other populations, all noted in the field as distinctive, appear as outliers. Three of these were from woodlands (151, 238, 252: see Table 2 for localities). Populations 238 and 252 consisted of spindly pale-flowered plants growing in deep shade. Three outliers were from sea-cliffs: population 153 was made up of thick-stemmed, tall, stiffly-hairy individuals with large, thick leaves and little variation in flower colour; plants from population 257 were also unusually robust; population 248 included plants with much-branched inflorescences with numerous large flowers. Population 267 was from an atypical saltmarsh habitat—a dense reed bed—and consisted of tall, weak-stemmed plants. Population 243, scored for seed characters only, had few inflorescence branches, long-pyriform capsules, and the largest seeds of all the populations visited.

Given that the Shetland populations are representatives of a local race rather than a coastal ecotype, should the race be recognized taxonomically? My answer is no, for several reasons. Firstly the race is differentiated by only a few characters. Secondly, it is no more distinctive than a number of other possible taxa: there are more distinctive outliers, and other groupings related to ecology or geography. Thirdly, the race overlaps too much with non-Shetland populations, because of substantial, uncorrelated within-population variation in the critical characters. Many Shetland *S. dioica* plants could not be confidently assigned to the Shetland race on morphological criteria without information on the whole population. Subsp. *zetlandica* on present evidence fails the '75% rule', which is an ultra-minimal criterion for recognizing subspecies (Jardine & Sibson 1971). Compton's (1920) variety might be retained for the occasional extreme individuals of *S. dioica* found in Shetland, but this taxon also makes little biological sense because it merely embodies a chance combination of character-states.

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Hieracium zygophorum Hyl., new to the British Isles

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ABSTRACT

Hieracium zygophorum Hyl., originally described from Sweden, is recorded for the first time in the British Isles, from E. Suffolk, v.c. 25. It is related to *H. scotostictum* Hyl.

INTRODUCTION

In the course of a survey of the extant railway lines in East Anglia, conducted by the Institute of Terrestrial Ecology and funded by the Nature Conservancy Council, J. O. Mountford collected on 28th May, 1977, two specimens of a *Hieracium* from Weston Crossing, near Beccles, E. Suffolk, v.c. 25, which we could not identify. One of us (P. D. S.) accompanied Mountford to the locality on 12th June, 1978, and found 35 plants on a bank of calcareous rabbit-grazed grassland (pH 8.3) south of Weston Crossing at GR 63/413.859, and several hundred plants on the margin of the track to the north of Weston Crossing at about GR 63/416.865.

At the site to the south of Weston Crossing it was associated with species such as *Briza media*, *Carex flacca*, *Daucus carota*, *Leontodon hispidus*, *Leucanthemum vulgare*, *Lotus corniculatus*, *Pilosella officinarum* subsp. *micradenia* and *Poa angustifolia*. In this locality it had the appearance of being native. In the site to the north of Weston Crossing it grew in loose cinders along the margin of the track in association with *Ajuga reptans*, *Epilobium angustifolium*, *Equisetum arvense*, *Heracleum sphondylium*, *Hieracium exotericum* Jordan ex Bor., *Hypochoeris radicata*, *Potentilla anserina* and *Rumex angiocarpus*. In this locality it was clearly an introduction.

THE IDENTIFICATION OF THE PLANTS

The main features of the plant are its distinct basal rosette of leaves, 0–1(–2) cauline leaves and a large panicle of small capitula, the involucres of which are clothed with numerous glandular and numerous simple eglandular hairs (Fig. 1). It therefore clearly belongs to what Continental hieraciologists call the *H. praecox* group and which in Sell & West (1976, p. 377) we have called the *H. glaucinum* group. We are aware of several unidentified taxa belonging to this group which occur in the British Isles, but their complexity is such that we have so far refrained from dealing with them. Hylander (1943) described a large number of new species of the *H. murorum* and *H. glaucinum* groups from Swedish grasslands and in discussion with one of us (P. D. S.) suggested that some of them occurred in the British Isles. He promised a set of duplicates for **CGE** but this did not arrive until 1977, after his death. The set is very important for a study of these groups and contains many isotypes and paratypes. A comparison of the Weston Crossing plants with Hylander's set showed that they are referable to one of his new species, *H. zygophorum* Hyl. (Hylander (1943), p. 130, tab. IIa).

H. zygophorum is characterized by:

1. Oblong or oblong-lanceolate basal leaves deeply divided into narrowly mammiform, often cusped teeth.
2. An ovate, sharply toothed cauline leaf.
3. Involucres with numerous glandular hairs and numerous longer simple eglandular hairs.

Hylander's Swedish specimens have blotched leaves, but the Weston Crossing plants were only tinged with purple. A detailed Latin description is given by Hylander (1943). The plants collected by Mountford in 1977 and a series of specimens collected in 1978 (Sell 78/68, 78/69, 78/72) have been deposited in **CGE**.

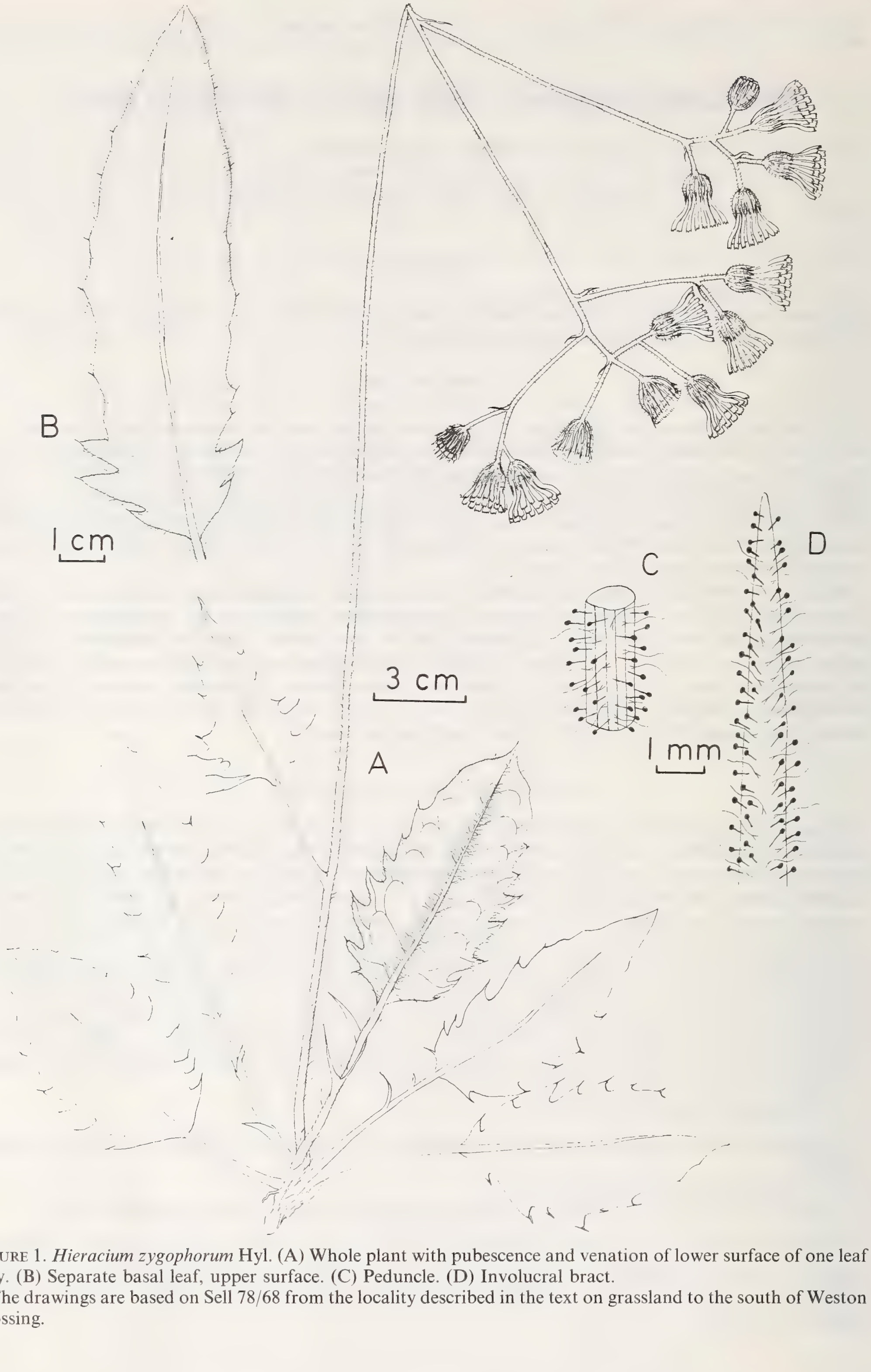

FIGURE 1. *Hieracium zygophorum* Hyl. (A) Whole plant with pubescence and venation of lower surface of one leaf only. (B) Separate basal leaf, upper surface. (C) Peduncle. (D) Involucral bract.

The drawings are based on Sell 78/68 from the locality described in the text on grassland to the south of Weston Crossing.

In Sweden *H. zygophorum* occurs at Karlskrona, Blekinge where it is found in tall grassland. That it is known only from two widely separated localities almost certainly results from lack of attention to the group, which is found introduced into disturbed areas throughout the lowlands of Europe. In the British Isles it should be looked for on roadsides and other disturbed places.

In the shape of its leaves *H. zygophorum* resembles the widespread *H. grandidens* Dahlst., but that species has no simple eglandular hairs on its involucres.

An allied species which has spread along railway banks and roadsides is *H. scotostictum* Hyl., first recorded in the London area in 1920 (as *H. praecox*) and now found as far north as Inverness. *H. scotostictum* was also first described from the Swedish grasslands (Hylander (1943) p. 127, tab. Ib); it also occurs in Denmark. It is immediately distinguished by its ovate, more sharply toothed leaves which are heavily marbled with brownish-purple. *H. exotericum* (a local species in the British Isles), with which *H. zygophorum* grows, is easily distinguished by its almost entire leaves and by the absence of simple eglandular hairs from its involucres.

The sites are in the Norwich division of the Eastern Region of British Rail, but occur in two administrative areas. The greatest danger to the colonies is from seepage and drift from total weed killer which is sprayed annually on the track-bed. Negotiations with British Rail for conservation and management of the site are being conducted by the Nature Conservancy.

ACKNOWLEDGMENTS

Our thanks are due to Owen Mountford for making available his information on the sites and to Tim Sell for drawing the illustration.

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Notes on British *Rubi*, 6

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ABSTRACT

Three new brambles are described, *viz.* **Rubus intensior**, which is abundant in north Staffordshire, **R. fuscicaulis**, which is widely distributed in southern England, and **R. malvernicus**, of local distribution near Malvern.

INTRODUCTION

The object of this paper, which concludes the present series, is to describe three taxa omitted from earlier papers for further consideration. The first belongs to the section *Triviales* P. J. Muell, as understood by W. C. R. Watson, the other two are related to *R. fuscus* Weihe & Nees.

DESCRIPTIONS

1. **Rubus intensior** E. S. Edees, **sp. nov.**

Turio arcuato-procumbens, obtuse angulatus, rubescens, glaber, aciculis glandulisque stipitatis, 0·3–1 mm longis, satis numerosis instructus, aculeis patentibus, haud ad angulos solum dispositis, 1–7 mm longis inter se paulatim abeuntibus dense armatus. Folia pedata; foliola 3–5, imbricata, superne strigosa, subtus pilis simplicibus mox etiam stellatis molliter vestita; foliolum terminale late ovatum vel ellipticum, *c* 9 × 6·5 cm, acuminatum, basi emarginatum vel cordatum, planum, argute serratum vel biserratum; foliola infima subsessilia. Ramus florifer vix flexuosus, sparsim pilosus aciculis numerosis glandulisque stipitatis longitudine variantibus praeditus, aculeis tenuibus patentibus 1–7 mm longis spisse armatus. Inflorescentia foliosa e ramulis brevibus, inferioribus distantibus, superioribus confertis composita. Flores usque ad 3 cm diametro; sepala griseo-viridia, glandulosa, saepe attenuata, patentia vel erecta; petala *c* 12 × 9 mm, alba, obovato-elliptica, nonnunquam apice emarginata, contigua; stamina alba stylos pallidos superantia; carpella et receptaculum glabrum.

Stem low-arching, bluntly angled with flat sides, becoming bright red, glabrous, with numerous acicles and red stalked glands 0·3–1 mm; prickles crowded, on angles and faces, unequal but grading into one another with no marked gap between the longest and those next in size, 1–7 mm, patent, with compressed or bulbous bases and fine yellow points. Leaves pedate; leaflets 3–5, imbricate, light or dark green, strigose above, soft beneath with numerous short simple hairs and sometimes an underlayer of dense stellate hairs; terminal leaflet *c* 9 × 6·5 cm, broadly ovate or elliptical, with an acuminate or acuminate-cuspidate point 1·5 cm and emarginate or cordate base, finely serrate or biserrate, flat, the petiolule *c* 1/3 as long as the blade; basal leaflets subsessile; petiole about as long as the basal leaflets, with numerous slender unequal patent prickles. Flowering branch with 3-foliate leaves below and simple (often trifid) leaves above extending nearly to the apex; inflorescence consisting of a dense head of flowers, the peduncles 2–3 cm, and 2–3 distant branches, usually much shorter than their leaves but sometimes developed as secondary panicles; rachis nearly straight, green or bright red, with sparse (numerous above) short and very short simple and tufted hairs, numerous sessile glands, numerous very short to long stalked glands and acicles and crowded slender more or less patent prickles 1–7 mm; pedicels with numerous to dense stellate and very short simple hairs and many unequal stalked glands and slender prickles. Flowers up to 3 cm in diameter; sepals greyish-green-felted, glandular, often long-pointed, patent or erect; petals *c* 12 × 9 mm, white, obovate-elliptical, sometimes notched, glabrous or nearly so on the margin, contiguous; stamens white, longer than the green styles; carpels and receptacle glabrous.

HOLOTYPUS: Springpool Wood, Keele, GR 33/82.43, Staffs., v.c. 39, 13/8/1977, *E. S. Edees* 21835 **(herb. E.S.E.)**

R. intensior is allied to *R. tuberculatus* Bab. but differs from it in several ways. Both flower early and have compact heads of white flowers, but the flowers of *R. tuberculatus* are often 4 cm in diameter and distinctly larger than those of *R. intensior*. The young carpels of *R. tuberculatus* are hairy at the tip and the first year stems are also slightly hairy. On the other hand the stems and carpels of *R. intensior* are quite glabrous. Both species are strongly armed, but, whereas the prickles of *R. intensior* grade into one another, the largest prickles of *R. tuberculatus* are often conspicuously longer than the rest. The terminal leaflets differ in shape and colour. Those of *R. tuberculatus* are typically obovate and convex, those of *R. intensior* are ovate or broadly elliptical with rounded sides, flat, more finely toothed and usually a brighter green.

R. intensior is abundant in north Staffordshire and has also been recorded for Derbyshire. Its distribution further afield is not yet known. There are several unnamed taxa which approach it more or less closely. One of these is plentiful in central Scotland and was erroneously identified with *R. iodnephes* W. C. R. Wats. by the author of that name, perhaps because of its bright reddish-purple or violet stems.

2. **Rubus fuscicaulis** E. S. Edees, **sp. nov.**

Turio obtuse angulatus, fusco-rufescens, dense pilosus aciculis glandulisque stipitatis numerosis brevioribus obsitus, aculeis *c* 10 per 5 cm, 3–7 mm longis rectis declinatis aculeolisque inaequalibus nonnullis armatus. Folia pedata; foliola 3–5, contigua vel inter se distantia, utrinque viridia, supra strigosa, subtus molliter pilosa; foliolum terminale *c* 8 × 5 cm, obovatum nonnunquam basin versus angustatum, basi emarginatum vel subintegrum, apice abrupte et longe acuminato-cuspidatum, parum duplicato-serratum. Ramus florifer flexuosus, dense villosus aciculis glandulisque stipitatis numerosis inaequalibus praeditus, aculeis tenuibus declinatis armatus. Inflorescentia inferne foliosa ramulis adscendentibus distantibus axillaribus aucta, superne aphylla e ramulis brevibus paucifloris erecto-patentibus composita. Flores 2–2·5 cm diametro; sepala tomentosa villosa glandulosa, attenuata, nunc patentia vel laxe erecta, nunc reflexa; petala c 8 × 5 mm, alba, obovata, margine subglabra; stamina alba stylos rubros aequantia vel parum superantia; carpella leviter pilosa.

Stem arching, bluntly angled, dark reddish-purple, with numerous patent, short (to 1 mm), simple and tufted hairs, sparse to numerous stellate hairs, numerous short and very short acicles and stalked glands and often a few longer acicles (some gland-tipped) and short to medium pricklets; prickles *c* 10 per 5 cm, on the angles, 3–7 mm, straight, declining from a broad or compressed base, often slender, reddish-purple with yellow point. Leaves pedate; leaflets 3–5, contiguous or not, green on both sides, strigose above, soft beneath at first with numerous short simple hairs; terminal leaflet *c* 8 × 5 cm, obovate, sometimes narrowed to the base, with a long (*c* 2 cm) acuminate-cuspidate point and subentire or emarginate base, more or less evenly or coarsely serrate, flat or undulate, the petiolule *c* 1/3 as long as the blade; petiolules of basal leaflets 2–5 mm; petiole a little longer than the basal leaflets, coloured and clothed like the stem, with 6–10 declining or curved prickles 3–4 mm. Flowering branch with 3-foliate leaves below and sometimes 1–2 simple leaves above, not leafy to the apex; inflorescence with a short cylindrical upper part, the middle peduncles 3-flowered and *c* 2 cm, and, when well developed, with one or more distant ascending axillary peduncles shorter than their leaves; rachis flexuose, green or dull reddish-purple, with numerous to dense patent, short to medium, simple and tufted hairs, a thin or dense underlayer of stellate hairs, numerous reddish-purple acicles and stalked glands, varying from 0.1 to 1 mm, and frequent slender declining prickles 2–4 mm; pedicels clothed and armed like the upper part of the rachis. Flowers 2–2·5 cm in diameter; sepals felted, hairy, glandular and often slightly aculeolate, long-pointed, reflexed to patent; petals *c* 8 × 5 mm, white, obovate, glabrous or subglabrous on the margin; stamens level with or slightly longer than styles, filaments white, anthers glabrous; styles red or red-based; young carpels slightly hairy; receptacle glabrous.

HOLOTYPUS: Mitcheldean Meend, GR 32/65.18, W. Gloucs., v.c. 34, 30/7/1964, *E. S. Edees* 18912 **(herb. E.S.E.)**

R. fuscicaulis is related to *R. anglofuscus* Edees but can be readily distinguished by the comparatively slender prickles, the shape of the panicle, which has a narrow leafless sometimes nodding top, the darker colour of the foliage and particularly by the obovate terminal leaflet with its characteristically long cuspidate point. There is also some resemblance to *R. hyposericeus* Sudre, but that species has short stalked glands of even length, strongly reflexed sepals, grey-white felted leaves and short-pointed terminal leaflets.

R. fuscicaulis has so far been recorded for v.c. 6, 7, 12, 23, 34–37, 41–42, 50. In addition to the holotype the following exsiccata are representative:

Speech House Road, Forest of Dean, GR 32/6.1, W. Gloucs., v.c. 34, 27/7/1955, E. S. Edees, **herb. E.S.E.**

Chase Wood, Ross, GR 32/6.2, Hereford, v.c. 36, 9/9/1909, A. Ley as *R. fuscus* Weihe & Nees var. *nutans* Rogers, **herb. E.S.E.**

Vale of Neath, GR 22/8.0, Glamorgan, v.c. 41, 11/7/1929, H. J. Riddelsdell, herb. Barton & Riddelsdell, no. 2407, **BM**

Lea Bailey Woods, GR 32/6.2, W. Gloucs., v.c. 34, 23/7/1970, A. Newton, **herb. A.N.**

Andover, Harewood Forest, GR 41/408.452, N. Hants, v.c. 12, 19/7/1976, R. J. Pankhurst, **BM**

There is also a bramble represented by many specimens in the national herbaria from Leigh Wood (or Woods), Bristol, N. Somerset, v.c. 6, which must be considered. Most of the specimens were collected by J. W. White, who (1912) said it (as *R. fuscus*) was plentiful there and grew 'on both flanks of Nightingale Valley, but chiefly about the roads and paths on the southern side, where much of it has been enclosed or built over'. He told R. P. Murray (1886) that it was 'a strong well-grown bramble, easily recognised, which grows in some quantity in open spaces near the Suspension Bridge'. I have not been to Leigh Woods and do not know whether it is plentiful there today or not. According to White (1912) this is the bramble of which Focke (1890) wrote: 'A closely allied bramble seems to be more frequent in England than the true *R. fuscus*. It has broader leaflets than this species, and the sepals embrace the fruit. I have seen it in the Leigh Woods, near Bristol, where it is abundant'. Rogers (1914) described it as 'a difficult form' differing from typical *R. fuscus* 'conspicuously in its elongate racemose (or subracemose) and usually nodding panicle-top'. Watson (1947, 1949) identified it with *R. fusciformis* Sudre. There may be more than one taxon involved here. Some of the specimens I have seen from Leigh Wood seem to me to be *R. fuscicaulis*, but others are too heavily armed and have rounder terminal leaflets and patent to erect sepals.

Sudre (1906) gave the name *R. fusciformis* originally to a French bramble, which he said was apparently common in Valois, and distributed specimens (Batotheca Europaea no. 503) collected by Questier 'vers 1863' from Forêt de Retz to illustrate it. There is a good example in **BM**, which I have seen, consisting of a fruiting panicle and two leaves. There are resemblances between the panicles of *R. fusciformis* and those of *R. fuscicaulis*, but the terminal leaflets are different, those of *R. fusciformis* being broadly elliptical and having an acuminate point, cordate base and broad teeth. A. Newton has seen another specimen of Sudre's in **K** which he says is not identical with *R. fuscicaulis*.

3. **Rubus malvernicus** E. S. Edees, **sp. nov.**

Turio arcuato-procumbens, obtuse angulatus faciebus planis vel leviter excavatis, fusco-rufescens, pilis brevibus (*c* 0·5–1 mm) patentibus copiose vestitus, aciculis pilos aequantibus numerosis glandulisque stipitatis nonnunquam multo sparsioribus obsitus, aculeis 8–12 per 5 cm, 4–7 mm longis, e basi lata valde curvatis armatus. Folia subpedata; foliola 3–5, contigua, supra glabrescentia, subtus molliter pilosa; foliolum terminale *c* 9 × 6 cm, ovatum vel ellipticum, basi subintegrum, apice sensim acuminatum, non grosse serratum. Ramus florifer parum flexuosus, dense villosus aciculis glandulisque stipitatis brevibus inaequalibus numerosis praeditus, aculeis satis crebris e basi longa valde curvatis armatus. Inflorescentia angustiora, inferne ramulis brevibus axillaribus aucta, superne aphylla e ramulis brevibus paucifloris vel nonnunquam unifloris composita. Flores *c* 2 cm diametro; sepala dense pilosa, glandulosa, aculeolata, appendiculata, patentia vel laxe amplectentia; petala *c* 8 × 5 mm, alba vel dilute rosea, margine sparsim pilosa; stamina alba stylos pallidos vix superantia; carpella pilosa.

Stem low-arching, bluntly angled with flat or slightly furrowed sides, dark reddish-brown, with numerous short (*c* 0·5–1 mm) simple and tufted hairs, numerous sessile glands, sparse to numerous short and very short stalked glands and numerous short to medium (to 1·5 mm) acicles and pricklets;

prickles 8–12 per 5 cm, on the angles, (3–) 4–7 (–8) mm, declining or strongly curved from a long compressed base, red with yellow point. Leaves pedate or subpedate; leaflets 3–5, often 5, more or less contiguous, mid-green or yellowish-green, glabrescent above, soft beneath with numerous short simple hairs and sometimes a thin underlayer of stellate hairs; terminal leaflet *c* 9 × 6 cm, ovate or ovate-elliptical or slightly obovate, with an acuminate point *c* 1·5 cm and subentire base, shallowly and more or less evenly serrate, the petiolule 1/4 to 1/3 as long as the blade; petiolules of basal leaflets 3–6 mm; petiole about as long as the basal leaflets, coloured and clothed like the stem, with *c* 12 curved prickles 3–4 mm. Flowering branch with 3-foliate leaves below and one or more simple leaves above, not leafy to the apex; inflorescence consisting of a short head of flowers, the peduncles 1·5–3 cm and single-flowered or deeply divided and 2–3-flowered, and distant few-flowered axillary branches usually much shorter than their leaves; rachis slightly flexuose, dark reddish-brown (sometimes purple tinged), with numerous to dense patent, short to medium, simple and tufted hairs, numerous short and very short stalked glands and short to medium acicles (some gland-tipped), some longer pricklets and many often long-based and strongly curved prickles 3–6 mm; pedicels with dense short and very short simple and tufted hairs, numerous unequal stalked glands (to 1 mm) and several acicular prickles 1–3 mm. Flowers 1.5–2 cm in diameter; sepals greyish-green, white-bordered, with dense stellate hairs, numerous short to medium simple hairs, numerous sessile and short and very short stalked glands and few or many short acicles, long- or leafy-pointed, loosely reflexed or patent or clasping; petals *c* 8 × 5 mm, white or pale pink, elliptical, with sparse very short simple hairs on the margin, not contiguous; stamens equalling or slightly exceeding styles, filaments white, anthers glabrous; styles pale green; young carpels hairy, especially at the tip.

HOLOTYPUS: Cowleigh Park, near Great Malvern, GR 32/7.4, Hereford (Worcester), v.c. 36, 24/7/1960, *E. S. Edees* 13902 **(herb. E.S.E)**

R. malvernicus is locally abundant in woods near Great Malvern. There are many specimens in the national herbaria from Cowleigh Park, the earliest I have seen being one in Babington's herbarium in **CGE**, collected by A. Bloxam in 1846. Most of them were named *R. fuscus* Weihe & Nees, sometimes with the addition of agg. or forma, but they are very different from that species. I have also seen it in Buckholt Wood, Cranham, GR 32/89.13, E. Gloucs., v.c. 33, 29/7/1955, 11093 **(herb. E.S.E.)**.

R. malvernicus is related to *R. informifolius* Edees, but differs from it in having strong prickles which are often strongly curved, ovate terminal leaflets which are regular in outline and soft beneath and short peduncles. The direction of the sepals is variable. In the holotype, which is in early fruit, they are nearly all erect. But in other specimens, which are not so advanced, in my herbarium many of the sepals are loosely reflexed. A sheet of no. 18 of the Set of British *Rubi* in Barton and Riddelsdell's herbarium (their no. 11027) in **BM**, which consists of a specimen from West Malvern collected by W. M. Rogers in 1893 and is labelled *R. fuscus*, should be renamed *R. malvernicus*. But it differs from the holotype in having a longer and more leafy panicle, which because of the short peduncles is conspicuously narrow, and most of the sepals are reflexed even on developing fruit.

ACKNOWLEDGMENTS

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Progress in British *Rubus* studies

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ABSTRACT

The attempt to group together *Rubus* microspecies in *species collectivae* as practised by Focke and Sudre is contrasted with the modern tendency to abandon such categories. The aims and progress in the study of *Rubus* taxonomy in Britain are outlined, with special reference to the formation of a *Rubus* data bank and to the importance of distributional criteria in a full understanding of the genus.

The history of *Rubus* studies can be thought of as a 'tug-of-war' between diametrically opposed schools of thought—on the one hand recognition of increasing numbers of microspecies, on the other an attempt to group together members of morphologically similar entities as *species collectivae*.

Incidentally, it solves no problems to ascribe varietal or subspecific rank to taxa. All must be treated of equal status; this is because the vast majority of taxa reproduce apomictically and are thus constant, but occasionally reproduce sexually, giving rise to hybrids and new apomicts.

The major monographers (Focke 1914, Sudre 1908–13) have concluded that, in order to reduce the numbers-problem to assimilable terms, European *Rubi* should be grouped under about a hundred headings (*formenkreis*, circle species) under which can be allocated the multifarious legions of brambles which have been described by European authors since 1827, the completion date of Weihe & Nees' *Rubi Germanici*. The criteria used are combinations of characters compounded from growth-habit; stem armature and glandulosity; terminal leaflet shape, toothing and clothing; flowering branch structure and armature; and floral particulars.

The sectional treatment, with descriptions, given by Warburg (1962) provides a useful outline account of the taxonomic framework currently in use.

In most cases the monographers have chosen as *hauptform* or 'senior species' the name of a widespread and easily recognised taxon (e.g. *R. radula* Weihe ex Boenn., *R. gratus* Focke) but in other instances (e.g. *R. hirtus* Waldst. & Kit., *R. serpens* Weihe) they adopted ancient basic names which are used *sensu lato* (since the original author's specimens could not and cannot be located) to represent large numbers of widespread taxa with very similar characters, but each anomalous in small details. Two major sources of confusion arise from this treatment.

i) In some instances an early (often basically descriptive) name, e.g. *R. hirtus*, has been chosen as the *hauptform* of a *formenkreis* which embraces many closely similar taxa. Unfortunately, the use of the binomial *sensu stricto* may apply only to a very locally distributed taxon, and other much more wide-ranging (and therefore significant) species may be subordinated to it. This has led to considerable confusion among later interpreters who have been led into the trap of assuming a widespread distribution for a local species.

ii) It is impossible to draw the boundaries of each *formenkreis* so tightly as to be able to assign any bramble encountered unequivocally to any one *hauptform*—many taxa will fit equally uncomfortably into more than one compartment; inevitably these categories overlap and the compartments themselves are imprecise.

It is clear that the synoptic tendencies of batologists have varied with increasing age and experience. In their younger, energetic years they may have been disposed to think analytically in terms of large numbers of equally valid taxa—but in old age, patience tends to become exhausted, or perhaps it is tempting to resolve problems by adopting larger groupings in an attempt to smooth out the differences and with them the difficulties. Inevitably, also, dealing with such a widespread and polymorphous

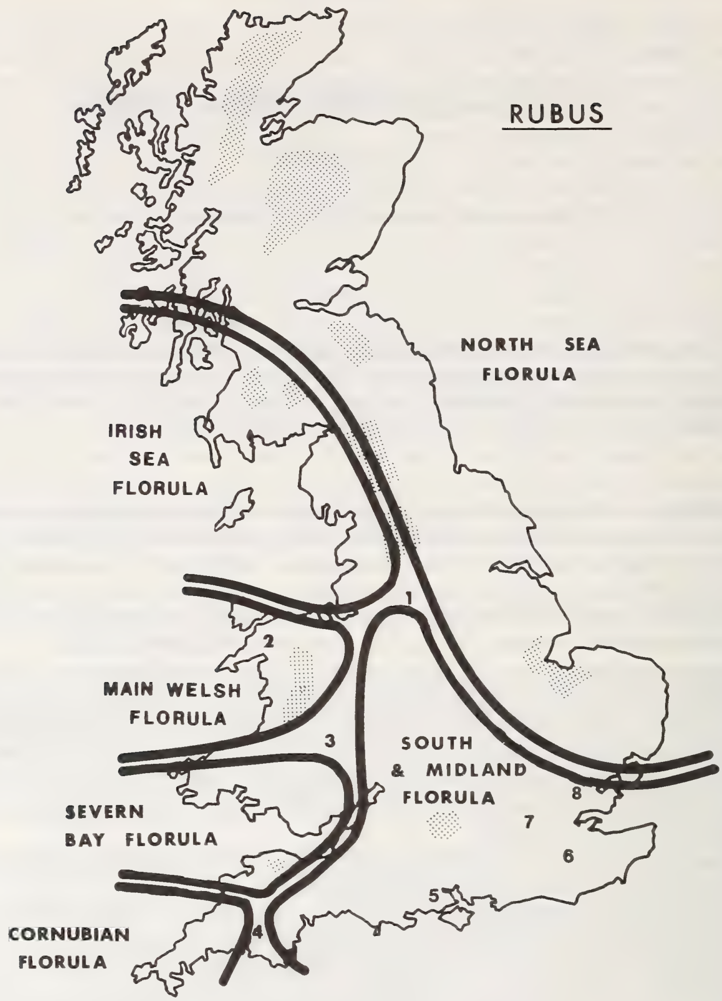

FIGURE 1. Distribution of *Rubus* florulas and regional endemic complexes in Great Britain. Main florulas identified by legend, regional complexes by number:

1. Sub-pennine	5. New Forest
2. Padarn	6. Ashdown
3. Archenfield	7. Thames Valley
4. South Devon	8. North Essex

Shaded areas denote high, wet or chalky ground with few or no brambles.

group as *Rubus* has imposed on the monographer strict limitations, bias and even distortion. He cannot possibly see all the brambles growing in the field; and reliance on herbarium specimens may lead as it did in both Focke's and Sudre's cases (particularly the latter) to misconceptions and mistakes. These were due in large part to unfamiliarity with the range of variation exhibited by a particular species, from soft, flaccid, large-leaved, small-panicled representatives grown in shaded, humus-rich localities ('*formae umbrosae*') to over-prickly, crisp-leaved, often dwarfed individuals from dry, sandy banks ('*formae apricae*'). A batologist relying solely on herbarium sheets of unfamiliar taxa will make many errors, and collectors have tended in many cases to be somewhat undiscriminating when gathering specimens. Many still are! 'Life is short and brambles are interminable', said Lord de Tabley (1899), and E. S. Edees has added (*in litt.*) that many of them are indeterminable also (*pace* Watson). I agree with both sentiments.

What strategy, therefore, is the earnest student to adopt? First, he has to understand what everyone else has said on the subject. He has to evaluate and check previous authors' efforts. He has to study vast numbers of herbarium specimens to see if commentators' views can be sustained and are consistent. He has to avoid being browbeaten by august authority and not be afraid to challenge accepted views, but also honest enough to accept a contrary view as correct if the facts support it. He has to work from his own field and herbarium knowledge (separate skills, these) outwards, getting to know the plants fresh and dried, verifying all his conclusions and testing his hypotheses on other pundits. And gradually, painstakingly, a commonly accepted hardcore of evidence can be assembled.

It will be obvious that no statement about the distribution of *Rubus* species and hence about their endemism or otherwise can be made unless the identity of taxa can be unequivocally established. For this it is essential for original syntype material to be located and inspected, the original diagnosis carefully examined with the specimens, and lectotypes chosen where holotypes are not cited. There are many problems to be wrestled with in these areas, but it is comforting to know that all contemporary batologists accept a compatible strategy. The concept of circle species, with its imprecision and obfuscation of crucial distinction, has been abandoned. Much careful work has been undertaken on these lines in Germany by H. E. Weber, in Holland and Belgium, and in England by B. A. Miles (in the 1960s) and by E. S. Edees and myself. Unfortunately, there are no contemporary workers in France, though J. van Winkel, a Belgian, has located much, often useful, material in the dusty vaults of French institutions; but as yet the main herbarium of Sudre has not been located and may well be lost. All of us have found cooperation beneficial and there has been a good deal of complementary and parallel research taking place with a large measure of agreement ultimately about the results. Recently Newton & Weber (1977) published a list of species which we agree to be common to Britain and north-western continental Europe; a similar exercise in depth needs to be attempted with northern and north-western France especially, and tentative steps are being taken to arouse interest amongst our French colleagues. Fortunately, due to the presence of Genevier's herbarium in Britain (originally purchased by Babington, it has now at last been reassembled at Cambridge) some work on the comparative taxonomy of French and British species has been possible (notably by W. C. Barton and H. J. Riddlesdell in the 1930s) and has been continued by Edees and myself, though there is room for a good deal of further research before we can be satisfied that the situation is fully understood.

One of the most important conclusions from recent research has been the realisation that distributional criteria offer the most fruitful methodology for establishing the relative importance of the various *Rubus* taxa; this, plus a taxonomic framework of 13 sections on the lines of that in Warburg (1962), containing all the clearly typified names of any member of the *R. fruticosus* group, is sufficient to establish a reliable *Rubus* list for any region. It is clear that the *Rubus* flora of a particular region can best be understood as a matrix of overlapping florulas (Fig. 1) each with its own central node or focus. It is necessary to define these carefully in the light of all the available evidence. There are two prime requirements:

1) An acceptable list of valid taxa (such as has been built up by Edees and myself for Britain over the last seven years and which is now fairly firm);

2) The formation of a *Rubus* information store in which data on the acceptable taxa can be stored and retrieved. The information we require is species number, locality, 10 km grid square, collector, date, whether herbarium or field record, name of herbarium, and authority for identity.

This information, now amounting to about 22,000 entries, is in course of collection from field visits and herbarium specimens; only material actually determined by Miles, Edees or myself is accepted, except for the most widespread and easily distinguished species. Taxa without valid names (so far as is known) also can be accommodated. From this store can be produced distribution maps for each taxon, county lists of all observations, lists of records for each taxon and numbers of species present in each 10 km grid square. These are of considerable value to many workers, such as county Flora writers and phytogeographers, but are particularly useful in directing the batologist's attention to underworked areas and in presenting distribution patterns graphically. Examination and analysis of this information produces fascinating results and indeed further questions about almost every species.

Recently (Newton 1975) I proposed eight distributional criteria as a framework for deciding the

TABLE 1. DISTRIBUTIONAL FRAMEWORK FOR *RUBUS* TAXA IN BRITAIN

Classification		No. of British taxa	
1. Widespread taxa (diameter of range more than 400km)			
i) Taxa widespread in Europe			
a) naturalized aliens		5	88 (30%) wides
b) density greatest on the Continent		26	
c) density greatest in the British Isles		24	
d) density not differentiated		33	
ii) Taxa apparently endemic to the British Isles		26	202 (70%) endemics
2. Regional taxa (diameter of range 50–400km)	all endemic to the British Isles	113	
3. Local taxa (diameter of range up to 30km)		63	
4. Individual bushes or small populations unlike any other		not included	
		Total 290	

This total may be reconciled with the 388 *Rubi* recognized by Watson (1958) as follows:

		388
less	descriptions incorrectly ascribed to (mostly) Continental taxa	197
		191
plus	taxa to be retained on the British list though given as synonyms by Watson	26
	taxa given as synonyms or varieties by Watson but subsumed incorrectly to other taxa	19
	taxa present in British Isles not mentioned	5
	taxa newly described since 1970	49
		290

relative importance of *Rubus* species. After further thought and discussion, particularly with H. E. Weber, I have now modified this structure (Table 1).

One of the very interesting peculiarities of *Rubus* distribution is the occurrence of disjunct populations, sometimes hundreds of kilometres away from the main or nearest other populations; the concept of widespread taxa must allow for a disjunct qualification. In some cases the migration pattern of the Turdidae (thrushes) may be of significance, but there are also other possibilities. Some brambles clearly travel by rail. A good example is *R. tuberculatus* Bab. If one goes from Altrincham to Chester, Cheshire, v.c. 58, by rail in mid-June, when the flowers of this species are just opening, it seems as if there is one continuous plant all the way along the railway tracks. I have seen it in derelict sidings near Edinburgh and Dundee, in areas where it occurs in no other habitat. In other cases there are no obviously convincing reasons for the disjunct distributions. As an example, *R. dumnoniensis* Bab. is widespread in Devon and Cornwall and western Scotland but is scarce in south-western Wales and absent from North Wales to Galloway.

When we analyse the total number of named taxa now recognised in the British Isles we must remember that there are possibly over 1,000 which could be included in group 4, and up to 100 in group 3, which might be thought eligible for description if sufficient resources were available to perform the task. There are also about 20 in group 2 which are first in the queue to receive names. Table 1 analyses the data at present available. On this reckoning 70% of the named *Rubus* species in the British Isles may be regarded as endemic, but this figure would undoubtedly rise if we took account of the additional 120 unnamed plants in categories 2 and 3.

Finally we come to the fascinating facts revealed by the study of the distributional data for each species, on which only a few comments will be made here.

1) As with some flowering plants with comprehensive distributions, certain taxa, e.g. *R. dasyphyllus* (Rog.) E. S. Marsh., are likely to be found almost wherever brambles grow. The most noteworthy feature of these species is their complete absence from some areas and their occurrence only as sparse isolated colonies in others, as if they are here submerged by the more vigorous development of regional and local taxa.

2) The number of species present decreases northwards; as exposure and lower winter temperatures become more severe, there is less suitable ground and diversity is reduced. In Caithness there are only 5 species; in South Devon, on the other hand, there are 62. In the whole of Scotland only the same number of species is present as in the average county in the Midlands.

3) Certain areas are particularly suitable for the greatest development of species; these tend to coincide either with long standing *Quercus robur* woodland on the richer loam soils or ancient *Quercus petraea* woodland in the lighter sandstone, drift or gravel terrace districts. It is noticeable that these areas have a markedly dissected topography and are also at some distance from the major (Weichselian) ice advance limits. The greatest development of brambles in general and of local and regional species in particular is to be found in these districts. A formation like the Lower Greensand provides a pathway for many continental species from Bedfordshire to North and South Devon. Of the 92 named species known in Herefordshire, 22 are local species and 28 are regional; of the 88 in Surrey 10 are local and 35 are regional. One is left with the thought that the most favourable ground for bramble development is also that which fortunately has proved least attractive to concentrated settlement and intensive agriculture. Where a knowledgeable enthusiast has been an inhabitant (e.g. A. Ley in Herefordshire) the local species are usually fairly well recognised and perhaps named; other districts such as North Essex and Merioneth have until recently existed in a pre-Linnaean state, batologically speaking.

4) When one attempts to map bramble distribution by distinctive communities, an interesting result appears. As may be seen in Fig. 1, Great Britain can be divided into six regions based on the distribution of the bramble florulas. In addition there are eight regional endemic complexes, numbered 1 to 8 in Fig. 1. Further micro-florulas exist, particularly in south-eastern England, e.g. along the North Downs, but are omitted on account of their small area. There is insufficient knowledge at present to describe or map the Irish bramble flora.

The Pennines form the western boundary of the north-western European influence (the other, eastern, end can be discerned in the Harz Mountains of Germany). From northern Norfolk to northern Scotland are to be found most of the brambles that we have in common with Holland, Germany and Denmark, e.g. *R. mucronulatus* Bor., *R. radula, R. septentrionalis* W. C. R. Wats., *R. anisacanthos* G. Braun, *R. plicatus* Weihe & Nees, a typical association which is almost if not completely absent from the Irish Sea, Severn Bay and Cornubian Florulas. Crossing the Pennines one enters a different batological universe. The western florulas have distinctive assemblages of their own, often unique to themselves and with only rare representatives (e.g. on the higher ground in mid-Wales) of the main north-western European species.

The South and Midland Florula contains all the species we have in common with northern and western France and Belgium, e.g. *R. insectifolius* Muell. & Lefev., *R. leightonii* Lees ex Leighton, *R. phaeocarpus* W. C. R. Wats., *R. formidabilis* Muell. & Lefev., *R. adscitus* Genev., *R. rufescens* Muell. & Lefev. Locally, however, they are swamped by the large endemic complexes of Archenfield, Ashdown, New Forest and Thames Valley. The Cornubian peninsula has a distintive florula, from which most continental species appear to be absent, and at least one major endemic complex south and west of Dartmoor.

It is clear that careful analysis of bramble communities and their affinities and disaffinities has much to tell us about the vegetation history of the British Isles over the last 100,000 years or so, and its connections with the Continent. The foci of endemic complexes, no doubt of ancient origin, can be pinpointed. It is important to continue our researches not only into the status of the as yet unnamed regional taxa and to add to our knowledge of the distribution of the 290 recognised taxa, but also to reach for further affinities with the French connection, and perhaps to find some correlation with quaternary stratigraphy—can microspecies be distinguished by nutlet characters? There is much to do to integrate the bramble situation with other similar studies, both floristic and geographical. That this will be a fruitful area for new discoveries I do not doubt.

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Germination and growth of *Primula vulgaris* Huds.

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ABSTRACT

Germination, survival, growth, and production of flowers and seeds of *Primula vulgaris* Huds. were studied on a range of soils and under a range of light regimes, to delineate more clearly the factors influencing its growth and reproduction in north-western England. Plants were grown at a number of woodland sites and in potted soil in the garden. Growth was extremely poor on soils of pH less than 4.7. On soils with pH greater than 4.7, growth and seed production were related to the amount of light received in summer and, to a lesser extent, in spring. Maximum dry weight and flower production were obtained with a moderate amount of shade (20% full daylight) in summer and less shade (37% daylight) in spring, whilst maximum seed production was obtained with less shade throughout the year. Seed production decreased more rapidly than plant dry weight with decreasing light intensity. The number of seedlings which survived under woodland conditions was very small in all but the most favourable circumstances. Dry weights of plants of different seed-origin were significantly different.

INTRODUCTION

Current trends in forest management have resulted in a fairly rapid replacement of old long-established woodland by new plantations in many areas (e.g. Peterken & Harding 1974). A comparable situation is also found in hedgerows. Newly-created hedgerows (i.e. less than a few hundred years old) contain very few such species, whereas ancient hedgerows often contain a number of woodland plant species (Pollard, Hooper & Moore 1974; Helliwell 1975).

One of these woodland species is *Primula vulgaris* Huds. and, in the case of 50 hedgerows in Shropshire, an association analysis indicated that it carried the most information on the woodland affinities of the hedgerow flora (Helliwell 1973). As it occurs in nearly all parts of the British Isles and is also relatively easy to grow under experimental conditions, it was selected as a suitable species for study in order to investigate the conditions under which successful colonization of newly-planted woodlands might occur.

Valentine (1948) and Woodell (1969) have studied *P. vulgaris* from the point of view of taxonomy and hybridization, and Wright-Smith & Fletcher (1947) suggest that there is only one race of this species in Britain. Keith-Lucas (1968) examined the effects of various degrees of shade, soil aeration, and water stress, but did not investigate the influence of soil nutrients or soil acidity, or the effects of various periodicities in light intensity.

Keith-Lucas (1968) reported a gradual decrease in viability of stored seed, that stored at room temperature for nine months not germinating at all; and Professor K. Mellanby (pers. comm. 1974) also reported lack of success in germinating seeds of *P. vulgaris* stored for four or eight months, or seed purchased from a seed merchant.

METHODS

Observations were made on the effects of storage on viability of seed. Germination of seed was compared on 50 different soils (for sources of soils see Helliwell (1974)). One pot of each soil was sown with seeds collected from an ash woodland (GR 34/274.740) over limestone and one pot with seeds from an oak woodland (GR 34/330.820) over shale. In the following year, a single young plant of *P. vulgaris* was set into each of these pots of soil, in order to study growth on a range of soils.

A number of sites within 30 km of Merlewood Research Station (GR 34/410.795) were visited in

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order to observe the distribution of *P. vulgaris* in relation to soil type, vegetation, and amount of shade. Experimental sowing of *P. vulgaris* was carried out at 12 of these woodland locations; at nine sites there were *P. vulgaris* plants within a few metres of the experimental area, but not actually on the area, and at three sites there was no *P. vulgaris* in the immediate vicinity. 18 five-month-old specimens of *P. vulgaris* were also planted at each of the 12 sites. Further sowing was carried out at five of these sites, using pots of garden soil, half of which were set in a surrounding of clean sand and half directly into the soil.

In April, 1975, an experiment was set up in the garden to examine the effects of different periodicities and levels of light intensity on the growth, flowering and seed-production of *P. vulgaris* of different seed origin on soils of varying pH and nutrient content. Three levels of shading were used, being approximately 6%, 20% and 37% of full daylight as measured by a Megatron type EA luxmeter on an overcast day in summer. These different levels were the product of four layers, two layers, and one layer respectively of grey P.V.C. netting on wooden frames placed over the plants on an old tennis court partly surrounded by trees at Merlewood.

Provision was made for three different periodicities, namely:

i) constant level of shade throughout the year
ii) more light in November-May
iii) more light in February-May.

The first of these (i) was intended to represent evergreen woodland conditions, the second (ii) to represent deciduous woodland, and the third (iii) to represent deciduous woodland conditions where the plants were partially covered by leaf litter for much of the winter. The combination of light levels and periodicities gave a total of nine treatments:

1. 6% light throughout the year
2. 20% light throughout the year
3. 37% light throughout the year
4. 20% light in summer, 37% from mid-February to early May
5. 6% light in summer, 37% from mid-February to early May
6. 6% light in summer, 20% from mid-February to early May
7. 20% light in summer, 37% from early November to early May
8. 6% light in summer, 37% from early November to early May
9. 6% light in summer, 20% from early November to early May

The experiment was laid out as a split-split plot design in three randomized blocks, each light treatment including one plant from each of three seed origins growing on each of five different soils, i.e. 9 light treatments × 5 soils × 3 seed origins × 3 replicates, making a total of 405 plants. Each plant was transplanted on 30 April, 1975 (soon after germination) from a seed-tray into a 125 mm diameter plastic plant-pot.

The main properties of the five soils are given in Table 1. These were all woodland soils, taken from the top 15 cm excluding any litter layer. Each soil was sieved through a 13 mm sieve and thoroughly mixed before being placed in the pots. Samples for analysis were taken in June, 1976. The origins of the seed used were:

1. Plants raised in the garden from seed from a river bank in Cumbria (GR 34/315.860)

TABLE 1. MAIN PROPERTIES OF THE FIVE SOILS USED IN THE SHADING EXPERIMENT

Soil no.	Grid ref. of origin	pH (April 1975)	pH (June 1976)	Loss-on-ignition (%)	K (mg/100 g dry soil extractable in N/2 acetic acid)	Ca (mg/100 g dry soil extractable in N/2 acetic acid)	P (mg/100 g dry soil extractable in N/2 acetic acid)	Total P (%)
1	34/411.795	5·3	5·3	7·5	6·4	67	0·33	0·10
2	34/409.797	5·1	4·7	7·6	5·8	18	0·13	0·07
3	34/435.797	6·2	6·3	13	8·5	320	0·17	0·06
4	35/383.237	5·1	4·8	69	8·7	540	19·0	0·38
5	34/309.864	4·8	4·4	11	7·0	30	0·28	0·11

2. Plants raised in the garden from seed from Coed Gorswen, an oakwood in North Wales (GR 23/755.710)
3. A fairly open ash wood on limestone in Cumbria (GR 34/274.740)

The pots were watered as necessary and in each of the years 1976 and 1977 the numbers of flowers and seeds were recorded. In September, 1977, the plants were removed from the pots, washed, dried, and their fresh and dry weights recorded.

RESULTS

GERMINATION OF SEED AND GROWTH ON DIFFERENT SOILS

Seeds sown in the garden gave over 50% germination in the winter and spring following sowing, if sown within three months of collection in July; but seeds stored for six or nine months in sealed jars at 2°C gave only about three per cent germination, with an additional three per cent one year later in the case of the latest sowing.

On soils with a pH value less than 4.5 only nine seeds out of a total of 600 germinated, whereas on soils of pH 4.5 or greater 181 seeds out of a total of 400 germinated. On soils with a pH greater than 4.5 there was no significant correlation between germination and any of the other measured soil variables, which included total P, isotopically exchangeable P, loss-on-ignition, and extractable (in acetic acid) K and P.

Four weeks after planting 100 young seedlings in pots of different soils in early May, several plants appeared to be dying, and after eight weeks one-third of the plants were dead, in spite of careful attention. By the end of July more than two-thirds of the plants had died. There were significant ($P < 0{\cdot}1\%$) correlations between growth and soil pH and, in this case, extractable P. There was a very clear cut-off point at about pH 4·7, below which no plants survived (Fig. 1).

FIELD OBSERVATIONS AND TRIALS

Some of the sites visited had a fairly acidophilous flora, and samples of soil were taken within a few centimetres of *P. vulgaris* plants to see if the soil was, in fact, acidic. The lowest pH value recorded adjacent to any *P. vulgaris* plant was 4.5.

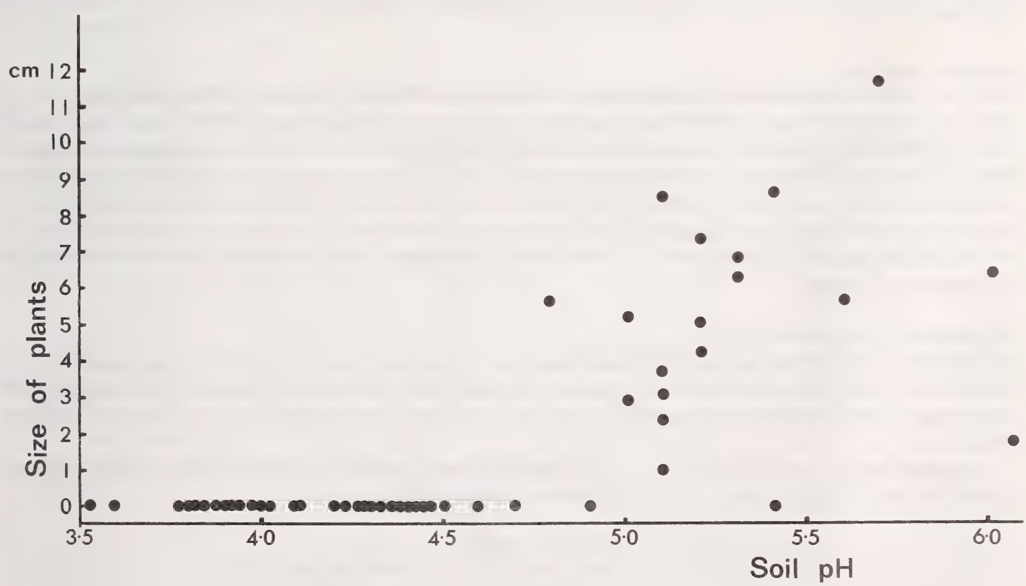

FIGURE 1. Growth of *P. vulgaris* on 50 different soils. Size of the plants is given as the total diameter of two plants after three months' growth.

The number of young seedlings observed in the field was extremely small and most plants had no young seedlings growing near them. The main exceptions appeared to be along the edge of trackways where bare soil was exposed.

Plants of *P. vulgaris* under a continuous tree canopy produced very few seeds. For example, a visit to one wood where there had been numerous flowers in April yielded only 17 seeds, of which only two germinated.

At the sites used for field trials, the pH of the surface soil at all of the nine sites with adjacent *P. vulgaris* plants was less than 4·7. Not surprisingly, in the light of the pot experiments described above, very few seeds (9 out of 2,420) germinated and no seedlings survived for more than four weeks on these sites, whether the seeds were sown on a prepared soil surface or into the existing vegetation. At the remaining three sites, which had pH values greater than 4·7, a greater number of seeds germinated (13 out of 820) but only four of the seedlings survived for more than 6 months. These four plants were, however, still growing after a further two years. Of the 216 five-month-old plants which were planted at these 12 sites 70% survived for 18 months, and 47% for three years more.

In the pots of garden soil at five of these sites, germination varied between 10% and 35%, compared with 52% under netting screens in the garden. Much of the difference between sites may have been due to the movement of the seeds out of the pots by the action of rain-drip from the tree canopy, for where pots were set in a surrounding of sand almost as many seeds germinated in the sand as in the pots. Most of the seedlings which germinated in the pots survived for at least 18 months.

SHADING EXPERIMENT

Numbers of flowers

Analysis of the numbers of flowers produced under different shading regimes showed no significant differences between seed origins. There were, however, significant ($P<1\%$) differences with respect to soils and also light treatments, and a significant interaction between the two.

The numbers of flowers produced in each light treatment in 1976 and the numbers produced on each soil are shown in Table 2.

The numbers of flowers produced in 1977 were again significantly different between light treatments and between soils but there was, in this case, no significant interaction between light and soils.

The number of flowers produced was correlated very closely with the dry weights of the plants, the number of flowers per unit dry weight of plant increasing in proportion to the square of the weight of the plant.

Numbers of seeds

The 2,912 flowers recorded in 1976 produced a total of 5,149 seeds, and the 2,398 flowers recorded in 1977 a total of 1,496 seeds, with much variation between individual plants. There was a significant ($P<1\%$) difference between the numbers of seeds produced at different light intensities and on the different soils, although the variation between soils followed a different pattern in the two years (Table 3). The increase in numbers of seeds with increasing light intensity was somewhat steeper than the increase in numbers of flowers, and, unlike dry weight and number of flowers, did not show any sign of ceasing at the highest light intensity. In both years the highest seed production was obtained at the highest light intensity.

Fresh and dry weights of plants

By May, 1977, 110 of the original 405 plants had died. 61 of the dead plants were on soil number five, which had a pH value very close to the apparent 'threshold' for growth of *P. vulgaris*. The remaining 49 deaths were evenly divided between the other soils, and were not relatable to seed origin or to light intensity.

Analysis showed a significant ($P<1\%$) difference between weights of plants grown at different light intensities, and a significant ($P<5\%$) difference between seed origins:

Seed origin	Mean dry weight per plant (g)	Standard error (g)
1	2·35	±0·17
2	2·15	±0·18
3	3·00	±0·16

TABLE 2. NUMBERS OF FLOWERS PRODUCED UNDER EACH LIGHT TREATMENT AND ON EACH SOIL TYPE (1976)

Light treatment	Total no. of flowers
1. Constant 6%	98
6. 6% in summer, 20% Feb. to May	99
5. 6% in summer, 37% Feb. to May	127
9. 6% in summer, 20% Nov. to May	178
8. 6% in summer, 37% Nov. to May	220
2. Constant 20%	494
4. 20% in summer, 37% Feb. to May	538
7. 20% in summer, 37% Nov. to May	613
3. Constant 37%	545
	2912

Soil no.	Total no. of flowers
1	606
2	615
3	359
4	1166
5	166
	2912

There was, however, no significant difference between the weights of plants on the four soils (nos 1–4) on which there was a high survival rate.

The mean dry weights under different light treatments are given in Table 4. The fresh weights followed a similar pattern, although, as might be expected, the ratio of fresh to dry weight was greater at the lower light intensities (7·36 in light treatment no. 1) than at the higher light intensities (4·76 in light treatment no. 3).

TABLE 3. NUMBERS OF SEEDS PRODUCED IN THE SHADING EXPERIMENT

Light treatment	No. of plants present in May 1977	No. of seeds produced 1976	1977
1	29	40	0
2	34	541	129
3	28	1330	466
4	37	1062	464
5	34	320	57
6	34	246	0
7	38	1280	287
8	32	250	93
9	29	80	0

Soil no.	No. of plants present in May 1977	No. of seeds produced 1976	1977
1	62	1787	229
2	64	1605	128
3	73	903	415
4	76	634	671
5	20	220	53

TABLE 4. DRY WEIGHT OF PLANTS UNDER DIFFERENT LIGHT TREATMENTS

Light treatment	Mean dry weight (g)	Standard error (g)
1. Constant 6% light	0·99	± 0·13
6. 6%, with 20% from February to May	1·62	± 0·17
9. 6%, with 20% from November to May	1·40	± 0·22
5. 6%, with 37% from February to May	1·70	± 0·19
8. 6%, with 37% from November to May	1·56	± 0·20
2. Constant 20% light	2·90	± 0·37
4. 20%, with 37% from February to May	3·59	± 0·22
7. 20% with 37% from November to May	3·19	± 0·36
3. Constant 37% light	2·41	± 0·43

DISCUSSION

The present study indicates that germination of *P. vulgaris* seeds can take place under partial shade or in full daylight; but on soils with a surface pH value of less than 4·7 germination is poor and few seedlings survive. Additionally, observations show that on bare soil many seedlings are lifted out of the soil by frost action, and on soil covered by leaf litter seedlings are often not able to emerge through the litter. Where there is a dense cover of herbage, seedlings have little or no chance of surviving. Survival of seedlings is, therefore, extremely low under most conditions. However, Woodell (1969) reported that individual plants can probably survive for several decades, if growing under suitable conditions.

Keith-Lucas (1968) reported that *P. vulgaris* had a peak leaf area production under moderate shade, rather than in full daylight, and the present experiments gave somewhat similar results in terms of both dry weight and fresh weight. This may possibly be an indication that there was a water deficit at the higher light intensities, perhaps related to the small size of plant-pots used in these experiments. Good (1944) and Valentine (1948) reported that the natural distribution of the species is related to soil moisture and atmospheric humidity, which would accord with this conclusion.

P. vulgaris can grow under as little as 6% of full daylight in north-western England, but seed production under a closed woodland canopy is likely to be small. *P. vulgaris* may therefore be able to survive and produce flowers for many years, but may produce copious amounts of seed only when there is an increased amount of light.

Additional light during the period when deciduous trees are leafless, particularly during the period February–May, can increase growth, but the level of illumination in the summer months has a dominant influence.

Seed does not appear to be very long-lived and is not readily dispersed over large distances. The main mechanism of dispersal is reported to be by the activities of ants (Keith-Lucas 1968). Seeds can also be moved over short distances by rain-splash, but in either case movement is likely to be not more than 30 to 50 cm. This would help to explain why *P. vulgaris* does not readily colonize isolated woodlands or travel rapidly along hedgerows which might present suitable conditions for survival of young seedlings at very infrequent intervals.

The differences found in this study between the growth of plants of different seed-origin, although not very large, may repay further study.

ACKNOWLEDGMENTS

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(*Accepted June 1979*)

Short Notes

POTENTILLA RIVALIS NUTT. EX TORREY & GRAY NEW TO BRITAIN

Potentilla rivalis Nutt. ex Torrey & Gray is thoroughly established on the broad, beach-like, sandy edge of the north-eastern corner of Barnsley Pool, Roughton, near Bridgnorth, Salop, v.c. 40, GR 32/753.927. The colony, which covers an area of approximately 50 by 2–5 yards, was observed by Mrs S. R. Price between 1976 and 1978, and a specimen of hers, sent by Miss M. Chorley to me for determination, collected in July 1978, is in **BM**. The number of plants visible on three visits varied from none (when deeply submerged) to thousands, depending upon the height of the water level. It is a very prolific seeder, but its precise ecological requirements appear to be the factor controlling its success here.

The pool, which seems to depend upon its existence from land drainage and a tiny stream at the southern end, is unpolluted, and supports fresh-water shrimps (*Gammarus* sp.). Red sandstone rocks form an outcrop behind the *Potentilla*. Associated species are *Ranunculus sceleratus, Cardamine hirsuta, Lotus corniculatus, Epilobium montanum, Polygonum aviculare, P. persicaria, P. lapathifolium, Rumex maritimus, Anagallis arvensis, Veronica beccabunga* and *Sonchus asper*.

This polymorphic, apomictic annual occurs in its native N. America on river banks and damp soil from Minnesota to Illinois, west to Alberta, British Columbia, California, Arizona and New Mexico, and is occasionally adventive further east (Gleason 1968). I have, surprisingly, not been able to find any adventive records for Britain, or, indeed, the rest of Europe. Some authors split this complex into three species and I originally named the above specimen as the segregate, *P. pentandra* Engelm. ex Torrey & Gray; but later, on seeing several seedling plants, I lost faith in the reliability of the diagnostic lower-leaf characters.

The origin of the Roughton plants is unknown. The area was used as a pheasant-rearing station some years ago, so introduction with pheasant food is one possibility. No other alien plants could be found nearby, except for the surprising but presumably unconnected occurrence of three bushes of the European *Euonymus latifolius* (L.) Miller by the public footpath.

P. rivalis much resembles both *P. intermedia* L. and *P. norvegica* L., but it differs from both in having the sepals about twice as long as the petals (not nearly equal), 5–10 stamens (not *c.* 20) and smooth 0·6–0·7 mm long achenes (not 0·9–1·3 mm long and sulcate-rugose). This species should be searched for in similar sites elsewhere in Britain.

ACKNOWLEDGMENT

I am greatly indebted to Mrs S. R. Price for kindly supplying all the information about the locality.

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E. J. Clement

THE KARYOTYPE OF *ARMERIA MARITIMA* (MILL.) WILLD.

Armeria maritima (Mill.) Willd. has a disjunct distribution in Britain. Its populations grow in a range of habitats and several ecotypes have been described, some of which are recognized as subspecies (Baker 1953). In this study chromosomes from plants from different populations were counted and the karyotype of *A. maritima* subsp. *maritima* described.

TABLE 1. LOCALITIES OF *ARMERIA MARITIMA* IN THE BRITISH ISLES FROM WHICH CHROMOSOME COUNTS OF $2n = 18$ WERE OBTAINED

Locality	Grid Reference	No. of plants counted
Armeria maritima subsp. *maritima*		
Braunton, N. Devon, v.c. 4	21/483.335	2
Bossington, S. Somerset, v.c. 5	21/892.484	4
Hurlstone Point, nr Porlock, S. Somerset, v.c. 5	21/899.493	2
Treath Crugan, Caerns. v.c. 49	23/342.327	1
Jenny Brown's Point, W. Lancs., v.c. 60	34/461.735	1
Rye Loaf, nr Malham, Mid-W. Yorks., v.c. 64	34/862.637	2
Woodhall, Wensleydale, N. W. Yorks., v.c. 65	34/986.898	2
Widdybank Fell, Teesdale, Durham, v.c. 66	35/813.304	1
Howhill, Teesdale, Cumberland, v.c. 70	35/729.433	1
Whitesike Mine, Teesdale, Cumberland, v.c. 70	35/751.425	2
Ben Lui, Mid Perth, v.c. 88	27/267.273	2
Black Head, Clare, v.c. H9	H12/145.112	2
Oranmore, S. E. Galway, v.c. H15	H12/376.246	1
Carraholly, W. Mayo, v.c. H27	H02/958.853	2
Croagh Patrick, W. Mayo, v.c. H27	H02/905.801	2
Armeria maritima subsp. *elongata*		
Pasture, nr Ancaster, S. Lincs. v.c. 53	43/983.436	1
Burial Ground, Ancaster, S. Lincs. v.c. 53	43/983.436	2

TABLE 2. KARYOTYPE OF *ARMERIA MARITIMA* SUBSP. *MARITIMA* ($2n = 18$)

No. of chromosomes	Centromeric[1] position	Mean length of chromosome (μm)	Mean ratio of arm lengths
6	Submedian	4·8	1·89
6	Submedian	4·0	1·78
6	Median	3·2	1·21

[1] After Levan *et al.* (1965)

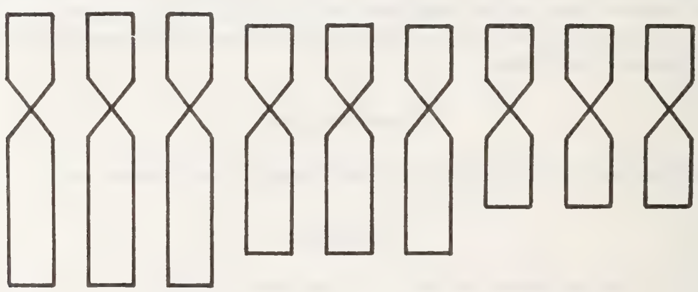

FIGURE 1. Ideogram of the haploid karyotype of *Armeria maritima* subsp. *maritima*

All chromosome counts were made on mitotic preparations from root-tips fixed from plants grown in pots. Excised root-tips were pre-treated in 0.002 M 8-hydroxyquinoline for 3 h and fixed in 3:1 absolute ethanol: glacial acetic acid. They were hydrolysed in 1 N hydrochloric acid at 60°C for 10 min and stained with Feulgen reagent.

Chromosome counts of *Armeria maritima* subsp. *maritima* from 17 localities in the British Isles (Table 1) and the Quiberon Peninsula, Morbihan, France, and of *A. maritima* subsp. *elongata* (Hoffm.) Bonnier from two localities in S. Lincs., v.c. 53 (Table 1), all showed $2n = 18$. These counts agree with all previous ones from Britain (Baker 1954, 1959; Hedberg 1958) and continental Europe (Löve & Löve 1961).

The karyotypes of plants of *Armeria maritima* subsp. *maritima* were compared; one plant from each of Widdybank Fell, Hurlstone Point and the Quiberon Peninsula, Morbihan, France. They were all similar, with three groups of six chromosomes. The mean karyotype is detailed in Table 2 and Fig. 1.

The karyotype described here differs from those of other species and subspecies of *Armeria*, including those of *A. maritima* subsp. *alpina* and subsp. *interior*, described by Suda (1969). Suda concluded that all karotypes of *Armeria* species have (1) at least one pair of 'heteromorphous' chromosomes which differ from each other in size and arm length, (2) at least one pair of chromosomes with satellites and (3) nine distinguishable pairs of chromosomes. The karyotypes determined here for *A. maritima* subsp. *maritima* differ from Suda's karyotypes in all these features.

However, Donadille (1967) gave idiograms of three *Armeria* species, including *A. maritima* subsp. *alpina*. In these none of the chromosomes had satellites or 'heteromorphous' chromosomes. Also, not all of the nine pairs of chromosomes could be distinguished from each other. These agree with my own observations, although Donadille was able to distinguish more pairs of chromosomes in *A. maritima* subsp. *alpina* than I have in subsp. *maritima*.

ACKNOWLEDGMENT

This work was done during a research studentship from the Teesdale Trust.

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A. Dale

THE KARYOTYPE OF *SESLERIA ALBICANS* SCHULTES

Sesleria albicans Schultes is part of a European polyploid complex and in continental Europe chromosome counts have shown it to be tetraploid (Bielecki 1955). In the British Isles it has a disjunct distribution, so in this study chromosome counts were made on plants from several different areas; there appear to be no previous counts of this species in the British Isles.

All chromosome counts were made on mitotic preparations from root-tips fixed from plants grown in pots. Excised root-tips were pre-treated in 0·002 M 8-hydroxyquinoline for 3 h and fixed in 3:1 absolute ethanol: glacial acetic acid. They were then hydrolysed at 30°C for 8 h in a solution of 3 parts 8% pectinase solution (Koch-Light Laboratories Ltd, ex *Aspergillus niger*) in pH 5·0 citrate buffer and 1 part 0·07 M EDTA in pH 5·0 citrate buffer and stained in alcoholic-HCl-carmine (Snow 1963) overnight. The mixture of pectinase and EDTA solution was used since the cells separated more completely than when a pectinase solution was used alone (Humphries & Wheeler 1960).

Chromosome counts of *Sesleria albicans* from six British and Irish localities (Table 1) all gave $2n=28$, in agreement with those published for continental Europe (Bielecki 1955, Ujhelyi 1960).

The karyotype of one plant of *S. albicans* from Widdybank Fell, Teesdale is given (Fig. 1, Table 2). In this karyotype only one chromosome of the largest pair of chromosomes had a satellite. This is the first detailed description of a karyotype for the genus *Sesleria*.

TABLE 1. LOCALITIES OF *SESLERIA ALBICANS* FROM WHICH CHROMOSOME COUNTS OF $2n = 28$ WERE OBTAINED

Locality	Grid Reference	No. of plants counted
Cronkley Fell, Teesdale, N. W. Yorks., v.c. 65	35/840.283	2
Widdybank Fell, Teesdale, Durham, v.c. 66	35/814.302	2
Highfolds, Malham, Mid-W. Yorks., v.c. 64	34/894.674	2
Jenny Brown's Point, W. Lancs., v.c. 60	34/461.735	1
Creag an Lochain, Mid Perth., v.c. 88	27/590.411	1
Lough Carra. E. Mayo, v.c. H26	H12/163.726	1

TABLE 2. KARYOTYPE OF *SESLERIA ALBICANS* ($2n = 28$)

No. of chromosomes	Centromeric[1] position	Mean length of chromosome (μm)	Mean ratio of arm lengths	Satellite length (μm) and position
4	median	6·1	1·07	[2]1·6 L. A.
4	median	5·4	1·25	
2	median	5·4	1·27	1·6 S. A.
2	median	4·9	1·30	1·4 S. A.
2	median	4·8	1·56	
6	median	4·6	1·07	
2	median	4·1	1·08	1·3 L. A.
4	submedian	4·0	1·82	
2	submedian	3·5	1·75	

[1] After Levan *et al.* (1965).
[2] Only one chromosome in this group had a secondary constriction.
L. A. = long arm; S. A. = short arm.

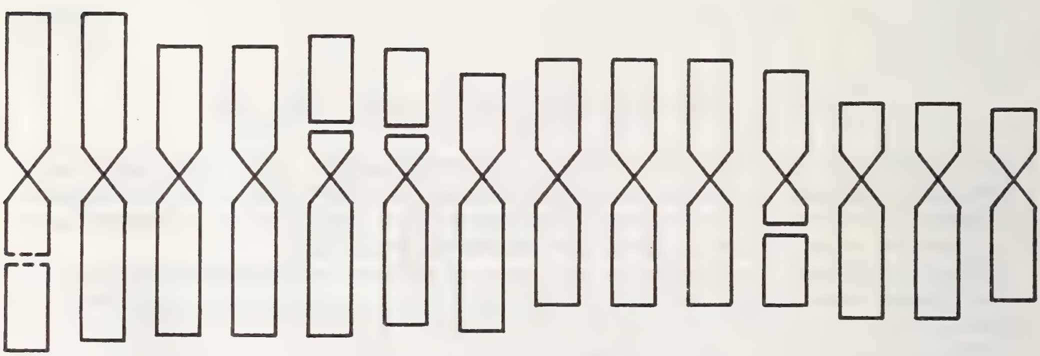

FIGURE 1. Ideogram of the haploid karyotype of *Sesleria albicans*.

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This work was done during a research studentship from the Teesdale Trust.

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A. Dale

THE DISTRIBUTION OF *CAREX ORNITHOPODA* WILLD. IN BRITAIN

Carex ornithopoda has a European and West Asian distribution similar to that of its close ally *C. digitata* (David 1978), but in general prefers more open and more upland conditions and is absent from much of the northern European plains. In Britain, at its north-western limit, it is concentrated in two main areas in Derbyshire and Westmorland. Where it occurs, it is usually in abundance, on rocky outcrops and grassy ledges of the limestone. It is somewhat surprising that over one third of its British stations have a northerly aspect; while on Whitbarrow, Westmorland, *C. digitata* and *C. ornithopoda*, whose distributions overlap in both the areas mentioned above, exchange their normal roles, *C. digitata* being found here and there on the open screes of the west-facing escarpment and *C. ornithopoda* being widespread in woodland rides on the dip-slope.

Such interchanges, and the close similarity of the two taxa, have caused some confusion in the records. In particular, there is as yet no certainty as to whether *C. ornithopoda* does or does not occur on the eastern side of the northern Pennines. The evidence that it does is derived from two records. A single specimen purporting to come from Hawnby (see list below) is undoubtedly *C. ornithopoda*, but Hawnby is a well-known locality for *C. digitata* and there may have been a muddle over the specimen's provenance. The identity of Borrer's plant from Mackershaw (see list below) rests on W. W. Newbould's word, for the specimen has not been traced, and Borrer himself did not know *C. ornithopoda*, which was not recognized in Britain until twelve years after his death (Babington 1874). Mackershaw, moreover, is another noted locality for *C. digitata*, which there grows very small, and I have deposited in **CGE** a specimen that demonstrates how easily a misidentification could arise.

In view of this history it may be as well to set out the main differences between the two taxa. When flowering or fruiting they should be easily distinguishable, for the lowest spike of the inflorescence of *C. digitata* is clearly separated from the one above it, whereas in *C. ornithopoda* all the spikes originate from almost the same point; the inflorescence of *C. digitata* will somewhere carry at least a tinge of crimson while that of *C. ornithopoda* is straw-coloured; and in *C. digitata* the female glumes are as long as the utricles whereas in *C. ornithopoda* they are markedly shorter. When the plants are in the vegetative state separation is not so easy, for the intensity of the red colouration of the basal sheaths and the breadth and degree of hairiness of the leaves (the distinctions usually quoted) are relative. Yet it is true that in *C. digitata* the sheaths are, in general, more deeply and genuinely crimson (as opposed to rust-coloured) and the leaves broader as well as being of a more yellowish or bronzy green (as opposed to mid- or dark-green). Furthermore, the new shoots of *C. digitata* are very distinctive. They begin to appear in October and are then tinged with deep red and tipped with green. In March they elongate and arch over at the tips, presenting a highly characteristic fountain-shape. None of these marks can be found in its ally.

The recorded stations of *C. ornithopoda* in Britain have all been resurveyed since 1970, and the present status of the sedge in each is indicated in the following list by the letters A = 1 to 20 plants, B = 21 to 100, C = 101 to 1000, D = over 1000. Where the plant has not been refound, the date of the last known sighting is given, together with the authority. The authenticity of the herbarium specimens quoted has been confirmed by me.

Derbys., v.c. 57: 43/1.7, Miller's Dale (C); near Monsal Dale, 1915, **K** ('Monsal Dale, high', 1896, **BM**) may be the same as the preceding; Cressbrook Dale (C). An erroneous record for 43/2.4 (Perring & Walters 1962) arose from a confusion between the 'Ravensdale' north-east of Brailsford and the same name used for the northern part of Cressbrook Dale.

N. E. Yorks., v.c. 62: 44/5.8, Hawnby, 1881, **NMW.** The unique specimen, collected by J. A. Wheldon and determined by E. Nelmes, is authentic, but some error may be suspected. Wheldon was 19 when the plant is said to have been gathered.

Mid-W. Yorks, v.c. 64: 44/2.6, Mackershaw (Lees 1888). Another doubtful record (see second paragraph of this paper).

N. W. Yorks., v.c. 65: 34/7.9, Fell End Clouds (B). An erroneous record for 34/8.8 (Perring & Walters 1962) was due to a misreading.

Westmorland, v.c. 69: 34/4.7, reports of *C. ornithopoda* from 'limestone pavements on the eastern side of Morecombe Bay' are errors for *C. digitata* (David 1978); 34/4.8, Halecat (C); Aslew Green (C); Mill Side, Low Fell (C); Whitbarrow, locally abundant between Howe and Raven's Lodge (D); Brigsteer, 4 places (A,B,B,C); 34/4.9, Helsington Barrows (C); Scout and Underbarrow Scars at frequent intervals (C); Cunswick (A); 34/5.7, Curwen Woods (B); Hutton Roof (B); 35/5.1, Shap (B); 35/6.0, Orton, Broadfell (B); Sunbiggin, scattered over the limestone pavements (B); 35/6.1, Crosby Gill, a main colony (C) and many scattered plants; on most of the terraces between Orton Scar and Great Asby Scar (C); Flass House, no date, **OXF**; 35/7.0, Smardale (B); Potts Beck (B); Fell End Clouds, continuation of colony in v.c. 65 (B); 35/7.1, Helbeck (C).

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R. W. David

BIOGRAPHICAL NOTES ON THOMAS GREENLEES (1865–1949)

The current interest in biographical details and the incomplete and incorrect entry in R. Desmond's *British and Irish botanists and horticulturalists* (1977) has prompted the following notes on Thomas Greenlees.

Thomas Greenlees was born in 1865 in Astley Street, Bolton, S. Lancs. His father was a shoe-maker by trade and Greenlees also took up this trade when he became of working age. This was not to be his life-long career, however, and he had several other jobs. According to his daughter, Mrs Alice W. Crook, this was due to his being very public-spirited; when work became short at the tannery he would leave and take up another job for a while so that his fellow-workers could have more work and therefore more pay. He did eventually return *c.* 1916 to the tannery where he was a leather-dresser, and he became a trade union secretary (*c.* 1927–32), a job which involved visiting many other tanneries.

Amongst his other occupations, he was a herbalist and had a shop in Morris Green Lane, Bolton. His interest in botany began in his youth, although he came from a very humble background and had a poor education. All his knowledge of plants was self-taught. The Bolton Botanical Society began in December 1895 with Greenlees and a few of his friends, also interested in botany, who used to go for rambles at weekends. They had a plot of land in Queen's Park, adjacent to the Chadwick Museum, which was made into a small botanical garden. Mr T. K. Holden was one of these pioneers and also a great friend of Greenlees, both being interested in chess as well as botany. Holden was not a Bolton man but came from Appleby in Westmorland, and it is thought he had a university education.

On the rambles the Society collected botanical specimens which were identified with the aid of 'Hayward's Classification', pressed between books and mounted. The Society gained many more members over the years and Greenlees became the president. Eventually, in 1907, the Society became the Bolton Field Naturalists' Society and as such is still in existence today, the 50th anniversary having been celebrated by a dinner in the Town Hall in 1957. The Botanical Garden in Queen's Park was a special privilege granted by the Parks Committee to the Society.

Holden was the first Honorary Secretary of the Society, from 1907 until 1934, when he died. He was also the referee for biology and geology, while Greenlees was referee for botany. Greenlees and Holden were the authors of *The flora of Bolton*, which appeared as a series of articles in Parts 6–11 of Volume 12 of the Lancashire and Cheshire Naturalist (December 1919–May 1920) and was reprinted in booklet form by the Bolton Field Naturalists' Society in 1920. From 8th May, 1908, to late in the year 1914 Greenlees wrote articles for the *Bolton Chronicle* under the name of 'Flora'. The articles were mainly botanical but he also wrote several on astronomy. Mrs Crook has in her possession two large albums containing these articles.

During the summer months the Society organized rambles and Greenlees led several, mainly to Gale plantation, which was his favourite area. In winter, films were shown in the usual meeting-place of the Society, which was Mawdsley Street Congregational School. In April, 1938, Greenlees became one of the Vice-presidents.

He died of a stroke in 1949 and a seat was placed at Walker Fold in memory of him. His specimens were donated to the Chadwick Museum and they remain the only past record of the local flora at the present museum. His sheets number about 1,500, of which about one third (from Germany) were donated earlier.

ACKNOWLEDGMENTS

I am indebted to Mrs A. W. Crook of 72 Bennetts Lane, Bolton, daughter of Greenlees, and Dianne Beckwith, who compiled most of the information.

E. G. HANCOCK

CORRIGIOLA TELEPHIIFOLIA POURRET NEW TO BRITAIN

In June, 1974, two minute plants of a *Corrigiola*, tentatively named *C. litoralis* L., were found at Gloucester Docks, E. Gloucs., v.c. 33, by C. W. Bannister. They were among a remarkable collection of some 46 adventives, all typical of sandy soils and obviously originating from the Iberian Peninsula, growing on two small heaps of granite chippings on the dockside (Bannister 1975). Unfortunately the whole area was sprayed later in the summer and the plants disappeared.

However, a visit by S. C. H. *et al.* on 11th September, 1977, revealed that not only had the *Corrigiola* survived but it was well established in two separate places. In both, the plants were growing on a gravelly mixture of fine granite chippings and sand, Site A being adjacent to the original site and Site B on the quayside in another part of the Docks. 20 plants were counted in Site A and 30 in Site B, the majority of them flowering freely on decumbent, branching, leafy, often reddish stems (up to 23 cm long) radiating from a central rosette (Fig. 1), inconspicuous against the off-white background. They were still flowering on 5th February, 1978.

It then seemed that the plants might well be referable to the perennial Mediterranean species *C. telephiifolia* Pourret and not to the annual *C. litoralis*, and mature specimens with well developed fruits were sent to E.J.C., who had no hesitation in naming them *C. telephiifolia*, a species he had frequently seen in south-western Spain growing on waysides.

After contacting the importers of the granite, S.C.H. learned that the shipments to Gloucester came from N. Portugal, from two different quarries to the north of the Doura, and are exported from the port of Leixoes. The granite is used in this country for road making and architectural work.

Early in 1978 the quaysides and railways sidings were again sprayed. Site A was covered with steel girders throughout the summer and in early October was being used for storing boats. It will be surprising if the *Corrigiola* appears there again. Site B was piled high with granite blocks and only 8 small plants of the *Corrigiola* could be seen on 7th October. On a visit on 23rd June, 1979, the quay was still being used for stacking granite and no plants were visible. However, if the quayside should be left clear for a long enough period, there might well be a resurgence of the plant.

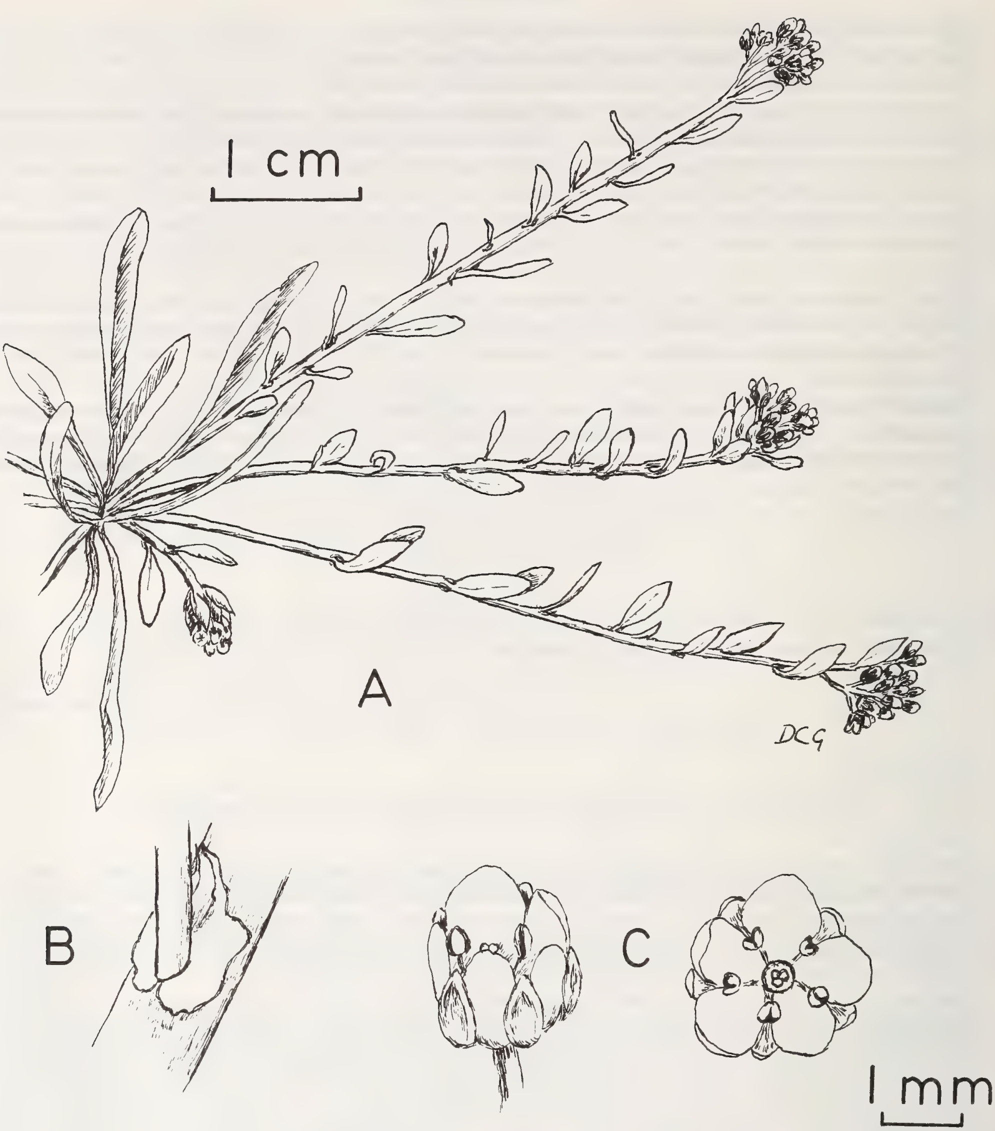

FIGURE 1. *Corrigiola telephiifolia* Pourret from Gloucester Docks. A, Habit; B, Stipules; C, Flowers.

Walters (1964) separated these two species in the traditional way, describing *C. litoralis* as an annual with inflorescence-branches bracteate and *C. telephiifolia* as a perennial with inflorescence-branches usually ebracteate; supplementary characters are the stouter stems of *C. telephiifolia* and its larger fruits (1.5–2.5 mm contrasting with 1.0–1.5 mm in *C. litoralis*).

Inspection of pressed specimens in **BM** reveals that typical specimens are readily nameable but, due to virtual overlap of all the diagnostic characters, some individuals are not so easily assigned. Maire (1963) very reasonably regarded the two taxa as subspecies of *C. litoralis*; Brummitt (1967) and others have certainly suggested that biennial/perennial variants of *C. litoralis* exist. Such stout plants of *C. litoralis*, suggesting a short-lived perennial habit, may be seen in **BM**:

a) Torcross, S. Devon, H. W. Pugsley, 5 September, 1934;

b) Lizard, Cornwall, waste ground, Colonel R. Meinertzhagen, August, 1931.

However, no British specimens, even those from railway sidings, are clearly *C. telephiifolia*, and so this species at Gloucester Docks appears to be new to Britain. It is an established alien in Belgium and Germany (Walters 1964), so its occurrence here, in the mild south-west, is not altogether surprising. It may be overlooked elsewhere.

ACKNOWLEDGMENT

We are most grateful to Mrs D. C. Grenfell for drawing Figure 1 for us.

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S. C. Holland & E. J. Clement

RANUNCULUS PENICILLATUS (DUMORT.) BAB. IN THE BRITISH ISLES

There has been understandable confusion concerning the taxonomy of *Ranunculus penicillatus* (Dumort.) Bab., since it was not until 1966 that Cook demonstrated that the taxon is 'a collection of segmental amphidiploids' which has resulted from hybridization. Determination of parentage is difficult since the original hybridizations are believed to have occurred before the parents evolved to their present forms. Cook (1966) recognized three varieties of *R. penicillatus*: var. *penicillatus*, var. *calcareus* (R. W. Butcher) Cook, and var. *vertumnus* Cook. The first is synonymous with *R. peltatus* Schrank subsp. *pseudofluitans* (Syme) Cook in Clapham (1962), and *R. pseudofluitans* (Syme) Newbould ex Baker & Foggitt in Cook (1964). Var. *calcareus*, first described by Butcher (1960), was included within *R. penicillatus* by Cook (1966), but the clear distinguishing feature separating the two, namely that var. *calcareus* never forms laminate leaves, was not stressed. Var. *vertumnus* was newly described by Cook (1966) and has highly branched, rigid and divergent capillary leaves which are much shorter than the internodes. Professor C. D. K. Cook (pers. comm., October 1978) reported the presence of distinctive material of this taxon on the Continent which has leaves that are more or less in one plane. Since in this country I have not seen convincing material which is sufficiently different from very short, rigid var. *calcareus*, details of the morphology and distribution in the British Isles of only the vars. *penicillatus* and *calcareus* will be given here. For further detailed comparisons, tabular key, and silhouettes and descriptions of all British species, see Holmes (1979).

R. penicillatus (Dumort.) Bab. var. *penicillatus*
Key features: both laminate and capillary leaves produced; laminate leaves large, orbicular, entire; capillary leaves flaccid and longer than the internodes of mature, vegetative shoots; receptacle and achenes pubescent.

Vegetative plants can be confused with either small plants of *R. fluitans* Lam. or var. *calcareus*. Floral shoots, however, develop large laminate leaves which distinguish it from these other taxa. In my experience var. *penicillatus* rarely forms more than three flowers without developing laminate leaves. In the flowering state, therefore, var. *penicillatus* could be confused only with *R. peltatus* Schrank. The only differences between these two taxa are the form of the capillary leaves and a slight difference in peduncle length. The capillary leaves of *R. peltatus* are usually shorter than the internodes and rigid when taken from the water and shaken to remove surplus water. In var. *penicillatus* they are generally longer than the internodes (especially on vegetative shoots), and are flaccid and limp when lifted from the water. Typical var. *penicillatus* from large rivers is easily identified whereas material from smaller areas of water is more likely to be confused with *R. peltatus*.

Var. *penicillatus* occurs only in fast-flowing rivers, where it is capable of growing in torrent conditions, as well as in more slow-flowing sections which have a high current velocity during flood periods only. It occurs in a substantial number of rivers in Wales, Ireland and western England but it has not been found in central or eastern England or Scotland. Material from Wales and Ireland is robust, very fertile and closely resembles the type material. Material in the rivers of the Lake District and south-west England is usually far less fertile. Var. *penicillatus* thus occupies geographical regions where *R. fluitans* is either absent or very rare.

R. penicillatus (Dumort.) Bab. var. *calcareus* (R. W. Butcher) Cook
Key features: only capillary leaves produced, mature capillary leaves approximately equalling the length of the internodes; prostrate summer growth with nodal roots; receptacle and achenes pubescent.

This variety is clearly different from var. *penicillatus* when in flower since the latter forms very large laminate leaves. When the two varieties are not flowering it is viritually impossible to tell them apart, although var. *calcareus* shows much greater variability in size. In some large rivers plants are up to 5 m long with sparsely branched capillary leaves that exceed the internodes, whereas in small streams there are plants which rarely exceed 1 m long and which have densely branched leaves that are shorter than the internodes. The former plants often resemble *R. fluitans* whereas the latter could be referred to *R. penicillatus* var. *vertumnus*. These variations are frequent in single river catchments, where the larger plants occur in the larger, more stable sections of the main river and the smaller plants occur in the headwaters and smaller tributaries; the River Severn and River Avon (Wiltshire) are good examples. Most confusion arises when separating var. *calcareus* from *R. fluitans*. The latter, however, usually has four or fewer divisions of the capillary leaves compared with seven or eight in the former. Care should be taken when looking at flowering shoots since these usually have more segmented leaves. Flowering plants are identified more easily because *R. fluitans* has receptacles that are either totally glabrous or with only a few hairs, whilst those of var. *calcareus* are densely pubescent. During the summer growth period *R. fluitans* does not form roots at the nodes whereas var. *calcareus* usually does. Some large rivers in southern England are dominated by plants that are intermediate in character between *R. fluitans* and *R. penicillatus* var. *calcareus*. Vegetative shoots and flowering shoots produced early in the year have leaves characteristic of *R. fluitans*, yet floral characteristics indicate *R. penicillatus*.

Like var. *penicillatus*, var. *calcareus* occurs most frequently in fast-flowing rivers, although it is less dependent on torrent conditions. It thus occurs in rivers which do not necessarily rise at high altitude. It is common throughout England, occasional in Wales, known only from the south of Scotland, and not recorded from Ireland. The two varieties, therefore, occur in different geographical regions of the British Isles and are rarely found in the same river system. However, one site where both do occur together is the River Eden, Cumberland, v.c. 70. Var. *calcareus* is, on the other hand, frequently found in the same river systems as *R. fluitans*. Although the name *calcareus* is not always apt, in many areas this variety occupies more base-rich rivers and is replaced by var. *penicillatus* in the more base-poor rivers.

Since Cook (1966) has suggested how *R. penicillatus* arose by hybridization, it would be not unreasonable to further his evolutionary hypothesis by suggesting the parentage of the present day varieties. Cook (1966) suggested that var. *pencillatus* probably arose from a *R. fluitans* × *R. peltatus* hybrid, the latter species giving rise to the large laminate leaves. The morphology of var. *calcareus* would suggest that it arose from a *R. fluitans* × *R. trichophyllus* hybrid, since neither parents nor hybrid have laminate leaves. Var. *vertumnus* could have arisen from hybridization involving *R. circinatus* with *R. fluitans, R. trichophyllus* or *R. penicillatus* var. *calcareus*. The great variation in the morphology of these varieties is also not totally surprising when it is considered, for example, that *R. fluitans* exists as $2n=16$, 24, 32 and 40 and *R. peltatus* exists as $2n=16$ and 32 cytotypes (Cook 1966).

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N. T. H. Holmes

ERICA × *STUARTII* E. F. LINTON—A CORRECTION

In the text of my article on *Erica* × *stuartii* (McClintock 1979), the author citation of the hybrid binomial should have read simply 'E. F. Linton', and not '(Macf.) E. F. Linton'. The latter would have been correct if Linton had referred to Macfarlane's name of *E. tetralix* subsp *stuartii*. In fact, Linton made no allusion to it in either of his papers in which he published his binomial. He was under no obligation to take over Macfarlane's name: when he was describing the plant at a different rank, he could have chosen another. That he did use *stuartii* again is not in itself reason to cite it as originally of Macfarlane, even though courtesy and clarity would have suggested at least some acknowledgment of the detailed work which had preceded his hasty publication.

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D. McClintock

DESCRIPTIVE KEY TO BAMBOOS NATURALIZED IN THE BRITISH ISLES

At the Manchester B.S.B.I. Conference in April, 1979, I spoke for half an hour on some aspects, notably flowering, of the bamboos naturalized in our islands—see Report, p. 74. I also referred to the quite particular difficulties of deciding whether a given plant is naturalized or not. With me I had a draft key to the nine species which probably have the best claim to inclusion in our Floras. This has now been elaborated and is reproduced below.

Nomenclature is that currently used in Britain and in *Flora Europaea*, **5**. But agreement with Japanese names is being actively sought, and the generic names usually employed in Japan are added in brackets.

Bamboos belong to the subfamily Bambusoideae of the Gramineae (Poaceae). They are woody perennials, usually of considerable size and rapid growth. Characters common to the nine included here are: culms generally terete, with a central internodal hollow and glabrous nodes; leaves petiolate, jointed to the sheath, green, paler beneath. The data are for our own islands, and statements on flowering are valid at the time of writing (July 1979). The details are so drawn up as, hopefully, to exclude other species grown but not considered to be naturalized.

1. Culms up to 8 m, terete at least below; leaf-blades glabrous; *Arundinaria* Michx *pro parte* 2
1a. Culms up to 2 m, terete throughout; leaves concolorous beneath . . . 6

2. Culms up to 3 m, relatively thin (up to 15 mm diam.) so arching or drooping when mature; branches and branchlets finally numerous at a node; leaf-blades small, narrow, thin, up to 10 cm × 8 mm, with up to 6 pairs of veins, concolorous beneath, shrivelling in winter winds 3
2a. Culms up to 8 m, stouter (up to 25 mm diam.) so not or much less arching; leaf-blades larger, thicker, up to 30 cm, with up to 10 pairs of veins, not or less shrivelling in harsh winters 4

3. Plant in dense clumps; culms dull purple or greyish-green, often overlaid with a glaucous bloom; sheaths usually long-persistent; leaf-blades up to 8 cm, with 3–4 pairs of veins. No flowers (*Sinarundinaria* Makino ex Nakai) . *A. nitida* Mitf.

3a. Plant surrounded by far-running rhizomes; culms greenish-brown; sheaths soon deciduous; leaf-blades up to 10 cm, with 4–6 pairs of veins. May show flowers. *A. anceps* Mitf.

4. Branches 1 at a node; plant in clumps, occasionally with a wandering rhizome; culms up to 5(–8) m × 20 mm, thin-walled, somewhat arching when mature; sheaths long-persistent; branches from upper part of culm in second year; leaf-blades up to 20(–30) cm × 40 mm, glaucous for $\frac{1}{4}$ of the width of the lower surface, not usually shrivelled in winter. May show flowers (*Pseudosasa* Makino) . . . . . . *A. japonica* Siebold & Zucc. ex Steudel

4a. Branches finally several at a node 5

5. Plant in clumps; culms up to 6(–8) m × 25 mm, very thin-walled, sometimes somewhat grooved above, always stiffly erect; sheaths deciduous, or tattered after one year; branches short, erect, from upper part of culm; leaf-blades up to 20 cm × 20 mm, concolorous beneath, hardly shrivelling in winter. Flowering finishing (*Semiarundinaria* Makino ex Nakai) . . . . *A. fastuosa* (Latour-Marliac ex Mitf.) Lehaie

5a. Plant with running rhizomes; culms up to 3(–5) m × 20 mm, terete, thin-walled, arching when mature; sheaths persistent; branches longer, ± horizontal, starting from lower on the culms; leaf-blades up to 30 cm × 30 mm, $\frac{1}{2}$ of the width beneath typically glaucous, shrivelling in severe winters. Has flowered (*Pleioblastus* Nakai) . . . *A. simonii* (Carrière) A. & C. Rivière

6. Culms ascending, relatively stout, often purplish or purple-mottled; branches 1 at a node; sheaths persistent; leaf-blades relatively huge, up to 30 cm × 70 mm or more, glabrous; *Sasa* Makino & Shibata 7

6a. Culms ± erect, slender, up to 1.2 m × 6 mm, greenish, branches usually 2–3 at a node; leaf-blades slenderer and narrower, up to 25 cm × 25 mm; *Arundinaria pro parte* 8

7. Culms up to 2 m, usually purple-mottled (var. *nebulosa* Makino); rhizome far running; leaf-blades up to 30(–40) cm × 70(–95) mm, acuminate, bright shining green above, with up to 13 pairs of veins; petioles green. Flowering finishing . . . . *S. palmata* (Burbidge) E. G. Camus

7a. Culms up to 1 m, often purplish and glaucous-bloomed; rhizome shortly running; leaf-blades up to 25 cm × 60 mm, blunter, greyish-green above, soon with broad white-withered margins, with 5–9 pairs of veins; petioles often purplish. Flowers unknown in British Isles . . . .*S. veitchii* (Carrière) Rehder

8. Rhizome far-running, the whole forming dense patches; branches 1 at a node, wide-spreading from rather under half way up the culm; sheaths persistent; leaf-blades up to 20 × 25 mm, pubescent (especially beneath, with margins sometimes narrowly withering white in winter. Flowers unknown . . . . *A. vagans* Gamble

8a. Rhizome running, forming open patches; branches (1–)2–3 at a node, erect, starting from near the base of the culm; sheaths deciduous; leaf-blades up to 15(–25) cm × 15(–20) mm, ± glabrous, with margins not withering in winter. Has flowered in recent years . . . .*A. humilis* Mitf.

Several species of *Phyllostachys* Siebold & Zucc., many difficult to discriminate, are grown. They are more or less clump-forming and can persist where they have been planted. The genus is distinctive in its 3–5 m hollow culms being markedly grooved on alternate sides (except sometimes below in giant species) with deciduous sheaths and two unequal, long, wide-spreading branches at a node, often with a depauperate one in between.

D. McClintock

CORYNEPHORUS CANESCENS (L.) BEAUV. IN W. SUFFOLK, V.C. 26

Corynephorus canescens (L.) Beauv. has five post–1930 records from E. Suffolk, v.c. 25, five from E. Norfolk, v.c. 27, one from W. Norfolk, v.c. 28, two from S. Lancs., v.c. 59, and in addition is recorded from Jersey, Channel Islands (Perring & Walters 1962). All these sites are on coastal sand-dunes. Hind (1889) recorded two inland sites in the Breckland of W. Suffolk, v.c. 26, namely: 'between Lakenheath and Wangford, G. C. Druce and Bolton King: Lackford Heath, G. C. Druce 1883'. *Corynephorus canescens* had been considered extinct in Breckland for many years until it was re-discovered by the writer and M. G. Rutterford in January, 1970, on a reserve of the Suffolk Trust for Nature Conservation known as Wangford Glebe.

Specimens in Herb. Druce (**OXF**) collected by Bolton King give 'July 1883, Brandon, Suffolk', and it appears that Druce followed to collect *Corynephorus* in 'August 1883, Brandon, W. Suffolk' and then went his own way to find another inland site in the same month at 'Culford Heath, W. Suffolk'', not, as reported by Hind (1889), at Lackford Heath. The Wangford Glebe site is only two miles south-west of Brandon and it is reasonable to consider that it may well be the site found by Bolton King in 1883.

The site is a low, wind-raised sand-bank facing south and the small colony of plants covers an area of 7 by 5 m. The vegetation is open and the only plant associates are *Agrostis canina* subsp. *montana* and *Carex arenaria*, together with small patches of *Cladonia gracilis, C. impexa, C. pyxidata* agg., *Cornicularia aculeata* and *Polytrichum piliferum*.

Marshall (1967) stated that *Corynephorus* is evergreen and grazed by rabbits. Although this ancient warren still has a fair rabbit population, it is kept in check and no damage to *Corynephorus* has been noted. Marshall made the point that 'populations are maintained on stable sand for several years on suitably dry, semi-open habitats in the presence of lichens and some annual species, by successfully resowing themselves'. The plant is described as self-eliminating and that 'competition for water takes place in the presence of *Carex arenaria* at Winterton, Norfolk, to the detriment of *Corynephorus*'. This also describes the habitat at Wangford. It is likely that the fortunes of the colony have changed over the years, for the population size between 1971 and 1978 has been noted and has shown considerable variation.

The perennial life-span of *Corynephorus* is relative to conditions. At Wangford, the colony is in a sheltered position and does not experience much sand movement. Marshall (1967) recorded no vegetative spread occurring beyond individual clumps and that it only forms a close sward under favourable moisture conditions, which also allow for favourable germination, in such places as dune-hollows, old wheel-tracks and blow-out bases. For the conservation of this species, note must be taken of Marshall's comment that 'it grows most vigorously where there is up to 10 cm of sand accretion per year . . . and that it is a potentially long lived perennial so long as sand accretion is taking place'.

On 12th October, 1971, a total of 231 plants was recorded at Wangford. Observations made between 1972 and 1974 showed that the population of *Corynephorus* had declined to *c*. 150 plants. A count in the autumn of 1975 revealed 112 plants. Few seedling plants were seen and there was a large number of dead plants from which there was no new vegetative growth. These observations were made in the early summer and late autumn when the grey-green of the leaves is marked and the bright pink-purple of the sheaths is noticeable. The site of the colony has a problem in its topography for most of the plants are on a bank slope. The sand is firm and held by rhizomes of *Carex arenaria*; if more of the plants were at the foot of the bank they would have greater opportunity of some blown sand accretion and less loss of moisture.

The sand-dune area of this Reserve is the only remaining significant area of sand erosion in the

Breckland. Whilst *Carex arenaria* and a few grass species have stabilized the dunes elsewhere on the Reserve, the Trust aims to maintain some degree of erosion in certain areas, which are annually rotovated, but there is little movement of the firm sand in the *Corynephorus* area.

In the autumn of 1975, a wide trench of sand was disturbed at the foot of the bank below the colony, to encourage sand accretion by wind movement, and, additionally, sand was thrown over the area of the plants. These operations have been repeated each year up to 1978 and, in spite of the droughts of 1975 and 1976, the sand accretion has made a marked improvement in the plant population, both of seedlings and new vegetative growth from old plants. On November 15th, 1978, 232 yearling plants were recorded, a few of which had flowered in 1978, as well as a further 190 flowering tufts, many of which were developing new vegetative shoots. A total of 422 plants, following simple conservation management, compares very well with 231 plants recorded in 1971.

Marshall's conclusion that 'many of the present European communities containing *Corynephorus* owe their existence to human interference' is amply supported by its response to the active conservation measures now being taken at Wangford.

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P. J. O. Trist

Book Reviews

Climate and evolution. R. Pearson. Pp. 274, with 79 figures. Academic Press, London, New York and San Francisco. 1978. Price £14·00.

If natural selection has been the mainspring of evolution, it follows that climate has had a profound influence on the course of evolution, since all organisms must be adapted to life under the prevailing climatic conditions. Most biologists have only the vaguest notion of historical climatology, and Dr Pearson has done us a service by introducing us to the subject in a well produced and thoroughly researched book.

Nearly half this book is devoted to a review of the science of climatology. This is no mean task, and Dr Pearson has written a most interesting and readable account of a highly complex subject without resorting to technical jargon. As a biologist, I am in no position to judge the accuracy of the subject matter of this part of the book, but was left with a strong impression of a science which, if not in its infancy, has a long way to go before it is able to correlate cause and effect in a precise way. The climate at any particular place and time is the result of the interaction of a large range of different physical processes. Many of these processes are better understood now than was the case even relatively recently, but their interaction is so complex that there is still plenty of room for disagreement about the interpretation of data.

In the second part of the book Dr Pearson takes each of the major geological eras in turn and presents the evidence for the climate of that time alongside a survey of the major events from the fossil record of animals and, to an inevitably lesser extent, plants. Thus, for example, the chapter on the Mesozoic era, a particularly critical time for the evolution of plants, begins with a general introduction which picks out the major biological changes of the period, such as the emergence of the flowering plants as a dominant component of world floras. A review of the changing position of the continents during the Mesozoic is followed by a discussion of climatic periodicity during the same period, evidence for which comes largely from the interpretation of data from pollen analysis. Then, after an account of the reversals of the earth's geomagnetic polarity, the evidence for the climate itself is given, partly in a section on the way that isotope analysis can indicate temperature changes and partly in a more general account of Mesozoic climates with diagrams for the inferred oceanic circulation and the distribution of 'climate sensitive' rocks. In this and other equivalent sections it might have been wiser to distinguish more sharply between physical and biological evidence, so that determinations of temperature by isotope analysis, for example, are more clearly separated from determinations that depend on interpretations of changes in the fauna. There is always the danger of circular argument if deductions about the climate on evolution are based on deductions about the climate made from the evolving organisms. In the final section of this chapter the biology and climate of the period are brought together to indicate correlations.

The chapters on each of the other periods dealt with (Paleozoic, Tertiary, Quaternary, late Weichselian and Flandrian, and Recent) follow a similar format, although the content varies, of course, according to the type of evidence available.

In this way a fascinating picture is built up of the major changes that have taken place during the evolution of organisms, side by side with contemporary changes in the climate. But how are these related? To what extent are the climatic changes the cause of the evolutionary changes, and to what extent are they merely coincidental? Such questions are almost impossible to answer. Of course, climatic changes are likely to have had a profound influence on the course of evolution, but there are many other factors involved as well. Dr Pearson is a very convincing advocate for the importance of climatic influences and can be forgiven for stressing their significance; but the dangers of the approach are neatly brought out by the last chapter of the book, which links historical events with climate. As our range of sources of evidence increases, so we find that the correlation between history and climate seems more tenuous. While biological and climatic events that occur at the same time may not do so solely as a result of coincidence, the links between them are often remote indeed.

Bearing this in mind, I would recommend any biologist to read this book, which is a most interesting introduction to a complex but most important subject. Topics which can cross the traditional boundaries between sciences are always difficult to write about, and Dr Pearson deserves our thanks for having done so in so stimulating a way.

G. C. S. Clarke

Palms of Malaya. 2nd edition. T. C Whitmore. Pp. xv + 132, with 106 text figures and 16 plates. Oxford University Press, Oxford. 1978. Price £7·50.

In a global context, Malaya has one of the richest and most diverse palm floras known. Palms are a conspicuous feature of the Malayan landscape, yet aids to their identification were until recently either very out-of-date or else written in such a recondite style as to be generally of little use to the layman or student. Whitmore's *Palms of Malaya* was first published in 1973 to fill the need of a popular introduction. That a second edition should be presented now is ample proof that *Palms of Malaya* has been used. The new edition has been changed only as much as the constraints of format of the first edition have allowed—there has been no attempt to rewrite the text; rather, additional text notes in an appendix inform the reader of changes. There is, however, the welcome addition of the cultivated village palm *Actinorhytis calapparia*. In the four years since the publication of the first edition and the seven years since the manuscript first went to press there have been great changes in the nomenclature of Malayan palms, and several additions to the flora, yet few of these have been indicated. *Palms of Malaya* may be responsible for the perpetuation of names like *Ptychorhapis* (though its synonymy with *Rhopaloblaste* was indicated in the first edition), *Cornera* and *Teysmannia*. However many of the grosser errors of the first edition have fortunately been corrected.

This remains the only popular introduction to Malayan Palms. It is an attractive book which, in this new paperbacked edition, should not be beyond the reach of students. It is just unfortunate that no further alterations could be made to the text without rewriting it and thus changing the format.

J. Dransfield

Flowering trees in subtropical gardens. Gunther Kunkel. Pp. 346, with 139 line drawings by M. A. Kunkel and 6 photographs. W. Junk, The Hague. 1978. Price Hfl. 70, US $36·85.

Subtropical gardens hardly come into the orbit of B.S.B.I., although with so many people spending holidays in the Mediterranean region, Portugal and the Canary Islands this book will be of interest to some members. In fact the most conspicuous plants growing in such places are usually not the native ones at all, but introduced trees and shrubs from the ends of the earth—and how difficult they can be to name. Local Floras, if available, deal mainly with native species, and it is very useful to have an assemblage of introductions such as is included in this volume. Of course, colour photographs of the habit and close-ups of the flowers are all in vogue these days and relatively cheap, but they tend to be pretty and superficial. The Kunkels have worked as a husband-and-wife team to produce one that will satisfy the enthusiast who is used to studying line drawings. These are very accurate and splendidly executed, with a descriptive text on the opposite page (including notes on their uses) as well as the botanical details. Some references are given for those who wish to follow up further information. The half dozen photographs in monochrome unfortunately add little to its usefulness.

The selection of species is based on those growing in the Canary Islands, where conditions are singularly favourable for a wide range of introductions; hence some rather locally cultivated trees are included. This is not a bad thing, either, since it is just such species, e.g. of *Eucalyptus*, that are so difficult to trace elsewhere. There are surprises with say, *Quercus robur* representing the temperate extreme and *Spathodea nilotica* the tropics. There is even a key to the trees included and a useful classified list, but why the author has to begin with An Apology—for the definition of a tree—certainly puzzles this reviewer.

F. N. Hepper

Advances in botanical research. Volume 6. Edited by H. W. Woolhouse. Pp. xiii + 342. Academic Press, London & New York. 1979. Price £16.

Continuing the pattern of previous volumes, Volume 6 of this series contains five articles on specialized botanical topics. It is doubtful whether all of them will be of interest to the readers of *Watsonia*, but two, 'Aspects of chromosome evolution in higher plants', by Keith Jones (pp. 120–194) and 'Cytogenetics, biosystematics and evolution in the Bryophyta', by A. J. E. Smith (pp. 196–276), are of considerable interest for evolutionary biologists and taxonomists.

Professor Jones's paper is not an exhaustive review but a highly critical appraisal of chromosome evolution in higher plants as influenced by years of research at Kew on the Commelinaceae. The main thrust of his argument is that, through the development of new cytological techniques and new philosophical approaches to the interpretation of cytological observations, the time is ripe to 'form and reform our concepts' and reject 'the dogmas of the past'. After describing the techniques of the 'New Karyology', such as relative DNA measurement by microdensitometry, the analysis of nucleotide sequences by DNA hybridizations and increased karyotype resolution by giemsa banding, Professor Jones assesses the relevance of this new information to accepted principles of development and heredity. The bulk of the article is directed towards an analysis of chromosome variation, particularly in chromosome numbers, and of such structural mutations as size differences, centromere positions, isochromosomes and accessory chromosomes. Many ideas of the 'Old Karyology' are rejected in the desire to provide better general hypotheses on structural variation. Particularly fascinating in this respect is evidence for the reinterpretation of metacentric chromosomes as derived products of fusion rather than as primitive structures, and for the wider significance of meiotic pairing behaviour in polyploids and complex number series. As a result of principles developed from the study of Commelinaceous genera, the classical interpretations of chromosomal behaviour in several other vascular groups, e.g. Cycads, *Haplopappus* and *Luzula*, are turned upside down.

It is interesting to compare this polemical account with the more orthodox article by Dr Smith, where the emphasis of interpretation lies in traditional views of chromosome variation. On the one hand it is surprising to see how much published biosystematic and cytogenic research work is available for bryophytes, in a group I always thought to be beset by technical problems. On the other hand, one must seriously question what new ideas can be gained from narrative accounts such as modal base numbers and the relationship between polyploidy and latitude in a subject going through exciting new developments. Nevertheless, Dr Smith's article is an excellent general review of bryophyte cytogenetics and has, therefore, particular value as a reference chapter.

In view of the disparate contents of this book it is unlikely that many individuals will purchase it. However, it should be consulted by all professional biologists. The uniqueness of the articles, written by leaders in their own fields who are capable of speculating on past interpretations and future developments, means that no institution can afford to be without them.

C. J. Humphries

Trees and shrubs of the Mediterranean. Helge Vedel. Translated by Aubrey Rush. Edited and adapted by Hugh Synge. Pp. 127, with numerous illustrations by R. Als and Anette Rasmussen. Penguin Nature Guides, London. 1979. Price £1·95.

There are at least three levels at which information about a particular group of plants and animals can be presented. I would name them as academic or scholarly, keen amateur or naturalist, and finally books for the beginner. I would consider the Flora, the field guide, and the beginner's book as equally important in building up a general knowledge of any subject; and today the greater amount of leisure, facilities for travel, and the development of colour printing processes have made books at the beginner's level increasingly important.

This book is certainly for the beginner or those casually interested in Mediterranean trees and shrubs, whether the latter are native or planted in gardens or along roadsides. It illustrates and gives brief descriptive notes on 136 species. Each is illustrated in colour by excellent paintings by Roald Als and Anette Rasmussen, showing the distinctive parts of the plant (leaves, fruit, flowers, etc.). There is no doubt that in almost every case the beginner will be able to name with confidence the tree or shrub he sees before him, by matching it with the very clear illustration. This after all is the first and most important step in setting the tyro on the right road to knowledge about a plant. Naturally the scope of the book is limited; many trees and shrubs are not described or noted, but the visitor to the Mediterranean should return home knowing at least 100 species by sight.

The list of trees and shrubs is interesting and includes a number of species which are not well known to the majority of northern citizens, such as Norfolk Pine, Banyan Tree, Casuarina, Kakee, Persian Lilac, Flamboyant, Cassia, Honey Locust, Pagoda Tree, Coral Tree, Cape Myrtle, Pepper Tree, Thorn Apple, Paulownia, Jacaranda and various Palms and Trumpet climbers. Many of the commoner Mediterranean species are illustrated by attractive line drawings to set the scene.

In addition, there is a very brief outline of the main types of vegetation, and a well illustrated but tantalizingly short introduction on the importance of certain plants in religion, history, design and mythology.

This simple, well illustrated, small book is most suitable to take away on a holiday to the Mediterranean; and it can certainly stimulate interest and set one along the right path to further knowledge about trees and shrubs.

O. Polunin

Euphorbes prostrées de France. P. Huguet. Pp. 89, with 34 text figures. Librairie Scientifique et Technique Albert Blanchard, Paris. 1978. Price Fr. 80.

An exhaustive study such as this would have been best reserved for a monographic treatment, rather than one with a regional circumscription; as it is, one feels that much effort has been expended to little purpose, since other shades of expression of the group in question are of necessity not taken into account. The 89 pages are taken up with a treatment of only seven species, including a newly-described one, *E. jovetii* Hugnet, the type of which comes from the Atlantic Pyrenees. It is said (p. 53) to differ from the polymorphic *E. maculata* L. as follows: 'caulibus numerosis magis ramosis secondis ramis altieribus rosulae diametrum usque 80 cm. habentibus figuris foliis haud maculatis falciformis dentibus numerosis involucri glandulis appendice latissima'. Now, all these distinctions are of degree and not of kind, and furthermore they are false distinctions because the characters involved are notoriously variable in members of this group as a whole. I would not therefore regard *E. jovetii* as having any taxonomic significance. At the same time, the very distinct and widespread *E. prostrata* Ait. is relegated to synonymy with *E. chamaesyce* L. and is accorded only formal rank. Thus the work betrays a certain inconsistency.

The size and appearance of the book, 31 × 24 cm, in stiff glossy paperback, is like that of a prestigious company report, and this, coupled with the heavy, floppy paper, makes for much awkwardness in consultation. The chatty, informal style of presentation of such data as distribution is extremely irritating, since it means that one has to plough through the lot in order to find the information one wants. Much store is set upon illustration—one might say 'ad nauseam'—since there are, for example, ten separate diagrams of leaves of *E. chamaesyce*, a dozen of *E. peplis* L., and no less than 23 of *E. maculata*!

The author's prime aim in writing this work is to attempt to show that the prostrate Euphorbias are neotenous forms derived by the suppression of the main axis of an esuloid spurge—of which group he selects as typical *E. peplus* L.—since the leaves in the pseudopleiochasia in this species are somewhat asymmetric at the base. However, such a derivation is ill-starred, because in the esuloid spurges there are no stipules, no petaloid glandular appendages, and well-developed caruncles.

It is noted that the author does not adopt the terminology used in *Flora Europaea* to rid *Euphorbia* descriptions of such ambiguities as calling the pseudopleiochasial leaves 'bracts', therefore leaving no meaningful term for the structures which subtend the male flowers within the cyathial involucre; nor does he regard the Chamaesyce group as worthy of more than sectional rank, whereas the reviewer feels that it is best accorded subgeneric status.

A. Radcliffe-Smith

Obituaries

CECIL THOMAS PRIME
(1909—1979)

Within the confines of a necessarily short obituary one cannot hope to do full justice to a man like Cecil Prime, who achieved much in many different fields, and who meant so much to many different groups of people. The following will therefore concentrate on his main life's work as a teacher of biology, and on his associations with the B.S.B.I.

He was born on 30th August, 1909, in Cambridge, the son of a master builder, and from 1920 to 1928 was educated at Perse School. From there he went on to Christ's College, Cambridge, and took the Natural Science Tripos. Unhappily, the first of a number of serious illnesses that punctuated his life prevented him from taking his part II examinations, but he was nevertheless awarded an *aegrotat* degree in 1931 on the strength of the considerable promise that he had shown as an undergraduate. He was then appointed to the staff of Whitgift School, Croydon, where he remained for the whole of his career, becoming Chief Biology Master and eventually Chief Science Master before his retirement in 1969. During his spare time in the 1940s he undertook detailed research on the biology and autecology of *Arum maculatum*, which formed the basis for a Ph.D. awarded by the University of London. The many interesting results of this project were made generally available in *Lords and Ladies* (1960), a monograph in the New Naturalist series, which vividly illustrates what can be achieved by determined, single-minded study of a small group of plants. He was the author of nine books and numerous papers, which ranged from the improvement of biological education to the scholarly, yet very readable, *Lords and Ladies* monograph. One of his earlier books, the *Shorter British Flora* (1948), was well received but never had the serious critical recognition that it merited, a matter for regret since it was a significant attempt to combine the rigorous methodology of a 'professional' Flora with a non-technical style designed to make it accessible to beginners. Such an approach has much to recommend it when compared with 'picture spotting', which is the usual basis of the identification manuals offered to learners, amateur and would-be professional alike. Following the death of J. E. Lousley, he and Dr C. P.Petch assumed responsibility for the *Flora of Surrey* and saw the work through the press to successful publication.

A member of the B.S.B.I. since 1933, he was at various times a member of Council, and at the time of his death he was a Vice-President. His long service to the B.S.B.I. was reflected in equally distinguished membership of many other societies and organisations, including the Council for Nature, the Croydon Natural History and Scientific Society, and the South London Botanical Institute. He was one of the first group of five schoolmasters elected to the Fellowship of the Institute of Biology, and he had been a Vice-President of the Linnean Society—the doyen of British organisations concerned with Biology, clear indications of his standing amongst his peers in professional science. In 1962 he spent a period of sabbatical leave from teaching as a Fellow Commoner of Corpus Christi College, Cambridge. He was for many years an examiner for London University in 'O' and 'A' level papers, and also acted as a University Extension Lecturer from 1950 right up to the time of his death.

As a teacher Cecil Prime was successful at all levels in the school, but especially so with the sixth forms. The abnormally large number of his old pupils now occupying senior positions of responsibility in botany, zoology, medicine and related disciplines, both in this country and abroad, has been noted by impartial observers on several occasions. Those of us who were privileged to have his guidance during our early biological education invariably point to this as a key factor in the later development of our professional careers. I have often wondered what it was about his teaching that resulted in such success. First and foremost, he was above all a true scientist in the fullest meaning of the word, with a deep love and respect for his subject. From the beginning, he taught his students *real* science, and not the watered-down version that some teachers appear to judge appropriate for the presumed intellectual capacities of their charges. This was sometimes strong meat, but success in the laboratory or the field was invariably recognised, and rewarded by further challenges to stretch the capacities of those concerned. In all aspects of his work he was invariably helpful; but he did not suffer fools gladly, and was particularly scornful of ostentation, hypocrisy and cant. Cecil was a biologist in the most literal meaning of the word, with an intense concern for *living* organisms, their autecology and the roles they played in our environment. His pupils were encouraged to make full use of all their faculties in making scientific observations, and few of them will ever forget the fungus *Russula emetica* after just one small bite! He was not a collector of specimens, and the dead remains of organisms that had once exhibited so many fascinating aspects of life failed to excite his interest.

He kept in close contact with his old pupils and took a great interest and very real pleasure in the development of their careers, a concern that was fully reciprocated. For many years he and Mrs Prime provided hospitality for regular informal gatherings at their home for those at University and in employment in various biological fields. On his retirement from teaching an *ad hoc* group of his former pupils arranged a dinner and presented him with a copy of Ray's Catalogus *Plantarum circa Cantabrigiam nascentium* . . . (1660), a work renowned in British Botany as the first in a long line of County Floras. His reaction to the gift was especially characteristic. Instead of expressing thanks and then putting the book away in his library, as most men in that position would have done, he at once set to work, with the assistance of A. H. Ewen, an old school colleague, on a modern translation of Ray's work, liberally supported with notes which recorded the background to the work and changes in the flora since Ray's times. It was duly published as *Ray's Flora of Cambridgeshire* (1975). Such deeds speak louder than words of thanks, and illustrate graphically the intellectual energy and sense of inquiry that he so abundantly radiated, and this in a man who over the years had overcome medical problems that would have reduced most men to a state of indolent apathy.

He was married to Miss Frances Welby in 1940, and in due course three daughters, Claire, Helen, and Catherine, were added to his family. Those who knew him well were aware that his astonishing resilience and energy were in part the product of a remarkably happy home and family life. The funeral, which was held in the country church at Farleigh, near Croydon, where he had lived for many years, was packed with friends and representatives from the numerous organizations with which he was connected, so much so that there was literally standing room only for late-comers, a striking testimony to the esteem in which he was held. Despite the sad circumstances of the day, it was a serene and even strangely happy occasion for his many friends who were there, all of whom can continue to draw on the rich concern with life that this quiet and unassuming man so abundantly expressed.

J. F. M. CANNON

EDWARD JAMES SALISBURY
(1886—1978)

An Honorary Member and one of the most senior personal members of the B.S.B.I.—as well as one of the most distinguished—Sir Edward Salisbury died on 10th November, 1978, in his 93rd year. He first became a member of our Society in 1914, at a time when British botany—and the world—wore a very different and now almost forgotten face. Most of his contemporaries have gone, and even those who recall him as a working colleague are a small and dwindling number. Although, perhaps, mainly 'a name' to most B.S.B.I. members, Salisbury's contributions to British botany, as to many other fields of plant science, were great and their impact enduring. In spite of the fact that at the time of his death he had been in retirement for 23 years, his interest in and his observations on the biology of British plants continued undimmed, and indeed papers on the reproductive biology of *Anagallis minima, Lythrum hyssopifolium* and *Hypericum calycinum* appeared in *Watsonia* as recently as 1968. His comments on the first two species included characteristically acute and original observation of seasonally dimorphic plants.

Sir Edward James Salisbury, C.B.E, D.Sc., F.R.S., was born in Hertfordshire, at Limbrick Hall, Harpenden, on 16 April, 1886, where his father, Mr J. Wright Salisbury, was a businessman. As with so many good botanists, his interest in plants developed in boyhood and preceded any formal teaching in the subject. It is said (Anonymous 1959) that at the age of 14 he had his own garden at home, stocked with wild flowers labelled with their Latin names. It is also related that his family referred to it as 'The Graveyard'! Much time in his boyhood, it is said, was spent walking or cycling in Hertfordshire, sandwiches in one pocket and Hooker's *Students Flora* in the other!

His education was at University College School and subsequently at University College, London, where he had a most distinguished academic career, and where his interest in British plants was further stimulated by the teaching of Professor F. W. Oliver. After taking his doctorate, and following a brief spell as Senior Lecturer in what is now Queen Mary College of the University of London, Salisbury returned to University College in 1918. Here he was steadily promoted through the hierarchy until in 1929 he became Quain Professor of Botany, a post which he occupied until 1943.

Then, during the dark days of World War II, he was, as one biographer put it, 'taken out of a professorial chair to do a job of post-war reconstruction and rehabilitation involving as much administrative as scientific flair', on his appointment to the directorship of the Royal Botanic Gardens, Kew. At that time Kew was still exposed to enemy bombing and much of the priceless herbarium and library was still evacuated in Oxford and Gloucestershire. He saw Kew safely through this time of survival, and indeed also the first phase of post-war development. Those who visit and enjoy the Australian House at Kew are seeing a notable product of his directorship. He retired from Kew in 1956, aged 70.

This is not the place to assess in any detail Salisbury's influence as Director of Kew or his impact, direct or indirect, on the many aspects of plant science and its administration with which he was connected. Suffice it to say that it was great and far-reaching in public and university life as well as in many fields of biology. A colleague once recounted that he was told by Sir Edward that he served on more than 120 committees!

Salisbury was deservedly highly honoured. He became a Fellow of the Royal Society in 1933, serving for ten years as Biological Secretary and for two periods as Vice-President. In 1945 he was awarded its Royal Medal. He was a Veitch Gold Medallist of the Royal Horticultural Society and was also awarded its Victoria Medal of Honour. He was publicly honoured by the award of the C.B.E. in 1939 and by a Knighthood in 1946. The Universities of Edinburgh and Glasgow conferred Honorary Doctorates on him.

It is difficult to sum up in a brief notice the scope of his research on British plants. He was primarily an ecologist in the good old wide sense of this now so grossly abused word. His work not only covered synecology—the study of vegetation in relation to its environment—but also autecology—the biology and life-history of individual species and taxa. Although synecology was an important ingredient in his earlier work, later on autecology played a progressively greater rôle.

A number of his earlier papers embody the results of botanical observations in his native Hertfordshire, mostly published in the *Transactions of the Hertfordshire Natural History Society*, including one paper on gentians and another on records of hepatics. His interest in ecology was already evident, and in 1917 he became Secretary of the British Ecological Society, a post he retained until 1932. This interest led to one of his most important early pieces of work, on the oak-hornbeam woods of Hertfordshire, published in *J. Ecol.*, **4**: 83–117 (1916); **6**: 14–52 (1918).

The influence of F. W. Oliver, already mentioned, led to Salisbury's studies of the coastal plant communities near Blakeney Point, Norfolk, and to a series of papers, some jointly with Oliver, that have been described as 'classics of their kind' (Dick 1943). Coming to more recent years, many will be familiar with his *Downs and dunes* (1952).

His interest in the life history of plants again started early in his career and indeed was often integrated with his autecological work. In addition to a number of papers dealing with individual species, especially their reproduction, he published *The reproductive capacity of plants* (1942) and later on that excellent volume in the New Naturalist series *Weeds and aliens* (1961), a record of so much accumulated personal knowledge about the behaviour and biology of categories of plants that play so important a rôle in the constantly changing flora of Britain.

In these works personal observation and recording are evident throughout. This, with his aptitude for bringing together in a productive synthesis results derived from different disciplines, is perhaps the hallmark of his research. An excellent example is provided by *The East Anglian flora* (1932), his Presidential Address to the Norfolk and Norwich Naturalists' Society, in which he analysed the phytogeography of the flora in relation not only to its more general distribution but also to ecology and past history.

Salisbury was also a gifted 'populariser'. Many will still recall the guidance they received as students from 'Fritsch & Salisbury'. *The introduction to the study of plants*, first published in 1914, went through nine editions, and the later companion volume *An introduction to the structure and reproduction of plants* (1920) was scarcely less popular. But perhaps the book by which he became most widely known and esteemed was *The living garden*, first published in 1935. This synthesis of horticulture, biology and ecology, described in a contemporary review as 'one of the most delightful books on gardening that has appeared for years . . .', won itself by its readability and sharp observation a multitude of appreciative readers.

Short in stature, decided in his opinions, Sir Edward Salisbury was a great talker and delighted in explaining things. These attributes no doubt accounted for his success in academic life as a lecturer and teacher and for his influence in the many advisory and governing bodies on which he served. In spite of a busy hard-working life that made many inroads on his time, his interest in and love of British plants was deep and life-long. He is commemorated by *Begonia salisburyana* Irmscher, from West Africa, and *Mercurialis perennis* L. var. *salisburyana* Mukerji.

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J. P. M. Brenan

NANCY SAUNDERS
(1907—1979)

The death of Mrs Nancy Saunders on 16th January, 1979, will sadden many B.S.B.I. members, who will remember her for her enthusiasm and friendliness on many field meetings, as well as her unfailing hospitality in her Gloucestershire home.

She joined the B.S.B.I. in 1950 and had enormous enjoyment in the Society's activities, especially in connexion with mapping for the *Atlas*. She had tremendous energy and a keen eye for plants, and was a great 'shoddy' enthusiast, living as she did not far from the Worcestershire fields.

At Gretton she created a most interesting botanical garden, and grew many unusual plants collected during her extensive travels abroad; but she also loved her native Cotswold plants, which flourished as ground cover all over her garden.

In the last few years increasing lameness curtailed her botanizing, but she continued to care for her garden with indominatable courage, and no-one who visited her there will ever forget her vivid personality and genius for friendship.

J. Russell

Reports

CONFERENCE REPORT
RECENT ADVANCES IN THE STUDY OF THE BRITISH FLORA

THE UNIVERSITY OF MANCHESTER, 20TH–21ST APRIL, 1979

INTRODUCTION

The retiring President of the B.S.B.I., Professor D. H. Valentine, organized this conference to review recent and current work on the taxonomy and biosystematics of the British flora, with special reference to the forthcoming new *Flora of Great Britain and Ireland*. Some 120 members and guests of the B.S.B.I. heard 21 papers, organized into four sections covering the topics of endemics and endemism, aliens and their status, infraspecific variation, and interspecific variation. Question and discussion of the papers was lively, with many members of the conference participating.

On the evening of the first day of the conference, Mr E. F. Greenwood of the Merseyside County Museums gave an illustrated talk on the flora of man-made sites in Lancashire, preceded by a reception, kindly given by the Office of the Vice-Chancellor of the University of Manchester.

A number of exhibits on the theme of the conference were on view in the Botany Department of the University. On the Sunday following the conference many participants made an informal visit to the Botany Department's Experimental Grounds and the Arboretum at Jodrell Bank.

All participants in the conference agreed that it had been one of the most enjoyable and informative conferences ever organized under the auspices of the B.S.B.I. A vote of thanks and best wishes were offered to Professor Valentine, who not only hosted and organized the conference, but was giving his farewell as President of the B.S.B.I. and as Professor of Botany in the University of Manchester. Despite the word 'retirement', the conference had no doubt that there would be many years of active botanical work yet to emanate from Professor Valentine.

FRIDAY, 20TH APRIL, MORNING

D. H. Valentine. *Endemics, sexual and apomictic.*

In a short introductory paper, the terms 'endemic' and 'apomictic' were defined. Sexual endemics are rare in the British Isles, but in some genera apomictic endemics are numerous and many microspecies have been described. The variation in number of microspecies in different genera calls for explanation; past history, geographical factors, habitat preference and breeding system may all be invoked. The papers in the first session record significant progress in the analysis of all the important genera.

E. Leadlay & V. H. Heywood. *Endemic species of* Rhynchosinapis (*Cruciferae*).

Reasons were put forward for combining the genus *Rhynchosinapis* with the Spanish genus *Hutera* under the earlier published name *Hutera*. Since the appropriate combinations have not yet been published the taxa are mostly referred to under *Rhynchosinapis*. This treatment was based on a study which included comparative analyses of morphology, population studies, seed proteins, cytology, ecology, and reproductive biology, reinforced by breeding experiments.

The combined genus occurs in western Europe and is composed of six species. These were described briefly to show how the British members are related to those of the Continent. They are *R. transtagana* (Cout.) P. Silva (S. Portugal & S. W. Spain), *R. longirostra* (Boiss.) Heywood (S. Spain), *R. richeri* (Vill.) Heywood (S. W. Alps in France & Italy), *R. wrightii* (O. E. Schulz) Dandy (Lundy Island, Great Britain), *Hutera rupestris* Porta (S. Spain) and a species which includes the British endemic taxon *R. monensis* (L.) Dandy (Isle of Man & W. coast of Britain).

The first five taxa are taxonomically and geographically isolated whereas the last species is more variable, consisting in this treatment of six subspecies and two varieties and occurring throughout the range of the genus. The variation of the latter taxon was illustrated by characters used to differentiate *R. monensis*: habit, leaf shape, indumentum, seed-size, seed shape and surface reticulation, and chromosome number. *R. monensis* has been given subspecific rank on the basis of this and other evidence. *R. wrightii* is considered a relict species and *R. monensis* to have been isolated more recently.

A. J. Richards. *The status of* Taraxacum *agamospecies in the British Isles.*
Taraxacum is almost entirely apomictic in the British Isles, reproducing by seed which is almost invariably genetically identical to the parent, through diplosporous parthenogenesis. Traditionally, British taxonomists have recognized four 'species' (which would be increased to five with the modern discovery of *T. obliquum* (Fr.) Dahlst. *s.l.*). These are very unsatisfactory taxa, both typologically and biologically, each being composed of between 2 and 500 apparently invariable biotypes. The justification for naming these as agamospecies rests on two broad criteria: a) whether a significant number of British and Irish botanists can recognize and use independently the taxa employed by the present author in *Taraxacum Flora of the British Isles* (1972); and b) whether these taxa have an information content, for instance distributionally or ecologically, which makes their use worthwhile.

The distributional integrity and information content was examined for about 30 of the 178 species (of which, perhaps, 140 are native) currently recognized in the British Isles. A number of distributional categories were recognized, using as evidence a combination of distribution maps for Northumberland, v.c. 67 & 68, (5 km squares); for the British Isles (10 km squares); and for Europe, using the European mapping scheme template. These categories are listed, with some typical examples of each:

Narrow endemics: *T. acutum* A. J. Richards, *T. pseudonordstedtii* A. J. Richards
Habitat endemics: *T. cambriense* A. J. Richards, *T. drucei* Dahlst.
Regional endemics: *T. hibernicum* Hagl., *T. cherwellense* A. J. Richards
Widespread endemics: *T. laetifrons* Dahlst., *T. fulvicarpum* Dahlst.
Mostly British: *T. oxoniense* Dahlst., *T. unguilobum* Dahlst.
Disjunct relics: *T. cymbifolium* H. Lindb. f. (Arctic), *T. lainzii* van Soest (Lusitanian)
Channel disjuncts: *T. tortilobum* Dahlst., *T. hygrophilum* van Soest
North-west European: *T. faeroense* (Dahlst.) Dahlst., *T. landmarkii* Dahlst.
Northern European: *T. maculigerum* Lindb. f., *T. praestans* H. Lindb. f.
Subarctic: *T. naevosum* Dahlst., *T. croceum* Dahlst. *s.s.*
Baltic: *T. gotlandicum* (Dahlst.) Dahlst., *T. obliquum* (Fr.) Dahlst. *s.s.*
Western European: *T. nordstedtii* Dahlst., *T. hamatum* Raunk.
Southern European: *T. silesiacum* Dahlst., *T. retzii* van Soest
European: *T. brachyglossum* (Dahlst.) Dahlst., *T. proximum* (Dahlst.) Dahlst.
Relict, widespread in Europe: *T. glaucinum* (Dahlst.) Dahlst., *T. austrinum* Hagl.
Adventive: *T. fasciatum* Dahlst, *T. copidophyllum* Dahlst.
Casual: *T. austriacum* van Soest.

It was especially noted that in the *Taraxacum* flora of the British Isles, as currently conceived, there are no examples of Mediterranean, Alpine or Continental/Steppic elements.

It was concluded that *Taraxacum* agamospecies show informative distribution patterns, and are likely to yield information of phytogeographical interest. Thus there is a sound basis in fact for the continuing study of these taxa. In particular, it is becoming possible to suggest which species are native and which are likely to be introduced through the activities of man.

A. Newton. *Methodology in* Rubus *studies.*
The substance of this paper is presented on pp. 35–40.

A. C. Leslie. *Apomixis and endemism in* Ranunculus auricomus *L.*
This paper reviewed the cytological studies of apoximis in *R. auricomus* and a number of closely related taxa from Europe. Apomixis in this group has been shown conclusively to involve pseudogamy. Rare instances of normal, haploid, embryo-sac formation are reported, and hybrids have been obtained in cultivation between normally apomictic plants; to date this has only been achieved with the Eastern European *R. cassubicus.* Evidence confirming the pseudogamous nature of apomixis in British *R. auricomus* was presented.

A large number of taxa can be recognized in British material, many of which are endemic. This closely parallels most of the studies published on the Continent. Eighty taxa have so far been distinguished in Britain, although this figure mainly represents southern and eastern England (and even here the work is far from complete). Most of these taxa have very restricted distributions.

It was suggested that although hybridization may have been important as a source of variation in the past, and perhaps is still so today, variation originating from mutation is equally important. Some possible examples concerning British plants were discussed.

S. M. Walters. *Apomictic endemism in* Alchemilla *and* Hieracium.
The British representatives of the apomictic genera *Alchemilla* and *Hieracium*, both well known taxonomically, provide interesting parallels and contrasts. Thus there is only one endemic *Alchemilla* described for Britain out of a total of 12 British native species (8% endemism), whereas in *Hieracium* approximately 150 species are thought to be endemic out of the total for the British Isles of *c.* 250 (60%).

Some non-endemic *Hieracium* species (e.g. *H. schmidtii*) have a scattered distribution in the north and west of the British Isles essentially similar to that of *Alchemilla glabra* (though the latter is a more abundant plant). An 'arctic-alpine' pattern, again shared by many sexual species, is seen in, for example, *Hieracium holosericeum* and *Alchemilla wichurae*. Both these are familiar distribution patterns shared by many widespread northern European sexual species. Some widespread British *Hieracium* species with similar distributions are, however, endemic (e.g. *H. subcrocatum*), and their origin presents interesting problems.

Most *Hieracium* endemics are local or rare, often characterizing a particular mountain or even a particular cliff. Why such variation patterns are commoner in *Hieracium* than in *Alchemilla* may be related to the fact that some sexual or sub-sexual reproduction may be operating in the former, but seems to be wholly absent (at least in northern European taxa) from the latter genus.

FRIDAY, 20TH APRIL, AFTERNOON

D. A. Webb. *Criteria for presuming native or alien status.*
Decisions on native or alien status seem all too often to be based on inappropriate criteria, on irrelevant emotions such as local patriotism, on misinterpretation of fossil data, or on an uncritical acceptance of earlier opinions. Neither abundance nor 'looking wild' can be accepted as firm evidence of native status, as is clearly demonstrated by such species as *Rhododendron ponticum* and *Epilobium brunnescens*.

The practice of treating long-established aliens as equivalent to natives only gives rise to confusion; the former may be more difficult to recognize than recent introductions, but they are aliens none the less.

Eight criteria were suggested; very seldom will any one of them give a clear and definite answer, but if several of them provide circumstantial evidence pointing in one direction it is wise to act on it, while if they point in different directions one has to accept that for many species the status must always remain uncertain. The criteria suggested are: fossil evidence; historical evidence; habitat; geographical distribution; ease of known naturalization elsewhere; genetic diversity; reproductive pattern; supposed means of introduction.

J. G. Dony. *Wool aliens.*
Attention was first drawn to wool aliens in Britain by Hayward & Druce in *The adventive flora of Tweedside* (1919), in which they accounted for 348 species from below the woollen mills at Galashiels. In the meantime J. B. Cryer and others had recorded similar plants, mainly from the Frizenhall sewage works at Bradford.

Shortly after the Second World War it was found that wool waste, or shoddy, was used as a manure in various parts of the country. Grey shoddy, the waste from the scouring processes, contains seeds which are glutinous or covered with burs and stick to the wool; however, black or coloured shoddy, the waste from breaking down woollen garments, contains none. Most of the species recorded from fields on which shoddy has been applied are annuals, mainly because perennials cannot become established, though they may persist, at least temporarily, on sites adjacent to the fields. Lousley (*Proc. bot. Soc. Br. Isl.*, **4**: 221–247 (1961)) was able to account for 529 species presumed to have been introduced with wool, but the number now known is much higher. The species are mainly Mediterranean in origin but Australasian and South African species account for a proportion; a few are now cosmopolitan.

In Bedfordshire, where shoddy has probably been in continuous use longer than elsewhere, 31% of the 366 species so far recorded are grasses and 10% Leguminosae, these apparently being most evident, and often themselves introduced, on the sheep runs abroad. In the course of time the list of species observed has changed, with some which were common 30 years ago no longer appearing, while others which are common now having only been recently recorded. There is no proof of an annual species introduced with wool becoming established, although it is possible that *Solanum sarrachoides* may have arrived in this manner.

J. L. Mason. *Bird-seed aliens.*
The paper defines bird-seed aliens as those alien plants introduced into Britain with cage-bird food. The species of plants involved fall into two categories. The first consists of a group of about 30 plants whose seeds are imported as ingredients in bird-seed mixtures. The second is a much larger group of perhaps 200 weeds which are introduced accidentally as impurities in bird food.

The identification of these alien plants presents problems because they originate from a wide variety of countries. An understanding of the bird-seed industry, and the way in which seed is imported, cleaned and marketed is helpful in explaining the presence of the species we find growing on waste ground. The staple bird food species Canary grass (*Phalaris canariensis*) and the various millets (e.g. *Setaria italica*) are good indicators as they have no other uses in Britain. These seeds are imported from a wide variety of regions including U.S.A., Argentina, Morocco, Mediterranean Europe and Australia. A more specialized seed, Niger (*Guizotia abyssinica*), is imported from Ethiopia and India. The seed imported from some of these countries is rich in impurities, reflecting the primitive agricultural methods employed there. These factors account for the wide range of possible alien plants.

Seed imported into Britain is cleaned by the dealer to remove dust, stones and unwanted seeds. The commercial product is relatively clean and contains only a few impurities, but the cleanings are often used as, or incorporated into 'wild bird food' mixtures. Many weeds grow in areas where these products have been scattered. Other plants appear on domestic refuse tips originating from the cleanings of cages of pet birds.

D. McClintock. *Bamboos.*
The taxonomy and nomenclature of bamboos are far from settled. A broad view is usually taken, until clearer information is available. All those species naturalized in our islands come from the Far East, from northern India to Japan. They may be found growing all over the British Isles, but the decision as to whether they are naturalized is much harder to make than with most other plants. For one thing they need care in transplanting, so it is almost unknown for any detached portion to make good on its own. What we see are the survivals of human plantings, usually in present or past demesnes, policies or parks. For another, flowering is an uncertain phenomenon—two or three of the common species have never been known to flower anywhere in the world; and viable seed is usually rare or non-existent, so the genetic range cannot be ascertained. Few instances of self-sown seedlings are known, none in the wild. (Only a minority of species show any clear flowering interval in our area, and far fewer die after flowering, despite widespread belief to the contrary). Those which have running rhizomes can look to be impressively naturalized. Those which grow in close clumps never cease to look planted, even if they have been slowly ousting native vegetation for half a century or more.

With such caveats in mind, the species eventually chosen for treatment in *Flora Europaea* were *Arundinaria anceps, A. fastuosa, A. japonica, A. simonii, A. vagans, Sasa palmata* and *S. veitchii.* In addition the long overdue *Alien Flora* will include *A. humilis* and *A. nitida.* A descriptive key to these is given in Short Notes, pp. 59–61. It is doubtful if any of the species of *Phyllostachys* qualify, even though four were eventually allowed into *Flora Europaea.* Some 30 species are discussed by me in *The Plantsman*, **1**: 31–50 (1979).

C. C. Townsend. *Taxonomic confusion caused by aliens.*
One primary reason for taxonomic confusion is species which do not, or rarely, flower (e.g. *Artemisia verlotorum*). If one presumed native, *Hydrilla*, has caused much difficulty in the British Isles, even on a generic level, how much more likely are aliens to do so. Given complete specimens, the difficulties caused may be summarized as follows:

1. Plants which may be confused with other species and thus not recognized as being different:
   a. those confused with native species;
   b. those confused with well-known and distinctive known aliens (e.g. the creeping willow herbs and *Acaena* spp.).
2. Plants which are recognized as introduced, but for which there is difficulty in finding the correct name:
   a. a group in confusion in its native area;

b. a group with no revision, or revisions of limited value;
c. the absence or non-availability of types;
d. difference of opinion among specialists.
3. Hybridization and other genetic complications.

In conclusion, an alien Flora is much needed. Descriptions of the species selected should be full, or plants will be misplaced into the nearest short description. Descriptions as well as keys should be carefully used; this is true in any Flora, particularly so of one concerning aliens. This will not make identification easier, but will guard against misidentifications, and against interesting plants being overlooked.

FRIDAY, 20TH APRIL, EVENING

E. F. Greenwood. *The flora of man-made sites in Lancashire.*

An illustrated review was given of the flora of man-made sites in Lancashire. The earliest sites still remaining are marl pits formed by the agricultural practice of marling, particularly prevalent in the second half of the 18th century. At about the same time serious attempts at reclaiming salt-marshes for agriculture were started. A little later the first navigable canals in Britain were built in Lancashire and, by the early 19th century, they had formed an extensive network throughout the county. During the 19th century there was a massive increase in the industrialization and urbanization of South Lancashire and many abandoned industrial sites now remain. These include reservoirs, gravel pits, railway cuttings, quarries, clay pits, salt and glass waste heaps, colliery shale heaps, mining subsidence hollows, sand pits and alkali waste heaps.

The generally damp and base-rich characteristics of many of the sites and the affinity of the flora with coastal areas was demonstrated. The value of the habitats formed as refugia for locally rare species, especially orchids, and their importance for nature conservation were discussed.

SATURDAY, 21ST APRIL, MORNING

B. S. Rushton. Plantago coronopus *L.: populations, seeds and chromosomes.*

Plantago coronopus possesses a rich pattern of infraspecific morphological variation which has been described under at least four subspecies, 20 varieties, 16 subvarieties and several forms. In the British Isles, only one subspecies and five varieties have been recorded.

A morphological comparison, using a multivariate analysis, of 78 *P. coronopus* populations, mainly from Britain and Ireland, observed both in the field and under greenhouse cultivation, and scored for 45 leaf and inflorescence characters indicated that:

a. Whilst there is general similarity between populations derived from the same geographical area, there is considerable overlap between populations from different geographical regions. Coastal populations from Scotland, Ulster, Wales and England show a variation pattern that could be described as clinal. Inland English populations are different from all coastal ones, but their range of variation overlaps that of the coastal English populations. A small number of Mediterranean populations show morphological character expressions very different from any Irish or British material examined.
b. Within certain geographical regions, particularly inland English sites, the pattern of variation observed in the field and greenhouse material can be accounted for by characteristics of the original site; in the case of inland English sites, by either altitude or degree of trampling.
c. At some sites, selection has operated over relatively short distances (20 m) to produce significant morphological differences.
d. Generally, population differences observed in the wild are maintained under cultivation.

Chromosomal variations (mainly trisomics) were found in populations but these showed no correlation with morphological differences. Examination of plants grown from the two seed types produced by *P. coronopus* showed that the smaller seeds produce smaller, slower growing plants and the larger seeds produce larger, faster growing plants. This is thought to contribute significantly to field population variability. Stereoscan examination of the mucilaginous seed-coat revealed extensive differences between the two seed types. There are also differences in the tolerance to salt water of germinating seeds from inland and coastal sites.

Individual plants and some populations correspond to existing varieties, but the majority do not. It is suggested, therefore, that a less rigid view of the infraspecific variation of *P. coronopus* be accepted.

J. K. Akeroyd. *Variation in* Rumex crispus *L.*

Rumex crispus, a widespread and abundant species of open plant communities, has long been recognized as the most variable member of its genus in the British Isles. There are three principal native variants, each occurring in a particular type of habitat. Var. *arvensis* Hardy (= var. *crispus*) is a weed, var. *littoreus* Hardy is a plant of maritime habitats, especially shingle beaches, and var. *uliginosus* Le Gall occurs on tidal mud in rivers. Each of these three variants retains distinguishing characters in cultivation.

Although the comparative biology of the weed and maritime variants has been investigated, var. *uliginosus* has received no previous experimental treatment. The plant has more or less uncrisped leaves and a tall, lax inflorescence, with long branches. The perianth segments in mature fruits bear three well-developed, subequal tubercles, as in var. *littoreus*; these probably function as a flotation device, facilitating dispersal of the fruits by water. Var. *uliginosus* and var. *littoreus* have heavier seeds than var. *arvensis*. Var. *uliginosus* is the earliest of the variants to come into flower. Only very rarely do plants of var. *uliginosus* flower in their first year of growth. Indeed, some plants do not begin to flower even in the second year. During the first year of growth a greater proportion of the biomass of var. *uliginosus* is allocated to the production of a taproot than in the other two variants.

The variation in *Rumex crispus* tends to be continuous, the picture being complicated by apparent hybridization between variants and with *R. obtusifolius*. Nevertheless, populations of *R. crispus* from riverine tidal mud are distinctive, although undoubtedly under-recorded. Further investigation may show that var. *uliginosus* is a common plant in the British Isles.

S. L. Jury. *Infraspecific variation in* Torilis.

A number of populations of several *Torilis* species have mericarps with their normal spines and hairs reduced to small tubercules. In the past these have caused considerable taxonomic confusion, often having been described as new taxa. Only in *T. nodosa* does this fruit character correlate with other characters (habit, chromosome number and distribution) and therefore warrants taxonomic recognition at subspecific level. It is suggested that the tuberculate mericarps serve to maintain the local population and the spiny ones to colonize new areas.

Torilis arvensis shows considerable morphological variation: height of plant, size and position of umbels, number of flowers per umbel, ratio of hermaphrodite to male flowers, size of petals and calyx teeth, length of styles and stamen filaments, and the degree of protandry. These characters are all correlated and relate to the degree of inbreeding/outbreeding shown. Three subspecies are recognized: subsp. *arvensis*, subsp. *neglecta* and subsp. *purpurea*.

T. A. Cope. *Taxonomy of the* Juncus bufonius *aggregate.*

After a long and confusing taxonomic history, the *Juncus bufonius* aggregate has been resolved into five segregates which are recognized at the species level. These comprise four diploids and a complex of various polyploids.

J. foliosus Desf. ($2n = 26$) is the most distinctive of the diploids and is characterized by its unique seed-coat morphology. It is found in the western Mediterranean and oceanic parts of western Europe, especially Ireland.

J. ambiguus Guss. (*J. ranarius* Song. & Perr.) ($2n = 34$) is geographically the most widespread of the diploids and is characteristically found in saline or brackish habitats throughout Europe, including the British Isles. It can be recognized by the very blunt inner tepals, equal in length to the truncate capsule.

J. hybridus Brot. has the same chromosome number as *J. ambiguus* but is morphologically quite different, with a fan-shaped inflorescence and acute outer tepals. It is confined to the Mediterranean region.

J. sorrentinii Parl. ($2n = 28$) is similar to *J. hybridus* but has very long, acuminate-cuspidate outer tepals, and is likewise confined to the Mediterranean region. It is, however, much rarer than *J. hybridus* and is the least known of all the species.

J. bufonius L. *sensu stricto* is commonly hexaploid ($2n = 108$). It is an ubiquitous weed found throughout much of the world. It is morphologically extremely variable and shows a much wider range of variation than any of the diploid species.

Three hybrid plants, all morphologically referable to *J. bufonius sensu stricto*, are known. Two of these, both having *J. foliosus* as the female parent, arose spontaneously in the wild and are fertile allotetraploids. The third, produced artificially from a cross involving *J. ambiguus* (female) and

J. foliosus (male), was a sterile diploid but otherwise indistinguishable from the tetraploids and hexaploids. Octoploids are also reported in the literature.

It has been concluded that the aggregate is a polyploid pillar complex and that *J. bufonius* has arisen from a number of diploids as a series of hybrids and amphidiploids. *J. bufonius* is assumed to be of polytopic, polyphyletic origin and is probably represented at four levels of ploidy.

C. A. Stace. *Taxonomy of the* Festuca rubra *aggregate*.

Festuca is a large, complex genus, economically important and taxonomically difficult. The *Festuca rubra* aggregate consists of those taxa included under *Festuca rubra* by Hackel in his *Monographia Festucarum Europaearum* (1882), which account for 21 species recognized by Markgraf-Dannenberg in *Flora Europaea*, Volume 5.

Many taxa can be recognized within the aggregate, which is not much complicated by problems of hybridization, apomixis or inbreeding. Some of the taxa are widespread, but most are relatively localized, both geographically and ecologically, and, although hybridization is not difficult to perform and most of the taxa are outbreeders, very few hybrids have been detected in the wild. The plants vary from diploids ($2n = 14$) to decaploids ($2n = 70$). They appear to fall into a pattern of variation which should be adequately catered for by the species-subspecies-variety hierarchy. Before that can be satisfactorily achieved much more basic research is needed, expecially in Britain, where work has fallen seriously behind that on the Continent.

It is clear that several more British taxa exist than are covered by the existing taxonomic treatments, particularly coastal taxa and montane taxa. Some 'taxa' may in fact be only characteristics, e.g. plants with flat or glaucous culm-leaves, which recur in different genetic backgrounds. Many cultivars are now available, mostly imported, and a satisfactory classification of these is needed both for legal reasons (breeders' 'rights') and because they frequently become naturalized.

These problems are being tackled at Leicester by the systematic collection of wild and cultivated taxa, the documentation of their taxonomic characters, the typification of the available names, and the investigation of hybridization potential within the group.

SATURDAY, 21ST APRIL, AFTERNOON

P. M. Smith. *Chemical characters and variation in annual Bromes*.

The use of chemical studies in taxonomy is now common. Protein comparisons have been found profitable, especially those of storage proteins. Serological and electrophoretic analyses provide considerable taxonomic information; they are cheap, rapid and require small quantities of material—all important considerations for taxonomists.

In the genus *Bromus*, protein analyses give characters to separate sections and species, and can provide quick comparisons such as 'percentage similarities'. Annual species have a range of 30–90% similarity in seed proteins. Ruderal populations of *B. hordeaceus* show little seed protein variation over wide geographical areas. Ecotypic subspecies such as subspp. *ferronii*, *thominii* and *molliformis* nevertheless show small but consistent differences.

B. interruptus is an intriguing member of this group for several reasons. It is a British endemic with strikingly distinct morphology (perhaps suggesting mutant origin); it has a record of sporadic past appearances and disappearances; it is said to have achieved its largely calcicole and south-eastern distribution as a weed of sainfoin; and it seems now to be extinct in the wild, though happily not as a laboratory organism.

Irradiation and chemical treatment of *B. hordeaceus* grains have not so far produced *interruptus*-like mutants. Marginally inductive daylengths produce panicle anomalies but do not disrupt the '*interruptus*' character syndrome. Both serological and electrophoretic seed protein analyses reveal a 75–80% similarity to *B. hordeaceus*, less than several non-controversial, 'good' species—*B. lepidus* for example. Though protein data show that the taxon differs from *B. hordeaceus* in more than just reproductive morphology, they cannot explain the adaptive significance of the latter. Shape, size, texture and density of reproductive parts do not suggest that *B. interruptus* can ever have been a sainfoin mimic.

R. S. Callow. *Evolution in a polyploid complex*.

The genus *Koeleria* is a large polyploid complex of outbreeding perennial grasses ($x = 7$; $2n = 2x$–$12x$). Some morphological species are always found at the same ploidy level while others are divided into distinct diploid and polyploid races. *K. cristata*, the commoner of the two British species, is tetraploid throughout Great Britain. *K. vallesiana*, distinguished by its persistent leaf sheaths, is restricted to the Mendip Hills in N. Somerset and is predominantly hexaploid. Pentaploid F_1 interspecific hybrids and putative $5x \times 6x$ backcross hybrids have been found in five of the seven sites where both species occur together.

The largest British population of *K. vallesiana* occurs on Brean Down (*c*. 10,000 plants) and presents a wide spectrum of ploidy ($2n = 2x$, $4x$, $6x$, $7x$ and $9x$). Diploids and polyploids often grow within a metre of each other and are randomly scattered over the south-facing limestone scarp. Since ancestral diploids have not otherwise been found north of the Pyrenees, the diploid plants on Brean Down may be ancient, possibly pre-glacial, relics. *Koeleria* species certainly flourish close to modern glaciers, both in the Alps and Himalayas.

Q. O. N. Kay. *Hybridization in the Anthemideae.*
Four large-flowered mayweeds in the Anthemideae grow as weeds of farmland and roadsides in Britain: *Anthemis arvensis, A. cotula, Chamomilla recutita* and *Matricaria perforata*. They are fly-pollinated, self-incompatible annuals, and are so closely similar in habit, ecology and floral characteristics that the minority species in mixed mayweed populations may be eliminated by the pollinator-mediated mechanism of minority type disadvantage.

In mixed populations of *Anthemis cotula* ($2n = 18$, AA) and *Matricaria perforata* ($2n = 18$, MM) there is a surprisingly high level of interspecific hybridization (up to 87% of F_1 seeds on *A. cotula* surrounded by *M. perforata*) that may reinforce minority type disadvantage, but may also enable intergeneric introgression to take place. F_1 hybrids are locally frequent in the field, have $2n = 18$ (AM) and are fairly vigorous. Although pairing fails almost completely at meiosis (0–3 II) they produce functional reduced ($n = 9$, A) and unreduced ($n = 18$, AM) gametes and have up to 1% seed fertility. Triploid plants ($2n = 27$, AAM) produced by a backcross of the F_1 to *A. cotula* form 9II + 9I at meiosis and have up to 30% seed fertility, with $2n = 19$–24(AA+, forming 9II + Is at meiosis) in the second backcross generation, some of which are already almost indistinguishable from *A. cotula*, and $2n = 18$–20 in the third backcross generation. Of two diploid or near-diploid plants produced by the F_1 (as seed parent) backcrossed to *A. cotula*, one had $2n = 18$ and closely resembled *A. cotula*. It formed 9II at meiosis, and had more than 20% seed fertility, with $2n = 18$ and full fertility in the second backcross generation. It was identical to *A. cotula* and presumably had the AA genome.

Intergeneric introgression from *M. perforata* to *A. cotula* is thus potentially able to take place, and a similar process may lead from *A. cotula* to *M. perforata*. The regaining of the parental diploid genome is possible because there is a very low level of intergenomic chromosome pairing, combined with high, and regular intragenomic pairing. Although similar pairing behaviour is often involved in the origin of new fertile allopolyploid species its possible role in introgression between distantly related diploid species has apparently been ignored.

G. M. Fearn. *Interspecific variation and hybridization in* Cochlearia.
The genus *Cochlearia* has been the subject of considerable taxonomic confusion, particularly within *C. officinalis* agg. This confusion is thought to be due to a combination of factors: the immense range of variation in coastal and inland populations of the *C. officinalis* group, erroneous chromosome reports, and interspecific hybridization. Recent cytotaxonomic research has shown the existence of three distinct cytotypes within the *C. officinalis* group which are correlated with differences in geographical and ecological distribution. Natural hybrids (*C. anglica* × *C. officinalis* and *C. danica* × *C. officinalis*) occur where the habitats of the parent species overlap, and introgression may occur. Artificial hybrids have been synthesized between almost all British species (inland and coastal) and the majority of hybrid plants have extremely high pollen fertility, indicating that there is little genetic isolation of species. It is suggested that the most useful taxonomic treatment of the genus, in the light of recent studies, is to retain *C. anglica, C. danica* and *C. micacea* as distinct species. *C. officinalis* is subdivided into coastal tetraploids (subsp. *officinalis*), high altitude tetraploids (subsp. *alpina*) and mid-altitude diploids from base-rich sites (subsp. *pyrenaica*). *C. scotica* is thought to represent no more than a local ecotype of *C. officinalis* subsp. *officinalis*.

H. McAllister. *Recently discovered segregate taxa in the British flora.*
Chromosome counts made in connection with the B.S.B.I. ivy survey revealed the presence of two

chromosome races of ivy in the British Isles. *Hedera helix* is diploid ($2n = 48$) and occurs throughout most of Great Britain except the West Country and West Wales. In these areas, and in Ireland and the Isle of Man, only tetraploid ($2n = 96$) plants have been found. The cytotypes can be distinguished by the form of their scale-hairs—appressed to the leaf surface in the tetrapoid and standing out in all directions in the diploid *H. helix*. The tetraploid is found in western France, the Pyrenees and Spain, while *H. helix* occurs through Central Europe eastwards to the Crimea. The tetraploid is therefore an Atlantic species with a southerly distribution.

In the *Campanula rotundifolia* aggregate the large flowered hexaploid ($2n = 102$) has a northern Atlantic distribution in the British Isles but has been replaced from the south and east by the now much commoner tetraploid ($2n = 68$).

In recent work by David Parker, *Saxifraga hypnoides* has been shown to have diploid ($2n = 26$) and tetraploid ($2n = 52$) cytotypes. The diploid occurs in Wales and the Burren, Ireland, while the tetraploid is found in Scotland, the Pennines, Northern Ireland and the Burren.

Deschampsia cespitosa also consists of diploids ($2n = 26$) and tetraploids ($2n = 52$) with distinct geographical distributions, and the tetraploid has given rise to viviparous forms which have been confused with the arctic *D. alpina*.

Other species being investigated include *Ledum groenlandicum*, *Vaccinium uliginosum* and seminiferous *Poa alpina*.

ANNUAL GENERAL MEETING, 12th MAY, 1979

The Annual General Meeting of the Society was held at the University of Leicester on Saturday, May 12th, 1979, at 12 noon, with 65 members present. Professor D. H. Valentine (retiring President), in the chair, opened the meeting.

MINUTES OF ANNUAL GENERAL MEETING, 1978

The minutes as published in *Watsonia*, **12**: 281–282 (1979) were passed with the following corrections to the minuted Report on the B.S.B.I. Committee for Scotland (para 2):

The meeting recorded thanks to all who had served as officers and members of the Committee for the Study of the Scottish Flora during the 23 years of its existence, particularly to Mr B. L. Burtt, Chairman on its inception in 1955; to the late Mr R. Mackechnie, who, sadly, had died earlier this year, but had been Chairman from 1958, and to Mr B. W. Ribbons who had been a founder member and secretary to the Committee for 15 years.'

REPORT OF COUNCIL

The Report of Council for the calendar year 1978 had been circulated to members and was adopted unanimously by the meeting.

TREASURER'S REPORT AND ACCOUNTS

The Report of the Treasurer and Accounts had been circulated to members. The deficit of £645 excess of expenditure over income had arisen despite economies in many directions. The Report and Accounts were adopted unanimously.

INCREASE IN MEMBERSHIP SUBSCRIPTIONS

The Treasurer's proposal to increase membership subscriptions was passed *nem. con.* after discussion, the new rates per annum from 1st January, 1980, to be as follows:

Ordinary	£7·50
Junior	£3·00
Family	£1·00
Subscriber	£7·50

(New members who join on or after 1st October, 1979, to pay the new rates to cover to 31st December, 1980).

CHANGE TO RULE

The proposed amendment to Rule 24, Annual Subscription, namely to add:

'Persons over 60 who have been members of the Society for at least 10 years and who are no longer in full time employment may elect to pay an annual reduced subscription at such rate as from time to time shall be decided by Council'

was passed with few abstentions after discussion. It was stressed that this new category of subscription would be only for those of the eligible members who individually applied for the reduction.

ELECTION OF PRESIDENT

Mr R. W. David, C.B.E., M.A., had been nominated by Council. His election was proposed by Miss E. Young and carried unanimously with applause. Mr David then took the Chair, and thanked Professor Valentine for his tactful Chairmanship as President during an important two years, culminating in the highly successful Conference held in his Department at the University of Manchester in April.

ELECTION OF VICE-PRESIDENT

The nomination of Mr D. H. Kent was proposed by Dr J. G. Dony, who recalled that Mr Kent had contributed much to the Society, and for one period of 15 years the B.S.B.I. had revolved around his activity and effort. The election was carried by acclamation.

ELECTION OF OFFICERS

Mrs M. Briggs (Honorary General Secretary); Mr M. Walpole (Honorary Treasurer); Drs S. M. Eden, N. K. B. Robson, C. A. Stace and D. L. Wigston (Honorary Editors); Mrs J. M. Mullin (Honorary Meetings Secretary); Miss L. Farrell (Honorary Field Secretary) and Mrs R. M. Hamilton (Honorary Membership Secretary) had been nominated. Their re-election was carried unanimously and these Officers were thanked collectively for their hard work on which the organization of the Society depended.

ELECTION OF COUNCIL MEMBERS

Mr R. J. Pankhurst, Dr G. Halliday and Dr S. L. Jury had been nominated and were unanimously elected. Their order of precedence (for Rule 10) as given, was determined by ballot.

ELECTION OF HONORARY MEMBERS

Dr C. A. Stace, proposing the election of Dr G. Halliday, an Honorary Editor of *Watsonia* for the past 12 years, praised Dr Halliday's editorial expertise in the highest terms. The present editorial team felt that he was irreplaceable. His election was unanimous, and Dr Halliday recorded his thanks, saying how much he had enjoyed his term as Editor which had greatly extended the number of his botanical friends and contacts.

Professor D. H. Valentine then, with warm commendation, proposed Mrs M. Briggs, who had been an officer of the Society since 1964 and Honorary General Secretary for seven years. The election was carried, and Mrs Briggs sincerely thanked the Society for this honour which had come as a complete surprise and was very much appreciated.

ANY OTHER BUSINESS

There being no further business the President thanked Professor H. Smith for his permission to hold the meeting in the Department, and Dr C. A. Stace for the excellent arrangements. The meeting closed at 12.33.

M. BRIGGS

PAPERS READ AT THE ANNUAL GENERAL MEETING

THE LEICESTERSHIRE FLORA SURVEY, 1967–79

The survey was formally initiated by a steering committee of nine in September 1967. It has been a team effort, involving in all some 30 local botanists, but most of the credit for its smooth and efficient running must go to the Rev. A. L. Primavesi who has acted as Hon. Secretary to the Committee since its inception.

Detailed instructions for fieldworkers were drawn up in the first six months and fieldwork started in spring 1968. The survey was based on the tetrad (2 × 2 km) of which there are 457 complete and 98 significant marginal (i.e. containing more than 1 sq. km.) in the pre-1974 administrative county of Leicestershire. Two field record cards were completed for each tetrad. The *common species card* has the abbreviated names of 248 species and columns for a subjective estimate of frequency and characteristic habitat in the tetrad as a whole. The *other species card* has columns for abbreviated name, six-figure grid-reference, habitat and frequency for each record. Up to four records were entered on this second card for any one species in any one tetrad. Fieldworkers were required to forward material of critical groups to a referee unless, or until, given exemption for that group. The following genera were the subject of special surveys made in co-operation with national experts: *Hieracium, Rosa, Rubus, Taraxacum* and *Ulmus*.

At the end of each field season fair copies of the field record cards were forwarded to the Hon. Secretary, who transcribed the records on to *species record cards* and *tetrad map cards*. These cards formed the starting point for the systematic account which will be a major component of the Flora. Other features will include habitat studies, a gazetteer and, if time and space permit, a parish-by-parish account of the flora of the county. In eleven field seasons over 100,000 records have been accumulated, averaging 180 species per tetrad and exceeding 450 in two cases. The survey was funded from local and national sources and the *Flora* will be published by the Leicestershire Museums Service in 1980.

I. M. Evans

PROBLEMS ASSOCIATED WITH THE GENUS *ROSA* IN LEICESTERSHIRE

The genus *Rosa* is taxonomically difficult because of its unique method of reproduction, many species being unbalanced polyploids in which the seed parent provides most of the genetic material. They also hybridize freely, making it difficult to define the limits of a species. For the practical purpose of recording, a system of classification is needed to accommodate as many as possible of the complex hybrids which cannot be positively identified, otherwise the majority of the roses would be left unrecorded. Most British rhodologists favour the system which was adapted for the British roses by A. H. Wolley-Dod, in which a fairly wide view of the limits of a species is taken, and the species are subdivided into 'groups', into which most of the roses actually encountered in the field can be placed. In recording for the new Flora of Leicestershire, these 'groups' have been used as the recording units. For someone unfamiliar with the roses, the multiplicity of intermediates is extremely bewildering, and the taxa which predominate in one part of the country differ markedly from those from elsewhere. An experienced rhodologist can appreciate the problems peculiar to a particular district. Before an attempt is made to record roses for a local *Flora*, the advice of such an expert should be sought, and ideally he should examine a collection of local material, and make a visit to the region. It is not difficult, with initial help from an experienced rhodologist, to become familiar with the species and their 'groups'. Provided that time is not wasted in attempting to assign individual rose bushes to a named variety, tetrad recording for a local Flora is a practical possibility. It is, however, essential that the field-workers keep within the limitations of their knowledge of this difficult genus, and submit anything doubtful for expert determination.

A. L. Primavesi

ULMUS IN LEICESTERSHIRE

The Leicestershire flora contains populations of five quite distinctive variants of elm, within which little morphological variation is evident, and a whole range of others much less easily separable into distinct groups. The five are best known under the following names:—*Ulmus glabra, U. procera, U. plotti, U. coritana* and *U. × sarniensis*. The remainder can either be regarded as hybrids descended from two or more of these, or as members of vegetatively reproducing clones showing different and often intergrading mixtures of morphological characters. These are characters also found among the more clearly demarcated taxa, though are not necessarily inherited from them. A dozen or more such clones have been observed to occur only in single localities or in a small number of neighbouring ones, but far more frequent and widely distributed are intermediates which for practical purposes can best be thought of as constituting two 'field elm pools', one showing signs of *U. glabra* ancestry and the other not. Colour slides of examples of different types and of distribution maps were shown and discussed.

Three problems relating to what the speaker had found in a comprehensive field survey based on tetrad mapping were discussed. These were, first, the effects of Dutch elm disease and the possibility that some elm populations may eventually be reestablished from sucker growth; second, the existence of two quite different systems of nomenclature depending on the view taken of the taxonomic status of the elms seen, and the difficult choice between the systems facing the local Flora writer; third, questions arising from the difficulty of deciding in the field the likely origin of individual populations and specimens, whether indigenous or deliberately introduced. Related to this is the sparseness of information in the literature about experimental breeding of elms, particularly in respect of the view that elms do not self-fertilize and that all viable seed is the result of cross-fertilization.

K. G. MESSENGER

PROBLEMS ASSOCIATED WITH ALIEN PLANTS IN THE BRITISH ISLES

The study of species alien to the British Isles (i.e. brought here deliberately or unintentionally by man) is very popular with some botanists, but shunned by others. There are often great problems in the identification of aliens, especially since new species are arriving every year and their origin is often unknown. Alien species should certainly be excluded from a floristic analysis of a region. Nevertheless, there are many very well established aliens which have a marked effect on one or other aspects of our flora and vegetation, and they cannot be ignored. Apart from their accurate identification, the biggest problem lies in deciding which species are sufficiently common or well established to be worthy of inclusion in Floras, plant lists, etc.

For the forthcoming *Flora of Great Britain and Ireland* the following categories are to be included: naturalized aliens (even if in only one locality); commonly recurrent casuals; crop species. Extinct aliens are to be excluded. After wide circulation of a draft list and the incorporation of the numerous replies to it, a revised list of nearly 900 species to be included in the *Flora* has been compiled.

In the talk the importance of aliens in four main ways was emphasized:

1. For floristic analyses and distributional studies the correct identification and status of each species is essential.

2. For the accurate documentation of experimental work, correct determination is vital; too often alien species are misidentified or confused with native or other alien species.

3. In studies of hybrids—many alien species hybridize with native ones in this country, or even form new amphidiploid species, so that the genetic structure and spectrum of variation of native species is altered.

4. In ecological studies—many alien species have profound effects on the native vegetation and the early history of all alien species should be carefully followed.

C. A. STACE

EXCURSIONS HELD IN CONNECTION WITH THE ANNUAL GENERAL MEETING

PASTURE AND ASPLIN WOODS, AND CROFT PASTURE, LEICESTERSHIRE. 13TH MAY, 1979.

A number of members attending the Annual General Meeting on the previous day visited Pasture and Asplin Woods, which lie to the edge of the parish of Breedon-on-the-Hill in north-western Leicestershire, over boulder-clay. A considerable amount of woodland was present in this area at the time of the Domesday survey in 1086, and from their flora and knowledge of their history it would appear that the greater part of the woods is 'ancient'. A comparison of maps made at the time of the enclosure and at present show that some changes in the outline of the woods have occurred and these are reflected in a complicated set of woodbanks and old hedge-lines which are now within the woods. The area is a proposed Site of Special Scientific Interest and the Nature Conservancy Council have been involved in discussions on its future.

The party also visited Croft Pasture, similarly scheduled as an S.S.S.I., situated a little to the west of Croft village. The main interest of the site is botanical, with approximately a fifth of the total acreage being herb-rich siliceous grassland interrupted by outcrops of syenite. Here a fine collection of sand-loving plants are found. The remaining area is 'improved' grassland, much of which is flooded in the winter. The whole site is bisected by the River Soar, which here has an interesting aquatic and riparian vegetation, highlighted by *Oenanthe fluviatilis* in its only known site in the county. The Leicestershire and Rutland Trust for Nature Conservation recently negotiated an access and management agreement for the property as a nature reserve. Access is limited to permit holders.

P. A. EVANS & S. H. BISHOP

BOTANICAL SOCIETY OF THE BRITISH ISLES, COMMITTEE FOR SCOTLAND EXHIBITION MEETING, 1978

An Exhibition Meeting was held at the Department of Botany, University of Glasgow, on Saturday, 4th November, 1978, at 12.00 hours jointly with the Botanical Society of Edinburgh and the Andersonian Naturalists of Glasgow. The following exhibits were shown:

G. H. BALLANTYNE. Brambles in Fife and Kinross.
R. W. M. CORNER. *Carex vaginata* and other plant records for Roxburgh and Selkirk.
R. W. DAVID. The distribution of *Carex rupestris* All. in Britain.
J. H. DICKSON. (a) Plants that the Romans brought to Glasgow.
(b) Plants from the Canary Isles.
U. K. DUNCAN. The *Festuca rubra/F. ovina* agg. complex.
M. J. FRASER. *Atropa belladonna* L. in mediaeval Elgin.
G. HALLIDAY. Recording the flora of Cumbria.
N. T. H. HOLMES. A guide to the identification of species of *Ranunculus* L. subgenus *Batrachium*.
A. G. KENNETH. A *Rubus* sp. sect. Triviales widespread in Kintyre.
P. MACPHERSON & E. R. T. CONACHER. *Coriandrum sativum* L. introduced to Glasgow by immigrants.
D. M. PARKER. *Saxifraga hypnoides* and *S. rosacea* in the British Isles.
F. H. PERRING. Recently published local Floras, including a reprint of Buchanan White's Flora of Perthshire.
A. RUTHERFORD & H. A. MCALLISTER. A *Hedera* new to Britain.
A. J. SILVERSIDE. *Pulmonaria rubra* in Glen Shee.
O. M. STEWART. (a) Flower paintings.
(b) V.C. 73 records.
A. MCG. STIRLING. (a) Specimens from Glasgow University Herbarium.
(b) *Ledum palustre* and *L. groenlandicum*.
E. C. WALLACE. Herbarium sheets of plants collected by the late R. Mackechnie.
M. MCC. WEBSTER. (a) Plates from the *Flora of Moray, Nairn and East Inverness*.
(b) Plants from north-eastern Scotland, fresh and pressed.

FIELD MEETINGS, 1978

ENGLAND

CRANBERRY ROUGH, GREAT HOCKHAM, W. NORFOLK. 11TH JUNE

The object of the meeting, attended by 28 members, was to examine sedges. The water-level in the fen, flooded a fortnight earlier, was still very high, and the path along the northern boundary was extremely boggy and in places precarious. Some members had visions of disappearing for ever, like Carver Doone, into the mud. But the sun shone bright, the party voted to do or die, and on the whole enjoyed the adventure and the extraordinary Everglades-like scenery of the adjoining carr, full of *Hottonia* and *Thelypteris palustris*. A dozen *Carices* were seen, including fine specimens of *C. psuedocyperus* in all stages of growth, and particular attention was given to separating the three species-pairs *C. acutiformis/C. riparia, C. elata/C. nigra*, and *C. paniculata/C. appropinquata*. After a picnic lunch on the dry land of the disused railway, the party returned through open water-meadows on the south of the carr, where three more sedges (including *C. disticha* in sheets) were added to the list.

Particular thanks are due to the Norfolk Naturalists' Trust, who gave permission for this visit to their Reserve, and to the Warden, Mr Eric Campbell who, though prevented by illness from attending the meeting as planned, gave invaluable help in the preliminary organization and reconnaissance.

R. W. DAVID

WARMWELL CROSS, DORSET. 19TH–20TH AUGUST

About 30 members attended this meeting and were lucky to have good weather. The first locality visited was Winfrith Heath, where a small piece of recently ploughed land had a weed new to Dorset, *Solanum sarrachoides*, growing with *Misopates orontium* and *Stachys arvensis*. Nearby, *Chamaemelum nobile, Anagallis minima* and *Radiola linoides* were found along damp, sandy tracks. On the heath, the heathers and *Ulex minor* were recovering well from the devastating fire of 1975, and the valley bog which escaped the worst of the fire still had *Gentiana pneumonanthe, Hammarbya paludosa, Pinguicula lusitanica* and a rich associated flora. Only two species known to be present before the fire were not refound (*Lycopodium inundatum* and *Rhynchospora fusca*); *Deschampsia setacea* was seen in a later visit.

Lunch was taken at Hardy's monument on Black Down, with soaring buzzards and panoramic views. A small area of turf had *Anthyllis vulneraria, Gentianella amarella* and *Sagina nodosa* growing amid heather, bilberry and *Ulex gallii*; despite careful search, moonwort could not be found here.

After a short stop at Portesham to see *Cyclamen hederifolium* in flower, with what seems to be *Ulmus americana* planted nearby, the party moved to Abbotsbury. The ridge of iron ore running north from the Tropical Gardens was found to have several interesting plants, including *Armeria maritima, Bromus ferronii, Genista tinctoria, Oenanthe pimpinelloides* and *Trifolium subterraneum*. By permission of the Estate, we were allowed to visit the ruins of the old castle, which was destroyed by fire in 1913, where a number of alien plants have survived (*Acanthus mollis, A. spinosus, Allium siculum, Atriplex halimus, Cordyline australis, Euonymus japonicus, Ficus carica, Oxalis incarnata, Rhus typhina* and *Salpichroa origanifolia*). The back of the Chesil beach was visited, and despite the densely-parked cars, *Apium graveolens* and *Carex divisa* were seen; *Lathyrus japonicus* and *Suaeda fruticosa* occur further east by the Swannery, where access is restricted.

The party then split into groups to record tetrads on the Isle of Portland. Among the many interesting plants seen were *Asplenium marinum, Crambe maritima, Inula crithmoides, Hypericum hircinum* and *Matthiola incana* (the last two naturalized in very wild country near East Weares), *Medicago polymorpha* and *Thesium humifusum; Orobanche hederae* was abundant. A *Limonium* believed to be *L. recurvum* was seen in two localities, but it was agreed that the characters distinguishing this taxon from *L. binervosum* scarcely warrant their separation as species.

After a barbecue at Ringstead where *Cantharellus* featured on the menu, there was just enough light remaining to find *Spiranthes spiralis* and *Trifolium squamosum* by the cliffs.

On 20th August the party reassembled at Rempstone and walked to Cleavel point via Ower, through plantations with *Tsuga heterophylla* and *Quercus borealis* and wet heaths with masses of Dorset Heath (*Erica ciliaris*) and its hybrid with *E. tetralix*. *Equisetum variegatum* and *Polygonum mite* were found in one spot. In sandy cultivated fields *Hypochoeris glabra* was growing with *Lotus hispidus*, while *Briza minor* was found surviving in sown pasture which was a cornfield last year. An unexpected bonus was a good view of an iron age pottery kiln in course of excavation, with its spoil heaps colonized by the yellow-flowered form of the wild radish. Lunch was taken on the shores of Poole Harbour, enlivened by a heron, a flock of Canada Geese and possible Sandwich Terns. Many common salt-marsh plants were seen here, including *Limonium vulgare, Oenanthe lachenalii* and *Spartina anglica*.

After ascending Brenscombe Hill through old woodland with ancient holly trees, *Campanula trachelium, Polystichum* sp. and *Veronica montana*, the summit grassland had little of interest, but the views of Purbeck, Poole Harbour and the Isle of Wight were superb. Developments caused by the discovery of petroleum were changing the face of Wytch Heath. On descending to this heath, so many landmarks had been obliterated that the leader got lost, but eventually *Cicendia filiformis* and *Parentucellia viscosa* were both found along rutted tracks. The meeting broke up after a valedictory tea at Wareham, apart from an unsuccessful attempt to refind *Leersia oryzoides*.

H. J. M. BOWEN

WALES

RHOS GOCH BOG, PAINSCASTLE, MID RADNORSHIRE. 8TH JULY

A party of 15 including members of B.S.B.I., Hereford and Radnor Nature Trust and Hereford Botanical Society met in mixed weather to examine a variety of mire communities. The area, one of the early S.S.S.I.s, consisted of a raised mire with a well developed willow carr along the surrounding lagg streams and fen and wet peaty meadows. The meadows were the first to claim attention and yielded a very diverse flora, with over a hundred species recorded. The wetter hollows supported species such as *Triglochin palustris, Scirpus setaceus, Pedicularis palustris* and *Pinguicula vulgaris*, whilst the ridges were marked by an abundance of *Cirsium dissectum, Dactylorhiza* spp.and *Genista tinctoria*.

With difficulty the lagg stream was crossed and the willow carr penetrated with its tall tussocks of *Carex paniculata* and *Menyanthes trifoliata*. The drier slopes of the raised mire were then examined. Dwarf shrubs predominated with *Genista anglica* in some abundance. On the central dome, apparently being at present colonized by birch, *Osmunda regalis* proved to be widespread, whilst *Drosera rotundifolia* and *Narthecium ossifragum* grew in the *Sphagnum* lawns of the pools.

Happily the weather cleared after a somewhat damp picnic lunch. The party then moved to the south-west end of the site where the fen provided a challenge to the nerve of the hardiest botanist. Fortunately the floating lawns of vegetation proved capable of carrying the weight of the party and a wide range of 'poor fen' species were examined.

Later in the day a small party travelled south to an area of common land called the Begwns where a shallow mud bottomed pool was looked at. In common with many other pools in the area *Pilularia globulifera* was abundant with *Apium inundatum* and *Scirpus fluitans*.

A. C. POWELL & R. G. WOODS

LAMPETER, DYFED. 21ST–24TH JULY

A four-day Bramble Foray at Lampeter was attended by some 15 members. The object was partly to provide some teaching and understanding of bramble taxonomy, and partly to make distribution records on a 10 km square basis in N. W. Carmarthenshire and S. Cardiganshire. Two parties, each of two carloads, were organized, and each was led by one of the two leading British batologists, Mr E. S. Edees and Mr A. Newton. The participants ranged from absolute beginners to those with a sound knowledge of the brambles of their own areas, and the enthusiasm and the patient, often of necessity repetitive, helpfulness of the leaders made it an extremely rewarding foray for all concerned. Mr H. Vannerom, a Belgian batologist, was a welcome guest.

Members from two of the national herbaria, and several members building up their own reference collections (essential for the serious study of brambles), made the most of the opportunity to collect expertly determined specimens, selected to show the characters of the species in their fullest expression. Brambles are one of the few groups of native plants in which collecting can still be done with a clear conscience, although batologists themselves may sometimes look askance at the billhooks in the hands of their local conservation corps.

A total of 132 records of 33 species in twelve 10km squares were made. Two non-invasive species rare in Wales were refound in localities where they had last been seen by E. S. Marshall in 1899—*Rubus sprengelii* on a dry, scrubby, south facing slope near Llanarth in v.c. 46, and *R. hylonomus* in its woodland refuge in the Monachty Dingle 10km to the north-east. Among the predominantly Welsh or western species, *R. silurum, R. bartonii* and *R. leyanus* were especially abundant. The discovery, on a steep slope above Llangrannog, of some inflorescences of *R. incurvatus*, mainly a species of N. Wales that had long eluded some members, led to prodigious feats of clambering in search of first-year shoots to provide the leaves and stem-pieces without which no bramble specimen is complete. Section *Suberecti* eluded both parties until the final day, when four species were seen—*R. scissus* in a characteristic bog-margin habitat near Gorsgoch, *R. bartramii* and *R. nessensis* in recently planted Forestry Commission land (a very useful habitat for brambles) near Trefilan, and *R. plicatus* on Llangybi Common where two of the participants were encamped. A number of undescribed species in Section *Appendiculati* were seen, and three of these were found repeatedly over a wide area and seemed likely candidates for description in the future.

The Welsh Annual General Meeting took place at Lampeter on 22nd July, attended by 27 members, and on the following morning an enlarged bramble excursion took place on the disused railway line at

Pencarreg. In rain and drizzle, nine species were demonstrated by the leaders and the newcomers received a good impression of the diversity of brambles, the problems of identification and the dedication of batologists. After lunch, the party proceeded to the coast for a visit to Traeth Penbryn east of Aber-porth. Brambles were studied on the lane leading to the beach, and from the beach itself the unusual plant communities on the cliffs were easily seen. Calcareous sand, blowing up on to the boulder clay and silurian mudstone cliffs, provided a common habitat for many species normally found in very diverse habitats. Abundant *Anacamptis* and *Euphorbia portlandica* represented a sand-dune element, *Hieracium caledonicum* and *Euphorbia amygdaloides* represented a cliff and woodland element, *Daucus gummifer*, the prostrate form of *Ligustrum vulgare, Anthyllis vulneraria* and others represented a coastal element, and several species rare in western Wales such as *Orobanche hederae* and *Rubia* were seen. *Calystegia soldanella* was in abundant flower on a small fenced area of dune by the lane.

Bereft of their leaders, a residual group of members visited Falcondale Lake near Lampeter on the final evening and recorded *Potamogeton obtusifolius* new to v.c. 46, and after dinner visited Lampeter churchyard, in which 120 species were recorded including the first record for v.c. 46 of *Hordeum secalinum* and the second of *Brachypodium pinnatum.*

The success of the meeting was in no small measure due to the organizational efforts of the Secretary of the Committee for Wales, who had prevailed upon St David's College to provide, among its other facilities, ample space for evening discussions and the display of bramble specimens, so that the parties could inspect each others' finds, compare techniques of herbarium preparation, watch the tally of records being updated on the blackboard, and revise the lessons of the day.

A. O. Chater

MYNYDD CILAN, ABERSOCH, GWYNEDD. 2ND SEPTEMBER

A keen group of some dozen assembled on the common by Castell Cilan, south of Abersoch, and spent the morning paddling the many pools thick with *Hypericum elodes, Scirpus fluitans* and *Apium inundatum* and searching for *Pilularia*, which at first was small and elusive but at a later pool was seen in commendable abundance. We discussed the identity of the *Sparganium* (surely *S. emersum* from the number of male heads) and admired the abundant *Radiola linoides*, Vera Gordon obligingly finding the companion *Anagallis minima* (a desideratum for this 1km square). We smelled the Chamomile (*Chamaemelum nobile*), and were pleased to see how well the *Deschampsia setacea* was doing. In the afternoon, down by the sea nearer Abersoch, we cautiously examined splendid clumps of *Juncus acutus* and the range of *Dactylorhiza* taxa growing at their base. Here, on an erstwhile *Sphagnum* mire once sporting *Carex limosa* but now spoiled by encroaching mining waste, was an intriguing mixture of *Myrica, Cladium* and *Juncus subnodulosus* along with *Linum catharticum, Epipactis palustris* and *Centaurium erythraea*. Across the golf-links we lost count of the number of *Spiranthes spiralis* spikes, and then saw the sand-dune specialities: *Vulpia fasciculata* in particular. Abersoch aliens seen included *Artemisia verlotiorum, Sisymbrium orientale*, and the locally restricted *Papaver dubium, Chelidonium,* and *Silene alba*. Irish ivy was identified, the *Orobanche hederae* admired, and the elm trees left unnamed. Finally genuine *Vulpia myuros* gave a welcome confirmation of this species for Lleyn.

A. P. Conolly

SCOTLAND

FORESTMUIR, ANGUS. 24TH JUNE

Eight members and guests attended the field meeting at Forestmuir. The aim of the meeting was to record in this little worked area of damp unimproved grassland and scrub. The area proved to have a surprisingly diverse flora. This was because the predominantly acid grassland was enriched by base-rich flushes. The most memorable feature of the excursion was a tremendous display of orchids, particularly *Platanthera bifolia* and *Gymnadenia conopsea*. We were also pleased to find *Corallorhiza trifida* in two localities.

None of the 137 species recorded was new to the 10km square, but the richness of the flora was unexpected, both to the participants of the meeting and to the landowners, Kinnordy Estates, to whom we are grateful for permission to visit the area.

R. Ingram

SOW OF ATHOLL, EAST PERTHSHIRE. 25TH JUNE

The party of 22 members and friends met at the bridge over the Aalt Dubhaig, Dalnaspidal Lodge (by kind arrangement of Mr Kennedy, the Keeper). Members were invited to assist in recording the species of the area and were informed of many likely species unrecorded, on lists made in 1961 and 1967. The main party headed for the shoulder leading up to the north-eastern face of the Sow. They clambered over the morainic heaps, strewing the lower slopes, observing the dominantly acidophilous flora, which nevertheless produced some interesting plants in abundance, including *Carex pauciflora, C. pulicaris, C. curta, Eriophorum angustifolium, Narthecium ossifragum* and *Drosera rotundifolia. Saxifraga stellaris* was growing in the brightly coloured flushes of *Dicranella palustris*. Common calcicolous species made a sudden appearance as outcrops of native rocks were reached; confusing associations of *Thymus, Linum, Lotus* and *Viola lutea* along with *Vaccinium* spp. and *Chamaepericlymenum*, etc., were encountered. As an aperitif, *Geranium sylvaticum, Lysimachia nemorum, Anemone nemorosa* and others indicated former woodland conditions. However the main meal was undoubtedly the wonderful display of *Phyllodoce caerulea* in flower and fruit along with *Vaccinium uliginosum* and *Loiseleuria procumbens*.

The splinter party, led by Alan Stirling, examined the moorlands to the south of the Sow and the cloud-capped Sgairneach Mhor to the west. They returned with two *Taraxacum* species: *T. craspedotum* from Sgairneach Mhor and *T. pycnostictum* from by the Aalt Coire Luidhearnaidh, both new records for v.c 89. They also found a flowering specimen of *Vaccinium microcarpum* from the latter area. Apart from the *Taraxacum* species only nine species new to the area were found. Surprisingly they included *Ajuga reptans, Caltha palustris, Plantago lanceolata, Rumex acetosella, Salix phylicifolia* and *Viola canina*, showing how even well covered areas can throw up unrecorded common species. The total list for the day was 161 species.

Altogether it was a satisfying and productive day for me and one in which I made many new friends.

A. W. ROBSON

BROADFORD, ISLE OF SKYE. 1ST–7TH JULY

Twenty years ago the present V.C. Recorder first met the B.S.B.I. when invited to join the Field Meeting based on Dunvegan, working in N. W. Skye. Since then two other meetings (Broadford in 1966; Raasay in 1969) have checked old records and added new ones. This year, Broadford was again chosen. The checklist (1973) needed revision, and visits to out of the way corners often turn up something interesting. Many quite common plants were still unrecorded from some of the Sleat squares.

The meeting started well when two members did some recording on Saturday around Armadale and Ardvasar. In addition to 20 new records for square 18/60, *Poa compressa* was seen on a wall opposite Ardvasar Hotel, and *Centaurium erythraea* in the stonework of Armadale Castle!

Next day, 14 members met on the Ord road (18/61), and worked in groups, one following the Allt a'Ghasgain to Lochan Fada on the moor above. *Scutellaria minor* was in damp grassland, and *Carex limosa* and *C. lasiocarpa* by the loch. Beyond, on the way to the wooded gorge of the Allt Mor, two members noticed *Drosera anglica* in a wet boggy patch, and looking closer found a minute *Hammarbya*. When others came to admire, three more plants were added. The Allt Mor gorge provided nothing as good. The groups following the road to Ord saw *Carex laevigata* in woodland, and *Arenaria serpyllifolia* and *Valerianella locusta* (already recorded, but both rare in Skye).

After a wet and windy night, the weather on 3rd July improved, and we travelled north to allow those on their first visit to Skye to see *Eriocaulon* near Sligachan, and *Koenigia* below Ben Edra (18/46). Starting in bright sunshine, we reached, at the level where mountain plants first appear, swirling cloud and a very strong wind—confirming the need for winter clothing in July! On the Bealach Amadal the *Koenigia* took some finding—as a result of the drought it was June-sized rather than July-sized, and when found drew cries of disbelief. We managed 15 additions to 18/46 (all common), and the two members who preferred to stay in south Skye (18/71), away from the wind, did much better, with over 40 additions, including more *Carex laevigata* and *Spergularia rubra* (in gravel by the bridge at Kinloch, 18/61).

On 4th July there was still a wintery gale, with breakers rolling in across Broadford Bay. We dodged the worst by reversing our route to Boreraig (18/61), and starting from Camus Malag (18/51) instead of

Suardal (18/62). Two members who tried to record round Camus Malag quickly became soaked and frozen, and wisely retired. The rest reached Suishnish fairly dry, and began recording below Carn Dearg (18/61). The cliffs had been recently burnt, but the vegetation below had survived and included *Agrimonia eupatoria, Orobanche alba, Rosa* spp., *Stachys ambigua*, and three fine patches of *Vicia sylvatica*. Attempts to photograph the last had no results; both the plants and the photographers were too wind-battered. The lower cliffs and the shore at Dun Boreraig also had several good plants—*Galium verum* (not common in Skye), *Hieracium* spp., *Phyllitis scolopendrium*, some brilliant red *Silene dioica, Sedum acre* and *Torilis japonica*.

Wednesday was too wild for Coruisk, or even Beinn na Caillich, and a substitute was found in the grounds of Dunringell Hotel at Kyleakin (18/72), which could have interesting weeds—and did—*Veronica hederifolia, V. persica*, and *Vicia angustifolia* among the fine collection of trees and flowering shrubs. Beyond the garden was an extensive salt-marsh which included *Aster tripolium* and *Suaeda*, but added nothing new; and beyond that, on a bank above the inlet, a mixture of garden 'throw-outs' (including *Sedum* spp.) and weeds, with *Fumaria capreolata, Myrrhis odorata, Sisymbrium officinale* and *Vicia hirsuta*. The afternoon was spent exploring a wooded gorge at the head of the Kylerhea river (18/72)—apart from some *Salix caprea*, not as good as another gorge in the same square where *Orthilia secunda* was found a month earlier.

The Cuillin ridge was still in cloud when the party reached the Elgol boatslip (6th July), after some minor adventures when one car broke down, leaving one leader stranded in square 18/51 all day (to the advantage of the record card, as *Lycopodium alpinum* was added from Ben Meabost, which also had the only *Arabis hirsuta* seen during the week). Weather improved, and the party divided below An Garbh-choire, three going up to look for an old record of *Tofieldia* (the only locality on Skye)—they did not find it, but returned with a list including *Saussurea, Thalictrum alpinum* and an *Equisetum* specimen that, since confirmed as *E. variegatum*, makes a first definite record for Skye (18/41). The rest followed the path to beyond the head of Loch Coruisk, in brilliant sunshine, with all the tops clear, but apart from *Dactylorhiza incarnata* subsp. *pulchella*, saw nothing new until back near the landing stage, where *Lycopus europaeus* was added to 18/41.

An early start for the last day—we had to be at Sconser by 10 o'clock for the ferry to Raasay. There one group went to Brochel by hired car (18/54), while the rest, joined by two Cambridge students, walked from the pier to Inverarish, and in the grounds of Raasay House (18/53). The northern group stopped at Brae to look at the *Orthilia secunda* found there in 1969, but found only one flower. Beyond Brochel we crossed the moor to the coast and back, taking in a couple of lochs on the way. Apart from *Carex lasiocarpa, C. pauciflora, Orobanche alba* and possible *Dryopteris assimilis*, the extra square records were 'ordinary'. Perhaps enthusiasm was dampened by the heavy drizzle that began after lunch, and made us wetter than any other day of that week.

By the end of the week we had been in and out of 11 squares, and collected over 200 new square records. Many of these were added by M. McC. Webster, who kept to low ground, but had a good eye for grasses, as well as collecting roses and brambles for further study.

C. W. Murray & B. S. Brookes

BARRA, OUTER HEBRIDES. 8TH–15TH JULY

The purpose of this meeting was to record the flora of Barra and adjacent islands. With a party of 16 we were able to split up and visit each of the three 10km squares on a number of occasions. We also had with us some very energetic members who attacked with vigour the more inaccessible parts of the island. We were fortunate in having beautiful weather for nearly the whole week. 392 species plus hawkweeds and planted trees were recorded, of which about 16 are new records based on master cards obtained from Monk's Wood dated 1935 and 1947 onwards. Of these *Juncus inflexus* is new to v.c. 110 and *Rumex longifolius* a second record. *Stellaria graminea* and *Stachys sylvatica* are both very rare in v.c. 110. Other new species included *Cystopteris fragilis, Epilobium angustifolium, Callitriche hermaphroditica, Melampyrum pratense, Potamogeton pusillus* and *Sparganium minimum*. On the whole we found Barra deficient in species compared with Lewis, Harris and the Uists, especially the sand dune areas and machair grassland, of which there is very little on Barra.

8th July: Those first to arrive on Barra looked at Halaman Bay and Loch na Doirlinn in the south-west, adding *Botrychium lunaria* and *Carex distans* at Borve Point and *Fumaria bastardii, Lamium purpureum* and *Catabrosa aquatica* at Borve village.

9th July: We worked round the south-western shore from Kentangaval through Nask, over Ben Tangaval and down to Loch St Clair which had seven *Potamogeton* species: *P. natans, P. gramineus, P. perfoliatus, P. friesii, P. pusillus, P. filiformis* and *P. pectinatus*. The following additions were made: *Callitriche hermaphroditica, Lycopus europaeus* and *Potamogeton pusillus*. However, other plants of interest not recorded since 1935 were *Ranunculus bulbosus, R. trichophyllus, Arabis hirsuta, Centunculus minimus* and *Hieracium scoticum*, which is on Heslop Harrison's list.

10th July: In low cloud and drizzle we travelled by mini-bus to Port an Lodain, the northermost part of the island. One group worked southwards down the coast to Eoligarry and over Ben Eoligarry while another came down the exposed western shore and then examined the sand dunes. Mrs Clark went to Orosay to look for brambles but before crossing found *Anacamptis pyramidalis*. 17 additions were made to existing records, perhaps the most interesting being *Ranunculus peltatus* and *Alchemilla glabra*. A cuckoo was still calling on this date.

11th July: In brilliant sunshine the whole group took the ferry to Vatersay, divided and worked different parts of this beautiful island. 11 new records were made, of which *Ranunculus peltatus, Campanula rotundifolia, Rubus saxatilis, Petasites fragrans* and *Zostera marina* are some. We refound 73 species on the 1935 card, which were missing from the 1947 list; of these *Hymenophyllum wilsonii, Cochlearia danica, Ononis repens, Ligusticum scoticum* and *Calystegia soldanella* might be mentioned. Looking into the clear water as we returned in the ferry, we noticed that we were travelling over a forest of *Zostera marina*.

12th July: We had the mini-bus on the outward journey and were dropped off in nine groups to record in different parts of the south and east of the island. The best find of the day was *Salicornia europaea* discovered by two groups, one in the Ard Veenish peninsula and one near the village of Bruernish. Another group examined two small patches of woodland, two parties worked in the hills, one finding *Salix herbacea* on all the summits of the Heaval-Hartaval group. One individual looked at the lochs from Loch an Duin to Lochan nam Faoileann, one worked along the road from Crannag to Ersary and another along the shore from near Balnabodoch to Ruleos. Species added that day included *Osmunda regalis*, found by more than one group. We all returned to Castlebay in time to be rowed to Kissimul Castle to be shown around the imposing keep and attractive present day additions within the castle walls, by Mr MacNeil, the clan chief, who had kindly invited us. Vegetation in the courtyard and on the castle walls was noted (total 19 species) including a magnificient display of *Asplenium marinum* near the dungeon.

13th July: We walked from Greian Head along the cliffs then over basic turf and across sand dunes, examined the sandy bay north of Sgeir Liath, followed a brackish stream for some distance, saw a small area of saltmarsh, and re-visited Loch na Doirlinn and Loch St Clair. The following new square records were made: *Sagina maritima, Polygonum raii, Coeloglossum viride, Puccinellia maritima* and *Elymus arenaria*. *Catapodium rigidum* was on the cliff tops and *Ophioglossum vulgatum* and *Coeloglossum viride* were not uncommon, *Gentianella campestris* was occasional and there was a little *Helictotrichon pubescens*. *Catabrosa aquatica* and *Sparganium erectum* were associated with the stream, *Carex distans* with the salt marsh and *Scirpus tabernaemontani* and *Scirpus maritimus* with the loch.

14th July: One group scrutinized Castlebay, noticing the abundance of *Coronopus didymus* and *Anagallis arvensis* as a garden weed. This group continued around the southern coastline and found *Ligusticum scoticum* while examining cliffs and *Juniperus communis* while crossing the saddle between Beinn nan Carnan and Ard Rudha Mor. *Melampyrum pratense* was found on the moorland and *Scutellaria minor* in a damp patch, but the best find of the day was *Juncus inflexus*, a new record, in a lay-by. Another group walked up Castlebay Glen, looking particularly at weeds of cultivation, then up the hill to the Craig before returning to Kentangaval. *Vaccinium myrtillus, Veronica officinalis, Galeopsis tetrahit* and *Senecio vulgaris* were all noted. Two people returned to Vatersay in search of *Ligusticum scoticum*. One group returned to the north to the Ben Scurrival region and to the south-east of Eoligarry and saw much *Anacamptis pyramidalis* and *Rosa spinosissima*. The remaining three spent a gentler day adding *Teucrium scorodonia* from the Allt Heiker (a rare plant in the Western Isles) and confirming that *Blysmus rufus* still grew at Brevig.

And so ended a very well worthwhile week due in no small measure to the careful preparation and organization of Mrs Murray.

E. R. T. Conacher

BEINN AN DOTHAIDH, ARGYLL. 22ND JULY

The weather forecast for the West Highlands spoke of a wet start to the day followed by clear spells in the afternoon. The rain fell incessantly and, had it not been for the mention of a possible clearance, the Beinn an Dothaidh expedition would, perhaps justifiably, have been called off. 13 botanists, however, gathered at Achalader Farm and headed for the hill into the teeth of a freshening southerly wind which funnelled down from Coire Achaladair.

We made our way up to the 1800ft contour across rather uninteresting wet heathland with *Calluna vulgaris, Trichophorum cespitosum, Molinia caerulea* and *Myrica gale*, though there were patches of *Carex pauciflora* which was unusually common in some of the wet flushes. Between 1800 and 2000ft the heathlands were drier with *Vaccinium uliginosum, V. vitis-idaea, Empetrum nigrum* and *Alchemilla alpina* with *Rubus chamaemorus* and *Chamaepericlymenum suecicum*.

The north-facing crags between 2000 and 2700ft support the most interesting assemblages of mountain flowers. Starting at the lower eastern end of these outcrops, and traversing westwards we soon found *Bartsia alpina* along with *Silene acaulis, Trollius europaeus, Cerastium alpinum, Thalictrum alpinum, Draba incana, Oxyria digyna, Saussurea alpina, Geranium sylvaticum, Galium boreale, Polygonum viviparum, Coeloglossum viride, Juncus triglumis, Rubus saxatilis* and *Salix herbacea*. Saxifrages were well represented by *Saxifraga stellaris, S. oppositifolia, S. hypnoides* and *S. aizoides*, with a number of *S. nivalis*. Ferns included *Cystopteris fragilis, Asplenium trichomanes* and *A. viride*, which were common. We were rewarded with the discovery of several plants of *Woodsia alpina*. Amongst the sedges *Carex atrata, C. saxatilis* and *C. vaginata* were found growing on these ledges. Content with this, all but five members returned to Achalder Farm. The promised clear spell in the afternoon did not materialize and the deluge continued all day long.

The enthusiasts who remained on the hill made their way westwards and into one of the gullies at around 2600 ft. *Potentilla crantzii* and *Salix phylicifolia* were added to the list, but we did not get the substantial patches of *Cystopteris montana* which had been located on a previous visit.

In spite of the atrocious conditions, most of the members present were greatly impressed by the flora of Beinn an Dothaidh which, on these crags, compares very favourably with parts of Ben Lui.

P. WORMELL

KINDROGAN, TAYSIDE. 26TH JULY–2ND AUGUST. ROSE & BRAMBLE MEETING

Have you ever had to consult the orifice to discover a flower's identity, become sick of a species because it threw up, or had a plant sit up and look at you? If not, book your place now on the next Roses and Brambles course!

These were tips given to help identify members of these two genera, which have always been notoriously difficult. Although tackled in the past, the position in Scotland has been confused to say the least, especially regarding *Rubus*. However, this is now being rectified through the efforts of Alan Newton, who considers there are up to 50 taxa in Scotland—43 named and a few waiting pronouncement. As some of these are distinctly western or southern in distribution, we aimed at 20 for the week.

Despite heavy rain, half that total was reached on the first day in the Stormont Loch/Lowes area, the first—appropriately in a Scottish setting—being *Rubus scissus*. The most common Scottish Sect. *Triviales, R. latifolius*, was soon found and subsequently it was seen in practically every locality (and proving very variable). By late afternoon we were thoroughly 'drookit', but so good was Alan Newton's tuition that not one of the party's attention sagged (?sogged) as he explained the reason why *R. mucronulatus* Boreau is so called and not *R. mucronifer* Sudre nor *R. mucronatus* Bloxam—all in very drenching drizzle. On the second day a further three species were found but thereafter they tailed off. A special trip, therefore, was made to Deeside and Howe o' the Mearns and it was enlightening to discover just how much altitude and temperature affect bramble distribution; going down the Dee it was at Bridge of Gairn before the first was found—the aforementioned *R. mucronulatus*, which proved to be just about the only species until we reached Banchory, where *R. echatinoides* turned up. Over Cairn o' Mount and the Brechin-Forfar area *R. raduloides* and, unexpectedly, *R. tuberculatus* were found.

Thus, we came to the last day with 17 species on record, needing three for the magic score. A stroll by the Ericht in Blairgowrie brought the awkwardly named introduction, *R. elegantispinosus* and another which could not be named. One to go, and the final trip to Kingoodie, just west of Dundee, raised hopes. But *R. latifolius* was dominant, until just before leaving when a different patch turned out to be another taxon without a 'proper' name but rejoicing in the temporary identity of 'false *iodnephes*'!

The 20 taxa found were: Section *Triviales—R. latifolius, R. tuberculatus, R. 'false iodnephes'; Suberecti—R. nessensis, R. scissus, R. plicatus, R. fissus; Sylvatici—R. nemoralis, R. leptothyrsos (danicus), R. septentrionalis, R. errabundus, R. lindebergii, R. elegantispinosus; Mucronati—R. mucronulatus, Rubus* sp.; *Radulae—R. radula, R. echatinoides; Anisacanthi—R. infestus; Apiculati—R. raduloides; Hystrices—R. dasyphyllus.*

We concluded the week with visits to the Scottish Horticultural Institute at Invergowrie where we saw several alien brambles, as well as experimental plots of cultivated blackberries, and to a commercial grower in the Carse of Gowrie.

As far as the roses are concerned, it is evident from a perusal of the Floras of the earlier part of this century that there was no scarcity of good rhodologists. However, most of them had not shaken off the habit of adding a new name (albeit varietal) to every strange rose they found. It was refreshing therefore to read an account of the 'Roses in Angus', written as far back as 1930 by Mrs Corstorphine. The author was apparently ahead of her time in accepting that much of the variation in wild roses could be explained if one accepted the hybrid origin of many of these so-called 'varieties'. Another factor, which is now more fully understood by those who study roses, is the unique breeding system of this genus, an account of which can be found in summary form in Turrill's *British plant life*.

Both factors were amply illustrated in the rose populations encountered during the course. The first day was spent in searching for and recognizing the few true species present in the area. Good examples were found at Balnaguard and *Rosa afzeliana, R. coriifolia, R. mollis* and *R. sherardii* were studied. The southern Dog Roses were harder to find and it became evident during the week that *R. canina* and *R. dumetorum* forms were more common in the lowlands and coastal areas. Good examples of both species were seen near Dundee.

At the Loch of the Lowes a very old bush of *R. pimpinellifolia* was encountered, of magnificent proportion. Near it was good *R. mollis* with one bush that appeared to have the parentage *R. mollis* × *R. coriifolia*.

The roses round the field centre were not so easy to elucidate. Although good *R. rubiginosa* was not seen in the vicinity, it evidently supplied the male parentage, or at least some genes, to many of the bushes examined. The *R. mollis* here was not typical but uniform throughout the area. It had very globose fruits, and both fruits and vegetative parts were highly suffused with a purple pigmentation—more mauve than the usual shade imparted by the presence of anthocyanin. *R. afzeliana* and *R. coriifolia* were present from Groups Subcaninae and Subcollinae. Many varieties within these groups are thought to be of hybrid origin even though some appear quite stable. Of good hybrids encountered there were *R. afzeliana* × *R. canina*, *R. coriifolia* × *R. rubiginosa* and *R. sherardii* × *R. rubiginosa*.

Three of the party were successful in recognizing both *R. rubiginosa* and *R. pimpinellifolia* on the dunes at St Cyrus. They also brought back a strange specimen which was evidently *R. rubiginosa* × *R. pimpinellifolia*. It matched well the description in 'Wolley-Dod' of *R.* × *moorei* which is one of the binomials indicating the above parentage.

Most of the *R. sherardii* bushes studied during the week matched var. *omissa* forma *resinosoides*, but in the interests of clarity no other varieties are mentioned here. However both they and the hybrids encountered reflected extremely well the pattern noted by Mrs Corstorphine in Angus, and W. Barclay in Perth nearly half a century ago.

The dozen participants had a very full week (lab. sessions went on to almost midnight once or twice) and all learned a great deal. This was especially true of the Scottish members who now have the opportunity of carrying out some useful mapping—reasonably confident of *some* of their determinations at least! By the way, the allusions at the beginning to consulting the orifice, and to 'throwing up', refer to the necessity of checking the diameter of the hole left when styles are removed from a rose hip, and to the way in which the sepals erect themselves after flowering. The bramble which 'sits up and looks at you' is *Rubus nemoralis*—which indeed it does, with its flat pink petals eyeing you from the hedgerows. Look out for it next summer.

G. H. Ballantyne & G. C. Graham

GLEN GIRNAIG, EAST PERTHSHIRE. 6TH AUGUST

This excursion was officially cancelled due to illness and business commitments abroad of the two leaders. However, since access permission had already been obtained from Mr C. Findlay, Urrard, three people went independently. We left our vehicles at the entrance to Glen Girnaig, GR 27/916.639, and entered the woodland, which is largely birch with some oak, just beyond this point. Descending to the river through this wood, we crossed several grassy clearings with a good range of species including *Carex caryophyllea, Galium verum, Helianthemum nummularium, Sieglingia decumbens* and *Veronica chamaedrys*. The river forms a gorge at this point; unfortunately high water prevented exploration other than the western side of the gorge. The rocks and wet grassland in the gorge had a relatively rich flora with species such as *Alchemilla alpina, Briza media, Carex pallescens, Rubus saxatilis* and *Saxifraga aizoides*.

Following the Allt Girnaig and its tributary the Allt a' Mhagain, we crossed somewhat uniform *Nardus* grassland and *Calluna* moorland to the crags below Meall an Daimh, an outlier of Ben Vrackie. These were locally moderately rich with *Asplenium viride, Botrychium lunaria, Cystopteris fragilis, Galium boreale, Polystichum lonchitis* and *Saxifraga oppositifolia*. Below the crags was a line of stony flushes with *Carex dioica, Eleocharis pauciflora, Saxifraga aizoides, Selaginella selaginoides, Tofieldia pusilla* and *Triglochin palustris*.

We then ascended to the col on the Ben Vrackie/Meall an Daimh Ridge, and on the southern side of this latter hill, facing the col, found a small patch of exceedingly calcareous rock with abundant *Astragalus alpinus* together with *Briza media, Empetrum nigrum, Galium boreale, G. verum, Helictotrichon pratense, Linum catharticum, Plantago lanceolata, Polygonum viviparum, Saxifraga aizoides, S. oppositifolia, Veronica officinalis*, and also a white *Gentianella amarella* subsp. *druceana*.

R. A. H. Smith

IRELAND

FERMANAGH. 10TH–11TH JUNE

A total of 12 people took part including two members from each of the Fermanagh and Armagh Field Clubs. During the two days we visited five localities in the west of the county, including areas for which there were few records, and a couple of sites known as localities of probable rare species. These were the shores of Tullynanny and Carran Loughs, an area of scrub and limestone; slopes above Boho; the Black Bridge area near the site of *Erica vagans*; and the woods below the Knockmore cliffs.

Record cards were made for each of these sites. A new county record of *Eleocharis uniglumis* and new stations for *Eleocharis quinqueflora* and *Carex dioica* were obtained at Tullynanny Lough, together with recognition of *Scirpus lacustris* subsp. *tabernaemontani* and *Poa subcaerulea*, neither of which had previously been named in the flora of Fermanagh. The occurrence of *Pseudorchis albida* caused Kodak shares to go up one or two on the Stock Market. Actually it occurs frequently in the west of Fermanagh so much so that Meikle and his helpers stopped recording it in this district. In the afternoon we visited Black Bridge and the Carrickbawn site of *Erica vagans* (where again we found *Pseudorchis albida*). It was here that Maura Scannell found a hybrid *Equisetum* which was orginally diagnosed as *E. palustre* × *E. fluviatile* (both of which parents were present). The material was identified by C. Page (**E**), however, as *E.* × *littorale* (*E. arvense* × *E. fluviatile*). It is not unusual for this hybrid to be found in the absence of *E. arvense*, and there are now 20 records for the county.

On the Sunday we visited Carran Lough which proved a most interesting area. *Carex acuta* was a new county record and *Geum* × *intermedium* was recorded for only the third time in the county. *Sisyrinchium bermudiana* found by Norah Dawson created a fair amount of interest. Meikle regards it as a recent introduction and says it is actively spreading in two separate parts of the county. The plant is now locally abundant by Upper Lough Erne. At Pollbeg above Boho Con Breen we found *Meconopsis cambrica*, which is known from cliffs near Boho, and Maura found *Aphanes microcarpa* which proved to be only the second record for the county. *Ophioglossum vulgatum*, the third record for this district (twelfth for the county), was also found.

Finally we moved to Knockmore cliffs where *Geum* × *intermedium* made its fourth appearance in the county flora! Doubled in one day! So two county records in two days, and a useful increase in the records of many other species, made the whole weekend worthwhile and enjoyable.

R. Forbes

LISTOWEL, N. KERRY. 5TH–9TH JULY

Only a few people attended this meeting, but this did allow more ground to be covered. On 5th July several parts of the Galey River (north of Listowel) were worked. The hydrophyte flora was rather poor, probably due to dredging. *Impatiens glandulifera* was seen and a *Potamogeton* thought to be *P. alpinus* was collected. On Knockanore Mountain *Cytisus scoparius* was seen in some abundance in the stream-gorge and *Dryopteris aemula* was noted in several places on the roadside banks.

On 7th July the cliffs west of the village of Ballyheigue were worked in a vain attempt to refind *Carex punctata*. *Carex distans* was seen there in some plenty. The usual maritime flora was present, including *Anthyllis vulneraria, Cochlearia officinalis* and *Malva sylvestris*. At Kerry Head, further to the north-west, *Radiola linoides* was collected on tracks in heathy ground. The cliff form of *Rumex acetosa* was seen in a rocky declivity above the sea. *Ranunculus flammula* approaching subsp. *minimus* Padmore was collected from wet ground near the cliff edge; the only other station reported for this subspecies in Ireland is at Loop Head, South Clare, some 12 miles to the north across the estuary of the Shannon. *Berula erecta* was later collected in a marshy field at Lixnaw.

On 8th July, en route to the coast, *Fuchsia, Polygonum cuspidatum* and *Spiraea salicifolia* were seen away from any dwellings on the Knockanore Mountain. A *Lycium* sp. was collected from hedges on the approach road to Beal Point. On the dunes rayless *Senecio jacobaea, Asperula cynanchica* and *Anacamptis pyramidalis* were common. A walk along the shore yielded the usual maritime flora. *Carex extensa* was found in a few places, in pools between the rocks, and very hirsute *Bellis perennis* was collected.

On 9th July the Feale River at Listowel was examined. *Juncus foliosus* was abundant on the trampled banks and *Senecio* × *ostenfeldii* was common as it is throughout north-western Kerry. Later the party travelled to Tarbet to cross to South Clare by ferry. The long queue allowed time for botanising the ramparts around the terminal, where *Linum bienne* was found to be common.

In South Clare, as time was short, two lakes near Killimer were looked at, St Senan's Lough and a lake at Knockerry. In the former *Carex curta* was found on *Sphagnum* tussocks and *Catabrosa aquatica* in soft mud in freshwater pools at the edge; these both appear to be new records for the south of the county. At Knockerry, *Isoetes* sp., *Apium inundatum* and *Senecio* × *ostenfeldii* were collected.

M. J. P. SCANNELL

THE NAMES OF VICE-COUNTIES IN *WATSONIA*

The present policy with regard to the use in *Watsonia* of vice-county names and numbers and administrative counties in the British Isles was explained by Halliday & Perring (1976). It is not intended to change this policy, and the vice-county map will continue to appear in every part of *Watsonia* (space permitting) , and the vice-county list about once a volume. It has become apparent, however, that, in those cases where the name of the vice-county employed coincides with the name of a town in that vice-county, uncertainty can arise according to whether the town or vice-county is intended. The revised vice-county list on p. 95 sets out to remove such ambiguities.

Although the precise boundaries of the vice-counties in Great Britain as laid down by Watson (1852) have been adhered to rigorously ever since, there has never been an 'official' or universally-adopted list of the names of the vice-counties. The original list produced by Watson (1852) is haphazard in the use of abbreviations (cf. Hunts., Northampton), yet those names were followed exactly by Dandy (1969). The list given by Druce (1932) shows some changes but remains equally inconsistent. The names adopted by Perring & Walters (1962) are more logical, but each county is written in full and adoption of this list in *Watsonia* would not be advisable.

The present revised list is not intended to serve as an 'official' list. It has been constructed by consultation with the regional committees of the B.S.B.I. in Wales, Scotland and Ireland, and the names adopted have been selected with a view to the measure of consistency, brevity and unambiguity required in the pages of *Watsonia*.

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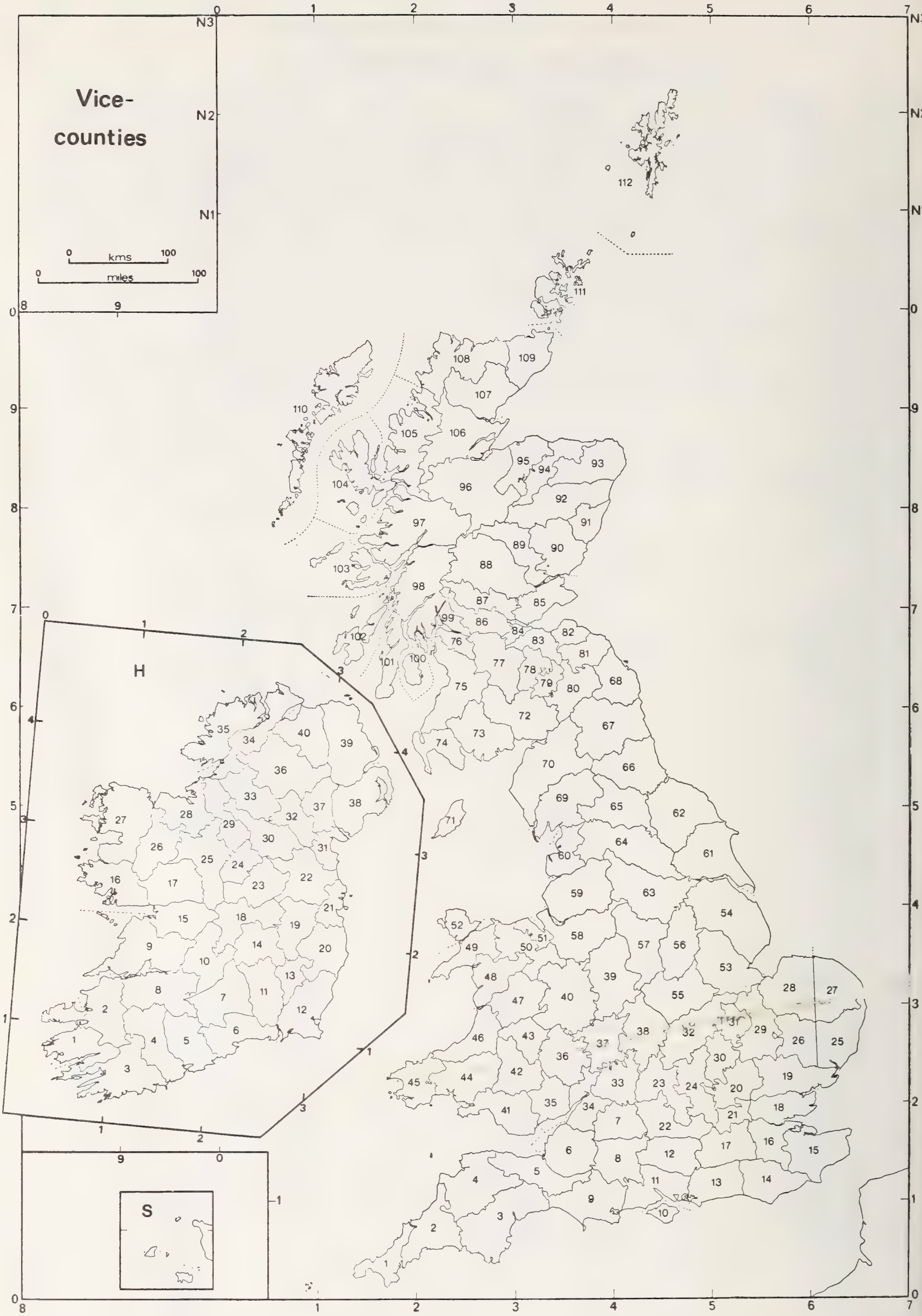
C. A. Stace

ENGLAND, WALES AND SCOTLAND

1. W. Cornwall
1b. Scilly
2. E. Cornwall
3. S. Devon
4. N. Devon
5. S. Somerset
6. N. Somerset
7. N. Wilts.
8. S. Wilts.
9. Dorset
10. Wight
11. S. Hants.
12. N. Hants.
13. W. Sussex
14. E. Sussex
15. E. Kent
16. W. Kent
17. Surrey
18. S. Essex
19. N. Essex
20. Herts.
21. Middlesex
22. Berks.
23. Oxon
24. Bucks.
25. E. Suffolk
26. W. Suffolk
27. E. Norfolk
28. W. Norfolk
29. Cambs.
30. Beds.
31. Hunts.
32. Northants.
33. E. Gloucs.
34. W. Gloucs.
35. Mons.
36. Herefs.
37. Worcs.
38. Warks.
39. Staffs.
40. Salop
41. Glam.
42. Brecs.
43. Rads.
44. Carms.
45. Pembs.
46. Cards.
47. Monts.
48. Merioneth
49. Caerns.
50. Denbs.
51. Flints.
52. Anglesey
53. S. Lincs.
54. N. Lincs.
55. Leics.
55b. Rutland
56. Notts.
57. Derbys.
58. Cheshire
59. S. Lancs.
60. W. Lancs.
61. S.E. Yorks.
62. N.E. Yorks.
63. S.W. Yorks.
64. Mid-W. Yorks.
65. N.W. Yorks.
66. Co. Durham
67. S. Northumb.
68. Cheviot
69. Westmorland
69b. Furness
70. Cumberland
71. Man
72. Dumfriess.
73. Kirkcudbrights.
74. Wigtowns.
75. Ayrs.
76. Renfrews.
77. Lanarks.
78. Peebless.
79. Selkirks.
80. Roxburghs.
81. Berwicks.
82. E. Lothian
83. Midlothian
84. W. Lothian
85. Fife
86. Stirlings.
87. W. Perth
88. Mid Perth
89. E. Perth
90. Angus
91. Kincardines.
92. S. Aberdeen
93. N. Aberdeen
94. Banffs.
95. Moray
96. Easterness
96b. Nairns.
97. Westerness
98. Main Argyll
99. Dunbarton
100. Clyde Is.
101. Kintyre
102. S. Ebudes
103. Mid Ebudes
104. N. Ebudes
105. W. Ross
106. E. Ross
107. E. Sutherland
108. W. Sutherland
109. Caithness
110. Outer Hebrides
111. Orkney
112. Shetland

IRELAND

H1. S. Kerry
H2. N. Kerry
H3. W. Cork
H4. Mid Cork
H5. E. Cork
H6. Co. Waterford
H7. S. Tipperary
H8. Co. Limerick
H9. Co. Clare
H10. N. Tipperary
H11. Co. Kilkenny
H12. Co. Wexford
H13. Co. Carlow
H14. Laois
H15. S.E. Galway
H16. W. Galway
H17. N.E. Galway
H18. Offaly
H19. Co. Kildare
H20. Co. Wicklow
H21. Co. Dublin
H22. Meath
H23. Westmeath
H24. Co. Longford
H25. Co. Roscommon
H26. E. Mayo
H27. W. Mayo
H28. Co. Sligo
H29. Co. Leitrim
H30. Co. Cavan
H31. Co. Louth
H32. Co. Monaghan
H33. Fermanagh
H34. E. Donegal
H35. W. Donegal
H36. Tyrone
H37. Co. Armagh
H38. Co. Down
H39. Co. Antrim
H40. Co. Londonderry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Tables, appendices and captions to figures should be typed on separate sheets and attached at the end of the manuscript. Names of periodicals in the references should be abbreviated as in the *World list of scientific periodicals*, and herbaria as in Kent's *British herbaria*. Line drawings should be in Indian ink, preferably on good quality white card, but blue-lined graph paper or tracing paper is acceptable. They should be drawn at least twice the final size and they will normally occupy the full width of the page. Lettering should be done in Lettraset or by high-quality stencilling, though graph axes and other more extensive labelling are best done in pencil and left to the printer. Photographs can be accepted only in exceptional cases.

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Ophrys apifera Huds. × *O. insectifera* L., a natural hybrid in Britain

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ABSTRACT

The well-established population of *Ophrys* × *pietzschii* Kümpel (*O. apifera* Huds. × *O. insectifera* L.), known since 1968 in Leigh Woods, Bristol, N. Somerset, v.c. 6, has been found to agree closely in floral characters with the artificial hybrid created in Germany. The distinctive characteristics of the hybrid are described, the most important being features of the labellum, especially its lobing and coloration. The performance of the hybrid is discussed in the context of the habitat, ecological conditions and vegetation of Leigh Woods. Reference is also made to the existence of the hybrid on the Continent, including a possible natural hybrid in the French Jura. The Leigh Woods plants represent the first recorded natural population of the hybrid, and the only population now extant in Europe. It appears that the binomial *O.* × *pietzschii* was in fact not validly published, as no preserved specimen was indicated as holotype.

INTRODUCTION

In early summer 1968 four orchids of unusual flower structure, suspected as being hybrids between *Ophrys insectifera* L. (*O. muscifera* Huds.) and *O. apifera* Huds., but regarded at the time as falling within the range of variation of *O. insectifera*, were found in an old quarry in Leigh Woods, Bristol (Willis 1969). The hybrid was then unknown, but three years later it was described and illustrated in colour (Kümpel 1971), it having originated as the result of artificial cross-pollination in the wild in East Germany. Subsequently the Leigh Woods plants were recognized as *O.* × *pietzschii* (Pankhurst 1977, Willis 1978).

The performance of the British plant has been monitored over the years and is described in relation to the environmental conditions and associated vegetation in Leigh Woods. This paper also describes the diagnostic characteristics of the hybrid, and gives details of the artificial hybrid in Germany and also of a putative natural hybrid in France.

PRODUCTION OF THE ARTIFICIAL HYBRID

Details of the origin of the artificial hybrid in East Germany are given by Kümpel (1970, 1971, 1977). In 1962, the late Karl Pietzsch transferred the pollinia of *O. insectifera* to *O. apifera* in their natural habitat in the Halle district, Lower Unstrut, East Germany (*O. insectifera* had almost finished flowering when the first flowers of *O. apifera* were opening). In 1967, the first flowering hybrid plants (three in all) were seen. Flowering, which was in the first half of June, continued well in following years, a fourth plant appearing in 1970. However, this small population subsequently disappeared, the last flowering specimen being seen in 1975 (H. Kümpel pers. comm. 1978).

DESCRIPTION OF THE HYBRID

All four of the plants arising from the artificial cross-pollination agreed closely in floral characteristics. A Latin diagnosis of the hybrid has been given by Kümpel (1971, 1977), who listed other *Ophrys* hybrids (Kümpel 1977; see also Danesch & Danesch 1972). For convenience, a translation of the Latin diagnosis is given here: Plant height 14–23 cm. Inflorescence with 3–6 large flowers. Flower 23 mm from the tip of the unpaired sepal (outer perianth segment) to the tip of the appendage. Sepals first dull

TABLE 1. COMPARISON OF THE MAJOR DIAGNOSTIC FEATURES OF *O.* × *PIETZSCHII* WITH THOSE OF THE PARENTAL SPECIES

	O. insectifera	*O.* × *pietzschii*	*O. apifera*
Outer perianth segments	Pale green	Dull green-pink	Pink-white to strongly pink or rose-red
Labellum	± flat	Convex	Strongly convex
Lower lateral lobes	± in one plane	Bent back	Rolled back
Protuberance of upper lateral lobes	Absent	Very small	Small to large
Appendage	Absent	Short, pointing downwards	Long, pointing backwards
Blotch	± square, without central spot	Arching transverse band, or ± square with indistinct central spot	A surrounding basal field with dark-brown centre
Connective appendage	Rudimentary, blunt	Short, pointed	Long, S-shaped, tortuous

yellow-green, later, especially at the margins, rose-pink but always dullish. Paired sepals at first more strongly bent back than those of *O. insectifera*, but much less than those of *O. apifera*. Median sepal strongly erect, later slightly turned forward, and the paired sepals then in line. Petals (inner perianth segments) dark brown, oblong-lanceolate, broader at the base, slightly hairy on the upper surface and about one-third as long as the sepals. Labellum dark-brown also, convex, 5-lobed. Upper lateral lobes densely covered with dark hairs on the outer parts, hemispherically curved, each lobe terminating in a triangular reflexed point, and with a small glabrous forward-tilted protuberance. Lower lateral lobes paler at the margin, almost ochre-coloured, glabrous and reflexed so strongly that they almost touch one another at the back, the labellum appearing very narrow from the front. The appendage appears like a fifth lobe, much smaller than in *O. apifera*, reddish, rounded 3-cornered, turned downwards, and exceeding the lower lateral lobes. The lead-grey blotch does not reach the base of the lip, originating in the region of the lateral lobes and occupying the middle of the labellum as a transverse arc, drawn out in two blunt corners. The marking varies. Sometimes a dark violet central spot can just be recognized, sometimes lateral spots and a girdle-like connection to them are faintly visible. Between the blotch and the base of the labellum is a dark forwardly-arched basal region, as in *O. insectifera*. The column resembles that of *O. apifera* more in form and colour; connective appendage short and acuminate. Staminode spots are present. Self-fertilization, normal in *O. apifera*, has not, as yet, been observed.

The structure of the flower of *O.* × *pietzschii* is intermediate between that of the parents in nearly every feature. The most important distinctive characteristics of the hybrid are the structure and marking of the labellum and the nature of its lobes and terminal appendage, the appearance of the connective appendage (anther point) and, to a lesser extent, the colour and disposition of the outer perianth segments. The chief differences between the hybrid and the parents are given in Table 1, which is based on the distinctions recognized by Kümpel (1977).

The holotype of *O.* × *pietzschii* was said to be in the Nature Reserve 'Tote Täler' near Freyburgh, Unstrut (Kümpel 1977). Since no herbarium specimen was designated, strictly the name *O.* × *pietzschii* was not validly published.

THE OCCURRENCE OF *O.* × *PIETZSCHII* IN LEIGH WOODS

FEATURES OF THE HABITAT AND ASSOCIATED VEGETATION

The hybrid occurs on the fairly flat low floor (*c.* 35–40 ft O.D.) of an old, long since re-vegetated, quarry of Leigh Woods, N. Somerset, v.c. 6. The woods flank the western bank of the river in the Avon Gorge and are known to be of considerable antiquity and have a rich flora (Hope-Simpson & Willis 1955). Until about 1928, stone was mined in six quarries, close to the towpath at the foot of the woods. Details of the geology of the area and of the quarries are given by Vaughan & Reynolds (1936). The northern section of the wood is on Old Red Sandstone, but the hybrid occurs in the more southerly part on Carboniferous Limestone. Here exposures are predominantly north- and east-facing, and consist for the greater part of Black Rock Limestone and Gully Oolite. Rainfall is in excess of 800 mm per year (at Long Ashton, about 4 km away, the average annual rainfall is 922 mm). The site is moderately well drained, and the soil, although deeper than on the more precipitous Bristol side of the Gorge, is fairly shallow.

The vegetation of the southern part of Leigh Woods provides a rich example of that devéloped on Carboniferous Limestone in the Bristol region. The major tree species are *Quercus petraea*, *Fraxinus excelsior*, *Ulmus glabra* and *Tilia cordata*, the last being characteristic of the area. The genus *Sorbus* is well represented; *Sorbus aria*, *S. aucuparia* and *S. torminalis* are present, and, mostly in the more open areas, *S. anglica*, *S. bristoliensis*, *S. eminens*, *S. porrigentiformis* and *S. wilmottiana*. The ground flora is diverse, and includes *Aquilegia vulgaris*, *Cardamine impatiens*, *Carex digitata*, *Convallaria majalis*, *Hypericum androsaemum*, *Polygonatum odoratum* and *Potentilla tabernaemontani*. Certain of the St Vincent's Rocks rarities are also present, e.g. *Arabis scabra*. Bryophytes are numerous (Willis 1964), the quarries containing a substantial number of less common species. *Ophrys insectifera* occurs sparingly under light shade in a number of places, and is associated with *O. apifera*, which is infrequent, at several sites. *O. apifera* var. *trollii* is also known in small quantity from Leigh Woods (see White 1912 for early records), as well as a virescent form of *O. insectifera*, approaching the 'peloric condition' (Sandwith 1963). Other orchids include *Anacamptis pyramidalis*, *Dactylorhiza fuchsii* (common especially in the quarries), *Epipactis helleborine* (scattered), *Listera ovata* and *Spiranthes spiralis* (regularly flowering along the towpath and in grassy areas); *Neottia nidus-avis* has also been recorded.

In the long-disused, wooded quarry where *O.* × *pietzschii* is found, there are rather few plants of *O. insectifera*, and only the occasional specimen of *O. apifera*. However, both species occur in somewhat larger numbers not far away. In the particular quarry, where conditions are somewhat open, with scrub and small tree cover, rather light shade is cast by *Betula pendula*, *Cornus sanguinea*, *Corylus avellana*, *Fraxinus excelsior*, *Sorbus aria* (*s.s.*) and *Tilia cordata*. Other woody plants include *Acer campestre*, *Betula pubescens*, *Clematis vitalba*, *Crataegus monogyna*, *Ligustrum vulgare*, *Salix caprea*, *Taxus baccata*, *Viburnum lantana* and *V. opulus*. Among the herbaceous plants of the quarry are *Eupatorium cannabinum*, *Euphorbia amygdaloides*, *Hieracium pilosella*, *Inula conyza*, *Orobanche hederae*, *Pimpinella saxifraga, Prunella vulgaris, Succisa pratensis* and *Teucrium scorodonia*. In two quadrats (of 1m side), each including one hybrid orchid, recorded in 1978 (C. M. Lovatt pers. comm. 1978) herbaceous plants included *Bellis perennis*, *Brachypodium sylvaticum*, *Carex flacca*, *Centranthus ruber*, *Fragaria vesca*, *Hypochoeris radicata*, *Linum catharticum*, *Listera ovata*, *Lotus corniculatus*, *Origanum vulgare*, *Plantago lanceolata*, *Poa nemoralis*, *Senecio jacobaea*, *Solidago virgaurea* and *Sonchus oleraceus*. Bryophytes in close proximity to the hybrid orchids included *Lophocolea bidentata*, *Bryum pseudotriquetrum*, *Eurhynchium praelongum*, *E. striatum* and *Brachythecium rutabulum*.

The hybrid orchids occur in rather open parts of the quarry, some being scarcely shaded, although several specimens are under bushes. One plant is associated with scree fragments, and there is moderate litter cover elsewhere.

THE PERFORMANCE OF THE HYBRID

When the hybrid was first seen in Leigh Woods by Dr M. Flower, Dr I. D. R. Stevens and Professor M. C. Whiting in 1968, four specimens were noticed. These plants bore up to seven flowers per inflorescence and were up to about 40 cm tall. The flowers were approximately 20 mm from the tip of the outer perianth segment to the appendage of the labellum. Photographs show details of these plants (Willis 1969). Although the possible hybrid origin of the plant was considered in 1968, the opinion of J. P. M. Brenan and P. F. Hunt then was that these specimens could be included within the considerable variation of flower structure found in *O. insectifera*.

In 1971, six plants, of similar 'aberrant' flower structure, found by S. Harris were reported from the same Leigh Woods quarry (Willis 1972). In 1973, eight specimens were found in the same locality in a survey of the less common plants of the Avon Gorge (Hendry & Pearson 1973). In mid June 1974, Mrs O. M. Stewart did a painting of the plant, again from the same quarry (O. M. Stewart pers. comm. 1976). The drawing shows five flowers in an inflorescence; Mrs Stewart also noted that one plant bore two spikes, which were at least 38 cm tall. Subsequently the painting was sent to the Royal Botanic Gardens, Kew, and the identity of the plant as the hybrid was strongly suspected (P. Taylor pers. comm. February 1976). In June 1976 the plant was examined and photographed in the quarry by

R. J. Pankhurst in the company of J. M. Mullin. Confirmation of the determination of the hybrid was subsequently given by P. F. Hunt and also by P. Taylor, P. Cribb and J. J. Wood at Kew. An exhibit of the plant was set up by R. J. Pankhurst at the B.S.B.I. Exhibition Meeting in November 1976 (Pankhurst 1977). More recently, H. Kümpel (pers. comm. 1978) has confirmed the plant as concurring with the artificial hybrid in all of the major characteristics of the flower.

Observations made in the quarry in 1978 by C. M. Lovatt (pers. comm. 1978) showed a flowering period from 8th June (early flowers) to 30th June (flowers over). On 5th June *O. insectifera* was in full flower, but *O. apifera* was only just coming into flower. Five specimens of the hybrid were noted, ranging in height from 17 to 31 cm (average 26 cm), with 2–5 flowers (average 4) per inflorescence and 2–4 leaves per plant. These plants were somewhat smaller than those of previous years. Two of the specimens each produced one capsule (1·5 cm long), but it is not known whether these resulted from selfing, crossing with other plants of the population or back-crossing with adjoining *O. insectifera*. An insect was seen by C. M. Lovatt on one flower of the latter species, and it flew off with one of the pollinia stuck to it. Only two species of insects are known to be regular visitors to *O. insectifera* (Proctor & Yeo 1973), males of the solitary wasps *Argogorytes mystaceus* (L.) (*Gorytes mystaceus*) and *Argogorytes fargeii* (Shuckard) (*Gorytes campestris*). *Argogorytes mystaceus* is known to be locally common and widespread in England and Wales, and *A. fargeii* is a rare or very rare species in the southern counties of England and Wales (M.E. Archer pers. comm. 1979). The flight period of the former is from May to July, and of the latter in June and July.

Although *A. mystaceus* is known to visit *O. insectifera* in southern France (Godfery 1929) and in Scandinavia (Wolff 1950; Kullenberg 1950, 1961), and to be very specific, it has not been observed to effect pollination in Britain. Casual visitors to *O. insectifera* appear to be rare (Godfrey 1929), and only very rarely does *A. mystaceus* visit any orchid other than *O. insectifera*. Because of this specificity, hybridization in *Ophrys* is not likely to be more than a rare event (Proctor & Yeo 1973). Nevertheless, a large number of hybrids within the genus are known in Europe (Danesch & Danesch 1972), although only four in addition to the present one have been recorded for Britain (Hunt 1975). In Britain self-pollination of *O. apifera* appears to be the rule and seed-set substantial, but many flowers of *O. insectifera* fail to set seed (Summerhayes 1951; Kullenberg 1950).

In 1979, flowering was poor, as only two flowering spikes were seen in late June; these persisted well into July. One of the spikes bore six flowers and was 41.5 cm tall, but the other was shorter (26.5 cm), with only two flowers.

Overall, from the period 1968 to 1979, there seems to have been a fairly steady flowering performance of the hybrid in Leigh Woods, averaging 5 or 6 specimens per year, of average height 30–35 cm. Its flowering period, while later than that of *O. insectifera*, is fairly similar to that of *O. apifera*.

It is hoped to study capsule production further. In the interests of conservation, no plants have been examined with respect to underground parts.

THE EUROPEAN DISTRIBUTION OF THE HYBRID

THE ARTIFICIAL HYBRID

The vegetation of the nature reserve near Freyburgh, East Germany, where the artificial hybrid was produced is developed under favourable climatic and environmental conditions, and is Xerobrometum with scattered bushes (H. Kümpel pers. comm. 1978). Growing together with the parental *O. apifera* and *O. insectifera* are *O. sphegodes* (frequent), *O. insectifera* × *O. sphegodes*, *Epipactis atrorubens*, *Listera ovata*, *Orchis militaris*, *O. purpurea*, *O. militaris* × *O. purpurea*, *O. tridentata* and *Platanthera bifolia*. No artificial hybrids were seen after 1975; these specimens were shorter than those of the more persistent Leigh Woods population of natural hybrids.

THE NATURAL HYBRID

The first recorded natural hybrids are from Leigh Woods, and this is the only population known to have continued to flower over a ten-year period. Conditions for the production and survival of the hybrid in Leigh Woods may perhaps be more favourable than elsewhere, although flowering times of the parents appear to be fairly similar in southern England and on the Continent. Danesch & Danesch (1975) give the flowering period of *O. insectifera* for the Continent from early May to mid June, and of

O. apifera from the beginning of June to early July. On the Continent there may be an overlap in the flowering of the parents of some two weeks, but in Britain the overlap period may be somewhat longer.

A single record of a possible natural hybrid has been made in the French Jura. On an excursion on 28th May, 1969, led by H. Sundermann (1970, 1975, and pers. comm. 1979; see also Danesch & Danesch 1972), he found and reported a plant (two specimens were seen) from near Ceyzériat (46°10′N, 5°20′E) which had a number of similarities to the hybrid (H. Sundermann pers. comm. 1979). The plant was in a dry grassy place on limestone, where the shrubs included *Buxus sempervirens*, *Cornus sanguinea*, *Juniperus communis* and *Prunus spinosa*. Orchids were well represented, as, besides *O. apifera* and *O. insectifera*, *O. fuciflora* and *O. sphegodes*, *Aceras anthopophorum*, *Anacamptis pyramidalis*, *Gymnadenia conopsea*, *Himantoglossum hircinum*, *Listera ovata*, *Orchis mascula*, *O. militaris* and *Platanthera bifolia* were present. The hybrid could not, however, be found in June 1976 (H. Sundermann pers. comm. 1979).

The plant from the French Jura was fairly tall (30-35 cm), with about eight flowers in the spike. The labellum bore a quite large lead-grey blotch. However, the lateral lobes of the labellum, although present, were little developed and the large middle lobe was strongly turned in, giving a bluntly rounded appearance (the terminal appendage was not visible from the front). This plant differs from the artificial hybrid and the Leigh Woods plants in several other features (such as size and orientation of perianth segments, the blotch spreading to the lower lip zone), and in the opinion of H. Kümpel (pers. comm. 1979), the Jura specimens are better considered as abnormal forms of *O. insectifera*. The view that a mutation is involved is not ruled out by H. Sundermann (pers. comm. 1979). Further light could be shed on the situation if hybrids are found elsewhere, or if the results of the reciprocal cross (with *O. insectifera* as female) are investigated.

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Ecotypic and polymorphic variation in *Centaurea scabiosa* L.

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ABSTRACT

Ecotypic and polymorphic variation in *Centaurea scabiosa* L. are described, with special reference to maritime populations in S. Wales. The relation of these populations to var. *succisiifolia* E. S. Marshall from northern Scotland is discussed and problems of taxonomic treatment are pointed out.

INTRODUCTION

Centaurea scabiosa is a widespread and variable European species. Hegi (1931) gave a long list of subspecies and varieties in Central Europe, and Britton (1923) discussed variation in the British Isles. The aim of this paper is to discuss one particular group of variants, associated with maritime habitats in Scotland and Wales, which show features of special interest. These habitats are to some extent geographical outliers; the main area of distribution of the species in the British Isles is in the south and east. Ecologically, the species favours dry lowland habitats and shows a preference for calcareous soils; its absence from most of Scotland may be connected with the fact that such habitats in Scotland are rare.

It is as well to state at the outset that the variants I shall be discussing are not associated with variation in chromosome number. Many counts are recorded in the literature, and all reliable and recent counts from the British Isles give $2n = 20$, including my own counts from v.c. 13, 41 and 62. Fröst (1958) made an extensive study of the cytology of *C. scabiosa* in western Europe, with special reference to B chromosomes. He found that such chromosomes were rare in British populations, occurring in only 25 of the 615 plants counted. There is no evidence that the presence of B chromosomes is associated with any morphological character. It may be added that tetraploids have been recorded from France by Gardou (1972) under var. *calcarea* Jord.

HISTORY OF THE MARITIME VARIANTS

Marshall & Shoolbred (1898) discovered a new variant of *C. scabiosa* in northern Scotland. The plant grew on sand-dunes at the Kyle of Tongue, W. Sutherland, v.c. 108. The variant is characterized by its undivided basal leaves, which are entire or crenate-dentate. The stem leaves are also undivided, or the middle ones may have one to two pairs of short pinnae at the base. The plants in one locality (where they occurred in quantity) were tall (up to 100cm) with leaves up to 30cm long, and in another locality (where they were scarcer) a good deal shorter (*c*.30cm). Marshall noted that intermediates between the variety and the type were to be found, though he said nothing about their frequency or distribution. Later, Marshall (1901) gave the variant the name var. *succisiifolia*; and he made the important observation that it remained quite distinct in cultivation, and reproduced itself from seed.

Subsequently, H. J. Riddelsdell (1907) discovered plants on limestone cliffs by the sea on the Gower Peninsula, Glamorgan, v.c. 41, which were accepted by Marshall as var. *succisiifolia*. They differed from the Scottish plants in their smaller size (15-30cm), in the usually solitary capitula, and in having larger black appendages on the phyllaries, but they agreed in having undivided leaves. Riddelsdell reported that the variety formed only a small part of the population and, as in Scotland, intermediates between the type and the variety were found. Plants similar to those from Gower were gathered by Riddelsdell from Colwyn, N. Wales (v.c. 50), but there seem to be no other records for the variety.

In eastern Europe, *C. integrifolia* Tausch, with undivided leaves, is recorded from the southern Urals, and is listed under *C. scabiosa* by Dostál (1976). Two varieties with the same name, var. *integrifolia* Gaudin and var. *integrifolia* Vuk., from Switzerland and Austria respectively, are known. Herbarium specimens of the latter bear a considerable resemblance to var. *succisiifolia*. Another variety of low stature and with undivided leaves is var. *gelmii* Briquet, from the Alpes-Maritimes and South Tyrol. None of these is maritime.

What is *not* known about these varieties is whether they are occasional mutants, occurring singly or in small quantity in a population, and of little permanent importance, or whether they form a significant part of populations, and can thus be interpreted in terms of polymorphic variation. The field observations of Marshall and Riddelsdell suggest that the variants differ genotypically from the type,

TABLE 1. SPECIES LISTS FOR HABITATS OF *CENTAUREA SCABIOSA*

	(a) Steep cliffs and rock crevices	(b) Open limestone slopes	(c) Closed grassland
Aira praecox	+	+	
Anagallis arvensis	+	+	
Anthoxanthum odoratum			+
Anthyllis vulneraria		+	
Arenaria serpyllifolia	+		
Armeria maritima		+	
Arrhenatherum elatius		+	+
Asperula cynanchica		+	
Asplenium adiantum-nigrum		+	
Brachypodium sylvaticum		+	
Carex flacca		+	
Centaurea scabiosa	+	+	+
Cerastium sp.	+		
Dactylis glomerata	+	+	+
Daucus carota	+		
Euphorbia portlandica	+	+	
Euphrasia sp.		+	
Festuca ovina	+	+	+
Geranium sanguineum		+	
Helianthemum chamaecistus		+	+
Hieracium pilosella		+	
Hypochoeris radicata		+	
Luzula campestris			+
Plantago lanceolata		+	
Poterium sanguisorba	+	+	+
Primula veris		+	+
Prunus spinosa		+	
Pteridium aquilinum		+	
Ranunculus bulbosus			+
Reseda lutea		+	
Rubus fruticosus		+	
Scilla verna			+
Sonchus oleraceus	+	+	
Teucrium scorodonia		+	
Thymus drucei	+	+	
Trifolium dubium			+
Trisetum flavescens		+	
Ulex europaeus		+	
Ulex gallii		+	

and occur in small but significant proportions in the population. It is to this point that my field observations have been mainly directed. These observations have been made on the Gower Peninsula, v.c. 41, and to a lesser extent in southern Pembs., v.c. 45, where the variety also occurs on limestone cliffs by the sea. It has not yet been possible to study the Scottish plants in the field.

FIELD AND EXPERIMENTAL OBSERVATIONS

ECOTYPIC VARIATION

The populations in the Gower Peninsula consist of plants which are very variable in size, and this variation is correlated to some extent with habitat. Broadly speaking, the species occupies three kinds of habitat: (a) steep cliffs and rocky crevices, (b) open limestone slopes which are often found at the top of the cliffs, and (c) closed grassland which occurs locally on the cliff-tops where the ground is flat.

Species lists for an example of each of these communities are given in Table 1. The lists are not complete, but are representative. Plants of *C. scabiosa* in habitat (a) are usually small and stunted, typically 15 × 15cm, with an inflorescence with only one or two capitula. Plants in habitats (b) and (c) are usually larger, sometimes reaching 60 × 50cm; they are rather bushy and compact and have dark green, shining and often coriaceous leaves, and inflorescences which may bear several capitula.

Seeds collected from dwarf plants have been grown in cultivation and, though the plants are usually small at first, in good garden soil they grow into bushy plants much like the larger plants seen in the field. This suggests that the dwarf plants seen in habitat (a) are the product of phenotypic plasticity. Nevertheless, the comparatively large plants seen in the field and from cultivation in the garden are still less tall than comparable plants from other limestone habitats, as shown in Table 2. At both places, the differences in plant height are significant. It is noteworthy that in the second example, one of the populations is from sea-cliffs in S. E. Yorkshire; but it does not have the dwarf habit of the Pembrokeshire plants. There is also another difference in habit. The Gower plants, and to a lesser extent those from Pembrokeshire, have a rather dense, bushy habit; those from the W. Sussex and S. E. Yorkshire localities are not only taller but have a laxer habit of growth.

These data suggest that the populations from Gower and Pembrokeshire have characters which distinguish them from other populations in England and Wales, and might thus be regarded as forming a distinct ecotype. It has not yet been possible to compare them experimentally with the plants from northern Scotland.

TABLE 2. MEAN HEIGHT OF FAMILIES OF *CENTAUREA SCABIOSA* GROWN IN EXPERIMENTAL GARDENS FROM SEED COLLECTED IN THE WILD

Locality	Mean height (cm.)
GROWN IN MANCHESTER	
Port Eynon, Gower, Glam. (v.c. 41)	57 (1 family, 10 plants)
Burpham, W. Sussex (v.c. 13).	110 (1 family, 6 plants)
GROWN AT JODRELL BANK, CHESHIRE	
Barafundle Bay, Pembs. (v.c. 45)	57 (4 families, 48 plants)
Flamborough, S. E. Yorks. (v.c. 61)	101 (1 family, 8 plants)

TABLE 3. LEAF CHARACTERS OF PLANTS RAISED FROM SEED OF *C. SCABIOSA*. SEED COLLECTED FROM PLANTS WITH DIVIDED LEAVES, GROWING IN NATURAL HABITATS

Origin of seed	No. of plants raised to maturity	No. of plants with some undivided leaves
Port Eynon, Gower, Glam. (v.c. 41)	12 (1 family)	4
Barafundle Bay, Pembs. (v.c. 45)	53 (4 families)	0
St Govan's Head, Pembs. (v.c. 45)	5 (1 family)	1

TABLE 4. LAMINA DISSECTION AND LAMINA LENGTH IN 7 POPULATIONS OF *C. SCABIOSA* FROM GOWER, GLAMORGAN (v.c. 41). (DATA ARRANGED IN ORDER OF MEAN LAMINA LENGTH)

	Number of leaves with lamina:				Percentage of sample with leaves undivided	Mean lamina length (cm) and standard deviation
	undivided	pinnatifid pinnae entire	pinnatifid pinnae toothed	more or less bipinnatifid		
1. Overton: sheltered gully	2	1	2	1	33	16.0 ± 1.0
2. Port Eynon: grassy plateau	5	2	10	11	18	14.3 ± 0.85
3. Port Eynon: limestone slope	6	8	8	12	18	12.8 ± 0.5
4. Port Eynon: grassy plateau	4	14	3	16	11	12.2 ± 0.4
5. Overton: cliff, vegetation open	2	3	3	10	11	10.5 ± 0.9
6. Overton: cliff, vegetation open	1	1	8	23	3	8.9 ± 0.3
7. Port Eynon: cliff, little vegetation	0	5	2	10	0	7.6 ± 0.4

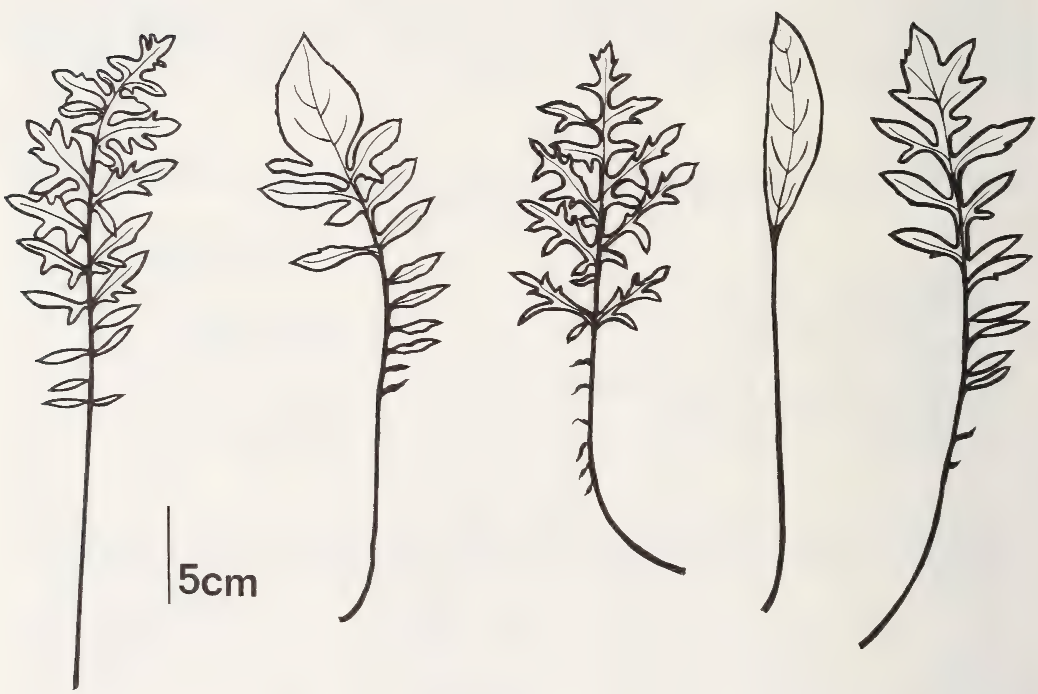

FIGURE 1. Largest basal leaf of each of the 5 members of the St Govan's Head family (Table 3).

POLYMORPHIC VARIATION

As regards leaf polymorphism in the Gower populations, the observations of Riddelsdell have been confirmed and extended. Plants with undivided leaves occur in nearly all the populations examined at three localities (Overton, Port Eynon and Pennard). Sometimes the plants concerned have all their leaves undivided (as in the description of var. *succisiifolia*), sometimes the same plant may have both undivided and pinnatifid leaves. There seems to be some developmental flexibility here, the basal leaves tending to be the undivided ones, and the stem leaves divided. There are also plants which have simply pinnatifid leaves which are intermediate between the undivided leaves of var. *succisiifolia* and the bipinnatifid leaves of var. *scabiosa*.

The first point to make is that there is some genotypic control of leaf-shape. That this is so for the Scottish plants is indicated by Marshall's observation that his var. *succisiifolia* retained its characters in cultivation and reproduced itself from seed. Some experiments on seed samples from localities in Gower (v.c. 41) and Pembrokeshire (v.c. 45), the results of which are given in Table 3, also provide clear evidence of genotypic control. The plants concerned, in two families, segregate clearly for divided and undivided leaves. This is illustrated in Fig. 1, in which the variation from plant to plant in one of the families is shown. Some of the variation may be due to environment, but, as the plants were grown side by side in a garden bed, there can be no doubt that at least some of it is genotypic. It is to be noted that *C. scabiosa* is self-incompatible (Marsden-Jones & Turrill 1937) and hence outbreeding; it is thus not surprising that the Gower and St Govan's plants in Table 3 were heterozygous for the genes controlling leaf-division.

Table 4 presents some field data for the proportions of plants with divided and undivided leaves in some Gower populations. Random samples were taken from plants in flower in a series of small areas in different habitats. In sampling, a single mature leaf was taken from near the base of each plant. In the great majority of cases, the plant bore either all divided or all undivided leaves. As shown in Table 4, an attempt was made to classify the leaves under four headings. It was easy to recognize the undivided and the bipinnatifid leaves, but the classification of the intermediate categories was difficult and rather arbitrary. It was noted that the leaves which were pinnatifid with entire pinnae sometimes had a large terminal lobe and only two or three pinnae. Some idea of the variation between populations in similar habitats can be obtained by comparing nos. 2 and 4 (Port Eynon, grassy plateau) and nos. 5 and 6 (Overton, cliff). In each pair, the differences are quite considerable, and this should be borne in mind when considering the Table as a whole.

Lamina length seems to be a good indicator of the nature of the habitat, the smallest leaves usually being associated with the most xerophytic habitats (rock crevices). Accordingly, the data of Table 4 have been arranged in order of mean lamina length, so as to indicate a possible ecocline. The result is to show a corresponding gradient in the percentage of plants with undivided leaves. Although the errors in both sampling and scoring are great, this gradient may well turn out to be a real one.

It should be noted too that the pinnatifid leaves may be regarded as intermediate between the undivided and the bipinnatifid. This agrees with the idea that the plants are part of an interbreeding and segregating population.

DISCUSSION

In many parts of the British Isles, *C. scabiosa* is often found near the sea, but its adaptations to the maritime habitat have not been explored. In the case of S. Wales, the populations, with their low, often bushy habit and dwarf stature, may be regarded as adapted to the environmental conditions of limestone cliffs. Whether the plants of var. *succisiifolia* described by Marshall from northern Scotland show similar features remains to be seen, and experiments are needed, but judging from Marshall's descriptions of tall plants up to 100cm in height they are very different. The fact that the Scottish plants occur mainly on dunes rather than rocks and cliffs may also be significant.

The occurrence of undivided leaves in some members of the populations is undoubtedly under genetic control, at least to some extent. The data indicate that the gene or genes are recessive, and the relatively sharp segregation observed in both natural and cultivated populations indicates that the number of genes involved is not large. The polymorphism thus falls under the definition of Huxley

(1955) in that it is oligogenic, and occurs in populations in frequencies too great to be attributable merely to occasional mutation. It must be maintained by selection.

Possible explanations for the polymorphic variation in terms of adaptation are hard to find. The data for the Gower peninsula suggest that exposure tends to favour divided leaves, and shelter entire ones. This is in line with the observations of Lewis (1972) on *Geranium sanguineum*, in which he found that plants with more highly dissected leaves were associated with the stresses of a dry continental climate. But many inland habitats of *C. scabiosa* are relatively sheltered, yet show no polymorphism or development of entire leaves. Again, Professor T. W. Böcher (pers. comm. 1972), who has cultivated many strains of *C. scabiosa* from wild localities, has not observed any specialized coastal race in Denmark.

Yet another problem which arises is that of the relationship of the Welsh and Scottish maritime populations. Herbarium specimens indicate that polymorphic populations similar to those in S. Wales may occur in N. Wales, yet even these are separated from the plants in Scotland by a distance of 650km. Over most of southern and central Scotland the species is entirely absent; there are no connecting links. It thus looks as though the Scottish and Welsh populations may have originated independently, or entered Britain by different routes. In this connection, it is worth noting that the Gower peninsula is the home of a number of relict species; some of these such as *Helianthemum canum* and *Aster linosyris* are also found in N. Wales, and occur on limestone cliffs. These species, disjunct from their main range to the south, are commonly regarded as relics of an early post-glacial flora, survivors in a few places where climate and habitat are suitable (Godwin 1975). It is possible that the *C. scabiosa* populations of Gower represent a relict population, distinct from the main body of the species which is primarily south-eastern in distribution in the British Isles, and has not penetrated in any quantity to western Wales. It would obviously be interesting to look further at the Scottish populations from this point of view.

Alternatively, the *C. scabiosa* populations may have colonized these coastal habitats relatively recently, and have become adapted to them strictly in relation to the local conditions. On this hypothesis, the development of a leaf polymorphism in both Welsh and Scottish populations would mean that the character had originated independently in both; and this would strengthen the view that it is in some way adaptive.

TAXONOMIC TREATMENT

The problem of how to deal taxonomically with this variation is an interesting one. There are really two problems, of different kinds.

The first is one of shortage of data. More information is needed about other populations, British as well as Continental, before definite proposals can be made. The second problem is a more difficult one. It is how to deal with cases in which, at the infraspecific level, we have both ecotypic and polymorphic variation. In a recent paper on *Viola riviniana* (Valentine 1975), I suggested that the ecotypes of this species be treated as varieties, and that the polymorphic variants, which existed in both varieties in Britain, be treated as forms. The polymorphic variation is of the same kind in both varieties, but because of the rules of nomenclature, the two forms have to be given different names.

This may be the way in which variation in *C. scabiosa* should eventually be treated. It is possible that when the position about variation at the varietal level is clearer, and we have more information about polymorphism in the Scottish populations, we shall be able to make firm proposals about nomenclature. In the meantime, it would be wise to make no change. The name var. *succisiifolia* E. S. Marshall can continue to be applied to the variants with undivided basal leaves; and it is hoped that this paper will stimulate field botanists to seek out this variety and look for extensions of range.

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Alien species of *Eragrostis* P. Beauv. in the British Isles

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ABSTRACT

A key to and an annotated list of all 51 species of *Eragrostis* P. Beauv. which are known to have occurred in the British Isles are given.

INTRODUCTION

This paper provides a key to and an annotated list of the 51 species of *Eragrostis* P. Beauv. known to have occurred in the British Isles. At present there is no readily available key to these species, which originate from many parts of the world.

Species of *Eragrostis* bear a superficial resemblance to those of *Poa*, both genera having unawned compressed spikelets consisting of many florets. However, the former differ in having 3-nerved lemmas (5-nerved in *Poa*), ligules which are nearly always ciliate or absent (membranous or almost absent in *Poa*), pointed leaves (often blunt in *Poa*), and no basal cottony hairs on the callus of the lemma (possessed by some species of *Poa*).

There are at least 300 species of *Eragrostis* (some authorities give twice that number, according to taxonomic opinion) distributed over the warm-temperate and tropical regions of the world. Less than a dozen species are established in central and southern Europe, being mostly annuals which fruit freely in hot summers and with seeds that survive cold winters. Only one is established in the British Isles (in the Channel Islands) (McClintock 1975) but several other species, occurring as casuals, may occasionally set seed or even survive a mild winter. In warmer countries, especially Australia, many species have become naturalised. There is little information on the occurrence of hybrids, but many species show considerable variation and sometimes precise identification of isolated alien plants is not possible. In the British Isles 51 species of *Eragrostis* are known to have occurred as aliens, some in wool waste or shoddy, and some around docks or, more rarely, on waste tips. To date only 35 of these species have been recorded in the literature, and the rest are here listed for the first time, although many have been represented as herbarium specimens for many years. Probst (1949) listed 35 species of *Eragrostis* from wool in Europe, nearly all of which have since been found in the British Isles. Species of *Eragrostis* have undoubtedly been under-recorded in the past in the British Isles; for example, Hayward & Druce (1919) identified only one species. The surprisingly large total presented in this paper has resulted from:

a. the expert identification readily given by the late Dr C. E. Hubbard, who had an unrivalled knowledge of the genus;
b. several exceptionally rich localities, notably Blackmoor, N. Hants, v.c. 12, and around Maulden, Beds., v.c. 30;
c. extensive collections of material, mostly from Blackmoor (where the use of wool waste is now discontinued), some of which were grown in frost-free surroundings to obtain semi-mature inflorescences, particularly from 1970 to 1975.

Several species other than the 51 listed here have been recorded. *E. verticillata* (Cav.) P. Beauv. has been recorded by J. E. Lousley, but with no detail. *E. articulata* (Schrank) Nees is in **RNG**; this species resembles young *E. schweinfurthii*, as do specimens of *E. racemosa* in **RNG**, **herb. E.J.C.** and **herb. T.B.R.** Specimens of *E. setifolia* (or *E. falcata* (Gaudich.) Gaudich. ex Steudel) in several collections may well be immature *E. lacunaria* or *E. dielsii*. The specimen labelled *E. capillaris* in **RNG** was incorrectly identified and is, in fact, *E. trachycarpa*. In Europe a few other alien species have been recorded recently, particularly from Sweden and Holland, adding to the earlier records listed by Probst (1949). In this account *E. subulata* Nees has been included in *E. curvula*.

CONSTRUCTION OF THE KEY AND ANNOTATED LIST

The artificial key has been constructed using many reference books (Black 1960, Bogdan 1958, Bor 1968, Cabrera 1970, Clayton 1972, Hitchcock 1950, Norton 1971, de Winter 1955), examination of specimens in the author's herbarium, and notes from Dr C. E. Hubbard.

The list of species gives brief details of native distribution, localities and the frequency of records in the British Isles, and several representative herbaria (certainly not a complete list) where specimens are held. Most species have occurred at Blackmoor, but the numerous individual detailed records have been omitted (see Lousley (1961), Dony (1969) and Ryves (1974) for many earlier records). Specimens of nearly all of the listed species were identified by Dr C. E. Hubbard.

In addition to contrasting characters, the key contains additional information, not readily available elsewhere, to aid the identification of these aliens. The 'collar' is the outer side of the leaf at the junction of blade and sheath; this zone is often a distinctive colour.

ARTIFICIAL KEY

1 Rhizomatous perennial 10–45 (60) cm with a dense tuft of short (<10 cm) glaucous, expanded basal leaves; spikelets *c.* $5 \times 1{\cdot}5$ mm; lemma purplish below with yellow tip .. .. 1. *E. bicolor*
1 Different combination of characters
 2 Annual; leaf-margins with prominent warty glands (not bulbous-based hairs) (also *E. neomexicana*, *E. procumbens* occasionally); panicle <20 cm; grain without dorsal pit
  3 Leaves glabrous; pedicel without prominent gland; spikelets 2–4 mm wide, often olive or grey; lemmas 2–2·8 mm .. .. 2. *E. cilianensis*
  3 Leaves often with sparse, coarse hairs; pedicels with gland; spikelets 1·3–2 mm wide, often purplish; lemmas 1·5–2 mm .. .. 3. *E. poaeoides*
 2 Leaf-margins without prominent glands (except *E. neomexicana*, *E. procumbens* occasionally)
  4 Culm-nodes with ring of glandular tissue below; pedicels with gland
   5 Annual; axillary panicles <20 cm, exserted from lower sheaths; spikelets $5\text{–}15 \times 1{\cdot}5\text{–}2$ mm, yellow-green .. .. 4. *E. barrelieri*
   5 Perennial; panicles >20 cm; spikelets *c.* $7\text{–}10 \times 2$ mm, grey-green .. 5. *E. leptostachya*
  4 Culm-nodes without ring of glandular tissue below; branch axes with glandular tissue occasionally; pedicels without gland
   6 Annual; sheaths with many prominent circular glands, with or without stout hairs; spikelets $5\text{–}8 \times 1{\cdot}5\text{–}3$ mm
    7 Culms 40–100 cm; leaves 5–10 mm wide; panicle large, 20–40 cm, with ascending branches; spikelets with 8–12 florets .. .. 6. *E. neomexicana*
    7 Culms <40 cm; panicle small, spreading; spikelets usually with ≤ 7 florets .. .. 7. *E. mexicana*
   6 Sheaths without prominent glands
    8 Spikelets short, ≤ 5 mm, with 3–5 (6) florets (also *E. caesia*, *E. atherstonei*)
     9 Panicle spike-like; spikelets with 3 florets, ≤ 1 mm; glume $>$ first lemma .. .. 8. *E. kennedyae*
     9 Panicle open or very diffuse
      10 Sheath with or without bulbous-based hairs, throat of sheath with tuft of stiff, long, white bristles; panicle open with spikelets on very short pedicels $\pm$ appressed to branches; spikelets with 3–5 florets, ≤ 3 mm .. 9. *E. glandulosipedata*
      10 Panicle very diffuse, with spikelets on long (up to 2 cm) divaricate pedicels
       11 Throat of sheath densely hairy but without glands; spikelets with 2–4 florets *c.* $2\text{–}3 \times 1{\cdot}5$ mm; grain ovoid, rough, 0·5 mm .. .. 10. *E. capillaris*
       11 Ligule and sheath glabrous with scattered, very small glands; spikelets with 3–5 (6) florets; grain spherical, pitted, 0·8 mm .. .. .. 11. *E. trachycarpa*
    8 Spikelets usually ≥ 5 mm long, some with 5–20 florets

12 Spikelets ± ovate (rarely longer), usually ≥3 mm wide
13 Annual; spikelets 5–10 × 3–4 mm; glume < lemma, acute, pale green .. 12. *E. wilmaniae*
13 Perennial; spikelets ± ovate (like *Briza media*)
14 Spikelets distant on branches, 3–5 × 3–4 mm; pedicels up to 3 mm; palea ciliate on keel .. .. 13. *E. obtusa*
14 Spikelets clustered on branches, 4 × 2·5–3 mm; pedicels shorter; palea with short wing on keel .. .. 14. *E. echinochloidea*
12 Spikelets linear to elliptic
15 Leaves short, rigid; spikelets terete, very narrow, very long (often >20 mm), with imbricate lemma
16 Panicle contracted; spikelets sessile, clustered, ± curved, usually pale green; lemma tightly imbricate .. .. 15. *E. dielsii*
16 Panicle diffuse; spikelets distant, pedicelled, ± straight, often purplish; lemma loosely imbricate .. .. 16. *E. lacunaria*
15 Spikelets linear, lanceolate to elliptic, not terete, with lemma ± overlapping
17 Basal sheath strongly compressed, glabrous, spreading like a fan; spikelets appressed, 6–10 × 2 mm, shiny olive-green (resembles *Diplachne fusca*); glumes very short, unequal; grain 1·5 mm, compressed, bumpy .. 17. *E. plana*
17 Basal sheath not strongly compressed
18 Culm slightly flattened and angled, very straight with very hairy sheath; collar very indistinct; panicle and spikelets as in *E. curvula* .. *18. E. planiculmis*
18 Culm terete; collar ± conspicuous
19 Panicle interrupted, spike-like, with spikelets in dense, sessile clusters along axis; spikelets 3–6 × 2 mm .. .. 19. *E. elongata*
19 Spikelets not in dense clusters along axis of panicle
20 Perennial; panicle lax, open; spikelets with lemmas free for most of their length, finally spreading out to show a saw-tooth margin .. 20. *E. tenuifolia*
20 Spikelets with lemmas not spreading out conspicuously, loosely or tightly overlapping
21 Mature spikelets ≥1·5 mm wide, often 4 times as long as wide (see *E. curvula*, *E. macilenta*, with spikelets up to 2 mm wide)
22 Annual; pedicels ≤ spikelets
23 Culms up to 35 cm; leaves mostly basal, up to 7 cm, covered and bordered with bulbous-based, coarse hairs; panicle loose and spreading, with short (up to 3 cm) simple branches spreading at 90°, bearing up to 6 spikelets; spikelets *c.* 5 mm .. .. 21. *E. schweinfurthii*
23 Different details
24 Panicles contracted, spike-like, with spikelets in dense clusters on branches; axillary panicles present; spikelets *c.* 7 mm .. 22. *E. procumbens*
24 Panicle rather lax, spike-like, with 3–5 spikelets on each branch; branches short, ascending, appressed; spikelets 8–10 mm .. 23. *E. kiwuensis*
22 Perennial
25 Panicle divaricate, effuse; pedicels 1–3 cm, > spikelets (up to 1 cm); lemma 3 mm, acute (also *E. molybdea*) .. .. .. 24. *E. patentissima*
25 Panicle dense, or spike-like, or open; pedicels usually < spikelets; lemma usually <3 mm (see *E. molybdea*)
26 Panicle spike-like, *c.* 10 × 1 cm; spikelets 4–7 × 1·5–2 mm, with 2–7 florets; lemma 2–3 mm, with elongate black spots near nerves .. .. 25. *E. caesia*
26 Different details
27 Culm-base bulbous, slightly woody; panicle spike-like, 12 × up to 3 cm; spikelets 8–20 × 1·5 mm; lemma *c.* 2 mm, soon diverging .. .. 26. *E. setifolia*
27 Different details, panicle usually not spike-like
28 Rhizomatous; leaves up to 20 cm; panicle open or contracted, with spikelets clustered on branches; spikelets 4–15 mm; palea

falling with lemma at maturity; stamens 3; grain spindle-shaped, ≤ 1 mm .. .. 27. *E. atrovirens*

28 Palea persisting after lemma falls at maturity

29 Panicle very open; pedicels 3–15 mm; spikelets up to 1 cm; lemma 3 mm; grain oblong, with truncate ends and deep ventral groove, *c.* 1 mm .. .. 28. *E. molybdea*

29 Panicle various; pedicels $\leq$ spikelets; lemma $<$ 3 mm; grain $\pm$ ovoid, ≤ 1 mm

30 Culms up to 45 cm; leaves up to 7 cm, often very hairy; panicle rather dense, oval-elliptic, *c.* 7×3 cm; spikelets distant on short spreading branches; lower glume $<$ 1 mm; lemma 1·5 mm; grain $\leq$ 0·5 mm .. .. 29. *E. neesii*

30 Panicle different; glumes *c.* 1·5 mm; lemma *c.* 2 mm; grain $>$ 0·5 mm

31 Resembles *E. schweinfurthii*; culms up to 100 cm but panicle narrower .. .. 30. *E. racemosa*

31 Different details

32 Without rhizomes; spikelets $\pm$ densely clustered on stiff branches; spikelets 5–10 mm, with 6–24 closely packed florets; palea-margin conspicuously ciliate; stamens 2; grain oblong-ovoid, 1 mm (resembles *E. atrovirens*) .. .. .. 31. *E. bahiensis*

32 Spikelets $\pm$ clustered on longer, $\pm$ flexuous branches; spikelets 5 mm, with *c.* 10 looser florets; grain obovoid, *c.* 0·6 mm

33 Panicle contracted or open; spikelets *c.* 2 mm wide; palea-margin hardly ciliate (can resemble *E. elongata*) .. 32. *E. brownii*

33 Panicle finally open, with less clustered spikelets on branches; mature spikelets brittle (rhachilla easily fracturing), breaking from the top downwards; spikelets *c.* 1·7 mm wide; palea-margin shortly ciliate .. .. 33. *E. philippica*

21 Mature spikelets $\leq$ 1·5 mm wide (see *E. curvula*, *E. macilenta*), often $>$ 5 times as long as wide

34 Perennial

35 Top of sheath very hairy; leaves $\pm$ hairy, flat; panicle diffuse, *c.* 15×15 cm; spikelets lanceolate, 3–4 mm; lemmas acute, closely overlapping .. .. 34. *E. lugens*

35 Top of sheath usually not very hairy; spikelets linear to lanceolate, $\geq$ 4 mm; lemmas rather loose

36 Basal branches whorled ($\geq$ 3 branches)

37 Base of branches with tuft of hairs; spikelets 5×1–1·5 mm, with 3–5 florets; lemmas $\geq$ 2 mm .. .. 35. *E. atherstonei*

37 Base of branches without tufts of hairs; spikelets *c.* 9×1 mm, with 6–16 florets; lemmas $\leq$ 1·5 mm, obtuse .. .. 36. *E. rotifer*

36 Basal branches single or sub-opposite

38 Panicle *c.* 20×20 cm; pedicels sub-sessile, $<$ 2 mm; spikelets with 10–12 florets; grain $\pm$ spherical (see *E. parviflora, E. pilosa, E. leptocarpa*) .. .. 37. *E. microcarpa*

38 Some pedicels $\geq$ 2 mm; grain oblong

39 Culms rooting at the nodes; nodes usually hairy .. .. 38. *E. barbinodis*

39 Culms usually not rooting at nodes; nodes $\pm$ glabrous

40 Glumes very unequal; lemmas narrow, acute, angular, scabrous .. .. 39. *E. heteromera*

40 Glumes $\pm$ equal; lemmas $\pm$ obtuse, blunt, membranous

41 Culms branched, geniculate, 30–60 cm; lower sheath papery with rounded well-separated nerves; spikelets 1(–1·5) mm wide; lemmas *c.* 1·5 mm .. .. 40. *E. lehmanniana*

41 Culms unbranched, erect or geniculate, 30–120 cm; lower sheath tough with flattened close-set ribs; spikelets 1·5(–2) mm wide; lemmas 2–2·5 mm

42 Leaves filiform, curling, rather short; panicle open, lax; spikelets spreading .. .. 41. *E. chloromelas*

42 Leaves ± narrow, not curling, long; panicle lax or contracted; spikelets usually appressed .. .. 42. *E. curvula*

34 Annual

43 Collar with fringe of stiff hairs; panicle axils hairy; spikelets breaking up from top downwards; lemma and palea falling together, enclosing the grain; spikelets 4–9 × 1–1·5 mm, with 4–16 florets; lemma obtuse .. .. 43. *E. aspera*

43 Spikelets breaking up from base upwards; lemma falling before palea

44 Spikelets narrow 3–6 × 0·8 mm, pale grey; lemmas 1·5–2 mm, scabrous or with short appressed hairs; grain oblong-linear, *c.* 1 mm .. .. 44. *E. leptocarpa*

44 Spikelets ≥1 mm; lemmas ± glabrous to slightly hairy or scabrous; grain oblong to ovoid

45 Throat of sheath without tuft of long hairs (see *E. macilenta*)

46 Panicle up to 15 cm; spikelets 3–6 × 1·5 mm; lemmas acute; palea ≤2/3 lemma; grain oblong, *c.* 0·7 mm .. .. 45. *E. multicaulis*

46 Leaves flat with a pale midrib; panicle up to 25 cm, with spikelets appressed along branches; spikelets 3–10 × 1 mm, usually very dark brown; lemmas obtuse; palea *c.* 2/3 lemma; grain ovoid, *c.* 0·6 mm .. .. 46. *E. parviflora*

45 Throat of sheath (when young) with conspicuous tuft of long (2 mm), white, stiff hairs

47 Panicle very diffuse, *c.* 15 cm wide, with sub-opposite or single branches spreading divaricately; spikelets not clustered; spikelets oblong 3–6 × 1–2 mm, very dark or black; grain oblong, *c.* 0·6 mm .. .. 47. *E. macilenta*

47 Panicle diffuse or loosely contracted, often with whorled branches; spikelets usually linear, often pale

48 Immature spikelets with upper lemma < lower lemma

49 Branch axils glabrous; spikelets often yellow-green; lower lemma 2–3 mm; grain ovoid, 1–1·5 mm .. .. 48. *E. tef*

49 Branch axils usually with long, white hairs; spikelets purplish grey; lower lemma *c.* 1·5 mm; grain oblong, 0·5–1 mm .. 49. *E. pilosa*

48 Branch axils glabrous or hairy; spikelets yellow-green to purple-green; in immature spikelets upper lemma equalling lower lemma, *c.* 1·5 mm

50 Culms 20–70 cm; spikelets 4–6 × 1 mm; grain ovoid with wide, shallow ventral pit, *c.* 1 mm .. .. 50. *E. virescens*

50 Culms 15–25 cm; spikelets 4–6 × 1·5 mm; grain ovoid, without pit, *c.* 1 mm .. .. 51. *E. pectinacea*

ANNOTATED LIST OF SPECIES

The name, distribution and alien habitat in the British Isles are given. Distributions in italics indicate that the occurrence is adventive. Frequency is expressed as: (VR) = very rare, one to three records; (R) = rare, four to ten records; (Oc) = occasional, eleven to 20 records; (Fr) = frequent, more than 20 records. Representative herbaria where specimens are held are given, usually **K** and **RNG**. The private collections of T. B. Ryves **(herb T.B.R.)** and E. J. Clement **(herb E.J.C.)** are occasionally cited. Brackets indicate the originator of the record when the location of the specimen is uncertain.

1. *E. bicolor* Nees. South Africa. Wool alien (VR). **RNG.**
2. *E. cilianensis* (All.) F. T. Hubbard. *Europe*, Mediterranean, Asia, *South Africa, America, Australia.* Occurs as a wool alien (Fr), in bird seed (VR) and on tips (R). **BM, K, RNG.**
3. *E. poaeoides* P. Beauv. *Europe*, the Mediterranean, Asia, *South Africa, America, Australia.* Occurs as a wool alien (Fr), in bird seed (VR) and on docks (VR). **RNG, LTN.**
4. *E. barrelieri* Daveau. *Europe*, the Mediterranean, Asia, *South Africa, America, Australia.* Occurs as a wool alien (Oc) and on docks (VR). **RNG, LTN.**
5. *E. leptostachya* Steudel. Australia. Wool alien (R). **K, E, RNG.**
6. *E. neomexicana* Vasey. North and *South* America, *Australia.* Occurs as a wool alien (VR), on tips (VR) and on docks (VR). **RNG, LTN.**
7. *E. mexicana* (Hornem.) Vasey. North America, *Australia.* Wool alien (VR). (J. G. Dony).
8. *E. kennedyae* F. Turner. *Australia.* Wool alien (VR). **E, herb T.B.R.**
9. *E. glandulosipedata* De Winter. South Africa. Wool alien (VR). **Herb T.B.R.**
10. *E. capillaris* (L.) Nees. North America. (G. C. Druce).
11. *E. trachycarpa* (Bentham) Domin. Australia. Wool alien (Oc). **K, E, RNG.**
12. *E. wilmaniae* C. E. Hubbard & Schweich. South Africa. Wool alien (VR). **Herb T.B.R.**
13. *E. obtusa* (Munro ex Ficalho) Hiern. South Africa. Wool alien (R). **K, RNG.**
14. *E. echinochloidea* Stapf. South Africa. Wool alien (VR). **RNG, herb T.B.R.**
15. *E. dielsii* Pilger. Australia. Wool alien (R). **K, E, RNG.**
16. *E. lacunaria* F. Mueller. Australia. Wool alien (R). **K, E, RNG.**
17. *E. plana* Nees. Africa. Wool alien (Oc). **RNG, herb T.B.R.**
18. *E. planiculmis* Nees. South Africa. Wool alien (VR). **Herb T.B.R.**
19. *E. elongata* Jacq. Australia. Wool alien (VR). **RNG.**
20. *E. tenuifolia* Hochst. ex Steudel. Africa. *Australia.* Wool alien (VR). **K, RNG.**
21. *E. schweinfurthii* Chiov. Africa. Wool alien (R). **K, E, RNG.**
22. *E. procumbens* Nees. South Africa. Wool alien (R). **RNG.**
23. *E. kiwuensis* Jedw. Africa. Wool alien (VR). **K, E, RNG.**
24. *E. patentissima* Hackel. South Africa. Wool alien (VR). **K, RNG.**
25. *E. caesia* Stapf. Wool alien (VR). **E, RNG.**
26. *E. setifolia* Nees. Australia. Wool alien (VR). (J. E. Lousley, M. McCallum Webster).
27. *E. atrovirens* (Desf.) Trin. Africa. Wool alien (VR). **K, RNG.**
28. *E. molybdea* Vickery. Australia. Wool alien (R). **Herb T.B.R.**
29. *E. neesii* Trin. South America. Wool alien (R). **K, E, RNG.**
30. *E. racemosa* (Thunb.) Steudel. Africa. Wool alien (VR). **E, herb E.J.C.**
31. *E. bahiensis* Schrader. *North* and South America. Wool alien (R). **K, herb T.B.R.**
32. *E. brownii* Nees ex Steudel. Australia. Wool alien (Oc). **K, RNG.**
33. *E. philippica* Jedw. Australia. Wool alien (R). **K, E, RNG.**
34. *E. lugens* Nees. America. Wool alien (Oc). **K, E, RNG.**
35. *E. atherstonei* Stapf. Africa. Wool alien (VR). **RNG, herb T.B.R.**
36. *E. rotifer* Rendle. South Africa. Wool alien (VR). **K.**
37. *E. microcarpa* Vickery. Australia. Wool alien (VR). **RNG.**
38. *E. barbinodis* Hackel. South and East Africa. Wool alien (VR). **K.**
39. *E. heteromera* Stapf. Africa. Wool alien (R). **Herb T.B.R.**
40. *E. lehmanniana* Nees. South Africa. Wool alien (Oc). **K, E, RNG.**
41. *E. chloromelas* Steudel. South Africa. Wool alien (Oc). **K, E, RNG.**
42. *E. curvula* (Schrader) Nees. South Africa, *America, Australia.* Wool alien (Fr). **K, E, RNG.**
43. *E. aspera* (Jacq.) Nees. Africa. Wool alien (VR). **RNG.**
44. *E. leptocarpa* Bentham. Australia. Wool alien (VR). **Herb T.B.R.**
45. *E. multicaulis* Steudel. *Europe, North* and *South America,* Asia. Occurs in grain (VR). (A. Copping).
46. *E. parviflora* (R. Br.) Trin. Australia. Wool alien (Fr). **K, E, RNG.**
47. *E. macilenta* (A. Richard) Steudel. Africa. Wool alien (R). **K, E, RNG.**
48. *E. tef* (Zucc.) Trotter. Africa. Occurs as a wool alien (Oc), in bird seed (VR) and as an ornamental (VR). **K, E, RNG.**
49. *E. pilosa* (L.) P. Beauv. Europe, Asia, the Mediterranean, *South Africa, America, Australia, Jersey.* Occurs as a wool alien (R), on tips (VR) and on docks (VR). **K, E, RNG.**

50 *E. virescens* C. Presl. South America, *Europe, South Africa*. Occurs as a wool alien (R) and on tips (VR). **RNG, herb T.B.R.**

51. *E. pectinacea* (Michx) Nees. North and *South* America. Occurs as a wool alien (VR) and on docks (VR). **K, E, RNG**.

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I am most grateful to Dr C. E. Hubbard for the identification of most of the collected specimens. Details of herbarium specimens were provided by J. E. Lousley, Dr and Mrs J. G. Dony, and Miss M. McC. Webster. E. J. Clement and Mrs S. Foster have notified me of many interesting records.

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Short Notes

A POSSIBLE SCENT DIFFERENCE BETWEEN *CRATAEGUS* SPECIES

An unpublished letter from R. P. Murray to E. F. Linton on 21 May, 1900, now among the latter's papers in the library of the Department of Botany, British Museum (Natural History), contains the following passage:

> 'When in Switzerland we had plenty both of *C. monogyna* and *C. oxyacanthoides*: the latter flowering a week or two earlier than *C. monogyna*. But I often gathered a lot of *C. oxyacanthoides* for decorative purposes: and tho' in smell quite like the other form when gathered, it used to absolutely *stink* of putrid flesh soon after:–sometimes within about half an hour. I do not remember that this *ever* occurred with *C. monogyna*.'

Murray goes on to suggest that it was this horrible smell that gave rise to the superstition found in many parts of western and central Europe that, if *Crataegus* blossom is brought into a house, death will occur there within a year.

Lecoq & Lamotte (1847) may have been the first to note the difference in flowering-time: in central France they found *C. laevigata* (Poiret) DC. (*C. oxyacanthoides* Thuill.) began 8–10 days earlier and was almost in full flower when *C. monogyna* Jacq. was first opening. In the English Midlands I have noticed that the time-interval is much the same, *C. monogyna* not normally opening before about the middle of May. In view of this it seems hardly possible for *C. monogyna* to have been the species whose first flowering was anciently such a matter of intense concern, particularly in England and France, that it is believed to have formed the centrepiece of the pre-Christian rites associated with the advent of spring. For before the change in the calendar in 1732 May Day fell thirteen days later than now–a date by which *C. monogyna* would not have been a sufficiently dependable flowerer to serve such a purpose, at any rate over much of England. While it is true that periods of more benign climate in the past will have made for earlier flowering, equally the adverse conditions that set in during the second half of the first millennium B.C. and those that prevailed through the medieval 'little Ice Age' will have operated to the contrary. It should also be borne in mind that the observed difference in flowering-time tends to be based on populations occurring in hedges, a habitat in which both species are liable to be relatively impure. If populations unaffected by crossing were to be studied exclusively, the difference would probably be found to be appreciably greater.

C. laevigata, accordingly, would seem to have been the original May-flower. This supposition would be considerably strengthened if Murray's finding that it is this species alone whose flowers are so pungently scented is correct. Grigson (1955) indeed has already made the suggestion that it was this putrid odour of trimethylamine that was responsible for fertility beliefs having become so powerfully attached to *Crataegus* in the first place.

Before the very extensive use of *C. monogyna* for hedging during the last three centuries or so, it may well have been a comparatively local plant, confined to fen carr, limestone ashwoods and downland scrub. In such habitats var. *laciniata* (Wallr.) Ledeb., with particularly deeply-cut leaves (allegedly in combination with greater thorniness (Elliott 1898), a tendency to flower less freely (Lees 1888), more slender shoots and smaller fruits), is especially common and Moss (1913) was led by this to suggest that it represents the original indigenous variety. It may in fact be 'true' *C. monogyna*, free of any *C. laevigata* influence.

The readiness with which the two species cross implies that they must once have been well separated ecologically. If *C. laevigata* was originally confined to the fairly deep shade on heavy clays where it now occurs most characteristically, this is likely to have been the case. Insofar as it is today a plant of hedges, it tends to feature only in those dating from 1,000 years ago or more (M. D. Hooper oral comm. 1974), suggesting that it owes its presence in this habitat to the assarting burst of late Saxon times, when it was evidently the practice for hedges to be created by being cut out of forest instead of being planted. On this assumption non-woodland *C. laevigata* is essentially a human artefact.

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D. E. Allen

FLIMWELL: EAST SUSSEX OR WEST KENT?

Dr Stace recently drew my attention to the fact that the records for *Lobelia urens* L. from Flimwell would have to be transferred from E. Sussex, v.c. 14, to W. Kent, v.c. 16, if the boundary dividing these two vice-counties as published in Dandy (1969) is correct.

The following one-inch to the mile (1:63,360) Ordnance Survey maps were compared:

Sheet 183. One-Inch Series, fully revised 1967, major roads revised 1969, printed in 1969, in my possession and marked by me some years ago to show the vice-county boundary, as shown on the set of maps in the Department of Botany, British Museum (Natural History). Referred to hereafter as Sheet 183.

Sheet 5. Published 1st February 1813, by Lt Col. Mudge. Tower., no survey date, library stamp dated 13th November, 1880, in the University Library, Cambridge. Catalogued as *Ordnance Survey 1805–73*. Ordnance Survey of England & Wales. Scale of 1 inch to a Statute Mile, 1:63,360 (1st Ed.) London 1805–73. Referred to hereafter as Sheet 5 (1813).

Sheet 5. Published 1st February, 1813, by Lt Col. Mudge. Tower., no survey date, no library stamp, dated in pencil (1858) in the University Library, Cambridge. Catalogued as *Ordnance Survey 1809–66*. Ordance Survey of England & Wales. Scale of 1 inch to a Statute Mile, 1:63,360 (Reprints from electrotypes, showing railways, various editions, with sheets dated 1809–66) London (*c*.1844–66). Referred to hereafter as Sheet 5 (1858?). Note: for 'various editions' one could, I believe, more accurately say 'various states'.

The county boundary in question was examined between GR 51/742.286 and 51/696.319. Sheet 5 (1813) shows the boundary as Dandy (1969). Sheet 5 (1858?) shows the boundary following the modern official county boundary line as marked on Sheet 183. The obvious conclusion from the examination of the foregoing Sheets is that a boundary change took place between 1813 and *c*.1858. Therefore, a brief search was made to ascertain when the change occurred, with unexpected results.

In Salzman (1937) there is a reproduction of Bugden's Map of Sussex, 1724, opposite page 1. This clearly shows the boundary following the official county boundary line as marked on Sheet 183. On page 252 is the following statement: 'Until 1836 the civil and ecclesiastical parishes of Ticehurst coincided; but in 1836 Stonegate and in 1839 Flimwell were made into chapelries and afterwards ecclesiastical parishes.' On page 257 'The church of St. Augustine at Flimwell built in 1839 . . . is a vicarage in the gift of the Bishop of Chichester.' These statements taken together indicate clearly that Flimwell has always been part of Sussex. Further references are given which show that the boundary in 1742 is identical with the boundary in 1451 and that Flimwell was always in Sussex.

Further supporting evidence comes from Copley (1977a, 1977b), where reproductions of maps of Kent and Sussex published by John Stockdale, Piccadilly, London, on 26th March, 1805, show that Flimwell was in Sussex. The boundary follows the official county boundary line as marked on Sheet 183.

I conclude that Sheet 5 (1813) marked the county boundary in the wrong position. The error would obviously have been noticed by many people and was corrected by the time Sheet 5 (1858?) appeared.

Vice-counties are defined in Watson (1859) where Watson states: 'To facilitate recognition the course of the dividing lines shall be given here by verbal explanation, adapted to the maps of England and Scotland, published under the auspices of the 'Society for the Diffusion of Useful Knowledge'.' This statement is repeated in both editions of Topographical Botany.

I examined Map 21 England, V., South-East. Wiltshire to Kent., scale 69.1 English Miles = One Degree, published by Baldwin and Cradock on June 15th, 1830, in *Maps of the Society for the Diffusion of Useful Knowledge*, in the University Library, Cambridge. This clearly shows the boundary between Kent and Sussex between GR 51/742.286 and 51/696.319 following the line shown on Sheet 5 (1813) and in Dandy (1969).

Thus, due to a series of errors and despite the fact that Flimwell is and always has been in Sussex, Flimwell is in botanical vice-county 16, W. Kent. The argument could be put forward that as Watson's boundary is based on an error the error should be corrected. I reject this reasoning because vice-county boundaries are only useful if they remain unchanged. Therefore, *Lobelia urens* must be omitted from the flora of E. Sussex, v.c. 14, and added to that of W. Kent, v.c. 16.

A comparison of the boundaries as shown on Ordnance Survey Sheet 4 (1816), Sheet 4 (1857?), Sheet 6 (1819) and Sheet 6 (1853?) with Map 21 of the Society for the Diffusion of Useful Knowledge revealed only one other variation between GR 51/435.401 and 51/987.180. This is at Tunbridge Wells, where the line followed by the boundary on Sheet 6 (1819) differs from that on Sheet 6 (1853?). The line followed on Map 21 is very close to that taken by Sheet 6 (1853?). I therefore conclude that the vice-county boundary as published in Dandy (1969) between E. Sussex, v.c. 14, on the one hand, and W. Kent, v.c. 16, and E. Kent, v.c. 15, on the other, is correct.

ACKNOWLEDGMENTS

I am indebted to P. C. Hall, E. G. Philp and C. A. Stace for many helpful comments and corrections.

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J. Bevan

A NEW BRAMBLE FROM EAST ANGLIA

The bramble described below is widely distributed in Norfolk and Suffolk, occurring in the four vice-counties 25-28. It probably extends into N. Essex, v.c. 19, as well, since specimens gathered from a roadside wood near Birch, GR 52/93.20, on 18th July, 1978, seem to be this species. But its main area of distribution is the country east of a line from King's Lynn to Ipswich. It does not shun clay but is most abundant on sands and gravels, especially near Norwich and the E. Suffolk coast. It has been recorded for the following 10 km squares: 52/79, 87, 88; 53/60, 61, 70, 71, 72, 73, 90, 91, 93; 62/08, 19, 24, 25, 27, 28, 29, 34, 35, 39, 45, 46, 47, 48, 49, 58, 59; 63/00, 03, 04, 10, 11, 14, 20, 21, 23, 30, 31, 40, 41. A specimen from Geldeston, GR 62/40.92, E. Norfolk, v.c. 27, was sent to Professor H. E. Weber who replied that it did not match any Continental species known to him. The name commemorates the East Anglian queen who defied the Romans.

Rubus boudiccae A. L. Bull & E. S. Edees, **sp. nov.**

Turio alte arcuatus, angulatus, rubescens, glaber vel subglaber, aculeis *c.*5–10 per 5 cm, ad angulos dispositis, 5–8 mm longis, subpatentibus vel declinatis, basi rubris. Folia pedata; foliola 3–5, vulgo non contigua, superne parce strigosa, subtus pilis simplicibus saepe etiam stellatis molliter vestita; foliolum terminale *c.*6 × 4–5 vel 9 × 7 cm, obovatum vel late ellipticum vel suborbiculare, breviter cuspidatum, basi subintegrum vel subcordatum, irregulariter serratum, interdum convexum, nonnunquam longe petiolulatum. Ramus florifer flexuosus, rubescens, praesertim ad apicem pubescens, aculeis 3–7 mm longis declinatis vel curvatis praeditus; inflorescentia inferne foliosa ramulis adscendentibus distantibus axillaribus aucta, superne aphylla e ramulis brevibus paucifloris erecto-patentibus composita. Flores *c.*3 cm diametro; sepala griseo-viridia, albo-marginata, tomentosa, reflexa; petala *c.*14 × 8 mm, elliptica, alba vel dilute rosea; stamina alba stylos virides multo superantia; carpella glabra; receptacula pilosa; fructus satis magni, sapidi.

Stem high-arching, angled with flat or slightly furrowed sides, green to bright red, glabrous or glabrescent with scattered, short and very short, simple and tufted hairs and with a few sessile and subsessile glands; prickles 5–10 per 5 cm, on the angles, the majority subequal, 5–8 mm, with a long compressed base, straight or slightly upturned, patent or declining, bright red with yellow point. Leaves pedate; leaflets (3 –)5, usually not contiguous, deep green, with sparse to numerous, adpressed, short simple hairs above, soft and often grey-felted beneath with numerous short simple hairs and an underlayer of dense stellate hairs; terminal leaflet *c.*6 × 4–5 or 9 × 7 cm, obovate or obovate-elliptical, sometimes with nearly straight sides, or nearly round, with a short (0.5–1 cm) cuspidate point and subentire or emarginate or subcordate base, evenly or irregularly serrate or serrate-dentate, flat or convex, the petiolule 1/3 to 1/2 as long as the blade; petiolules of basal leaflets 3–6 mm; petiole usually longer than the basal leaflets, with sparse to numerous, short, simple and tufted hairs, scattered sessile and very short stalked glands and *c.*10 declining or curved prickles 3–5 mm. Flowering branch with 3–5-foliate leaves below and often 1–2 simple leaves above, not leafy to the apex; inflorescence compact or lax above, with 1–3-flowered peduncles 2–4 cm, and, when well developed, with one or more distant axillary peduncles usually shorter than but sometimes nearly as long as their leaves; rachis flexuose, green or red, with numerous spreading, short, simple and tufted hairs, numerous to dense stellate hairs, sparse to numerous sessile and subsessile glands and frequent declining or curved prickles 3–7 mm; pedicels clothed like the upper part of the rachis, with few slender prickles 1–2 mm or unarmed. Flowers *c.*3 cm in diameter; sepals greyish-green with white margin, felted, hairy, short-pointed, reflexed; petals *c.*14 × 8 mm, white or pale pink, elliptical, more or less entire, flat, not contiguous, with sparse short or very short simple hairs on the margin; stamens much longer than styles, filaments white, anthers glabrous; styles green; young carpels glabrous or slightly hairy; receptacle hairy; fruit fairly large, of good quality and flavour, but sometimes ripening unevenly, dull red before turning black.

HOLOTYPUS: Ringland Hills, GR 63/13.12, E. Norfolk, v.c. 27, *E. S. Edees* with *A. L. Bull* 21706 (**BM**)

In addition to the holotype the following exsiccata are representative:
Colney Wood, GR 63/167.080, E. Norfolk, v.c. 27, 24/7/1977, E.S.E. with A.L.B., **herb. E.S.E.**
Easton Lodge, GR 63/144.120, E. Norfolk, v.c. 27, 20/7/1977, E.S.E. with A.L.B., **herb. E.S.E.**
Gawdy Hall Wood, GR 62/250.850, E. Norfolk, v.c. 27, 24/7/1977, E.S.E. with A.L.B., **herb. E.S.E.**
Dunwich Common, GR 62/47.68, E. Suffolk, v.c. 25, 3/8/1978, A.L.B., **herb. A.L.B., herb. E.S.E.**
Chedgrave, GR 62/35.99, E. Norfolk, v.c. 27, 18/7/1978, A.L.B., **herb. A.L.B., herb. E.S.E.**
Covehithe, GR 62/51.81, E. Suffolk, v.c. 25, 9/8/1978, A.L.B., **herb. A.L.B., herb. E.S.E.**
Ashby Dell, GR 63/49.00, E. Suffolk, v.c. 25, 17/7/1978, A.L.B., **herb. A.L.B., herb. E.S.E.**

R. boudiccae can usually be separated from related brambles in the field without difficulty by the combination of leaf characters, glabrous, often red stem and large, white flowers. Professor Weber considers it not far from *R. polyanthemus* Lindeb. and perhaps derived from it, but *R. polyanthemus* has more finely toothed terminal leaflets with a less indented base and longer point, pink petals and a moderately hairy stem. Some herbarium specimens of *R. boudiccae* seem to resemble *R. maassii* Focke ex Bertram which has not yet been reliably recorded for the British Isles. There is a good series of authentic specimens of *R. maassii* in **MANCH** which we have compared with *R. boudiccae*. Some of the stem-leaves of the English and Continental specimens seem identical in shape, colour, texture and toothing, but others are less close. The leaflets of *R. boudiccae* are often felted and usually more coarsely serrated. *R. boudiccae* is perhaps most closely related to *R. cardiophyllus* Muell. & Lefèv. but has a distinct appearance in the field. The terminal leaflets are more often elliptical and tend to be convex rather than concave and the petals are flat.

A. L. BULL & E. S. EDEES

SOLIDAGO × *NIEDEREDERI* KHEK IN BRITAIN

The hybrid *Solidago canadensis* L. × *S. virgaurea* L. was discovered in the Stoder district of Austria by a local schoolmaster called Niedereder in 1900 or 1901, and was named after him by Khek (1905), who gave it a lengthy description in German. Khek saw living material of the plant he described, but it is not clear how much. His publication, in an obscure and long defunct journal, remained the only reference to a natural *Solidago* hybrid in Europe for 70 years. Wagenitz (1964) considered Khek's identification doubtful in the absence of subsequent records. In 1966-75, however, a total of 15 plants of this parentage were found in five localities in Sweden and Denmark. Nilsson (1976), reporting these finds, adduced good reasons for his identification of the plants and, referring to Stace (1975), commented on the absence of British records, presumably with the implication that it is remarkable that British botanists, generally adept at spotting hybrids, should have missed this one. Having found one plant myself in September, 1979, I believe that there are probably more British occurrences, which have been overlooked.

The plant was found at the top of a railway cutting at Swanley, W. Kent, v.c. 16. *S. virgaurea* is only locally to be found in this neighbourhood, but there is quite a large relict population here where the railway cuts through the sandy Woolwich Beds. Post-war housing development has completely altered the character of this part of Kent; the modern boundary of Greater London passes about 150 yards west of the plant. In recent decades there has been ample opportunity for spread of the aggressive alien *S. canadensis*, one plant of which, at the foot of the cutting mentioned, flowers at a few centimetres distance from the native species. There must be many places in Britain and on the Continent where similar circumstances bring the two species together.

The principal characters of the British hybrid, which possesses a combination of the features of the two parents, are: plant forming a clump of tall, purplish-tinged stems which become leafless below; leaves mid green, lanceolate, with a weak longitudinal vein each side of the midrib and a very fine reticulation; inflorescence of numerous non-contiguous branches ascending at a narrow angle to the axis, the branches with reduced leaves in the lower part and rather crowded capitula $\frac{3}{4}$ of the way round the upper part (an abaxial strip being bare), the flowering parts of the branches together forming a cone; pedicels with numerous tiny bracteoles; capitula about twice the size of those of *S. canadensis*, the ligules 2.0–2.5 mm long; achenes not formed (none found in 15 capitula examined).

The most significant difference from Khek's description of his hybrid is that he says that the branches have capitula all round, which would be surprising in a hybrid involving *S. canadensis*, in which the capitula are closely crowded along only the upper sides of the branches. Also, he says that pappus is absent and discusses at some length the curvature of the branches of the inflorescence, which to me seems less important than their number, spacing and the angle they make with the axis. Nilsson's hybrids are not formally described, but their growth-form, height, inflorescence, leaves and capitula are contrasted with those of the putative parents in terms which equally embrace the British plant. He was able to find a small number of well-developed achenes in hybrid plants. Nilsson makes the additional observation, which I have not yet had the opportunity to confirm at Swanley, that the tip of the growing shoot of the hybrid is nodding, as in *S. canadensis*, making possible a ready field separation from *S. virgaurea* even before the plants flower. His paper illustrates this feature as well as a single leaf, an inflorescence and a capitulum of each of the three taxa. The hybrid leaf shown is rather more strongly serrate than that of mine.

Nilsson was able to take advantage of the known self-incompatibility of both parents by a simple experiment. He planted one individual of each species together in a garden isolated as far as possible from more remote individuals outside, and harvested the resulting achenes. With *S. virgaurea* as the ovule parent, but not *S. canadensis*, he was able to raise numerous hybrids. Further hybrid plants were among the progeny from *S. virgaurea* achenes he collected in mixed populations of the two species in two Swedish localities, concentrating on the earliest flowering plants which are most likely to have been fertilized by pollen of *S. canadensis*. This evidence supports the suggestion that the hybrid has occurred undetected in parts of Britain where *S. canadensis* and *S. virgaurea* occur in proximity. Unfortunately no attempt has ever been made to map the occurrence in Britain of the alien species, which is certainly widely naturalized. Several named clones are in cultivation. As these are interfertile and the achenes are dispersed by wind, *S. canadensis* escapes very readily from cultivation.

Artificial hybrids also exist. Nilsson was able to match *Solidago* 'Ballardii', found in a Danish garden, with his natural hybrids. This is one of a number of cultivars listed by Synge (1969, p. 93). I have been unable to find it in the catalogues of herbaceous plants at my disposal, but 'Golden Wings' and 'Mimosa' are available and appear from the very brief descriptions offered to be similar. These are sometimes listed as variants of *S.* × *arendsii* Bergmans, said by Stearn (1956) to be a synonym of *S.* × *hybrida*. Both names were evidently intended to cover a number of interspecific hybrids and therefore have no botanical standing. *S.* × *niederederi* Khek remains the only name for naturally occurring *S. canadensis* × *S. virgaurea*.

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R. M. Burton

THE DISTRIBUTION OF *CAREX RARIFLORA* (WAHLENB.) SM. IN BRITAIN

Of the four members of *Carex* section *Limosae*, three are British, while the fourth, *C. laxa* Wahlenb., ranges in northern Europe and Asia from Finmark to Japan. The three British taxa are all strongly calcifuge, but in other respects have markedly different ecological requirements. *C. limosa* L., a lowland plant of the north and west with small outlying populations in Wessex and East Anglia, is frequently found growing in standing water. *C. magellanica* Lam. (= *C. paupercula* Michx.) is more strictly northern and (though the two are sometimes together) is usually at a higher altitude and in somewhat drier situations. Though characteristically associated with patches of *Sphagnum*, it seems to dislike both swamp conditions and any appreciable flow of water, and its British stations are mostly level shelves of moorland, neither inundated nor sharply drained, at 1,000 to 1,500 feet. *C. rariflora* is in Britain confined to Scotland, and is there purely alpine. It occupies a limited area in the eastern Grampians, with a single outlier in Breadalbane, does not descend below 2,500 feet, and favours flushes in the high tablelands where there is perceptible but not marked movement of the water. A characteristic habitat is a fixed bank of silt in the headwaters of a burn before the gradient steepens. In such situations *C. rariflora* is a member of a fairly constant plant community, frequent associates being the alpine forms of *C. aquatilis* and *C. curta*, with dwarf *C. nigra*.

Though limited in range and confined to a very specialized habitat, *C. rariflora* may be locally very abundant and cannot in any sense be called a rare plant. Nevertheless it may be easily overlooked on account of its tendency, shared with *C. magellanica*, to be, in some seasons, extremely shy-flowering. Even when the dark inflorescences are present, they may escape notice except at anthesis, when the very white stigmas, disproportionately large for the plant, make them temporarily conspicuous. The foliage, however, is very distinct from that of all other sedges, and when the characteristics are known the little fans of greyish leaves, often with recurved tips, may be quickly recognized as forming extensive swards.

It is difficult to define precise localities for *C. rariflora*, as the colonies may be dispersed over a wide area. All recorded stations (with the exception of those in brackets) have been visited since 1970, and are here listed:

(E. Lothian, v.c. 82: a specimen in **K**, labelled 'Dunglass 1823', carries a pencilled annotation in another hand, 'Dumbarton or East Lothian'; but it is hardly possible that the specimen originated in either of these vice-counties.)

(Fife, v.c. 85: in a sheet of *C. limosa* in **CGE**, labelled 'Fifeshire, 1838, J. B. Bell', 3 stems are indubitably *C. rariflora*, but again some confusion must be suspected.)

Mid Perth, v.c. 88: 27/6.5, watershed between Lyon and Rannoch, a small starved-looking colony discovered by R. Mackechnie & E. C. Wallace in 1937, and the only station known in the western Highlands.

E. Perth, v.c. 89: 27/8.8, sources of the Caochan Lub and tributaries, frequent; 27/6.7, Allt a' Chama Choire, local; 37/1.7, Glas Maol and Glen Beg.

Angus, v.c. 90: 37/1.7, locally abundant above Caenlochan, and between Canness and Glen Fiagh; 37/2.7, upper Glen Doll, between Glen Doll and Glen Isla, and very abundant on the tableland thence to Tolmount.

S. Aberdeen, v.c. 92: 37/1.7, head of Allt Coire Fionn; 37/1.8, very abundant south and west of Corrie Kander; 37/2.8, Lochnagar in many places but usually in small quantity.

Easterness, v.c. 96: 27/6.7, Allt Choire Chuirn, sparingly; 27/6.8, near source of the Allt Choire Chais; 27/7.8, Gaick Forest, headwaters of burns flowing into the Allt Garbh Ghaig; 27/8.8, head of Coire Bhran; 27/8.9, Moine Mhor, abundant; 27/9.9, moorland south of Glen Einich, locally abundant; 28/6.0, Glen Banchor, headwaters of burns flowing into Loch Dubh.

Westerness, v.c. 97: 27/4.7, Coire na Coichille, 1979, A. G. Payne (not seen by R.W.D.).

(Dunbarton, v.c. 99: see under E. Lothian, v.c. 82.)

R. W. David

IRREGULAR TIMES OF FLOWERING OF *ONONIS RECLINATA* L.

From time to time during the past ten years observations have been made on a population of *Ononis reclinata* L. at Barafundle Bay on the Stackpole Estate, Pembs., v.c. 45, now owned by the National Trust. Late in 1978 D. H. D. Henshilwood was appointed warden and the site can now be regularly monitored.

On 8th April, 1969, A. J. Richards found about 70 *Ononis reclinata* plants in flower at Barafundle Bay. The record was entered in the card index of the Field Studies Council's Orielton Field Centre but was not published. On 16th June, 1971, D. S. Ranwell, L. A. Boorman and S. B. Evans, without knowledge of the earlier record, discovered the site, a bluff of eroded carboniferous limestone rock about 100m^2 in area with 1,000 or more plants in flower. J. W. Donovan and T. A. W. Davis visited the site on 2nd July, 1971, and on 24th July, 1973, S. B. E. and R. G. Woods again found hundreds of plants which had flowered but were desiccated because of the dry summer. Associated species noted on these visits were: *Agrostis stolonifera*, *Anagallis arvensis*, *Arenaria serpyllifolia*, *Armeria maritima*, *Bromus ferronii*, *Carlina vulgaris*, *Catapodium marinum*, *Centaurea scabiosa*, *Centaurium erythraea*, *Cerastium diffusum*, *Dactylis glomerata*, *Echium vulgare*, *Euphorbia portlandica*, *Festuca rubra*, *Lotus corniculatus*, *Plantago coronopus*, *P. lanceolata*, *Scilla verna*, *Sedum anglicum*, *Thymus drucei*, *Trifolium campestre*, *T. scabrum*.

On 18th September, 1974, T. A. W. D. collected seed for the Kew seed bank. The population was about the same size as in 1971. Most of the plants were dead with ripe seed but a considerable number were still flowering. The seed bank asked for more seed in 1976 and on 10th August the bluff was searched, but not a plant was found. Again, on 17th September, 1977, there were no plants. On 9th June, 1978, S. B. E., S. J. Leach and T. A. W. D. failed to find *Ononis reclinata* at the site and, in view of its apparent absence in three consecutive years, assumed that it was extinct. T. A. W. D. therefore asked for seed from the seed bank in order to reintroduce it. The finding by R. G. W. of two plants in flower in late July did not cause us (S. B. E. and T. A. W. D.) to change our minds on the desirability of sowing the 50 seeds received. On 9th October we sowed them along a contour line between two stakes and proceeded to search the bluff in case R. G. W.'s plants were still recognisable. To our surprise we found ten plants in flower and 130 seedlings which could be expected to flower in the spring of 1979.

On 12th June, 1979, S. B. E. and D. H. D. H. found 35 *Ononis reclinata* plants on the bluff, 30 of them probably survivors from the previous autumn, one about to flower. They assumed that five very small seedlings had germinated in 1979. On 29th June D. H. D. H. found 37 plants, of which ten were flowering. On 26th July a search by D. H. D. H. and R. G. W. revealed dry remnants only, no living plants. It is reasonable to assume that growth of the plants that survived a severe winter was retarded by a cold dry spring. On 2nd October S. J. L. and D. H. D. H. visited the site independently. Eight plants were in flower and fruit, one was already dead, and there were 127 seedlings up to 1 cm high with at most three or four pairs of true leaves, a situation almost exactly like that of October 1978. No plants from the seed bank seed were found at any visit in 1979.

In 1976 and 1977 spring flowering may have occurred since the plants would have disintegrated by the time of T. A. W. D.'s visits in August and September respectively, but in 1978 they would have been recognizable on 9th June had any flowered in the spring. In 1974 two age groups were represented on 18th September. In 1978 seed evidently germinated at three different times to produce flowering plants in July and both flowering plants and seedlings in October; the latter, well distributed over the bluff, were unlikely to have arisen from seed of the July plants but were probably from dormant seed. It is evident that at Barafundle Bay *Ononis reclinata* flowering is not confined to June-July, the period given by Tutin (1962). Whilst our observations show that seeds germinate and plants flower erratically between spring and autumn they do not indicate whether this is the result of irregular germination of the previous year's seed or whether it is at least in part due to a second generation arising in the same year. With the prospect of regular monitoring in future the problems raised may be solved. Observations on other populations are desirable so that the biology of this national rarity may be better understood.

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T. A. W. DAVIS & S. B. EVANS

FURTHER RECORDS OF *DIPSACUS STRIGOSUS* WILLD. IN CAMBRIDGESHIRE

Following an earlier note (Leslie 1976), five additional records of the alien *Dipsacus strigosus* Willd. (Fig. 1) have come to light in and around the city of Cambridge, Cambs., v.c. 29. They are as follows:

1. Refuse-tip, Duce's Lane, Cambridge, GR 52/467.589, G.M.S. Easy, June 1971. In 1972 there were 30–40 plants at this site, but it has now been built on and there are no records since then.
2. Untended garden at junction of Pemberton Terrace and Panton Street, Cambridge, GR 52/453.575, J. R. Akeroyd, October 1975. One plant, which left no progeny; the garden has since been 'tidied-up'.
3. Hedgerow, Coe Fen, Cambridge, GR 52/452.572, A. C. Leslie, July 1978. One flowering plant. In 1979 there were no flowering individuals, but 32 rosettes were counted around the site of last year's plant.
4. Laneside and field margin, Lammas Land, Coe Fen, Cambridge, GR 52/445.574, H. Marcan, 1978. In 1979 there were 15 flowering stems and many rosettes scattered in rough ground below a row of dying elms, at the edge of the field. Apparently a well established colony.
5. Trackside in woodland, Madingley Park, $2\frac{1}{2}$ miles north-west of Cambridge, GR 52/394.606, A. C. Leslie, August 1978. Three plants. Still there 1979 (*fide* D. E. Coombe).

These new sites confirm that *D. strigosus* is a characteristic alien of the Cambridge region, both as a transient casual (e.g. site 2) and in apparently established colonies (e.g. sites 4 and ?5). Site 3 appears to represent a newly formed colony, but it may be that numbers fluctuate sharply from year to year, depending on local conditions affecting the establishment and persistence of plants in their first year. The recent discovery of a large flourishing population of *Inula helenium* in the same woodland at Madingley only goes to show how a much more conspicuous plant can long remain unnoticed (or at least unrecorded)!

The Coe Fen plants are of particular interest, since this species was last recorded there by N. D. Simpson in 1913. Unfortunately the exact site of Simpson's record is unknown, but it is feasible that one of the recently discovered sites on the Fen may be of longstanding.

Finally, a correction and an addition to my earlier note: receptacular bract length should have read 15–20(–30) mm in *D. strigosus* and 7–12 mm in *D. pilosus*; a further differential character lies in flower colour, pure or greenish-white in *D. strigosus*, creamy-white in *D. pilosus*.

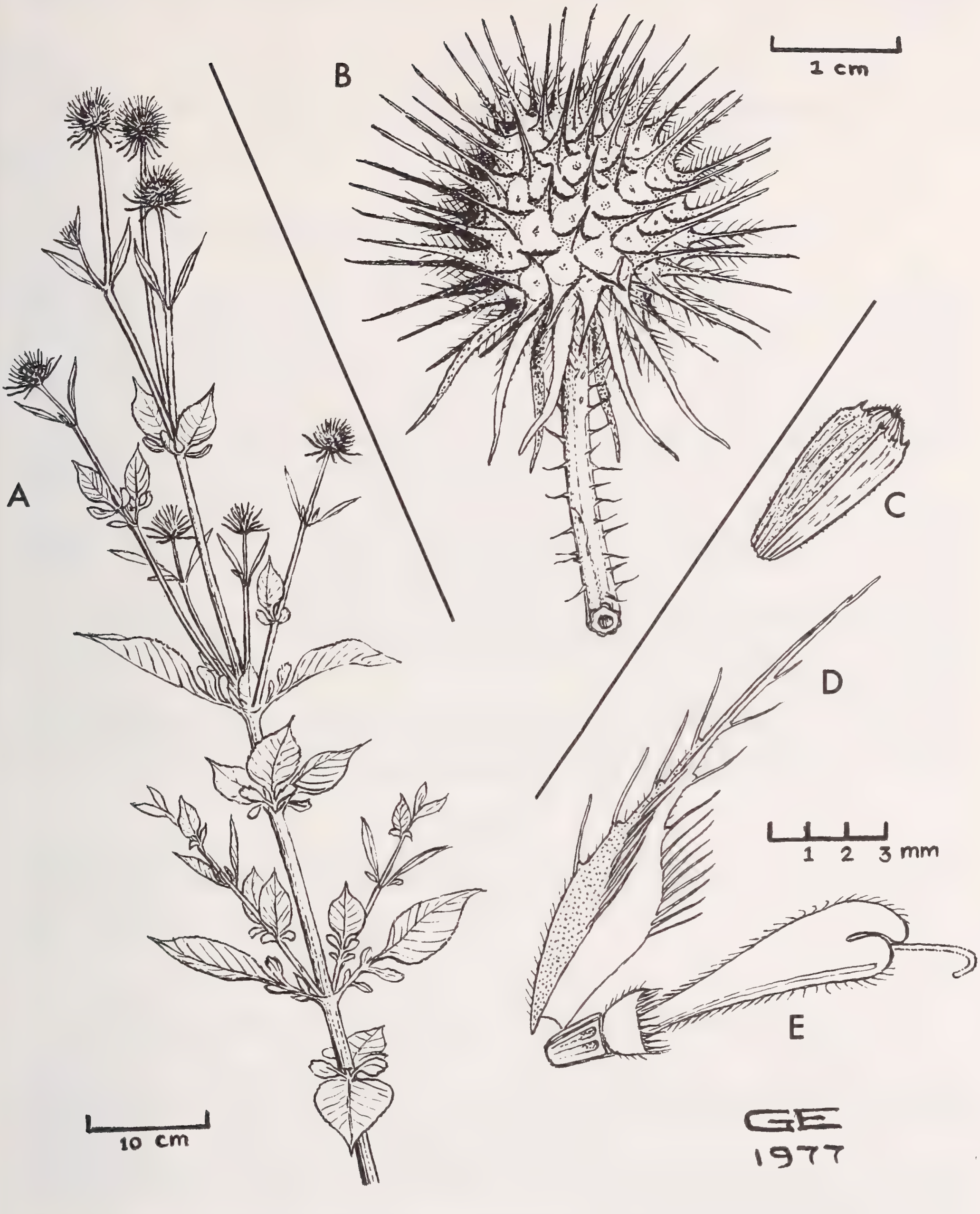


Figure 1. *Dipsacus strigosus* Willd., drawn from material from site 1: A, Upper part of plant; B, Capitulum; C, Achene; D, Receptacular bract; E, Flower.

ACKNOWLEDGMENTS

I should like to thank the recorders noted above for their records and G. M. S. Easy for providing the illustration.

REFERENCE

Leslie, A. C. (1976). *Dipsacus strigosus* Willd. in Cambridgeshire, v.c. 29. *Watsonia*, **11**: 67–68.

A. C. Leslie

LYCOPODIELLA INUNDATA (L.) HOLUB IN WEST NORFOLK

Wigston (1979) recorded the appearance of *Lycopodiella inundata* (L.) Holub in a man-made habitat in S. Devon, v.c. 3, far removed from any known source. Here I report a similar occurrence in W. Norfolk, v.c. 28, where there has been no other record of the plant during the present century. The site is one of a series of pits in the Lower Greensand at Ling Common, North Wootton, GR 53/653.242, which were worked during the last century. Sand was taken by a horse tramway down to barges on the coast of the Wash until 1862, when the Lynn-Hunstanton railway was built across the route, and subsequent loads went by rail. When I first knew the area (in about 1920) all work had long ceased, and the pit had a dry bottom, bare of vegetation. By the beginning of the second world war a small amount of water used to stand in it during the winter months, and in 1945 I noted that this had been invaded by rushes (*Juncus acutiflorus*, *J. effusus* and *J. squarrosus*), forming an open community of a few square feet. In 1949 I found in this two plants of *Lycopodiella*. Associated species at this time were, in addition to the above three, *Agrostis stolonifera*, *Calluna vulgaris* seedlings, *Juncus bulbosus*, *Leontodon taraxacoides*, *Plantago major*, *Sagina procumbens* and *Trifolium dubium*.

The clubmoss increased in 1950, and 17 plants were visible in 1951; fertile branches appeared in 1953 and again in 1954. I watched the colony every year and noted that as the community became closed and invaded by birch seedlings, the *Lycopodiella* decreased. In 1962 I could count only two plants and from 1965 onwards none.

The source of these plants presents the same problem as in S. Devon. Their disappearance must be attributed to natural successional change in the habitat. It would be of interest to know how far the spores travel in the wind, and how long they remain dormant in sand.

REFERENCE

Wigston, D. L. (1979). *Lycopodiella inundata* (L.) Holub at Fox Tor Mires, South Devon. *Watsonia*, **12**: 343–344.

C. P. Petch

SCHOENUS FERRUGINEUS L.–TWO NATIVE LOCALITIES IN PERTHSHIRE

Schoenus ferrugineus L. is a species distributed in Central Europe northwards to Scandinavia, occurring principally in calcareous mires. Up to 1950 it occurred on the shores of Loch Tummel, Mid Perth, v.c. 88, but in that year it was believed to have become extinct as a native species in Britain when the level of the loch was raised by the North of Scotland Hydro Electric Board. The history of the species in Britain and the various transplants that were carried out from the Loch Tummel site have been fully documented by Brookes (in prep.).

Two new, apparently native localities for *S. ferrugineus* were discovered in July and August, 1979, in other parts of Perthshire outside the catchment of Loch Tummel. Well over 1,000 plants were seen in five separate areas totalling several hectares in extent at the first site, and *c.*100 plants in a further, much smaller area on the second site. The species was growing in base-rich, wet flushes either as isolated tussocks in the more open areas or within a more continuous adjacent sward where the principal associated species included *Erica tetralix*, *Molinia caerulea* and *Carex flacca*. The sites do not coincide with any documented transplant sites and the number of plants and extent of the populations strongly suggest that they are native sites.

R. A. H. Smith

Plant Records

Records for publication must be submitted in the form shown below to the appropriate vice-county Recorder (*List of members* (1979)), and *not* the Editors. The records must normally be of native or naturalized alien plants belonging to one or more of the following categories: 1st or 2nd v.c. record; 1st post-1930 v.c. record; only extant v.c. record, or 2nd such record; a record of an extension of range by more than 100km. Such records will also be accepted for the major islands in v.c. 102–104 and 110. Only 1st records can be accepted for *Rubus*, *Hieracium*, *Taraxacum* and hybrids. Records for subdivisions of vice-counties will not be treated separately; they must therefore be records for the vice-county as a whole.

Records are arranged in the order given in the *List of British vascular plants* by J. E. Dandy (1958) and his subsequent revision (*Watsonia*, **7**: 157–178 (1969)), but *Taraxacum* is arranged according to A. J. Richards (*Watsonia*, **9**, Suppl. (1972)). With the exception of collectors' initials, herbarium abbreviations are those used in *British herbaria* by D. H. Kent (1958).

The following signs are used:

* before the record: to indicate a new vice-county record.
† before the species number: to indicate that the plant is not a native species of the British Isles.
† before the record: to indicate a species which, though native in some parts of the British Isles, is not so in the locality recorded.
[] enclosing a previously published record: to indicate that the record should be deleted.

1/4. Lycopodium clavatum L. **34**, W. Gloucs.: Rodge Wood, Staunton, GR 32/54.12. U. T. Evans, 1979, **herb. U. T. E.** Only extant record.

1/5. Diphasiastrum alpinum (L.) J. Holub **110**, Outer Hebrides: 1km E. and 8km N. of Tarbert, GR 19/16.08. D. & J. T. B. Bowman, 1977, **LTR**. 2nd record, 1st record since 1841.

3/2. Isoetes echinospora Durieu ***42**, Brecs.: N. of Brecon, GR 22/8.6. R. G. Woods, 1979, **NMW**.

4/6 × 10. Equisetum palustre L. × E. telmateia Ehrh. ***37**, Worcs.: Evesham, GR 42/04.44. Railway embankment. R. H. Roberts, 1978, **BM, E & K**, det. C. N. Page. 1st English record.

15/1c. Asplenium cuneifolium L. ***1**, W. Cornwall: Kynance, Lizard, GR 10/68.13. R. J. Murphy & C. N. Page, 1978, **E**.

15/4. Asplenium marinum L. †***57**, Derbys.: Derwent Hospital, Derby, GR 43/36.38. A. Willmot, 1977, field record, det. **BM**. **93**, N. Aberdeen: Den of Auchmedden, GR 38/84.65. D. Welch, 1979, **ABD**. 1st post-1930 record.

15/5a. Asplenium trichomanes L. subsp. trichomanes **47**, Monts.: Pont Crugnant, near Llanbrynmair, GR 22/8.9. P. M. Benoit, 1974, field record. 2nd record.

21/1 × 2. Dryopteris filix-mas (L.) Schott × D. pseudomas (Woll.) Holub & Pouzar ***74**, Wigtowns.: Castle Kennedy, GR 25/11.61. C. S. S. F. Field Meeting, 1977, field record, det. O. M. Stewart.

21/3. Dryopteris oreades Fomin ***83**, Midlothian: Caitha Hill, Gala Water, GR 36/46.40. R. W. M. Corner, 1976, **BM**, det. A. C. Jermy.

21/6. Dryopteris carthusiana (Vill.) H. P. Fuchs **45**, Pembs.: 3km N.E. of St David's, GR 12/77.27. F. H. Perring, 1979, **NMW**. 2nd record.

21/7 × 6. Dryopteris austriaca (Jacq.) Woynar × D. carthusiana (Vill.) H. P. Fuchs ***74**, Wigtowns.: Loch Heron, GR 25/27.65. A. J. Silverside & E. H. Jackson, 1977, **herb. A. J. S.**

21/7 × exp. Dryopteris austriaca (Jacq.) Woynar × D. expansa (C. Presl) Fraser-Jenkins & Jermy ***49**, Caerns.: Nant Ffrancon, GR 23/3.6. R. H. Roberts, 1976, **NMW**.

22/2 × 1. POLYSTICHUM ACULEATUM (L.) Roth × P. SETIFERUM (Forsk.) Woynar ***47**, Monts.: Bwlch-y-cibau, near Llanfyllin, GR 33/1.1. P. M. Benoit, 1974, **BM** and **NMW**, conf. A. C. Jermy.

25/1 int. × 1 vul. POLYPODIUM INTERJECTUM Shivas × P. VULGARE L. ***70**, Cumberland: Eden Lacy, GR 35/56.38. R. W. M. Corner, 1978, **herb. R.W.M.C.**, det. R. H. Roberts.

†27/1. AZOLLA FILICULOIDES Lam. ***61**, S.E. Yorks.: 1½ miles E. of Hemingborough, GR 44/70.30. H. Flint, 1977, field record.

†45/2. CLEMATIS FLAMMULA L. ***49**, Caerns.: Abersoch, GR 23/31.27. Sea cliffs. R. G. Ellis, 1978, **NMW**.

46/9. RANUNCULUS PARVIFLORUS L. **42**, Brecs.: Bwlch, GR 32/13.24. W. J. H. Price, 1977, **NWM**. 2nd record.

46/24 bul. RANUNCULUS FICARIA L. subsp. BULBIFER Lawalrée ***73**, Kirkcudbrights.: New Abbey, GR 25/96.66. M. McC. Webster, 1979, **E**.

50/1. THALICTRUM FLAVUM L. **†44**, Carms.: 1km E.S.E. of Cenarth, GR 22/27.40. Roadside verge. A. O. Chater, 1979, field record. 2nd record.

57/1. CERATOPHYLLUM SUBMERSUM L. **29**, Cambs.: Dry Drayton, GR 52/38.61. N. Stewart, 1978, **CGE**. 2nd record.

58/1. PAPAVER RHOEAS L. **78**, Peebless.: Peebles, GR 36/25.40. C. M. Morrison, 1978, field record. 1st post-1930 record.

†58/8. PAPAVER ATLANTICUM (Ball) Coss. ***73**, Kirkcudbrights.: New Abbey, GR 25/96.65. Established for 3 years on roadside verge. O. M. Stewart, 1979, field record.

61/1. GLAUCIUM FLAVUM Crantz **61**, S.E. Yorks.: Spurn Head, GR 54/41.12. F. E. Crackles, 1978, field record. 2nd record, 1st since 1798.

†67/jun. BRASSICA JUNCEA (L.) Czern. ***70**, Cumberland: by A6071 E. of Smithfield, GR 35/45.64. C. Smith & M. Smith, 1979, **LANC**, det. G. Halliday.

†71/1. HIRSCHFELDIA INCANA (L.) Lagr.-Foss. ***69**, Westmorland: Ramsden Dock, Barrow-in-Furness, GR 34/21.68. B. Fisher, 1979, **LANC**.

†74/1 lan. RAPHANUS RAPHANISTRUM L. subsp. LANDRA (Moretti ex DC.) Bonnier & Layens ***67**, S. Northumb.: S. of Blyth, GR 45/32.80. Sand dune. G. A. & M. Swan, 1979, **herb. G.A.S.**, conf. A. O. Chater.

79/6. LEPIDIUM LATIFOLIUM L. ***38**, Warks.: Water Orton, GR 42/17.91. Railway sidings. H. H. Fowkes, 1978, **WAR**. **61**, S. E. Yorks.: Hull, GR 54/09.30. F. E. Crackles, 1977, field record; 1978, **herb. F.E.C.** 1st post-1930 record.

†79/bon. LEPIDIUM BONARIENSE L. ***29**, Cambs.: Harlton, GR 52/38.52. C. D. Pigott, 1961, **CGE**, det. P. D. Sell.

†79/den. LEPIDIUM DENSIFLORUM Schrader ***29**, Cambs.: Great Shelford, GR 52/4.5. E. A. George, 1939, **CGE**, det. P. D. Sell. Fulbourn, GR 52/52.56. G. M. S. Easy, 1978, **herb. G.M.S.E**. 1st and 2nd records.

†79/hys. LEPIDIUM HYSSOPIFOLIUM Desv. ***29**, Cambs.: Chesterton, GR 52/4.5. C. E. Moss, 1914, **GCE**, det. P. D. Sell.

88/5 × 1. COCHLEARIA DANICA L. × C. OFFICINALIS L. ***46**, Cards.: Llangrannog, GR 22/30.54. Borth, GR 22/60.89. Both records J. E. Halfhide & A. J. Silverside, 1976, field records. 1st and 2nd records. ***74**, Wigtowns.: West Tarbet Bay, GR 25/13.30. A. J. Silverside, 1978, **herb. A.J.S.**, conf. G. M. Fearn.

†93/1. BERTEROA INCANA (L.) DC. **46**, Cards.: 2.5km E.S.E. of Mwnt, GR 22/21.50. E. B. Lee, 1970, field record. 2nd record.

94/4. DRABA MURALIS L. **†*78**, Peebless.: E. of Innerleithen, GR 36/34.37. Dry roadside bank. D. J. McCosh, 1979, **herb. D.J.McC.**

95/2. EROPHILA VERNA (L.) Chevall. subsp. SPATHULATA (Láng) Walters *83, Midlothian: Blackford Quarry, Edinburgh, GR 36/26.70. A. J. Silverside & E. H. Jackson, 1978, field record.

102/4. RORIPPA ISLANDICA (Oeder) Borbás *46, Cards.: by the R. Teifi at Llandysul, GR 22/41.40. By the R. Teifi at Cwm-cou, GR 22/29.41. Both records N. T. H. Holmes, 1978 field records. 1st and 2nd records.

†102/6. RORIPPA AUSTRIACA (Crantz) Bess. 59, S. Lancs.: 6km N. of Blackburn, GR 34/67.33. P. Jepson, 1979, **LIVU**, conf. E. F. Greenwood. 2nd record.

†108/vol. SISYMBRIUM VOLGENSE Bieb. ex E. Fourn. *68, Cheviot: Alnwick, GR 46/19.12. G. A. Swan & R. S. G. Thompson, 1971, **herb. G.A.S.**, det. R. D. Meikle, conf. E. J. Clement.

113/5 × 4. VIOLA REICHENBACHIANA Jord. ex Bor. × V. RIVINIANA Reichb. *52, Anglesey: Llugwy Wood, GR 23/49.85. R. H. Roberts, 1979, field record.

113/6. VIOLA CANINA L. 74, Wigtowns.: Larbrax Bay, Portpatrick, GR 15/97.59. A.McG. Stirling, 1976, field record. 1st post-1930 record.

†113/10. VIOLA CORNUTA L. *78, Peebless.: Eddleston Water, S. of Milkieston, GR 36/23.45. C. M. Morrison, 1978, field record.

†115/1 × 3. HYPERICUM ANDROSAEMUM L. × H. HIRCINUM L. *74, Wigtowns.: Claddyhouse Burn, 1 km S.E. of Cairnryan, GR 25/07.67. C.S.S.F. Field Meeting, 1977, field record.

123/2. SILENE MARITIMA With. 61, S.E. Yorks.: Spurn Head, GR 54/41.12. F. E. Crackles, 1978, **herb. F.E.C.** Only extant record.

133/3. STELLARIA PALLIDA (Dumort.) Piré 46, Cards.: The Patch dunes, Gwbert, GR 22/16.48. B.S.B.I. Field Meeting, 1979, field record. 2nd record. *69, Westmorland: South Walney, GR 34/21.61 A. O. Chater & G. Halliday, 1979, **LANC**. Roanhead, Dalton-in-Furness, GR 34/19.75. G. Halliday, 1979, **LANC**. 1st and 2nd records. 70, Cumberland: Drigg Point, GR 34/07.95. R. Stokoe & J. Rose, 1979, **LANC**. 2nd record, 1st post-1930 record.

136/9. SAGINA SUBULATA (Sw.) C. Presl 77, Lanarks.: Glasgow, GR 26/60.65. E. L. S. Macpherson. 1976, field record. 1st post-1930 record.

154/14. CHENOPODIUM RUBRUM L. *96, Easterness: Kingsteps, Nairn, GR 28/90.57. M. McC. Webster & M. J. Marshall, 1979, **E**.

†154/car. CHENOPODIUM CARINATUM R.Br. [*29, Cambs.: *Watsonia*, **12**: 170 (1978) has been redetermined as *C. pumilio*.]

†154/pum. CHENOPODIUM PUMILIO R.Br. *29, Cambs.: Kennett, GR 52/69.68. Rubbish tip. G. M. S. Easy, 1969, **CGE & herb. G.M.S.E.**

156/1. ATRIPLEX LITTORALIS L. 74, Wigtowns.: Beoch Burn, GR 25/07.64. C.S.S.F. Field Meeting, 1977, field record. 1st post-1930 record.

156/1 × 2. ATRIPLEX LITTORALIS L. × A. PATULA L. *83, Midlothian: Leith Docks, GR 36/26.77. O. M. Stewart & P. M. Taschereau, 1977, **E**.

156/lon. × 3. ATRIPLEX LONGIPES Drejer × A. PROSTRATA Boucher ex DC. *61, S.E. Yorks.: Barmston, GR 54/15.58. E. Chicken, 1978, **herb. E.C.**, det. P. M. Taschereau.

156/mue. ATRIPLEX MUELLERI Benth. *29, Cambs.: Thriplow, GR 52/44.44. Filled tip. G. M. S. Easy, 1974, **herb. G.M.S.E.**, det. E. J. Clements.

156/pra. ATRIPLEX PRAECOX Hulphers *106, E. Ross: Munlochy Bay, Black Isle, GR 28/66.52. U. K. Duncan, 1967, **E**, det. P. M. Taschereau.

163/4. MALVA NEGLECTA Wallr. †*78, Peebless.: Peebles, GR 36/24.40. C. M. Morrison, 1976, **herb. D. J. McCosh.**

164/2. LAVATERA CRETICA L. 1, W. Cornwall: St Anthony in Meneage, above Gillan Harbour, GR 10/78.25. R. M. Burton, 1978, field record. 1st post-1930 record.

†168/5. Geranium nodosum L. *70, Cumberland: Hutton-in-the-Forest, GR 35/46.35. Open woodland. R. Stokoe, 1978, **herb. R.S.**

168/7. Geranium sanguineum L. 93, N. Aberdeen: Sands of Forvie, GR 48/03.28. M. Smith, 1977, field record. 1st post-1930 record.

†170/6. Oxalis articulata Savigny *74, Wigtowns.: Low Salchrie, GR 25/03.65. A. J. Silverside, 1978, **E**. Drummore, GR 25/13.36. Well established along roadside. A. J. Silverside, 1978, field record. 1st and 2nd records.

†170/7. Oxalis corymbosa DC. *74, Wigtowns.: Ardwell House, GR 25/10.45. R. C. L. & B. Howitt, 1977, field record.

†170/11. Oxalis incarnata L. 74, Wigtowns.: Lochinch, GR 25/10.61. R. C. L. & B. Howitt, 1977, field record. 2nd record.

†170/exi. Oxalis exilis A. Cunn. 74, Wigtowns.: Ardwell House, GR 25/10.45. R. C. L. & B. Howitt, 1977, field record. 2nd record.

†182/2. Parthenocissus quinquefolia (L.) Planch. *70, Cumberland: Caldewgate, Carlisle, GR 35/39.55. Railway embankment. R. E. Groom, 1978, **LANC**.

†183/2. Lupinus arboreus Sims *69, Westmorland: North Walney, GR 34/16.71. Side of gravel pit. A. O. Chater & G. Halliday, 1979, field record.

†186/1. Spartium junceum L. *35, Mons.: Newport, GR 31/30.85. Rubbish tip. T. G. Evans, 1979, **herb. T.G.E.**

†188/str. Cytisus striatus (Hill) Rothm. *106, E. Ross: North Kessock, Black Isle, GR 28/65.47. On grass verge of new road. U. K. Duncan, 1979, **herb. U.K.D.**

189/1 × 2. Ononis repens L. × O. spinosa L. *57, Derbys.: near Taddington, GR 43/15.71. M. C. Hewitt, 1978, **DBY**, det. F. H. Perring. *61, S.E. Yorks.: S.W. of Tunstall, GR 54/31.31. Sand dune. F. E. Crackles, 1979, field record.

190/1. Medicago falcata L. *38, Warks.: Pooley Fields, Alvecote Pools N.R., Polesworth, GR 43/25.03. G. A. Arnold, 1975, **BIRM**, det. J. G. Hawkes.

†191/1. Melilotus altissima Thuill. *42, Brecs.: Llangynidr, GR 32/14.19. Gilwern, GR 32/24.14. Both records M. Porter, 1978, **NMW**. 1st and 2nd records. 45, Pembs.: Freshwater West, GR *c*.11/8.9. L. C. Style, 1979, field record. 2nd record.

†191/3. Melilotus alba Medic. 46, Cards.: Bow Street, GR 22/61.84. R. Lewis, 1978, **NMW**. 2nd record.

†Trigonella corniculata (L.) L. *35, Mons.: Newport, GR 31/30.85. Rubbish tip. T. G. Evans, 1978, **herb. T.G.E.**, det. E. J. Clement.

192/9. Trifolium arvense L. *84, W. Lothian: Bo'ness Harbour, GR 26/99.81. E. P. Beattie, 1972, **E**. Bathgate, GR 26/96.68. E. P. Beattie, 1977, **E**. 1st and 2nd records.

192/11. Trifolium scabrum L. *47, Monts.: Laundry wood, near Four Crosses, GR 33/25.19. D. E. Pugh, 1978, field record.

192/15. Trifolium glomeratum L. *1, W. Cornwall: near Mullion, GR 10/68.20. J. Hopkins, 1979, **CGE**.

†197/1. Galega officinalis L. 99, Dunbarton: Duntocher, Glasgow, GR 26/4.7. A.McG. Stirling, 1979, **E**. 2nd record.

†199/1. Colutea arborescens L. *38, Warks.: Oldbury Quarry, near Atherstone, GR 42/30.95. M. C. Clark, 1971, field record.

206/2. Vicia tetrasperma (L.) Schreb. *78, Peebless.: Walkerburn, GR 36/35.37. D. J. McCosh, 1978, **herb. D.J.McC.**

†206/5. Vicia tenuifolia Roth *57, Derbys.: Breadsall, GR 43/38.39. Railway cutting. R. Smith, 1979, field record, det. E. J. Clement.

206/12. VICIA LUTEA L. †***38**, Warks.: near Brandon Wood, GR 42/38.76. Recently reseeded meadow. M. E. Clark, 1977, **BIRM**, det. M. C. Clark & J. G. Hawkes.

†207/gra. LATHYRUS GRANDIFLORA Sibth. & Sm. ***74**, Wigtowns.: Glenwhilly, GR 25/1.7. C.S.S.F. Field Meeting, 1977, field record.

†209/2. SPIRAEA DOUGLASII Hook. ***69**, Westmorland: Ambleside, by R. Rothay, GR 35/36.04. K. M. Hollick, 1979, field record.

†209/alb. SPIRAEA ALBA Duroi ***74**, Wigtowns.: 3km W. of Kirkcowan, GR 25/30.61. Naturalized along damp hedgerow. E. H. Jackson, 1976, **herb. A. J. Silverside**, det. A.J.S. White Loch, Castle Kennedy, GR 25/11.60. C.S.S.F. Field Meeting, 1977, **herb. A. J. Silverside**. 1st and 2nd records.

211/11/16. RUBUS EBORACENSIS W. C. R. Wats. ***85**, Fife: Pitmilly, 1 mile E. of Boarhills, GR 37/5.1. G. H. Ballantyne, 1979, **herb. G.H.B.**, conf. A. Newton.

211/11/27. RUBUS TUBERCULATUS Bab. ***42**, Brecs.: Talgarth, GR 32/17.34. M. Porter, 1976, **herb. M.P.**, det. A. Newton. ***44**, Carms.: between Llanybydder and Pencarreg, GR 22/5.4. B.S.B.I. Field Meeting, 1978, field record, det. A. Newton.

211/11/49. RUBUS POLYOPLUS W. C. R. Wats. ***42**, Brecs.: Trallong, GR 22/94.30. M. Porter, 1976, **herb. M.P.**, det. A. Newton.

211/11/80. RUBUS PYRAMIDALIS Kalt. ***44**, Carms.: between Llanybydder and Pencarreg, GR 22/5.4. B.S.B.I. Field Meeting, 1978, field record, det. A. Newton.

211/11/81. RUBUS ALBIONIS W. C. R. Wats. ***42**, Brecs.: Brecon, GR 22/93.25. M. Porter, 1977, **herb. M.P.**, det. A. Newton.

211/11/117. RUBUS PROLONGATUS Boulay & Letendre ***44**, Carms.: Pont Cych. GR 22/27.37. B.S.B.I. Field Meeting, 1978, field record, det. A. Newton.

†211/11/139. RUBUS PROCERUS P. J. Muell. ***42**, Brecs.: Crickhowell, GR 32/21.18. Waste ground. M. Porter, 1976, **herb. M.P.**, det. A. Newton.

211/11/161. RUBUS ORBUS W. C. R. Wats. ***1**, W. Cornwall: near Ruan Major, Lizard, GR 10/70.15. L. J. Margetts, 1978, **herb. L.J.M.**, det E. S. Edees.

211/11/182. RUBUS MUCRONULATUS Bor. ***57**, Derbys.: near Castle Gresley, GR 43/29.17. R. Smith, 1979, **DBY**, det. A. Newton. 1st definite record.

211/11/183. RUBUS DREJERI Jensen ***85**, Fife: E. of Gelly Loch, GR 36/2.9. G. H. Ballantyne, 1978, **herb. G. H. B.,** det. A. Newton.

211/11/269. RUBUS LONGITHYRSIGER Lees ex Bak. ***44**, Carms.: Pont Cych, GR 22/27.37. B.S.B.I. Field Meeting, 1978, field record, det. A. Newton.

211/11/284. RUBUS RUFESCENS Muell. & Lefèv. ***42**, Brecs.: Llangynidr, GR 32/13.20. M. Porter, 1976, **herb. M.P.**, det. A. Newton.

211/11/304. RUBUS VECTENSIS W. C. R. Wats. ***42**, Brecs.: Glyn Collwn, GR 32/06.17. M. Porter, 1977, **herb. M.P.**, det. A. Newton.

211/11/348. RUBUS HYLOCHARIS W. C. R. Wats. ***44**, Carms.: Allt Rhyd y Groes N.N.R., GR 22/7.4. B.S.B.I. Field Meeting, 1978, field record, det. A. Newton.

211/11/354. RUBUS INFESTUS Weihe ex Boenn. ***42**, Brecs.: Coelbren. GR 22/85.11. M. Porter, 1977, **herb. M.P.**, det. A. Newton.

211/11/atr. RUBUS ATREBATUM A. Newton ***62**, N.E. Yorks.: Wass Bank, GR 44/55.79. A. Newton, 1972, **herb. A.N.** ***85**, Fife: The Jungle, Milesmark, 1 mile N.W. of Dunfermline, GR 36/0.8. G. H. Ballantyne, 1979, **herb. G.H.B.**, det. A. Newton.

211/11/bar. RUBUS BARTONII A. Newton ***44**, Carms.: between Llanybydder and Pencarreg, GR 22/5.4. B.S.B.I. Field Meeting, 1978, field record, det. A. Newton.

211/11/wir. RUBUS WIRRALENSIS A. Newton ***44**, Carms.: between Llanybydder and Pencarreg, GR 22/5.4. B.S.B.I. Field Meeting, 1978, field record, det. A. Newton.

†212/7. POTENTILLA RECTA L. *67, S. Northumb.: Slaggyford, GR 35/67.52. G. A. & M. Swan, 1973, **herb. G.A.S.**

†212/8. POTENTILLA NORVEGICA L. *99, Dunbarton: Dumbarton, GR 26/40.75. A. McG. Stirling, 1979, **E**.

212/14 × 13. POTENTILLA ANGLICA Laichard × P. ERECTA (L.) Räusch. *80, Roxburghs.: A7 at Torwoodlee, N. of Galashiels, GR 36/48.38. R. W. M. Corner, 1978, **herb. R.W.M.C.**, det. B. Matfield.

212/14. POTENTILLA ANGLICA Laichard. **80**, Roxburghs.: A7 at Torwoodlee, N. of Galashiels, GR 36/48.38. A. J. Smith, 1978, **herb. R. W. M. Corner**, conf. B. Matfield. 1st definite record since 1875. *82, E. Lothian: Yellow Craig, Dirleton, GR 36/52.85. I. R. Bonner, 1974, field record.

†216/2. GEUM MACROPHYLLUM Willd. *95, Moray: Boat o' Brig, GR 38/32.51. M. McC. Webster, 1976, **E**.

†222/2. SANGUISORBA CANADENSE (L.) A. Gray **74**, Wigtowns.: Black Loch, Castle Kennedy, GR 25/11.61. Naturalized by shore of loch. C.S.S.F. Field Meeting, 1977, field record. 2nd record, 1st post-1930 record.

225/1 × 8. ROSA ARVENSIS Huds. × R.CANINA L. *52, Anglesey: near Rhoscefnhir, GR 23/52.76. G. G. Graham, 1979, field record.

†225/3. ROSA MULTIFLORA Thunb. *70, Cumberland: near Watermillock, Ullswater, GR 35/44.23. Roadside hedge. J. Taylor-Page, 1979, **LANC**, det. G. Halliday.

225/14 × 7. ROSA RUBIGINOSA L. × R. STYLOSA Desv. *33, E. Gloucs.: Cooper's Hill near Painswick, GR 32/88.14. O. M. Stewart, 1978, **K**, det. R. Melville. 1st British record.

225/8 × 12. ROSA CANINA L. × R. SHERARDII Davies *42, Brecs.: near Pont ar Hydfer, GR 22/85.26. M. Porter, 1978, **herb. M.P.**, det. R. Melville.

225/8 × 13. ROSA CANINA L. × R. VILLOSA L. *42, Brecs.: near Merthyr Cynog, GR 22/98.36. M. Porter, 1977, **K**, det. R. Melville.

225/8 × cor. ROSA CANINA L. × R. CORIIFOLIA Fr. *42, Brecs.: near Methyr Cynog, GR 22/98.37. M. Porter, 1978, **herb. M.P.**, det. R. Melville.

225/12 × 13. ROSA SHERARDII Davies × R. VILLOSA L. *42, Brecs.: Methyr Cynog, GR 22/98.37. M. Porter, 1978, **herb. M.P.**, det. R. Melville.

225/dum. × 12. ROSA DUMETORUM Thuill. × R. SHERARDII Davies *42, Brecs.: Defynnog, GR 22/92.27. M. Porter, 1978, **herb. M.P.**, det. R. Melville.

225/14. ROSA RUBIGINOSA L. *42, Brecs.: Ystradgynlais, GR 22/78.09. M. Porter, 1975, **herb. M.P.**, det. R. Melville.

†227/3. COTONEASTER HORIZONTALIS Decne. *70, Cumberland: Frizington, GR 35/03.16. Disused limestone quarry. A. Dudman, 1979, field record.

†227/4. COTONEASTER MICROPHYLLUS Wall. ex Lindl. *H19, Co. Kildare: Carbury, GR 22/68.35. S. C. Holland, 1978, field record, det. E. J. Clement.

229/1. CRATAEGUS LAEVIGATA (Poiret) DC. *67, S. Northumb.: S. side of R. Coquet, E. of Weldon Bridge, GR 45/15.98. O. L. Gilbert, 1977, **herb. G.A.Swan**, det. A. D. Bradshaw. 1st definite record.

232/5/1 × 1. SORBUS ARIA (L.) Crantz × S. AUCUPARIA L. *83, Midlothian: Gorebridge, GR 36/33.61. A. J. Silverside, 1977, **herb. A.J.S.**

232/5/5. SORBUS PORRIGENTIFORMIS E. F. Warb. **49**, Caerns.: Penmaenmawr, GR 23/7.7. M. Morris, 1979, **NMW**. 2nd record.

†239/7. SAXIFRAGA CYMBALARIA L. subsp. HUETIANA (Boiss.) Engler & Irmscher *35, Mons.: Chepstow, GR 31/52.93. Garden weed. T. G. Evans, 1978, **herb. T.G.E.**

239/17. SAXIFRAGA OPPOSITIFOLIA L. 93, N. Aberdeen: Aberdour, GR 38/86.65. J. G. Roger, 1955, field record. 1st post-1930 record.

†241/1. TOLMIEA MENZIESII (Pursh) Torr. & Gray *38, Warks.: near Blackroot Pool, Sutton Park, Sutton Coldfield, GR 42/10.97. Large colony, known here for several years. J. H. Field, 1975, **BIRM**, det. J. G. Hawkes & J. T. Williams. **69**, Westmorland: near Mansriggs, Ulverston, GR 34/29.80. J. Adams, 1979, **LANC**, det G. Halliday. 2nd record. ***74**, Wigtowns.: Ninians Cave, GR 25/42.36. Streamside in wood. J. Ounsted, 1975, field record. Kircolm, GR 25/03.68. A. J. Silverside, 1978, **E**. 1st and 2nd records.

†248/1. SARRACENIA PURPUREA L. **69**, Westmorland: Grasmere, GR 35/3.0. T. Blackstock, 1978, field record. 2nd record.

†254/6. EPILOBIUM ADENOCAULON Hausskn. ***74**, Wigtowns.: Castle Kennedy, GR 25/11.60. Garden weed. C.S.S.F. Field Meeting, 1977, field record. Newton Stewart, GR 25/41.65. Waste ground. A. J. Silverside, 1979, field record. 1st and 2nd records.

254/11. EPILOBIUM ANAGALLIDIFOLIUM Lam. ***93**, N. Aberdeen: Craig an Sgor, Glenbuchat, GR 38/38.19. D. Welch, 1979, **ABD**.

†256/1 × 2. OENOTHERA BIENNIS L. × O. ERYTHROSEPALA Borbás ***38**, Warks.: Emscote, Warwick, GR 42/29.65. J. C. Bowra, 1978, **WAR**, det. K. Rostański.

†256/1 × cam. OENOTHERA BIENNIS L. × O. CAMBRICA Rostański ***38**, Warks.: Emscote, Warwick, GR 42/29.65. J. C. Bowra, 1978, **WAR**, det. K. Rostański.

†256/2 × cam. OENOTHERA ERYTHROSEPALA Borbás × O. CAMBRICA Rostański ***38**, Warks.: Emscote, Warwick, GR 42/29.65. J. C. Bowra, 1978, **WAR**, det. K. Rostański.

†256/cam. OENOTHERA CAMBRICA Rostański ***38**, Warks.: Emscote, Warwick, GR 42/29.65. On sand from Margam, S. Wales, which was used to extinguish a fire. J. C. Bowra, 1978, **WAR**, det. K. Rostański.

258/2. CIRCAEA INTERMEDIA Ehrh. **80**, Roxburghs.: The Island, Lindean, Selkirk, GR 36/47.31. R. W. M. Corner, 1979, **herb. R.W.M.C.** 1st localized record.

262/2. CALLITRICHE PLATYCARPA Kütz. ***46**, Cards.: Clarach, GR 22/58.83. Tanybwlch fields, Aberystwyth, GR 22/58.79. Both J. P. Savidge, 1959, field records. 1st and 2nd records.

267/1. CHAMAEPERICLYMENUM SUECICUM (L.) Aschers. & Graebn. **93**, N. Aberdeen: Craig an Sgor, GR 38/38.19. D. Welch, 1979, **ABD**. 2nd record.

270/1. SANICULA EUROPAEA L. **93**, N. Aberdeen: Den of Auchmedden, GR 38/85.64. D. Welch, 1979, field record. 1st post-1930 record.

†271/1. ASTRANTIA MAJOR L. ***73**, Kirkcudbrights.: near Ironlosh, E. of Balmaclellan, GR 25/67.80. Well naturalized on roadside verge. O. M. Stewart & J. Cameron, 1979, field record.

†283/lan. BUPLEURUM LANCIFOLIUM Hornem. ***50**, Denbs.: near Wrexham, GR 33/3.4. A. G. Spencer, 1979, **NMW**. ***52**, Anglesey: Holyhead, GR 23/24.81. Garden weed. W. J. Rielly, 1979, **herb. R. H. Roberts**, det. E. J. Clement.

284/4. APIUM INUNDATUM (L.) Reichb. f. **77**, Lanarks.: Muirhouses, East Kilbride, GR 26/68.53. P. & E. L. S. Macpherson, 1977, **herb. P.M.** 1st localized record.

300/6. OENANTHE AQUATICA (L.) Poir. **67**, S. Northumb.: E. of Gilsland, GR 35/64.66. G. A. & M. Swan, 1979, **herb. G.A.S.** 1st record this century. **70**, Cumberland: Irthington, GR 35/49.61. C. Smith, 1979, **LANC**, det. G. Halliday. 1st post-1930 record.

301/1. AETHUSA CYNAPIUM L. **99**, Dunbarton: Dumbarton, GR 26/39.75. A. McG. Stirling, 1979, **E**. 1st post-1930 record.

304/1. MEUM ATHAMANTICUM Jacq. ***95**, Moray: Grantown-on-Spey, GR 38/04.26. M. Dickinson, 1979, **E**.

305/1. SELINUM CARVIFOLIA (L.) L. **29**, Cambs.: Snailwell, GR 52/6.6. S. R. Payne, 1979, **CGE**. 3rd extant British locality.

309/2. PEUCEDANUM OFFICINALE L. **61**, S.E. Yorks.: Hornsea Mere, GR 54/1.4. R. Hawley, 1979, **herb. F. E. Crackles**, det. F.E.C. 1st record for over 100 years.

†311/2 × 1. HERACLEUM MANTEGAZZIANUM Somm. & Levier × H. SPHONDYLIUM L. ***85**, Fife: Coal Bridge, S. of Crossford, GR 36/07.85. G. H. Ballantyne, 1979, field record.

†311/2. HERACLEUM MANTEGAZZIANUM Somm. & Levier ***50**, Denbs.: Horse-y, Gresford, Wrexham, GR 33/3.5. B. Formstone, 1979, field record.

†319/15 × 14. EUPHORBIA ESULA L. × E. URALENSIS Fisch. ex Link ***77**, Lanarks.: Carmyle, Glasgow, GR 26/64.61. Roadside. P. Macpherson, 1974, **E**, det. A. Radcliffe-Smith.

†319/16. EUPHORBIA CYPARISSIAS L. ***49**, Caerns.: Deiniolen, GR 23/5.5 L. J. Larsen, 1979, **NMW**.

320/1/4. POLYGONUM ARENASTRUM Boreau ***99**, Dunbarton: Duntocher, Glasgow, GR 26/4.7. A. McG. Stirling, 1979, **E**.

320/11. POLYGONUM NODOSUM Pers. ***99**, Dunbarton: Dumbarton, GR 26/40.75. A. McG. Stirling, 1979, **E**.

320/14. POLYGONUM MINUS Huds. ***74**, Wigtowns.: White Loch, Castle Kennedy, GR 25/10.61. C.S.S.F. Field Meeting, 1977, field record. ***80**, Roxburghs.: Melrose, GR 36/5.3. T. Wise, 1918, **GL**, det. A. McG. Stirling.

†320/19. REYNOUTRIA JAPONICA Houtt. ***93**, N. Aberdeen: Craigmancie, 8km N.E. of Huntly, GR 38/58.46. D. Welch, 1979, **ABD**.

†320/wey. POLYGONUM WEYRICHII Fr. Schm. ex Maxim. ***70**, Cumberland: Wast Water, GR 35/14.04. C. C. Haworth, 1978, field record; 1979, **LANC**, det. A. P. Conolly.

325/1/3. RUMEX TENUIFOLIUS (Wallr.) Löve ***74**, Wigtowns.: Torrs Warren, Glenluce, GR 25/12.54. Bare, sandy ground. A. McG. Stirling, 1973, **E**, det. J. E. Lousley.

325/4. RUMEX HYDROLAPATHUM Huds. ***46**, Cards.: by R. Teifi near Lampeter Bridge, GR 22/58.47. By R. Teifi E. of Cilyblaidd, GR 22/54.46. Both N. T. H. Holmes, 1978, field records. 1st and 2nd records.

†325/5. RUMEX ALPINUS L. ***84**, W. Lothian: near Blackridge, GR 26/8.6. D. M. Henderson & P. H. Davis, 1958, **E**.

325/8. RUMEX LONGIFOLIUS DC. **74**, Wigtowns.: Glenwhilly, GR 25/1.7. C.S.S.F. Field Meeting, 1977, field record. 2nd record, 1st record since 1883.

325/8 × 12. RUMEX LONGIFOLIUS DC. × R. OBTUSIFOLIUS L. ***59**, S. Lancs.: 3km S.S.E. of Darwen, GR 34/70.19. P. Jepson, 1979, field record.

325/11 × 14. RUMEX CRISPUS L. × R. SANGUINEUS L. ***29**, Cambs.: near Borley Wood, GR 52/58.47. A. C. Leslie, 1978, **herb. A.C.L.**, conf. P. D. Sell.

325/18. RUMEX MARITIMUS L. **42**, Brecs.: Llysdinam, GR 32/00.58. F. M. Slater, 1977, field record. 2nd record.

†327/1. SOLEIROLIA SOLEIROLII (Req.) Dandy **46**, Cards.: Llangrannog, GR 22/31.54. Stream side. A. O. Chater, 1974, **NMW**. 2nd record.

†336/2. ALNUS INCANA (L.) Moench subsp. INCANA ***38**, Warks.: grounds of Birmingham University, GR 42/04.83. Apparently naturalized. C. R. Sladden, 1973, **BIRM**, det. J. G. Hawkes.

343/4 × 1. SALIX FRAGILIS L. × S. PENTANDRA L. ***50**, Denbs.: Cernioge-mawr, Cerrigydrudion, GR 23/90.50. P. Day, 1979, **NMW**, det. R. Meikle.

343/5. SALIX TRIANDRA L. **50**, Denbs.: Glyn Ceriog, Chirk, GR 33/20.34. J. Green, 1979, **NMW**, det. R. Meikle. 2nd record.

†343/7. SALIX DAPHNOIDES Vill. ***70**, Cumberland: Swifts, Carlisle, GR 35/40.56. R. E. Groom, 1978, **LANC**, det. R. D. Meikle.

343/11 × 9. SALIX CAPREA L. × S. VIMINALIS L. ***74**, Wigtowns.: Dirnow, GR 25/29.65. C.S.S.F. Field Meeting, 1977, **herb. A. J. Silverside**, conf. R. C. L. Howitt.

343/12b × 16. SALIX ATROCINEREA Brot. × S. REPENS L. ***73**, Kirkcudbrights.: N. of Crossmichael, GR 25/72.67. O. M. Stewart, 1979, **E**, det. R. C. L. Howitt.

343/16. SALIX REPENS L. **83**, Midlothian: East Calder, GR 36/08.64. E. P. Beattie, 1978, **E**. 2nd record.

343/21. SALIX HERBACEA L. **93**, N. Aberdeen: Craig an Sgor, Glenbuchat, GR 38/37.19. D. Welch, 1979, **ABD**. 2nd record.

†343/cor. SALIX CORDATA Muhl. ***38**, Warks.: Sutton Park, GR 42/09.96. B. R. Fowler, 1979, **herb. B.R.F.**

350/1. ANDROMEDA POLIFOLIA L. **42**, Brecs.: near Rhayader, GR 22/86.60. R. G. Woods, 1979, field record. 2nd record since 1800.

358/1. VACCINIUM VITIS-IDAEA L. ***61**, S.E. Yorks.: Hull, GR 54/13.28. F. E. Crackles, 1979, **herb. F.E.C.**

359/2. PYROLA MEDIA Sw. **93**, N. Aberdeen: Turf Hill, GR 38/45.27. D. Welch, 1979, **ABD**. 1st post-1930 record.

†370/5. LYSIMACHIA PUNCTATA L. ***46**, Cards.: near Falcondale, Lampeter, GR 22/56.49. By Ystwyth, Wenallt, Trawscoed, GR 22/67.71. Both R. G. Ellis, 1978, **NMW**. 1st and 2nd records. **78**, Peebless.: Romanno Bridge, GR 36/16.48. C. M. Morrison, 1978, field record. 1st post-1930 record.

371/1. TRIENTALIS EUROPAEA L. **78**, Peebless.: White Moss, West Linton, GR 36/14.49. D. J. McCosh, 1979, **herb. D.J.McC.** 1st localized record, known to have been present for 20 years.

†375/1. BUDDLEJA DAVIDII Franch. ***46**, Cards.: E.N.E. of Plwmp, GR 22/37.52. In hedges. A. O. Chater, 1979, field record.

392/1. SYMPHYTUM OFFICINALE L. **78**, Peebless.: Peebles, GR 36/24.40.C. M. Morrison, 1972, field record. 1st record since 1918.

†392/2. SYMPHYTUM ASPERUM Lepech. ***42**, Brecs.: Cantref near Brecon, GR 32/05.25. R. G. Ellis, 1978, **NMW**, det. A. E. Wade.

†392/bul. SYMPHYTUM BULBOSUM C. Schimper ***46**, Cards.: Llanbadarn Fawr, GR 22/59.81. V. G. Ellis, 1975, **NMW**, det. E. J. Clement.

400/7. MYOSOTIS SYLVATICA Hoffm. ***93**, N. Aberdeen: Craigmancie, 8km N.E. of Huntly, GR 38/58.47. D. Welch, 1979, **ABD**. 1st definite record.

401/2. LITHOSPERMUM OFFICINALE L. **74**, Kirkcudbrights.: St Mary's Isle, GR 25/66.48. O. M. Stewart, 1979, field record. 2nd record.

†406/2. CALYSTEGIA PULCHRA Brummitt & Heywood **43**, Rads.: Knighton, GR 32/28.72. Fence near houses. A. C. Powell, 1979, **NMW**. 2nd record.

†409/1. LYCIUM BARBARUM L. ***74**, Wigtowns.: Port Logan, GR 25/09.40. J. Cameron, 1978, field record.

†413/5. SOLANUM TRIFLORUM Nutt. ***29**, Cambs.: Kennett, GR 52/68.68. G. M. S. Easy, 1979, **herb. G.M.S.E.**

†416/pyr. × 1. VERBASCUM PYRAMIDATUM Bieb. × V. THAPSUS L. ***29**, Cambs.: near Fordham, GR 52/61.71. 1 plant with both parents on waste ground. G. M. S. Easy, 1976, field record. Burwell, GR 52/58.65. G.M.S. Easy, 1977, field record. 1st and 2nd records, 1st British records.

†420/2. Linaria purpurea (L.) Mill. ***46**, Cards.: Salem, GR 22/66.84. Aberystwyth, GR 22/58.81. Both J. E. Halfhide, 1976, field records. 1st and 2nd records. ***47**, Monts.: Welshpool, GR 33/22.07. Railway station. P. H. Oswald, 1978, field record. **74**, Wigtowns.: Newton Stewart, GR 25/41.65. C.S.S.F. Field Meeting, 1977, field record. 2nd record.

424/3. Scrophularia umbrosa Dumort. ***74**, Wigtowns.: Port Castle Bay, GR 25/42.36. A. J. Silverside, 1979, field record.

424/4. Scrophularia scorodonia L. †***44**, Carms.: between Pembrey and Pinged, GR 22/41.02. C. Sergeant & J. O. Mountford, 1978, field record.

†424/5. Scrophularia vernalis L. ***46**, Cards.: Llanbadarn Fawr, GR 22/59.81. R. G. Ellis, 1977, **NMW**.

†425/1 × 2. Mimulus guttatus DC. × M. luteus L. ***74**, Wigtowns.: Mochrum Loch, GR 25/30.52. H. Milne-Redhead, 1972, **DFS**, det. A. J. Silverside.

†425/2. Mimulus luteus L. [***74**, Wigtowns.: *Watsonia*, **9**: 384 (1973) has been redetermined as 425/1 × 2.] ***74**, Wigtowns,: Killantringan Bay, GR 15/98.56. A. J. Silverside, 1978, **herb. A.J.S.**

†425/3. Mimulus moschatus Dougl. ex Lindl. ***74**, Wigtowns.: Black Loch, Castle Kennedy, GR 25/11.61. C.S.S.F. Field Meeting, 1977, field record. Ardwell House, GR 25/10.45. R. C. L. & B. Howitt, 1977, field record. 1st and 2nd records.

426/1. Limosella aquatica L. **47**, Monts.: 5km S.S.W. of Welshpool, GR 33/21.02. Gravel bank of R. Severn. S. Stafford & F. H. Perring, 1979, field record. 2nd record. ***48**, Merioneth: Llyn Tegid, GR 23/8.3. P. M. Benoit, 1979, **NMW**.

430/3. Veronica catenata Pennell ***83**, Midlothian: Duddingston Bird Santuary, GR 36/27.72. O. M. Stewart, 1977, field record.

430/20a. Veronica hederifolia L. subsp. hederifolia ***1**, W. Cornwall: Chapel Porth, GR 10/69.49. K. Higgs, 1977, field record. 1st definite record.

†431/ell. × spe. Hebe elliptica (G. Forster) Pennell × H. speciosa (R. Cunn. ex A. Cunn.) Andersen ***49**, Caerns.: Abersoch, GR 23/31.28. R. G. Ellis, 1978, **NMW**.

432/1. Pedicularis palustris L. **29**, Cambs.: Chippenham Fen, GR 52/64.69. S. M. Walters, 1979, field record. Only extant locality.

435/1/1. Euphrasia micrantha Reichb. ***82**, E. Lothian: Faseny Water, GR 36/64.63. E. P. Beattie, 1971, **E**, det. P. F. Yeo.

435/1/12. Euphrasia tetraquetra (Bréb.) Arrondeau ***82**, Haddington: Catcraig, GR 86/71.77. E. P. Beattie, 1977, **E**, det. P. F. Yeo.

435/1/13. Euphrasia nemorosa (Pers.) Wallr. ***83**, Midlothian: Hermiston, GR 36/18.70. Stow, GR 36/42.49. Both E. P. Beattie, 1971, **E**, det. P. F. Yeo. 1st and 2nd records. **84**, W. Lothian: Carriden, GR 36/01.81. E. P. Beattie, 1971, **E**, det. P. F. Yeo. 2nd record.

435/1/15. Euphrasia confusa Pugsl. ***38**, Warks.: Burton Dassett Hills, GR 42/39.52. J. C. Bowra, 1978, **WAR**, det. P. F. Yeo.

435/1/19. Euphrasia rostkoviana Hayne ***84**, W. Lothian: Bo'ness, GR 26/98.81. E. P. Beattie, 1971, **E**, det. P. F. Yeo.

439/1. Lathraea squamaria L. **46**, Cards.: Clettwr Dingle, Tre'rddol, GR 22/6.9. J. P. Savidge, 1966, field record. 2nd extant record.

†445/6 × 5. Mentha longifolia (L.) Huds. × M. spicata L. ***83**, Midlothian: Blackford Quarry, Edinburgh, GR 36/2.7. O. M. Stewart, 1976, **E**, det. R. M. Harley.

448/1. Thymus pulegioides L. ***70**, Cumberland: near Moss Nook, Cumwhitton, GR 35/50.54. Sand pit. F. J. Roberts, 1979, **LANC**, det. C. D. Pigott.

454/1. Melissa officinalis L. ***70**, Cumberland: Mirehouse, Whitehaven, GR 25/99.15. Disturbed ground by wood edge. C. C. Haworth, 1979, **LANC**, det. G. Halliday.

459/6 × 7. STACHYS PALUSTRIS L. × S. SYLVATICA L. ***79**, Selkirks.: R. Ettrick at Ovenscloss, GR 36/47.30. R. W. M. Corner, 1979, **herb. R.W.M.C.**

462/3. LAMIUM HYBRIDUM Vill. ***74**, Wigtowns.: The Lighthouse, Black Head, GR 15/98.56. A. J. Silverside, 1978, field record.

†491/1. LONICERA XYLOSTEUM L. **70**, Cumberland: near Plumptonfoot, Plumpton, GR 35/48.39. Embankment of railway bridge. I. Mortemore, 1978, field record. 2nd post-1930 and only localized record.

†491/nit. LONICERA NITIDA Wils. ***44**, Carms.: Coomb House, GR 22/33.14. Established in roadside hedges. R. D. Pryce, 1979, field record.

†492/1. LEYCESTERIA FORMOSA Wall. ***74**, Wigtowns.: Castle Kennedy, GR 25/11.60. J. Cameron, 1978, field record.

495/3. VALERIANA DIOICA L. ***46**, Cards.: Tywi Valley, GR 22/8.5. I. M. Vaughan, 1965, field record.

†CEPHALARIA GIGANTEA (Ledeb.) Bobrov **83**, Midlothian: Fairmilehead, Edinburgh, GR 36/24.68. E. P. Beattie, 1978, **E**. 2nd record. ***84**, W. Lothian: Winchburgh, GR 36/08.75. E. P. Beattie, 1979, **E**.

†497/sat. DIPSACUS SATIVUS (L.) Honckeny ***35**, Mons.: Newport, GR 31/30.85. Rubbish tip. T. G. Evans, 1976, **herb, T.G.E.**, conf. E. J. Clement. ***38**, Warks.: Water Orton, GR 42/17.91. Railway sidings. H. H. Fowkes, 1978, **WAR**.

499/1. SCABIOSA COLUMBARIA L. ***46**, Cards.: Ynyslas dunes, GR 22/6.9. J. P. Savidge, 1972, field record.

†501/hir. RUDBECKIA HIRTA L. ***35**, Mons.: Newport, GR 31/30.85. Rubbish tip. T. G. Evans, 1979, **NMW**, det. E. J. Clement.

†COSMOS BIPINNATUS Cav. ***35**, Mons.: Newport, GR 31/30.85. Rubbish tip. T. G. Evans, 1979, **herb. T.G.E.**

†503/2. GALINSOGA CILIATA (Raf.) Blake ***35**, Mons.: Chepstow, GR 31/52.93. Garden weed. T. G. Evans, 1979, **NMW**. ***95**, Moray: Kinloss, GR 38/0.6. M.McC. Webster, 1979, **E**. ***96**, Easterness: Inverness, GR 28/6.4. A. Langton, 1979, field record.

506/2 × 1. SENECIO AQUATICUS Hill × S. JACOBAEA L. ***61**, S.E. Yorks.: Wharram Percy, GR 44/85.64. F. E. Crackles, 1979, **herb. F.E.C.** ***83**, Midlothian: Linhouse, GR 36/06.62. E. P. Beattie, 1978, **E**, det. **E**. ***84**, W. Lothian: Linlithgow, GR 86/00.75. E. P. Beattie, 1977, **E**, det. **E**.

†506/18 × 1. SENECIO BICOLOR (Willd.) Tod. subsp. CINERARIA (DC.) Chater × S. JACOBAEA L. ***44**, Carms.: Llanelli, GR 22/51.00. Roadside. I. K. Morgan, 1978, **NMW**, conf. P. M. Benoit. ***49**, Caerns.: Haulfre Gardens, Llandudno, GR 23/7.8. P.M. Benoit, 1978, field record. ***52**, Anglesey: Menai Bridge, GR 23/55.72. Wall top. R. H. Roberts, 1979, **herb. R.H.R.**

†506/4. SENECIO SQUALIDUS L. ***96**, Easterness: Balloch, GR 28/72.46. M. McC. Webster, 1978, **E**.

†506/9. SENECIO TANGUTICUS Maxim. ***52**, Anglesey: Mill Dingle, Beaumaris, GR 23/5.7. N. Cragg, 1979, **K**, det. **K**.

†506/18. SENECIO BICOLOR (Willd.) Tod. subsp. CINERARIA (DC.) Chater ***73**, Kirkcudbrights.: Mersehead, GR 25/92.55. Dunes. O. M. Stewart & N. F. Stewart, 1979, field record.

509/1. PETASITES HYBRIDUS (L.) Gaertn., Mey. & Scherb. **61**, S.E. Yorks.: Foston On The Wolds, GR 54/09.55. E. Chicken, 1978, **herb. E.C.** 1st record of the female plant.

†512/1. INULA HELENIUM L. **74**, Wigtowns.: Low Ersock, GR 25/44.37. R. C. L. & B. Howitt, 1978, field record. 1st post-1930 record.

514/2. FILAGO APICULATA G.E.Sm. ***61**, S.E. Yorks.: Spurn Point, GR 54/39.10. F. E. Crackles, 1978, **herb. F.E.C.**, det. C. Jeffrey.

515/1. Gnaphalium sylvaticum L. **79**, Selkirks.: Cardrona Forest, N.W. of Old Howford, GR 36/31.37. R. W. M. Corner, 1979, **herb. R.W.M.C.** 1st localized record.

517/1. Antennaria dioica (L.) Gaertn. **93**, N. Aberdeen: Turf Hill, GR 38/45.27. D. Welch, 1979, **ABD**. 1st definite post-1930 record.

†518/3. Solidago gigantea Ait. subsp. serotina (O. Kuntze) McNeill ***41**, Glam.: Cardiff, GR 31/17.76. A. D. Tipper, 1979, **NMW**.

†519/7 × 6. Aster laevis L. × A. novi-belgii L. ***83**, Midlothian: Warriston, Edinburgh, GR 36/26.75. O. M. Stewart, 1976, **E**, det. P. F. Yeo.

†519/8. Aster lanceolatus Willd. ***83**, Midlothian: Ratho, GR 36/13.70. O. M. Stewart, 1976, **E**, det. P. F. Yeo.

†519/9. Aster salignus Willd. ***106**, E. Ross: E. of Alcaig, Black Isle, GR 28/58.59. M. McC. Webster, 1978, **BM**.

†521/5. Erigeron karvinskianus DC. ***38**, Warks.: Stratford-upon-Avon, GR 42/20.54. M. Hughes, 1972, **BIRM**, conf. J. G. Hawkes. ***47**, Monts.: Powys Castle, Welshpool, GR 33/21.06. Walls. D. H. Kent, *c.*1974, field record.

†522/1 × 521/1. Conyza canadensis (L.) Cronq. × Erigeron acer L. ***29**, Cambs.: near Mepal, GR 52/42.82. D. Donald & A. C. Leslie, 1978, **CGE**.

†522/1. Conyza canadensis (L.) Cronq. ***H19**, Co. Kildare: Haggard, Carbury, GR 22/68.35. Garden weed. S. C. Holland, 1978, field record.

†523/1. Olearia macrodonta Bak. ***74**, Wigtowns.: Knock Bay, GR 15/98.57. Naturalized in scrub in coastal ravine. A. J. Silverside, 1978, **GLAM**, det. D. McClintock.

†533/3. Leucanthemum maximum (Ramond) DC. ***46**, Cards.: Penyrangor, Aberystwyth, GR 22/58.80. J. E. Halfhide, 1977, field record. ***49**, Caerns.: near Aberdaron, GR 23/1.2. Roadside. R. G. Ellis, 1978, **NMW**.

†535/2. Artemisia verlotiorum Lamotte **59**, S. Lancs.: 2km S.W. of the centre of Blackburn, GR 34/67.26. Waste ground. P. Jepson, 1979, **LIV**, det. J. M. Mullin. 2nd record.

535/7. Artemisia maritima L. **93**, N. Aberdeen: Sands of Forvie, GR 48/02.26. M. Smith, 1977, field record. 1st post-1930 record.

538/1. Arctium lappa L. ***50**, Denbs.: Rosset, near Wrexham, GR 33/39.56. T. Edmondson, 1979, field record.

540/8 × 3. Cirsium dissectum (L.) Hill × C. palustre (L.) Scop. ***45**, Pembs.: 2.5km N.E. of St David's, GR 12/77.27. F. Bog, 1979, **NMW**.

540/7. Cirsium heterophyllum (L.) Hill ***84**, W. Lothian: Bents, GR 26/98.62. E. P. Beattie, 1973, **E**. Faudhouse, GR 26/93.59. E. P. Beattie, 1976, **E**. 1st and 2nd records.

543/1. Saussurea alpina (L.) DC. ***78**, Peebless.: Little Craig, Cramalt Craig, GR 36/17.24. R. W. M. Corner, 1978, field record.

†544/2. Centaurea montana L. ***74**, Wigtowns.: Glenhapple, GR 25/37.70. Roadside. A. J. Silverside, 1978, **E**.

552/1. Tragopogon pratensis L. ***107**, E. Sutherland: Helmsdale, GR 39/02.15. A. J. Souter, 1973, field record.

†557/3. Cicerbita macrophylla (Willd.) Wallr. ***43**, Rads.: Beguildy GR 32/19.79. Roadside bank. A. C. Powell, 1979, **NMW**.

558/1/84. Hieracium anguinum (W. R. Linton) Roffey ***68**, Cheviot: Bizzle Burn, College Valley, GR 36/8.2. O. M. Stewart, 1975, **E**, det. P. D. Sell & C. West.

558/1/98. Hieracium exotericum Jord. ex Bor. ***82**, E. Lothian: Vester Estate, Gifford, GR 36/55.66. E. P. Beattie, 1972, **E**, det. C. E. A. Andrews.

558/1/199. HIERACIUM SCABRISETUM (Zahn) Roffey †*83, Midlothian: Blackford Glen, Edinburgh, GR 36/25.70. Roadside verge. E. P. Beattie, 1975, **E**, det. C. E. A. Andrews.

558/1/203. HIERACIUM EBORACENSE Pugsl. *67, S. Northumb.: Bavington, GR 35/96.77. J. Bevan, 1979, **CGE**, det. P. D. Sell.

558/1/206. HIERACIUM LATOBRIGORUM (Zahn) Roffey *84, W. Lothian: near Rousland Farm, Linlithgow, GR 26/98.79. E. P. Beattie, 1976, **E**, det. C. E. A. Andrews.

558/1/211. HIERACIUM RETICULATUM Lindeb. *83, Midlothian: Roslin Glen, GR 36/28.64. E. P. Beattie, 1976, **E**, det. C. E. A. Andrews.

558/1/209. HIERACIUM SUBCROCATUM (E. F. Linton) Roffey *99, Dunbarton: Dumbarton, GR 26/40.75. A. McG. Stirling, 1979, **E**.

558/1/sal. HIERACIUM SALTICOLA (Sudre) P. D. Sell & C. West †*59, S. Lancs.: Hightown turning on Liverpool to Southport road, A565, GR 34/3.0. C. P. Harris, 1970, **LANC**, det. P. D. Sell.

†558/2/6. HIERACIUM CAESPITOSUM Dumort. subsp. COLLINIFORME (Peter) P. D. Sell *78, Peebless.: 1 mile E. of Peebles on A72, GR 36/27.39. A. J. Silverside, 1976, **herb. A. J. McCosh.**

†559/tec. CREPIS TECTORUM L. subsp. TECTORUM *96, Easterness: Balloch, GR 28/72.46. New road verge. A. Grenfell, 1978, **E**, det. E. J. Clement.

560/1. TARAXACUM BRACHYGLOSSUM (Dahlst.) Dahlst. ***74**, Wigtowns. ***76**, Renfrews. ***82**, E. Lothian

560/3. TARAXACUM LACISTOPHYLLUM (Dahlst.) Raunk. ***44**, Carms. ***74**, Wigtowns.

560/13. TARAXACUM LAETIFORME Dahlst. ***73**, Kirkcudbrights. ***74**, Wigtowns.

560/15. TARAXACUM FULVUM Raunk. ***70**, Cumberland

560/16. TARAXACUM FULVIFORME Dahlst. ***70**, Cumberland

560/19. TARAXACUM GLAUCINIFORME Dahlst. ***46**, Cards.

560/20. TARAXACUM PROXIMUM (Dahlst.) Dahlst. ***74**, Wigtowns.

560/21. TARAXACUM SIMILE Raunk. ***85**, Fife

560/23. TARAXACUM DEGELII Hagl. ***1**, W. Cornwall

560/25. TARAXACUM PSEUDOLACISTOPHYLLUM van Soest ***1**, W. Cornwall ***74**, Wigtowns.

560/28. TARAXACUM OBLIQUUM (Fries) Dahlst. ***82**, E. Lothian

560/29. TARAXACUM PLATYGLOSSUM Raunk. ***74**, Wigtowns.

560/33. TARAXACUM UNGUILOBUM Dahlst. ***76**, Renfrews. ***82**, E. Lothian ***85**, Fife

560/34. TARAXACUM FULVICARPUM Dahlst. ***1**, W. Cornwall ***46**, Cards.

560/35. TARAXACUM LANDMARKII Dahlst. ***46**, Cards. ***69**, Westmorland ***83**, Midlothian ***85**, Fife

560/36. TARAXACUM FAEROENSE (Dahlst.) Dahlst. ***46**, Cards. ***74**, Wigtowns.

560/37. TARAXACUM SPECTABILE Dahlst. ***46**, Cards. ***74**, Wigtowns.. ***85**, Fife

560/42. TARAXACUM EURYPHYLLUM (Dahlst.) M.P.Chr. ***46**, Cards. ***74**, Wigtowns. ***85**, Fife

560/43. TARAXACUM MACULIGERUM H. Lindb. f. ***74**, Wigtowns. ***76**, Renfrews.

560/44. TARAXACUM PRAESTANS H. Lindb. f. ***46**, Cards. ***74**, Wigtowns.

560/45. TARAXACUM PSEUDOLARSSONII A. J. Richards ***74**, Wigtowns.

560/46. TARAXACUM NAEVOSIFORME Dahlst. ***70**, Cumberland ***74**, Wigtowns. ***85**, Fife

560/50. TARAXACUM NAEVOSUM Dahlst. ***85**, Fife

560/51. TARAXACUM LAETIFRONS Dahlst. ***74**, Wigtowns.

560/58. TARAXACUM STICTOPHYLLUM Dahlst. ***99**, Dunbarton

560/61. TARAXACUM NORDSTEDTII Dahlst. ***74**, Wigtowns. ***76**, Renfrews. ***99**, Dunbarton

560/64. TARAXACUM ADAMII Claire ***83**, Midlothian.

560/64a. TARAXACUM HIBERNICUM Hagl. ***74**, Wigtowns.

560/68. TARAXACUM CYANOLEPIS Dahlst. ***74**, Wigtowns. ***85**, Fife

560/69. TARAXACUM SELLANDII Dahlst. ***76**, Renfrews.

560/70. TARAXACUM ANCISTROLOBUM Dahlst. ***70**, Cumberland ***73**, Kirkcudbrights.

560/71. TARAXACUM SUBLACINIOSUM Dahlst. & H. Lindb. f. ***74**, Wigtowns.

560/72. TARAXACUM STENACRUM Dahlst. ***46**, Cards. ***70**, Cumberland

560/74. TARAXACUM PROCERUM Hagl. ***69**, Westmorland

560/75. TARAXACUM PANNUCIUM Dahlst. ***73**, Kirkcudbrights. ***74**, Wigtowns. ***76**, Renfrews. ***77**, Lanarks.

560/76. TARAXACUM LINGUATUM M. P. Chr. & Wiinst. ***46**, Cards.

560/78. TARAXACUM ALATUM H. Lindb. f. ***12**, N. Hants. ***74**, Wigtowns. ***76**, Renfrews. ***82**, E. Lothian

560/79. TARAXACUM LINGULATUM Markl. ***46**, Cards.

560/81. TARAXACUM CROCEIFLORUM Dahlst. ***48**, Merioneth

560/83. TARAXACUM EXPALLIDIFORME Dahlst. ***70**, Cumberland ***85**, Fife

560/84. TARAXACUM INSIGNE Raunk. ***85**, Fife

560/89. TARAXACUM VALDEDENTATUM Dahlst. ***12**, N. Hants.

560/93. TARAXACUM AEQUILOBUM Dahlst. ***99**, Dunbarton

560/94. TARAXACUM EKMANII Dahlst. ***46**, Cards. ***85**, Fife

560/95. TARAXACUM PORRECTIDENS Dahlst. ***46**, Cards.

560/98. TARAXACUM PECTINATIFORME H. Lindb. f. ***82**, E. Lothian

560/99. TARAXACUM AUROSULUM H. Lindb. f. ***76**, Renfrews.

560/100. TARAXACUM XANTHOSTIGMA H. Lindb. f. ***46**, Cards. ***69**, Westmorland ***85**, Fife

560/103. TARAXACUM CORDATUM Palmgr. ***74**, Wigtowns.

560/104. TARAXACUM HEMICYCLUM Hagl. ***99**, Dunbarton

560/106. TARAXACUM DAHLSTEDTII H. Lindb. f. ***46**, Cards. ***74**, Wigtowns.

560/113. TARAXACUM BRACTEATUM Dahlst. ***74**, Wigtowns.

560/114. TARAXACUM HAMATUM Raunk. ***44**, Carms. ***74**, Wigtowns. ***76**, Renfrews.

560/115. TARAXACUM HAMATIFORME Dahlst. ***74**, Wigtowns. ***76**, Renfrews. ***83**, Midlothian

560/116. TARAXACUM MARKLUNDII Palmgren ***12**, N. Hants.

560/118. TARAXACUM OBLONGATUM Dahlst. ***3**, S. Devon ***46**, Cards. ***74**, Wigtowns.

560/120. TARAXACUM FASCIATUM Dahlst. ***46**, Cards.

560/121. TARAXACUM RAUNKIAERII Wiinst. ***69**, Westmorland ***74**, Wigtowns. ***76**, Renfrews.

560/122. Taraxacum hemipolyodon Dahlst. ***74**, Wigtowns.

560/125. Taraxacum polyodon Dahlst. ***46**, Cards. ***74**, Wigtowns. ***76**, Renfrews. ***85**, Fife

560/127. Taraxacum crispifolium H. Lindb. f. ***46**, Cards.

560/129. Taraxacum obliquilobum Dahlst. ***82**, E. Lothian ***85**, Fife

560/130. Taraxacum privum Dahlst. ***46**, Cards.

560/132. Taraxacum cophocentrum Dahlst. ***46**, Cards. ***70**, Cumberland ***82**, E. Lothian

562/1. Luronium natans (L.) Raf. ***42**, Brecs.: near Hay-on-Wye, GR 32/20.41. R. G. Woods, 1979, **NMW**.

568/1. Stratiotes aloides L. †***38**, Warks.: Wedgnock Deer Park, near Warwick, GR 42/26.68. D. J. Jeffray, 1977, field record. **61**, S.E. Yorks.: by R. Hull near Beverley, GR 54/04.44. S. Priest, 1979, field record, det. F. E. Crackles. 1st record for over 100 years.

557/7. Potamogeton alpinus Balb. **84**, W. Lothian: Knock Hill, Bathgate, GR 26/99.71. E. P. Beattie, 1977, **E**, det. R. C. L. Howitt. 2nd record.

577/7 × 19. Potamogeton alpinus Balb. × P. crispus L. ***44**, Carms.: Llanfihangel-ar-Arth, GR 22/45.40. Pont Tyweli, GR 22/41.40. Both in R. Teifi, N. T. H. Holmes, 1978, **BM** & **NMW**. 1st and 2nd records. ***46**, Cards.: R. Teifi, 700m N. of Coedmore, GR 22/19.44. A. O. Chater, 1972, **BM**, det. J. E. Dandy. 1st record for Wales. R. Teifi at Llanfihangel-ar-Arth, GR 22/45.40. N. T. H. Holmes, 1978, **NMW**. 2nd record. ***69**, Westmorland: Small Water, GR 35/45.10. R. Stokoe, 1977, **herb. R.S.**, det. N. T. H. Holmes.

577/14. Potamogeton obtusifolius Mert. & Koch ***50**, Denbs.: Oaks Farm, Redbrook, near Whitchurch, GR 33/51.39. Farm pond. C. G. A. Paskell, 1979, **NMW**.

577/21. Potamogeton pectinatus L. ***84**, W. Lothian: Linlithgow Loch, GR 36/00.77. E. P. Beattie, 1977, **E**, det. R. C. L. Howitt.

580/1. Zannichellia palustris L. ***46**, Cards.: Dyfi estuary, GR 22/6.9. J. P. Savidge, 1961, field record. 1st definite record. ***84**, W. Lothian: Linlithgow Loch, GR 36/00.77. E. P. Beattie, 1977, **E**, det. R. C. L. Howitt.

597/1. Gagea lutea (L.) Ker-Gawl. ***50**, Denbs.: near Ruthin, GR 33/2.5. E. Chicken, 1979, **herb. E.C.**

598/1. Ornithogalum umbellatum L. †**74**, Wigtowns.: Port William, GR 25/33.44. J. Cameron, 1978, field record. 2nd record.

†600/2 × 1. Endymion hispanicus (Mill.) Chouard × E. non-scriptus (L.) Garcke ***74**, Wigtowns.: Chapel Rossan, GR 25/10.45. Coastal grassland. A. J. Silverside, 1978, **E**.

†600/2. Endymion hispanicus (Mill.) Chouard ***46**, Cards.: Upper Borth, GR 22/60.88. Penyrangor, Aberstwyth, GR 22/58.80. Both J. E. Halfhide, 1977, field records. 1st and 2nd records.

605/8. Juncus inflexus L. **78**, Peebless.: Heathpool Common, GR 36/24.44. A. Copland, 1979, **herb. D. J. McCosh.** 1st post-1930 record.

605/fol. Juncus foliosus Desf. ***1**, W. Cornwall: Constantine Bay, GR 10/85.75. L. J. Margetts, 1977, **herb. L.J.M.**, det. P. M. Benoit.

†606/4. Luzula luzuloides (Lam.) Dandy & Wilmott ***83**, Midlothian: Cobbinshaw, GR 36/01.57. Railway embankment. E. P. Beattie, 1978, **E**.

607/5. Allium vineale L. **42**, Brecs.: near Crickadarn, GR 32/10.42. M. Porter, 1978, field record. 2nd record. ***78**, Peebless.: Heathpool Common, S. of Eddleston, GR 36/25.44. Garden weed. D. J. McCosh, 1979, **herb. D.J.McC**.

†607/7. Allium carinatum L. **78**, Peebless.: roadside 1 mile E. of Peebles, GR 36/26.40. D. J.

McCosh, 1977, field record. 2nd record. *82, E. Lothian: Aberlady, GR 36/47.80. O. M. Stewart, 1977, field record. *99, Dunbarton: Clyde-side at Bowling, GR 26/4.7. J. H. Penson, 1975, **herb. J.H.P.**

†607/10. ALLIUM TRIQUETRUM L. ***50**, Denbs.: Colwyn Bay, GR 23/8.7. Roadside. J. M. Brummitt, 1968, field record.

†607/11. ALLIUM PARADOXUM (Bieb.) G. Don ***93**, N. Aberdeen: Craigmancie, 8km N.E. of Huntly, GR 38/58.47. D. Welch, 1979, **ABD**.

†614/6. NARCISSUS MAJALIS Curt. ***74**, Wigtowns.: above Knock Bay, GR 15/98.57. Well naturalized along roadside. A. J. Silverside, 1978 **E**.

615/1. SISYRINCHIUM BERMUDIANA L. **†49**, Caerns.: Waunfawr, GR 23/53.59. M. Griffiths, 1977, **NMW**. 2nd record.

628/2. LISTERA CORDATA (L.) R. Br. ***42**, Brecs.: near Rhayader, GR 22/92.64. R. G. Woods, 1979, **NMW**. **83**, Midlothian: Moorfoot Hills, GR 36/3.4. S. D. Ward, 1972, field record. 1st post-1930 record.

636/1b. GYMNADENIA CONOPSEA (L.) R. Br. subsp. DENSIFLORA (Wahlenb.) G. Camus, Bergon & A. Camus ***1**, W. Cornwall: Penhale Sands, GR 10/78.57. L. J. Margetts, 1979, **K**, det. P. J. Cribb.

643/3b. DACTYLORHIZA INCARNATA (L.) Soó subsp. PULCHELLA (Druce) Soó ***1**, W. Cornwall: Goonhilly, The Lizard, GR 10/73.21. J. Hopkins & L. J. Margetts, 1978, field record, det. R. H. Roberts.

643/5. DACTYLORHIZA PURPURELLA (T. & T. A. Steph.) Soó ***43**, Rads.: Moelfre City, near Llanbister, GR 32/13.77. A. C. Powell, 1979, field record, det. R. H. Roberts.

643/6 cam. DACTYLORHIZA MAJALIS (Reichb.) Hunt & Summerh. subsp. CAMBRENSIS (Roberts) Roberts ***48**, Merioneth: Glaslyn marshes, near Pont Croesor, GR 23/59.41. D. T. Ettlinger & R. H. Roberts, 1979, field record. Glaslyn marshes, near Minfford, GR 23/59.38. R. H. Roberts & T. Blackstock, 1979, field record. 1st and 2nd records.

†647/1. CALLA PALUSTRIS L. ***38**, Warks.: Sutton Park, GR 42/09.98. B. R. Fowler, 1979, field record.

†648/1. LYSICHITON AMERICANUS Hultén & St John ***46**, Cards.: Ynys-hir, Eglwys Fach, GR 22/68.95. W. M. Condry, 1955, field record. Melin-y-cwm, Furnace, GR 22/69.94. A. B. Pinkard & R. Lewis, 1979, **NMW**. 1st and 2nd records.

652/2. SPARGANIUM EMERSUM Rehm. **78**, Peebless.: Dawyck, GR 36/15.35. C. M. Morrison, 1976, **herb. D. J. McCosh**. 1st post-1930 record.

654/3. ERIOPHORUM LATIFOLIUM Hoppe ***85**, Fife: Waltonhill, 2 miles E. of Pitlessie, GR 37/35.09. S. Leach, 1979, **herb. G. H. Ballantyne**.

655/4. SCIRPUS SYLVATICUS L. **50**, Denbs.: Oaks Farm, near Redbrook, GR 33/51.40. J. M. Brummitt, 1979, **NMW**. 2nd record.

655/8. SCIRPUS LACUSTRIS L. ***1**, W. Cornwall: Penhale Sands, GR 10/76.56. E. W. Magor, L. J. Margetts & R. J. Murphy, 1979, **CGE**. 1st definite record.

655/9. SCIRPUS TABERNAEMONTANI C. C. Gmel. **74**, Wigtowns.: Wigtown, GR 25/44.55. P. Adam, 1974, field record. 2nd record, 1st record since 1899. Kirkcolm, GR 25/03.68. A. J. Silverside, 1978, field record. Rediscovery of original 1899 site.

655/11. SCIRPUS CERNUUS Vahl **74**, Wigtowns.: Larbrax, 4 miles N. of Portpatrick, GR 15/97.60. A. McG. Stirling, 1975, **E**. 1st post-1930 record.

655/12. SCIRPUS FLUITANS L. ***47**, Monts.: S. of Gaer Bank, GR 33/20.15. F. H. Perring, C. A. Sinker & P. H. Oswald, 1978, field record.

656/4. ELEOCHARIS MULTICAULIS (Sm.) Sm. [***78**, Peebless.: *Watsonia*, **9**: 278 (1973) has been redetermined as *E. quinqueflora*.]

656/6. ELEOCHARIS UNIGLUMIS (Link) Schult. *99, Dunbarton: Clyde-side, Clydebank, GR 26/4.7. L. Watt, 1879, **GL**.

657/1. BLYSMUS COMPRESSUS (L.) Panz. ex Link **70**, Cumberland: by R. Esk, Netherby, Longtown, GR 35/39.72. C. Smith, 1979, **LANC**. 2nd extant record.

660/1. RHYNCHOSPORA ALBA (L.) Vahl **50**, Denbs.: Fenn's Moss, near Whitchurch, GR 33/47.35. J. M. Brummitt, 1979, **NMW**. 2nd record.

663/11. CAREX EXTENSA Gooden. **99**, Dunbarton: between Cove and Barons Point, GR 26/22.81. A. McG. Stirling, 1979, **E**. 1st localized record.

663/15. CAREX PSEUDOCYPERUS L. *1, W. Cornwall: Crousa Downs, GR 10/75.19. J. Hopkins, 1979, **CGE**, det. R. W. David.

663/16 × 17. CAREX ROSTRATA Stokes × C. VESICARIA L. *48, Merioneth: S. W. end of Llyn Tegid, GR 23/8.3. P. M. Benoit, 1979, **BM**, conf. A. O. Chater, R. W. David & A. C. Jermy.

663/27. CAREX VAGINATA Tausch *78, Peebless.: Little Craig, Cramalt Craig, GR 36/17.24. R. W. M. Corner, 1978, **herb. D. J. McCosh**, det. J. G. Roger.

663/29. CAREX PAUPERCULA Michx **73**, Kirkcudbrights.: W. of Loch Urr, GR 25/74.84. D. A. Ratcliffe, 1978, field record. 2nd record.

663/33. CAREX LASIOCARPA Ehrh. *42, Brecs.: Brecon Beacons, GR 22/96.25. R. G. Woods, 1978, **BM**, conf. A. C. Jermy.

663/46. CAREX ELATA All. **50**, Denbs.: Hanmer 5km N.E. of Ellesmere, GR 33/45.38. M. J. Wigginton, 1979, field record. 2nd record. **73**, Kirkcudbrights.: Carlingwalk Loch, Castle Douglas, GR 25/76.60. O. M. Stewart, 1979, **E**, det. A. C. Jermy. 1st post-1930 record. *74, Wigtowns.: Elrig Loch, near Port William, GR 25/32.48. A. McG. Stirling, 1978, **E**. 1st definite record.

663/46 × 50. CAREX ELATA All. × C. NIGRA (L.) Reichard *29, Cambs.: Shepreth, GR 52/37.47. R. W. David & J. E. Raven, 1977, **CGE**. *49, Caerns.: Cors Geirch, GR 23/3.3. P. M. Benoit, 1979, **BM**, conf. A. O. Chater, R. W. David & A. C. Jermy.

663/47. CAREX ACUTA L. **80**, Roxburghs.: N. bank of R. Tweed, upstream from Trows, Makerstoun, GR 36/68.32. R. W. M. Corner, 1978, **BM** and **herb. R.W.M.C.**, det. A. C. Jermy. 1st record since 1876, found at same locality.

663/47 × 50. CAREX ACUTA L. × C. NIGRA (L.) Reichard *48, Merioneth: S.W. end of Llyn Tegid, GR 23/8.3. P. M. Benoit, 1979, **BM**, conf. A. O. Chater, R. W. David & A. C. Jermy.

663/48. CAREX AQUATILIS Wahlenb. **44**, Carms.: R. Teifi below Lampeter, GR 22/57.47. A. O. Chater, 1979, field record. 2nd record. *50, Denbs.: Rhyd-lydan, Pentrefoelas, GR 23/89.50. P. Day, 1979, **NMW**, det. P. M. Benoit. *70, Cumberland: by R. Irthing near Churnsike Lodge, GR 35/66.76. C. C. Haworth & F. J. Roberts, 1976, field record; 1978, **LANC**, det. A. O. Chater. S. end of Bassenthwaite Lake, GR 35/22.26. T. Blackstock, 1978, **herb. Brathay Field Studies Centre**, det. A. O. Chater. 1st and 2nd records. *74, Wigtowns.: Cree Marshes, GR 25/37.71. D. A. Wells, 1973, field record. A. J. Silverside, 1978, **herb. A.J.S.**

663/57 × 71. CAREX OTRUBAE Podp. × C. REMOTA L. *70, Cumberland: St Bees, Whitehaven, GR 25/95.11. C. C. Haworth, 1979, **herb. C.C.H.**, det. A. O. Chater.

663/65. CAREX DIVULSA Stokes **47**, Monts.: N.E. of Powys Castle, Welshpool, GR 33/21.06. F. H. Perring, 1978, field record. 2nd record.

663/67. CAREX SPICATA Huds. *99, Dunbarton: Milton, Dumbarton, GR 26/40.74. A. McG. Stirling, 1977, **E**, det. R. W. David. Ardoch, Cardross, GR 26/36.75. A. McG. Stirling, 1979, **E**, det. R. W. David. 1st and 2nd records.

663/69. CAREX ELONGATA L. **50**, Denbs.: Hanmer, 5km N.E. of Ellesmere, GR 33/45.38. M.J. Wigginton, 1979, field record. 2nd record.

663/71. Carex remota L. **93**, N. Aberdeen: Tore of Troup, GR 38/83.65. M. Smith, 1977, field record. 1st post-1930 record.

663/78. Carex pauciflora Lightf. ***74**, Wigtowns.: near Loch Maberry, GR 25/2.7. J. H. Penson, 1963, **GLAM**.

663/81. Carex dioica L. **45**, Pembs.: Brynberian Moor, GR 22/12.34. S. B. Evans, 1979, **NMW**. 2nd record. **46**, Cards.: Llyn Cynon, GR 22/79.64. P. D. Moore, 1966, field record. 2nd record.

†670/1. × 671/2. Festuca pratensis Huds. × Lolium multiflorum Lam. ***29**, Cambs.: Impingham, GR 52/44.61. P. J. O. Trist, 1978, **herb. P.J.O.T.**

670/2 × 671/2. Festuca arundinacea Schreb. × Lolium multiflorum Lam. ***38**, Warks.: Combroke, GR 42/29.50. J. C. Bowra, 1977, **WAR**, det. C. E. Hubbard.

670/4. Festuca altissima All. ***38**, Warks.: Bentley Park Wood, near Atherstone, GR 42/28.95. M. C. Clark, 1972, **BIRM**, conf. J. G. Hawkes.

†670/5. Festuca heterophylla Lam. **106**, E. Ross: Ardross Castle near Alness, GR 28/61.73. Large colony on shaded river bank. U. K. Duncan, 1979, **herb. U.K.D.**, det. C. E. Hubbard. 2nd record.

673/5. Puccinellia rupestris (With.) Fernald & Weatherby ***53**, S. Lincs.: Marine Villa, GR 53/35.35. Dawsmere, GR 53/45.30. Both A. J. Gray, 1974, field records. 1st and 2nd records.

676/11. Poa angustifolia L. ***83**, Midlothian: Edinburgh Castle, GR 36/25.73. C. W. Muirhead, 1977, **herb. C.W.M.** and **E**, det. C. E. Hubbard.

676/12. Poa subcaerulea Sm. ***47**, Monts.: Powys Castle, Welshpool, GR 33/22.07. F. H. Perring, 1978, field record. **74**, Wigtowns.: Port Logan, GR 25/09.40. A. McG. Stirling, 1960, **GL**. 2nd record.

†676/14. Poa palustris L. **99**, Dunbarton: near Erskine Bridge, Old Kilpatrick, GR 26/4.7. A. McG. Stirling, 1979, **E**. 2nd record.

†Lamarkia aurea (L.) Moench ***35**, Newport: GR 31/30.85. Rubbish tip. A. Grenfell & T. G. Evans, 1979, **herb. T.G.E.**, conf. C. E. Hubbard.

†683/4. Bromis inermis Leyss. ***70**, Cumberland: Haverigg, Millom, GR 34/14.78. J. D. Williamson, 1977, **LANC**, det. P. M. Smith.

†683/18. Bromus secalinus L. ***45**, Pembs.: 2km N.W. of Castlemartin, GR 11/88.98. Sand dune. F. Bog, 1979, **NMW**.

683/lan. Bromus lanceolatus Roth var. lanuginosus (Poir.) Dinsmore ***35**, Mons.: Newport, GR 31/30.85. Rubbish tip. A. Grenfell & T. G. Evans, 1979, **herb. T.G.E.**, det. C. E. Hubbard.

684/2. Brachypodium pinnatum (L.) Beauv. ***70**, Cumberland: Duncowfold, Cotehill, GR 35/48.51. Railway embankment. F. J. Roberts, 1979, **LANC**.

†687/jub. Hordeum jubatum L. ***38**, Warks.: Dunchurch, near Rugby, GR 42/49.72. M. D. G. Jones, 1974, **BIRM**. ***69**, Westmorland: by M6 between Hardendale and Tebay, GR 35/58.10. G. Halliday, 1978, 1979 specimen **LANC**.

688/1. Hordelymus europaeus (L.) Harz ***29**, Cambs.: Knapwell Wood, GR 52/33.60. O. Rackham, 1979, **CGE**.

†697/3. Aira multiculmis Dumort. ***74**, Wigtowns.: 3km S.E. of Cairnryan, GR 25/07.65. Roadside. C.S.S.F. Field Meeting, 1977, **herb. G. M. Kay**, det. C. E. Hubbard. Monreith Bay, GR 25/36.40. Short turf by shore. C.S.S.F. Field Meeting, 1977, field record. 1st and 2nd records. ***107**, E. Sutherland: Bonar Bridge, GR 28/61.91. Garden weed. U. K. Duncan, 1979, **herb. U.K.D.**, det. C. E. Hubbard.

700/1. Calamagrostis epigejos (L.) Roth **1**, W. Cornwall: near Coverack, The Lizard, GR 10/78.17. J. Hopkins, 1979, **CGE**. 2nd record. ***78**, Peebless.: St Mary's Loch, Cappercleuch, GR 36/24.22. R. C. L. Howitt, 1972, **herb. D. J. McCosh**.

701/4. Agrostis gigantea Roth *43, Rads.: Llandrindod Wells, GR 32/06.61. A. E. Wade, 1979, **NMW**. **70**, Cumberland: 1 mile N.E. of Kirkoswald, GR 35/56.42. R. W. M. Corner, 1979, **LANC**. 2nd record.

†701/7. Agrostis scabra Willd. ***77**, Lanarks.: Clyde Docks, GR 26/56.65. A. McG. Stirling & P. Macpherson, 1973, **herb. P.M.**, det. C. E. Hubbard.

†706/1. Lagurus ovatus L. ***38**, Warks.: Shuckburgh Park, GR 42/49.61. Rough pasture. M. C. Clark, 1973, field record.

709/1. Milium effusum L. ***93**, N. Aberdeen: Den of Auchmedden, GR 38/84.64. D. Welch, 1979, **ABD**.

†713/tub. Phalaris tuberosa L. ***38**, Warks.: 5km N.W. of Stratford, GR 42/15.57. B. R. Fowler, 1978, field record, det. C. E. Hubbard.

†Sasa palmata (Burbidge) E. G. Camus ***74**, Wigtowns.: Castle Kennedy, GR 25/10.61. Naturalized in estate woodlands. C.S.S.F. Field Meeting, 1977, **herb. A. J. Silverside**, det. D. McClintock. Knock Bay, GR 15/98.57. Extensively naturalized in damp scrub in coastal ravine. A. J. Silverside, 1978, **E**, det. D. McClintock. 1st and 2nd records.

Book Reviews

The biology and taxonomy of the Solanaceae. Linnean Society Symposium No. 7. Edited by J. G. Hawkes, R. N. Lester & A. D. Skelding. Pp. xviii + 738, with 43 black & white plates and 125 figures. Academic Press, London, 1978. Price £45·00.

This volume is the seventh in the Linnean Society Symposium Series and is the outcome of an international symposium held at the University of Birmingham, England, in July, 1976. Although now over three years have elapsed, most of the papers have been updated. This large book is divided into nine sections. The first, 'Taxonomy and floristics', starts with a contribution by W. G. D'Arcy, who gives a lucid account of the development of thought on the classification of the Solanaceae up to the present day. This is followed by papers on the Solanaceae of South America, India and Australia, and of *Solanum* species of Nigeria and Australia.

The second section of the book, 'Ethnobotany', contains three papers, which give interesting and detailed accounts of the traditional uses of the Solanaceae as a source of food and hallucinogens, the latter having been widely used for magico-religious purposes.

'Alkaloids', the third section, has six contributions on various aspects of steroidal alkaloids, starting with a clearly presented review by K. Schrieber of these compounds found in *Solanum*. The occurrence, chemical structure and biosynthesis of tropane alkaloids in the Solanaceae are reviewed by W. C. Evans, who shows that clear-cut chemotaxonomic features are evident. Tropane alkaloids have been utilized for a long time as medicines, hallucinogens and poisons.

In the fourth section, 'Flavonoids, terpenes and proteins', J. B. Harborne and T. Swain show that the Solanaceae have a particular flavonoid pattern which generally distinguishes them from other plant families with which they are most usually associated in systematic treatments. The section contains two papers on proteins and their use in chemotaxonomy. H. Stegeman shows how the separation and partial characterization of proteins by zone electrophoresis can be used for the characterization of potato cultivars, and R. N. Lester describes how serological data can be obtained and used for taxonomic purposes in *Solanum*.

The fifth section, 'Anatomy and fine structure', contains four well-illustrated papers describing the different hair types of *Solanum*, the stomatal characters of the family, and the pollen morphology both of the tribe Salpiglossideae and of Nigerian *Solanum* species.

The sixth section, 'Morphology and morphogenesis', has four papers, one of which is a review by A. Child of the branching patterns in the Solanaceae with a brief discussion of the relevance of this to the taxonomy of the family. Another paper, by H. D. Hammond, outlines the changes in morphological characters of *Solanum* species that can be induced by the application of growth regulatory substances and shows that these changes are dependent on photoperiod.

'Floral biology, incompatibility and haploidy' is the title of the seventh section and includes six papers which give detailed consideration to *Solanum*, *Capsicum*, *Nicotiana* and *Lycopersicon*. Section eight, 'Biosystematics of genera and sections' contains nine contributions, which deal with *Brunfelsia*, the physaloid genera of the Solaneae in North America, and the *Solanum*, *Basarthrum*, *Brevantherum*, *Acanthophora* and *Androceras* sections of the genus *Solanum*.

The final section, 'Biosystematics of domesticates' has ten papers, which concentrate on the members of the Solanaceae utilized as foodstuffs. One article of particular interest, by P. Grun, traces, from cytoplasmic evidence, the evolution of the cultivated potato.

The volume is well presented, logically arranged and covers the subject area thoroughly; it is remarkably free from typographical mistakes and the quality of the illustrations is generally good. The papers are of a consistently high standard and cover many disciplines. As such, the book will be of interest to workers in a wide range of subject areas. As well as those involved with the Solanaceae, the book is a 'must' for all libraries catering for people interested in biochemistry, taxonomy, cytogenetics, ethnobotany, phytochemistry and medicinal chemistry.

G. Blunden

Holy Thorn of Glastonbury. A. R. Vickery. Pp. 14, with 2 figures. The Toucan Press, Mount Durand Street, Peter Port, Guernsey, C.I. 1979. Price 30p.

A modest 30p will purchase an account of the mystery and legends surrounding the 'Glastonbury Thorn', together with an assessment of its botanical status. The author has disentangled and evaluated the many legends surrounding those hawthorn trees which flower in time for Christmas and are described as 'surely the most revered and loved tree in England'. References through tradition and history have been traced from 1125 to the present time, when sprays from a thorn tree at Glastonbury are sent at Christmas to the Queen and to our Patron, Queen Elizabeth the Queen Mother.

Early records from a number of sources and localities have been researched and traditional customs described, and a summary of the taxonomy of the tree is given. This interesting account is especially useful as other statements in print imply that no Glastonbury Thorn exists today. A bibliography of botanical historical and folklore references, also drawings of the Holy Thorn and a sprig of the Glastonbury Thorn by Margaret Tebbs and the author respectively, add to the good value of this informative booklet (19 × 12 cm) on botanical folklore.

M. Briggs

Mountain flower holidays in Europe. Lionel Bacon. Pp. 293, including 32 of photographs, some coloured. Alpine Garden Society, Woking. 1979. Price £8·00.

With about 70 conducted parties and who knows how many independent travellers from Britain visiting Continental mountains each year, there is an assured market for this guide, designed by the Alpine Garden Society to replace Hugh-Smith's long-out-of-print *Plant hunting in Europe*. It begins with a general account of the 'basic flora' of the Alps and sensible advice about travel, accommodation and language. The core is a sequence of chapters about various countries, selecting favoured mountain areas of each and describing how they can be visited, with notes of their more conspicuous flowers. Finally there are hints on plant photography (of which there are many excellent examples), a list of available maps and an index of botanical names.

Much of the work is excellently done, but too much is devoted to areas in Mediterranean countries which could fairly have been considered outside its scope, allowing room for a more uniform treatment of the remainder. Dr Bacon acknowledges the assistance of many contributors, but they cannot be blamed for any inconsistencies; for instance we are told on p. 30 that the Jura will be briefly considered under France, and on p.75 (under France) that the Jura is not separately treated. A paragraph on this range, the nearest Continental mountains worth a botanical visit, would fit this book better than the two pages about Lesbos and Rhodes, which have no land above 1,000m. There are far too many mentions of hotels which *might* still exist and flowers whose identity *may* be doubtful, where the information could be checked before being given the greater certainty implicit in print. There are numerous trivial inaccuracies, but the references to first pages of articles in the Society's *Bulletin* giving fuller treatments of some mountain areas are correct and a very useful feature.

R. M. Burton

Secretory tissues in plants. A. Fahn. Pp. ix + 302, with 149 figures. Academic Press, London, New York and San Francisco. 1979. Price £20·00.

Professor Fahn is well known to students of botany for his useful and clear text-book *Plant anatomy*. I was most pleased to find that, in this more specialized book on secretory tissues in plants, he has maintained his high standards.

For over 30 years now Prof. Fahn has followed an active research interest in nectaries and other secretory structures. In this book he has made use of his own work and also reports widely from the literature. The reader wishing to follow up points of interest will find the references very comprehensive.

Most text-books on general plant anatomy devote little space to this fascinating subject. There was a clear need for this book to be written, gathering as it does from a broad spectrum of knowledge. A major problem must have been to know what to leave out. Another problem facing the author was how he should classify the subject matter. He has achieved a level which will satisfy most, and an entirely sensible arrangement of material.

Following the introduction, the book is divided into two main sections. The first deals with hydathodes, salt glands and nectaries; that is, structures that secrete unmodified or only slightly modified substances. The second is about secretory tissues synthesizing the secreted substances, i.e. mucilage, glands of carnivorous plants, myrosin cells, stinging trichomes, lipophilic substances and laticifers. There is an account of the distribution, structure and fine structure, development, function and significance of each sort of secretory structure. In addition there are comments on evolutionary considerations in each case and, where pertinent, discussions on the economic significance of the secretions themselves. The book concludes with a brief chapter on general remarks, tying up a few loose ends.

There is a good balance between text and illustrations. The numerous line drawings are clear, and the photomicrographs, taken using light and scanning and transmission electron microscopes, are good on the whole; the reproduction of photographs from some of the latter does not do justice to the originals.

This book is already in demand – I have had difficulty in keeping it from my colleagues while writing this review!

The main readership will probably be research workers and students in anatomy and physiology. There is also much in this book to interest cytologists, biochemists and endocrinologists. Those with more general biological or botanical backgrounds should also find some chapters particularly worth reading, for example those on carnivorous plants and nectaries.

Altogether, this is a stimulating and worthwhile publication which should be widely appreciated in the biological world.

D. F. Cutler

An ecological Flora of Breckland. Edited by P. J. O. Trist. Pp. xxii + 106, with 96 pages of maps. E. P. Publishing Ltd. Wakefield. 1979. Price £22·50.

A new Local Flora is always welcome, and this especially so as it breaks the long tradition that such works should deal with the natural vegetation of a county or a Watsonian vice-county. Here we have a Flora covering an area of considerable botanical importance which extends into two counties. Realizing the need to know more of the flora of Breckland, some officers of the Nature Conservancy, with the help of a very small group of mainly local workers, began a floristic survey in 1962. The area chosen for this, since Breckland has been variously defined, is given on a map which also shows the areas used by previous workers and land over 61m, but little more. It would have been good to see other maps showing at least the county boundaries and the river systems more clearly.

The method used for the survey is described very clearly by Dr G. D. Watts, being identical in every detail with a scheme at that time being used in Warwickshire, a county about twice the size of the area chosen for the Breckland survey. Much was demanded from the field workers, who virtually finished their task in ten years, obtaining the very satisfactory average of about 200 species for the 300 one-kilometre grid squares they had studied intensively. *A computer-mapped Flora*, (by D. A. Cadbury, J. G. Hawkes & R. C. Readett), the end-product of the Warwickshire survey, was published in 1971, which was about the same time that the Breckland survey ended, thus making some comparisons inevitable. The Warwickshire Flora had very clear and what must have been expensive maps, the envy of all engaged in similar work, to display the results of their survey. Here we have maps with no grid shown, making it almost impossible to locate the tetrads to which the various symbols, nine in all, refer. It does not help that the symbols shown in the key are 15 times as large as those on the maps. The Breckland Flora gives no indication which one-kilometre square in the various tetrads was selected at random for detailed study; it is shown clearly in the Warwickshire Flora. With both surveys one wonders whether it was necessary to choose by random selection which one-kilometre square in each tetrad should be studied in detail. A better result would surely have been obtained by having the same one-kilometre square, say the south-eastern one, in every tetrad–random selection could well have ended with choosing which. The maps, which occupy nearly a half of the Breckland Flora, are a testimonial to the hard and valuable work done by a small band of botanists but provide little justification for describing it as 'ecological'. It is a great pity that better maps could not have been produced although some of their deficiency has been remedied by an overlay now available free of charge to anyone who has already purchased a copy of the Flora.

With the survey completed for only a quarter of the area involved, it was left for Mr P. J. O. Trist to provide a Flora; this he has done superbly. Breckland is unique in Britain for its vegetation, and above all it has some species to be found only here, or here in greater number than elsewhere. It needs some interpretation. To provide material for this Mr Trist made detailed studies of about 250 one-metre squares, 26 of which are given in full and the remainder used in giving full accounts of 22 of the Breck's very special plants. Here is valuable material giving guide lines for conservation as well as allowing future workers to measure change. The Flora is, however, much more than a recital of rare plants, as it gives in the normally accepted format a full account of all the wild flowers of the area now known or believed to be extinct, the latter being pleasingly few compared with the total flora. In short, we are given all that one can reasonably expect in a Local Flora. Mr Trist himself provides chapters on the climate and historical background of Breckland, and Dr N. H. Pizer adds a useful account of its soils. It is helpful to have a full bibliography and only one index, even if this is limited to plant names.

It is to be hoped that what has been achieved here will be encouragement to others to produce similar Floras of areas that cross the artificial lines of county boundaries. In this case it is unfortunate that there is no large town in or near the Breck to assist the all-important local sales, especially so since the price is high even taking into account the present soaring costs of book production.

J. G. Dony

Investigating chromosomes. Adrian F. Dyer. Pp. 138, with 38 figures and 13 tables. Edward Arnold, London. 1979. Price £6·75.

For many students of biology the study of chromosomes is limited largely to theoretical details. This book has been written to encourage both teachers and students to undertake more practical work on chromosomes. No previous experience in cytogenetics is assumed, and practical details of materials and technique are combined with theory to assist the reader in observation and interpretation.

The first chapter is devoted to the technique of obtaining dividing cells, fixation, staining and slide preparation. To prevent the reader from becoming confused by methodology, one straightforward staining schedule is described which can be used to demonstrate mitosis and meiosis in a wide range of plant and animal material. The author gives sound advice on how to record the observations made. Chapter two deals with chromosome structure as viewed with the light microscope, and the visible events of mitosis and meiosis. Karyotype diversity, pairing and disjunction of chromosomes at meiosis, and chromosome mutation and evolution are described in chapter three. In chapter four the author explains how to carry out cytogenetic research, and suggests a few projects which the student could undertake.

Throughout the book theory is interspersed with practical details. For example, the theory of mitosis is followed by a description of methods for examining both male and female gametophytic mitosis, as well as sporophytic mitosis in different tissues. Similarly, after descriptions of B chromosomes and nucleolar organizers, the author provides examples of species which can be used to demonstrate these features. Photographs and figures are provided to assist in the interpretation of chromosome preparations. Unfortunately some of the figures are rather complicated and confusing, particularly those which include 'thumb nail' sketches of chromosomes, for example Figure 3.4, which also includes some inaccuracies.

However, to the teacher embarking on practical cytogenetics for the first time, the book should prove most useful, particularly the appendix, which includes a chromosome calendar showing when different species are available for mitotic and meiotic study, a suggestion of plants for a genetic garden and where to obtain them, and a list of available films showing dividing chromosomes.

M. Gibby

Taxonomy in Britain. Advisory Board for the Research Councils. Pp. vii + 126. Her Majesty's Stationery Office, London. 1979. Price £3·50.

This is a Report by the Review Group on Taxonomy set up in 1974 by the Advisory Board for the Research Councils, under the chairmanship of Sir Eric Smith FRS. Its brief was to review current and future needs for taxonomy and the facilities required in the U.K. to meet them. Although the Report was presented to the Board in October, 1977, it has taken nearly two years for it to be published. Seventeen meetings of the Review Group were held and over fifty people either came to speak at meetings of the Group or sent in written comments or papers. Various organizations also submitted evidence, and questionnaires were sent out to Universities requesting information on teaching and research in taxonomy in Botany, Biology, Agricultural Botany, Genetics, Micro-organisms, Zoology and Entomology.

The actual report has ten chapters – introduction, the science of taxonomy, the organization of taxonomy, the requirement of taxonomy, the deployment of taxonomists, the users of taxonomy and their needs, the training and recruitment of taxonomists, the funding of taxonomy, and summary and recommendations.

None of the recommendations will cause any surprise. It is felt that the structure of the present institutional system within which taxonomy is practised in the U.K. is satisfactory and should be maintained. It recommends further collaboration between institutions, especially in multidisciplinary projects. As regards the National Institutions, the Royal Botanic Gardens, Kew, the Royal Botanic Garden, Edinburgh, and the British Museum (Natural History), it makes the point that the collections they house, made over two centuries, represent both a national heritage and an international obligation, having a special importance for the understanding and management of the rapidly changing ecosystems of developing countries. It specifically recommends that the curation of these collections and their development for education and research should be made the central purpose of their work programmes – a recommendation that could be open to several interpretations although apparently intended to mean that the collections should be adequately curated and made available for other workers and be the main basis for research programmes in the National Institutions.

Another recommendation is that major support for taxonomy should be directed to groups that have economic or social importance; and, by extension, this proposes that urgent attention should be given to taxonomic work on the floras and faunas of changing or threatened ecosystems and in support of conservation studies. The problems of taxonomic publication, indexes and libraries are also considered and appropriate recommendations made. Likewise the recruitment and training of taxonomists are reviewed and a modest increase in the number of postgraduate studentships for taxonomic research is recommended. The tricky problem of overseas aid programmes and their attitude to taxonomy is considered.

Apart from the recommendations, the detailed information on the tables and annexes makes fascinating reading. They indicate the very wide range of taxonomic activities in the United Kingdom and the sources of finance (Table 21). The latter total (in 1976/7) approximately £6,000,000 and reveal that, for example, the annual costs of taxonomic research at the British Museum (Natural History) were £1,300,000 plus £1,100,000 for curation and in-house publications; for the Royal Botanic Gardens, Kew, the figures were £500,000 plus £670,000 for the use of living collections, curation and the library; for the Universities a figure of £1,200,000 is given calculated on the basis of 560 workers, equivalent to 140 full-time equivalents at £10,000 each. The figure for the Universities is difficult to accept as very meaningful, especially when coupled with the fact that the total annual Research Council grants for University research in taxonomy were £200,000 of which £113,000 came from MRC, £35,000 from NERC and £45,000 from SRC. Three quarters of the derisory sum of £45,000 from SRC went to support flowering-plant botany, and 160 botanical taxonomists were estimated to be in post, 135 of them working on higher plants. The report is silent on the implications of these staggering figures, and it is to be hoped that a debate on them will be opened up by the scientific community

V. H. HEYWOOD

Botany. A study in pure curiosity. Jean-Jacques Rousseau, illustrated by P. J. Redouté, translated by Kate Ottevanger. Pp. 156, with 65 colour plates and 3 black & white plates. Michael Joseph, London. 1979. Price £10·00.

The text of this exquisite book derives from an idea in 1771 of the happily remarried Madeleine-Catherine Boy de La Tour, who suggested that her life-long friend, guardian and mentor, Jean-Jacques Rousseau should, by means of letters, help her with the botanical education of her four-year-old daughter. In his declining years Rousseau (1712–1778) had already turned away from subversive political theorizing and philosophical infighting with colleagues and enemies alike and was by then salving his well developed paranoia with the study of botany. Prior to Madeleine-Catherine's request he had already made a detailed study of every plant on the island of Saint Pierre on Lake Bienne in Switzerland and, whilst visiting Britain as a guest of Richard Davenport at Wooten Hall, he had studied the surrounding countryside in great detail. Thus equipped with this knowledge and a copy of Linnaeus's *Species Plantarum* he felt able to reply 'Your notion of directing your daughter's mind and of teaching her to observe such agreeable objects as plants seems to me excellent . . .'. The eight 'elementary' letters which resulted were soon published under the title *Lettres eleméntaires sur la botanique*, and these provide a fascinating and sometimes stimulating insight into the mind of a botanical eccentric of the period.

In 1805, nearly 30 years after Rousseau's death, the letters were republished embellished with 65 coloured illustrations (the originals of which have been lost) by Pierre Joseph Redouté, 'Le Raphael des Fleurs'. In an excellent introduction to the present volume, the art historian Roy McMullen comments: 'The life of Redouté is proof that plants, skilfully and lovingly depicted, can bring a man safely to port through almost any storm that history can blow up'. The main content of the book is based on this 1805 edition of the letters but also includes the rough draft, made by Rousseau himself, for *Notes towards a dictionary of botanical terms*. The text is beautifully presented, the original French having been excellently and sensitively translated by Kate Ottevanger. It is perhaps unfortunate that the thrilling, glowing colours achieved in the reproduction of the two illustrations selected for the dust jacket (a crocus and a wallflower) contrast with the less satisfactory and duller reproduction of the same and other plates in the text; thus some of the unique texture and subtle coloration, which was the hallmark of the refined technique of Redouté, appears to have been lost.

Though perhaps something of a botanical curio, nevertheless this is a delightful book, and is recommended as an excellent present for a not too demanding or critical botanical friend or perhaps even for, as stated at the end of Rousseau's Second Letter, 'a beautiful cousin busy with her glass taking apart heaps of flowers a hundred times less flourishing, less fresh and agreeable than herself'.

P. W. James

Survival or extinction. Proceedings of a conference held at the Royal Botanic Gardens, Kew, entitled: The practical rôle of botanic gardens in the conservation of rare and threatened plants, 11th–17th September, 1978. Edited by H. Synge & H. Townsend. Pp. 250. Bentham-Moxon Trust, Kew. 1979. Price £7·50 (incl. surface postage).

This is a report of the second conference held at Kew on the theme of the rôle of botanic gardens in conservation, the first being in 1975 (*Conservation of threatened plants*, ed. J. B. Simmons *et al.*, Plenum Press, 1976).

The main objective of this conference was to look at the practical rôle that botanic gardens can play in conservation and to establish policies for the future. The papers are arranged in five parts; the first, 'Rôles and principles', contains 10 papers, three of which I would draw attention to here. Derek Ratcliffe describes 'The rôle of the Nature Conservancy Council in conservation of rare and threatened species in Britain'. He reminds us that some relatively abundant species in Britain may have local distribution in Europe (e.g. *Endymion non-scriptus*), and he could have added that others (e.g. *Pilularia globulifera* and *Hammarbya paludosa*), whilst not included in the British list, are endangered on an international basis. Ratcliffe mentions the data-base at the Biological Records Centre and the rôle of the B.S.B.I. Recorders in monitoring threats and conservation management of our rarer plants. It is encouraging to note that, in a recent overhaul of B.R.C., the Institute of Terrestrial Ecology, which now administers the Unit, are taking this function very seriously.

The N.C.C. is also supporting regional surveys, and Max Walters' paper on 'The Eastern England Rare Plant Project' is of particular interest, showing how both Breckland and Fenland rare species are propagated and cultivated in the University Botanic Garden at Cambridge. Study of this cultivated material can lead to an understanding of the autecology of these rarities, which can help in their conservation management. No doubt other regional projects will be developed as finance becomes available.

Another interesting paper which should be read by all temperate-based botanists is that on 'The rôle of tropical botanic gardens in the conservation of valuable plant genetic resources in S.E. Asia', by Enki Soepadmo of the University of Malaya, Kuala Lumpur. He reminds us that with the rapid disappearance of tropical forest will go many plant species for ever, as even under present forestry practice 'not more than 10 per cent of the original number of tree species will be encouraged to regenerate or will be replanted'. Dr Soepadmo gives examples of different uses to which some of these species may be put, indicating enormous fields for future research which can be developed only with the aid of temperate institutes and universities. Tropical botanical gardens are playing a rôle, but they often lack trained manpower.

The book continues to discuss the subject under the headings 'National policies and activities' (10 papers), 'Education' (4 papers), 'Background support' (5 papers) and 'Special groups' (4 papers). Activities and policies of botanic gardens in S. Africa, Mexico, India, Australia, Czechoslovakia and the U.S.S.R. are given and each has new points to raise. E. E. Kemp of the University of Dundee Botanic Garden describes efforts there to create habitats and then phytosociological associations in Scotland, thus providing accommodation for rarities, material for classwork, and facilities for research. These proceedings contain views and reports from over 20 countries, and it is very rewarding to read what is actually being done. There is, however, a gentle reminder throughout this book on methods of *ex situ* conservation, that *in situ* conservation in the form of Nature Reserves and National Parks has still the more important rôle, and that we must not loose sight of this. Just as zoos have found a niche in conservation/preservation, so have botanic gardens shown that they can, with the right attitudes, develop their potential to conserve our plant heritage. I look forward to a conference on the rôle of herbarium taxonomists in the conservation of plants – they surely have one?

A. C. JERMY

Plant breeding and genetics in horticulture. C. North. Pp. 150. Macmillan Press, London. 1979. Price £4·95.

For many years Crane & Lawrence's well-known book *The genetics of garden plants* has been the main and almost the only text in this subject for the horticultural student and others interested in the field. It has stood the test of time remarkably well, but there has been a need for the subject to be brought up-to-date and presented in a more modern style. When I first saw Dr North's book I thought that at last a successor had appeared which would meet modern requirements, for after all it was produced in collaboration with both the Royal Horticultural Society and the Horticultural Education Association and written by someone with considerable practical experience in breeding at the Scottish Horticultural Research Institute. It is, therefore, with regret that I have to say that this book does not fulfil my expectations. It is one which races through its subject-matter in a superficial way, starting with the mechanism of inheritance and ending with the processes of selection of individual cultivars . It rarely provides sufficient detail adequate for the understanding of constitutions, processes and origins, but more importantly, it is quite misleading and sometimes incorrect in some of the fundamental areas of understanding.

The descriptions of cell divisions, which the author rightly states should form the essential basis for the understanding of the mechanism of inheritance, are particularly bad. Here the text is liberally sprinkled with omissions and misleading statements, but the diagrams are worse. The diagram of mitosis is the least harmful, since it has only the inaccuracy of a prophase with 5 chromosomes and metaphase and later stages with 4; but the portrayal of meiosis is nothing short of disastrous. First meiotic metaphase is a drawing identical with that given for mitotic metaphase; later stages, supposedly showing pairing and crossing-over, are unintelligible and, when eventually cross-over chromatids are shown, their pairing relationships are incorrect. It must be concluded from these and other references to the chromosomes that the author has never come to grips with them; and it is natural, therefore, that he should not be able to describe with accuracy their nature and behaviour. He is not alone in this, for there have been a number of recent texts by distinguished authors who have distorted the events of mitosis and meiosis so as to mislead an entire generation of students. It is most unfortunate that this should be so, for I know that these authors could, like Dr North, obtain sound advice on the matter from their own colleagues.

Throughout the rest of the book the author proceeds at such a pace that he rarely has time to explain adequately any of the subjects he covers; and again errors appear at many points, particularly where chromosomes or nuclei are being dealt with. I cannot see, for example, how anyone could see the origin of chromosome changes from the diagram in Figure 6.1, which certainly does not indicate their effect on pairing. The review of cultivar characteristics is too brief to be useful, and overall I see nothing to commend this book. My advice to the student is to stick with Crane & Lawrence and supplement it with Darlington's *Chromosome botany*.

K. JONES

A wood in Ascam. A study in wetland conservation. Edited by A. Fitter & C. Smith. Pp. viii + 162, with 4 black & white plates and numerous line drawings. Sessions, York. 1979. Price £4·95.

Ascam – a wood or a bog? An explanation for the dichotomy is offered in the third chapter, after one has gathered circumstantial evidence from enthusiastic amateur and professional naturalist witnesses, testifying since Victorian days, and been presented with a notecase of historical ecology.

The descriptive parts of the wetland nature reserve record are well expressed – not only the professional will understand what makes the site so special in ecological terms or appreciate the effort expended in collecting the records. The sensible approach chosen by the two editors to using the information from many amateur, voluntary and employed naturalists is that of management-plan preparation. This primarily involves assembling factual information into geographical, historical and biological sections — botany, zoology, entomology are given separate treatment. The clarity of the picture of the fen and acid woodland at Ascam improves as one reads on. There are few other published nature reserve records — those for Hayley Wood, Monk's Wood and Minsmere are in the league.

The conservationists' problems are revealed gradually — a chequered history, while natural resources were exploited and succession was contributing to and detracting from the biological richness of the site. The book concludes with an attempt to frame management objectives and options and an account of prescriptions employed.

Ascam Bog nature reserve is undoubtedly species-rich; it has been valued as an educational site for nearly two centuries and has an impressive natural history record. These features have enabled it to be recognized as a nationally important nature conservation area; but this status alone does not ensure its future.

The publication of this account of Ascam Bog nature reserve does however advance the conservation cause on a broader front; here we have a model for documenting and planning the management of a reserve. The book is to be recommended for all conservation students, naturalists' trusts and voluntary bodies with responsibility for managing land. One sees so much written about conservation that is merely entertaining; here is something of an admirably practical nature.

J. MARTIN

The Flora of Kintyre. M. H. Cunningham & A. G. Kenneth. Pp. 89, with one map. E. P. Publishing Ltd., Wakefield. 1979. Price £10·50.

This is the first Flora to be devoted entirely to vice-county 101. The area has much botanical interest to recommend it, as well as having been mentioned in popular song. Apart from the authors, there are few or no native botanists, so there are doubtless good commercial reasons for producing a slender volume.

There are but two pages of introduction, a short bibliography, and two appendices. One of the latter gives grid references to local place names, which is most useful. The vascular plant records are well annotated, and there is considerable critical detail. The difficult genera *Euphrasia*, *Rubus*, *Hieracium* and *Taraxacum* are treated in full. Kintyre boasts an endemic *Hieracium* (*H. solum*) and an endemic *Taraxacum* (*T. inane*). There is a short section on the Charophyta.

Archie Kenneth is well known in the bryological world for his indefatigable pursuit of liverworts and mosses in western Scotland, especially in Argyll and Kintyre. Vice-county 101 had, until recently, been rather neglected; it is therefore significant that a proportion of the species represented in the lists are of fairly recent discovery, and that the authors admit that 'undoubtedly there are still good discoveries to be made'. The list of species is nevertheless impressive and should provide the necessary stimulus for further work in the region.

R. J. Pankhurst & A. J. Eddy

Island ecology. M. L. Gorman. Pp. 79, with 39 text-figures and 5 tables. In *Outline studies in ecology*. Edited by G. M. Dunnet and C. H. Gimingham. Chapman & Hall, London. 1979. Price £1·95.

At a time when economic stringencies are reducing the financial support for education and the cost of books is constantly rising, the advent of another series of biological texts could be viewed with some degree of cynicism. Such a judgement must be tempered with caution in the present case as the editors' avowed intentions are to produce cheap booklets suitable for students and teachers which will 'offer an up-to-date summary' of selected topics in the field of ecology. There is, however, an inherent obsolescence in such a scheme, as there is no clear indication that the expansion in ecological research which has occurred in the last two decades will be reduced. Perusal of recent issues of such journals as *American Naturalist*, *Evolution* and *Systematic Zoology* will illustrate the rapidity with which changes have occurred in the field of 'island ecology'.

It is appropriate that the first text in this new series should be devoted to islands, as it clearly demonstrates the interdisciplinary nature of many ecological problems. In this context ecology is providing links with biogeography, evolution and systematics, and it could easily be extended to include genetics and geology. Studies on the genetics of *Drosophila* in the Hawaiian Islands have influenced ecological thought, and new interpretations of sea-floor spreading in the Pacific are changing ideas on the long-term stability of islands. Indeed, this booklet could easily be subtitled 'Ecological biogeography'.

While investigations of island biotas have always been a popular, albeit sometimes emotional, pursuit of field biologists, the nature and importance of such studies was transformed in 1967 with the publication of *The theory of island biogeography* by R. H. MacArthur & E. O. Wilson. The ensuing revolution has had considerable repercussions outside the immediate sphere of island biology and has helped to bridge the gap between the theoretical biologist and the field worker, for, as the mathematical models proposed by MacArthur and Wilson were explored, there was an increasing demand for more detailed and refined biological data. Island biology was, therefore, no longer dominated by purely descriptive and narrative studies, for an era of analytical investigations had dawned. The author of this booklet has provided an insight into these developments by a judicious review of the major trends in research. Although the choice of examples must be personal, the author is to be congratulated on the breadth and scope of the work. This is clearly reflected in the chapter titles, for example 'How many species?', 'Islands as experiments in competition' and 'Continental habitat islands'. The last of these illustrates the mosaic nature of our environment and the possibility of regarding many of the individual components as isolates. Paradoxically, the final chapter considers problems which have become increasingly important in developed nations or regions where exploitation of natural resources has occurred, for the models of island biotas are applicable to the design of nature reserves and to an understanding of conservation.

Having stimulated the reader's interest in island ecology, it is surprising that the author has not accepted the opportunity of expanding the bibliographies at the end of each chapter to include references to a wider range of publications, thereby extending the scope of the booklet and catering for individual spheres of interest. Nevertheless, if future booklets maintain the standard set by this initial publication, then the series should be successful. It will be increasingly difficult, however, to find subjects which are equally exciting as island ecology. Projected titles include 'Vegetation Dynamics', 'Modelling', 'Populations' and 'Palaeoecology'.

J. F. PEAKE

The identification of flowering plant families. 2nd edition. P. H. Davis and J. Cullen. Pp. viii + 113,, with 8 text figures. Cambridge University Press, Cambridge. 1979. Price £6·00 (boards); £1·95 (paperback).

When the first edition of this book appeared, in 1965, I noted that the key to families was restricted to those native to, or cultivated in, the North Temperate regions and sent it to North America to be reviewed. John Thomas found the keys to 'work very well for plants of these regions with very few exceptions' (*Watsonia*, **8**: 68 (1970)).

This second edition has been completely revised and the excellent introductory chapters on 'Usage of terms' and 'Examining the plant' enlarged. The system of classification employed in the (also enlarged) keys and the 'Arrangement and description of families' is now that of Stebbins, which is a modification of the popular Cronquist-Takhtajan system. This change seems sensible in the continued absence of a generally agreed family classification; but, as the authors point out, it has not been adhered to rigidly. For example, the Molluginaceae and Pyrolaceae have not been recognized, whilst the Asclepiadaceae and Corylaceae have.

The revised keys and family summaries work well in general, if their geographical limits are borne in mind. Thus it is quite easy to find genera that will not run down, but they are nearly all tropical or southern. For example, in the Ochnaceae only the (gynobasic-styled) Ochnoideae have been included, not the Luxemburgioideae, which have parietal placentas; and neither the atypical species *Garcinia stipulata* (Guttiferae with stipules) nor the atypical genus *Campylostemon* (Celastraceae without a disc) would run down to the correct family. Likewise, by no means all Celastraceae have arillate seeds, although those genera present in the North Temperate region probably do.

In general the selected key characters are easily observed, the need to determine the placentation, for example, having been apparently avoided or postponed whenever possible. One or two awkwardnesses remain, however, such as the necessity of examining the wood in all shrubs of 17 families to ascertain whether or not the plant under investigation belongs to *Xanthorrhiza* (Ranunculaceae). I can, however, thoroughly recommend this handy pocket-sized book to all those who require to identify flowering plants of the North Temperate regions as far as the family.

N. K. B. ROBSON

Dictionnaire sélectif des arbres, des plantes et des fleurs – A selective dictionary of trees, plants and flowers. J. P. Michaux. Pp. 149. Editions Ophrys, Paris. 1979. Price F.fr. 24·00.

This small book takes the form of a French-to-English followed by an English-to-French catalogue of translations of common plant names. Such a book has long been needed by botanists, gardeners, tourists and those concerned with translations of literature between the two languages. Unfortunately this book does not prove to be the answer to such needs. It is evident very quickly to the reader that the author (who may well be most erudite in both languages in a general sense) has little knowledge either of English botanical names or of their use in practice. The book 'smells of the lamp' in the sense that it is clearly the result of much compilation, but of little botanical experience, advice or comprehension.

This reviewer has studied a great many of the translations given, and while many are correct, others are misleading, some are mis-spelt, and a considerable number are quite wrong. This simplest way to demonstrate these aspects of the book is to quote a few samples out of many.

Let us take the French-to-English section first: 'Asphodèle' is not 'Daffodil' in English, nor is 'Buispiquant' the *normal* French name for 'Butcher's Broom' ('Fraqonpiquant' or 'Petit houx' would have been all right). 'Chêne pubescent' is not 'Durmast Oak', but *Quercus pubescens*, which has no real

English name anyway. 'Coucou' is not only defined as 'Cowslip' (correct) but as 'Wild Daffodil' (which is wrong) and 'Oxlip' (= Coucou too) is not mentioned, though so common in France. 'Dactyle' is translated as 'Orchard Grass' rather than 'Cocksfoot Grass'. 'Parisette' (= Herb Paris) is not mentioned at all; 'Tréfle d'eau' is not 'Marsh Trefoil', 'Renoncule des marais' is not 'Marsh Marigold' but is Hairy Buttercup (*Ranunculus sardous*). 'Gentiane de marais' is translated as 'Autumn Bells' or 'Windflower', 'Gaultheria' as 'Wintergreen', 'Lin sauvage' as 'Toadflax' (instead of Wild Flax) – 'Toadflax' should be 'Linaire'.

In the English-to-French section: 'Ground Ivy' is hardly 'Lierre terrestre' (but rather 'Courroie de St Jean' or 'Glechoma faux-bierre'); 'Daffodil' is *not* translated as 'Bonhomme' as it should be. 'Herb Paris' is given as 'Raisin de renard' (which is not wrong, but the usual French name of 'Parisette' is not given); 'Bell-Heather' and 'Scotch Heather' are both translated as 'Bruyère cendrée' – the name only applies to the former. Several names of well-known English plants are not mentioned at all, such as Elder, Ground Elder, Sundew and Sea Holly, to mention a few (out of many). Several English names are mis-spelt e.g. 'Gingko', 'Hoarhound', 'Hydrangia', 'Witch Elm', 'Colchium'.

There are *many* more errors. As a result this book cannot be in any way recommended – although the majority of translations are in fact correct, it is completely unreliable. Perhaps in the preparation of a new edition the author and publisher will obtain the services of an English-speaking botanist (and perhaps a good French botanist too!) to produce the book they should have done in the first place. It would also help if the scientific names were included as well, so that one could be quite certain what plants are intended – sometimes this is by no means clear – and if more, common ecological terms were included.

F. Rose

Flore de France, Fascicule 3. M. Guinochet and R. de Vilmorin. Pp. 819–1199, Figures 119–183. Centre National de la Recherche Scientifique, Paris. 1978. Price F.fr. 80·00.

Volumes 1 and 2 of this projected 5-volume Flora were reviewed in *Watsonia*, **10**: 93–95 (1974) and **11**: 267 (1977). All the idiosyncracies and short-comings of the first two volumes are equally evident in the third: the unique systematic sequence of Emberger (with the monocotyledons appearing half-way through the dicotyledons); the paucity of synonyms, hindering cross-referencing to other Floras; the irregular use of vernacular names (*Delphinium* = Pied d'Alouette, but none given for any *Ranunculus* species); and the many perplexing and unexplained taxonomic decisions. Volume 3 commences with a small group of dicotyledons including the Ranunculaceae and then treats all the monocotyledons.

Two examples from the grasses will exemplify some of the above comments. After a useful general commentary on the genus *Festuca*, two separate keys are given – the first 'abridged', after that of St Yves written in 1927; the second 'general', written anew by Huon and Bidault. The first uses the classification and nomenclature of Hackel and includes 13 species (some only by reference to the general key), while the second expresses the taxonomic views of the contemporary Continental Festucologists and recognizes 39 species. Some preference for the former over the latter system is stated, but the two are given equal prominence. In *Agrostis* (which includes *Apera*), *A. tenuis* is separated from *A. stolonifera* only on ligule length, and *A. gigantea* and *A. castellana* are treated as subspecies under *A. stolonifera*. No explanation for this unfashionable treatment (apparently based on Maire & Weiller and Fournier) is given.

One gains the impression throughout that this is a partially revised Fournier, very little attention having been paid to work done outside France. Since most of the important taxonomic advances in Europe in recent years have been made in Central Europe, Britain and Scandinavia, the gaps and imperfections are only to be expected. This new Flora will replace neither Fournier in the field nor Rouy & Foucaud in the herbarium and laboratory.

C. A. Stace

Orchids of northern Europe. Sven Nilsson, illustrated by Bo Mossberg, translated from the Swedish by H. W. Lascelles. Edited and adapted by P. Francis Hunt. Pp. 146, with numerous coloured illustrations. Penguin Books, Harmondsworth, Middlesex. 1979. Price £2·50.

In recent years a number of books in the semi-popular class on British and European orchids have been published, and so great is the interest in this small group of plants that no doubt there are others yet to come. While this volume is, on balance, no better or worse than its predecessors, it is presented in a rather novel fashion and does contain a great deal of information.

The preliminary chapters on structure, tropical orchids, pollination, distribution, etc., do succeed in putting into perspective the few European species which are in fact representative of only a very small part of this enormous family.

The descriptive text which accompanies the charming coloured illustrations is readable and full of little snippets of interesting information, but one feels that, perhaps inevitably, it has suffered in the translation. Certainly a few inaccuracies are apparent. The genus *Cypripedium* does not contain about 50 species, and it is difficult to imagine that *Orchis morio* was ever ‘possibly the most common plant over large stretches of southern and central Europe’.

The nomenclature has been brought up to date in the translation, and English names are included; but the latter include one rather ambiguous innovation – the layman could be forgiven for assuming that the ‘Bloody Early Marsh Orchid’ comes into flower long before any of the others.

The illustrations are on the whole accurate and reasonably well reproduced, with idyllic (and mostly Scandinavian) habitat sketches in the background. However, most of the plants and flowers are depicted at three different scales and, without previous knowledge of the species, it is not easy to know which one is at the natural size we were told, in the preface, to expect.

The book concludes with the now more-or-less mandatory chapter on conservation, a short bibliography (which strangely omits the Collins *Field Guide* by Williams *et al.*), a note on orchid societies and a comprehensive index.

P. Taylor

Obituary

LILIAN ELIZABETH WHITEHEAD
(1893—1979)

The recent death of Mrs Whitehead has robbed the County of Hereford of a personality of such rare quality that her many friends will find their lives impoverished by her loss. She was a woman of great modesty and kindness who unobtrusively made contributions to many aspects of life in the County.

Her early life was spent in remote country in Northumberland and later in Canada. She returned to this country to serve as a V.A.D. nurse in the 1914–18 war, during which time she met her future husband. They came to Hereford in 1925, when Peter Whitehead took up his appointment as Director of Education for Herefordshire. Thereafter she became closely involved with many organizations in the area, including the Soroptomists International of Hereford, the Townswomen's Guild, Herefordshire Community Council and the National Society for Cancer Relief. These activities reflected her concern for the well-being of her fellow men and women, and it was on errands connected with these works and with innumerable kindnesses to individual friends that she rode, with inimitable style, her magnificent ancient bicycle round the streets of Hereford.

She included stamp collecting and painting amongst her hobbies but she will be best remembered for her work in natural history in the area. She was a member of the Herefordshire Ornithological Club, and she served on the Council and Conservation Committee of the Herefordshire and Radnorshire Nature Trust from its formation in 1963 until her death. But her real love was plants, both wild and cultivated. She had always been interested in wild flowers, and this interest was given an added stimulus when she and a few others formed the Herefordshire Botanical Society in 1951. The society, with Mrs Whitehead as Recorder, quickly became involved in collecting data within the County for the projected *Atlas of the British flora*. In the 1950s and early 1960s this work gained momentum, and Mrs Whitehead acquired an unrivalled knowledge of the plants of the County. She joined the B.S.B.I. in 1952 and was soon appointed Recorder for Herefordshire, v.c. 36, a post she relinquished only in 1976. In the same year, at the age of 83, the knowledge acquired over half a century bore fruit in the publication of her *Plants of Herefordshire*, and in recognition of all her work the local Botanical Society made her an honorary member.

Mrs Whitehead's enthusiasm for plants never waned, and indeed neither did her energy. In the field she made no concession to her increasing years, and fortified with a grapefruit and some raisins she had climbed every hillside and identified every plant before most of the party had begun. In 1977 the Herefordshire Botanical Society started a scheme of recording by tetrads with the idea of eventually publishing an atlas of the plants of the County, and she entered into this with a zest which was envied by many a younger person. Only a few weeks before her death she was patiently explaining the differences between species of violet in the woods near Hereford.

Shy and retiring by nature, she was happiest botanizing alone or with one or two friends. But her botanical knowledge and experience was freely available to all who sought it, including the local police, who, a few years ago, enquired if she would be kind enough to identify cannabis for them!

We miss her sorely but remember her with affection. We remember the hospitality enjoyed by so many at Rydal Mount. We remember the disdain at the suggestion that at 85 perhaps it was a bit unsafe for her to be climbing her fruit trees to gather the crop. We remember grid references; they were the invention of the devil to be shunned at all costs. We sometimes suspected that, when finally cornered, she just popped down the first six figures that came to mind. As for those pink 'bus tickets' (Individual Record Cards to the rest of us), surely a snort of disapproval must have accompanied each package to Monk's Wood. But most of all we remember a fellow botanist with a delightful sense of humour, of spare build and abounding energy pirouetting on a cliff edge in search of plants, ever ready to proffer help whenever and wherever it might be required, and persistently independent to the end.

Mrs Whitehead died on 6th June 1979, after a mercifully short illness, and we are grateful for all that she gave so unstintingly over so many years.

P. & S. E. Thomson

Reports

EXHIBITION MEETING, 1979

The Annual Exhibition Meeting was held in the Department of Botany, British Museum (Natural History), London, on Saturday, 24th November, 1979, from 12.00 to 17.30 hours. The following exhibits were shown.

AQUATIC FLORA OF FARM-PONDS

An investigation of the farm-pond habitat of the Loughborough district of Leics., v.c. 55, has shown a decline in this habitat over the last 30 years. Surveys of 359 farm-ponds have described the aquatic flora, physical characteristics and surrounding land-use. The exhibit described some typical farm-ponds, with examples of species distributions within the habitat.

J. E. Beresford & P. M. Wade

CRASSULA HELMSII (T. KIRK) COCKAYNE

A specimen of *Crassula helmsii* (T. Kirk) Cockayne was observed growing on mud at the edge of a pool at Purshull Green, Worcs., v.c. 37, in 1977. A photograph of the compacted and matted plant was shown. No submerged plants have been observed.

D. I. Cockerill

POLYGONUM WEYRICHII F. SCHMIDT, AN ALIEN NEW TO BRITAIN

Specimens of a robust, alien, species of *Polygonum* L. were found by C. Haworth in 1978, near Wastwater, Cumberland, v.c. 70. The plants, appearing naturalized, have been identified as *P. weyrichii* F. Schmidt, a horticultural species not previously reported as an escape in the British Isles. *P. weyrichii* resembles *P. molle* D. Don more closely than any of the other alien species of *Polygonum* found naturalized or escaped in the British Isles, but differs from *P. molle* in having nuts which are large and winged, and a perianth which does not become black and fleshy at maturity.

A. Conolly

COCHLEARIA L.–A CONSENSUS TAXONOMY

Five species of *Cochlearia* L. are ascribed to the British flora. *C. anglica* and *C. danica* are taxonomically distinct; *C. micacea* and *C. scotica* are more difficult to separate, but over a range of characters can be distinguished. The status of *C. officinalis* L. and the inland cytotypes *C. alpina* (Bab.) Wats. and *C pyrenaica* DC. have, however, presented problems. As the two cytotypes cannot be distinguished morphologically, they should be regarded as subspecies of *C. officinalis*.

Two further species have been ascribed to the British flora: *C. atlantica* Pobedimova and *C. islandica* Pobedimova. The exhibit indicated that *C. atlantica* is probably a *C. officinalis* × *C. scotica* cross, with poorly formed seeds, and that British material of *C. islandica* is a luxuriant form of *C. officinalis*.

D. H. Dalby

MELAMPYRUM ARVENSE L.–A NATIVE OR ALIEN SPECIES?

At one time *Melampyrum arvense* L. was a pernicious weed in grain crops, especially in Essex and the Isle of Wight. It is now reduced to only four sites in Britain. These sites were examined for the Nature Conservancy Council in 1978, and the following counts were made: Wight, v.c. 10 (one site), three plants, N. Essex, v.c. 19 (one site), five plants, Beds., v.c. 30 (two sites), two plants and 292 plants – a total of about 300 plants for 1978. In 1979 there was a total of about 490 plants between the four sites, the increase being in part attributable to conservation measures being undertaken at two of the sites. The exhibit indicated that *M. arvense* was introduced with imported grain seed, being abundant in crops for a limited period, but now only found as a semi-parasite in rough grassland on field verges.

J. G. Dony

SOME STEREOPHOTOGRAPHS OF SEASHORE PLANTS

Stereopictures of eleven seashore flowering plants were shown, and one of a young plant of *Atriplex praecox* L. under two inches of seawater. Also shown was a stereopicture of *Juncus dudleyi* Wiegand from a site near Crianlarich, Mid Perth, v.c. 88, where the species was re-found by Mrs E. Norman and J. H. Fremlin in July 1979.

J. H. Fremlin

SOME ASPECTS OF FLORAL STRUCTURE AND SEED FORMATION IN *SAXIFRAGA CERNUA* L.

Seed production in *Saxifraga cernua* L. has only rarely been recorded, and there are no accounts of ripe capsules or seeds from British populations of the species. Ripe seed has been produced in cultivation using plants from Ben Lawers, Mid Perth, v.c. 88, as pollen recipients and a pollen donor from a population in northern Norway. Living specimens of this new genotype were exhibited. Also displayed were photomicrographs of sections through flower buds of plants from Ben Lawers, showing lack of pollen formation, ripe capsules from the hand-pollinated plants under cultivation, and scanning electron micrographs of seed.

J. Godfree

LIMONIUM BINERVOSUM (G.E.SM.) C. E. SALMON IN THE BRITISH ISLES

Limonium binervosum (G.E.Sm.) C. E. Salmon is an agamospermic species-group which includes both chromosomal and morphological variants, some of which have been given species rank. The usual chromosome number is $2n = 35$, but colonies in Dorset, v.c. 9, ($2n = 27$), Wigtowns., v.c. 74, ($2n = 27$), Pembs, v.c. 45, ($2n = 33$), and Co. Clare, v.c. H9, ($2n = 27$), deviate from the basic number. Particularly distinct variants with the normal chromosome number are *L. transwallianum* (Pugsley) Pugsley from Pembroke, and an un-named variant from E. Kent, v.c. 15. A colony in W. Cornwall, v.c. 1, possesses a different stigma type from any other known member of the aggregate.

Unlike in many other agamospermic species, sexual events do not appear to occur in *L. binervosum*. Many colonies are male-sterile and the pollen, if present, has a very low fertility. In addition the dimorphic pollen-stigma incompatibility system of the genus prevents both cross- and self-pollination within the *L. binervosum* species-group.

An agamospermic species of *Limonium*, but not in the *L. binervosum* group, distinguished by pinnate venation in the distal part of the leaf and by the distal spikelets, has been found in E. Sussex, v.c. 14. It is as yet unidentified, and appears new to the British Isles.

M. J. Ingrouille

BRYANT'S BITTERCRESS

A double-flowered variant of *Cardamine hirsuta* L. was found at Wollaston, Northants., v.c. 32, in July, 1979, by Mr E. Bryant. The stamens and ovaries were completely replaced with petaloid segments, rendering the plants sterile. Three plants were found, and herbarium sheets exhibited. It was not clear whether the mutation was of indigenous genetic origin or due to chemical damage. However, a similar specimen was exhibited by A. C. & J. F. Leslie as part of their exhibit (q.v.), suggesting that the change is spontaneous and genetic.

S. L. M. KARLEY

A SURREY MISCELLANY

The exhibit consisted of herbarium material, photographs and slides of miscellaneous botanical records from Surrey, v.c. 17. Included were the second county records of *Vulpia ciliata* subsp. *ambigua* and *Kalmia angustifolia*, both from Wisley Common, six miles north-east of Guildford. Other new records from this area included *Corylus maxima*, *Carum carvi*, *Polygonum minus*, *Achillea filipendula*, *Endymion hispanicus* × *E. non-scriptus* and *Potentilla anglica* × *P. erecta*.

Specimens of *Crepis setosa* (persistent as a nursery weed to the north-west of Guildford) were exhibited, together with *Lonicera nitida*, *Pulmonaria* 'Mawson's Blue' and *Doronicum* 'Harpur Crewe', all of which are locally established in Surrey.

Three additional herbarium sheets were of non-Surrey plants: a double-flowered variant of *Cardamine hirsuta* found in a Sussex garden, and *Solanum sarrachoides* and *S. nigrum* subsp. *schultesii* from near Dagenham, S. Essex, v.c. 18.

A. C. & J. F. L. LESLIE

A SMALL FORM OF *POA ANNUA* L.

A distinctive variant of the ubiquitous *Poa annua* L. occurs throughout the year, plentifully and regularly, in the garden of D. McClintock at Platt, W. Kent, v.c. 16. It grows with the common, lusher variant, and there are no intermediates. It is distinguished by its neat, dark look, with very thin leaves, and few-flowered, sometimes almost purplish, spikelets. This is in striking contrast to the apple-green, broader leaves and larger spikelets of the usual variant found in flower-beds and elsewhere. It may be the var. *parviflora* Fiek. A comparable plant is in the Kew herbarium, deposited by A. W. Stelfox, from Newcastle, Co. Down, v.c. H38. It was found in July 1965, and was named by Dr Hubbard as var. *parviflora* Fiek. It would be interesting to know if it occurs elsewhere. Herbarium sheets of the Kent material have been deposited at **BM** and at **MNE**.

D. McCLINTOCK

CRASSULA DECUMBENS THUNB. AND *C. MACRANTHA* DIELS & PRITZEL

In producing descriptions of plants for an Alien Flora, differences between the South African annual *Crassula decumbens* Thunb. and the Australian *C. macrantha* Diels & Pritzel were examined. The former has been known since 1959 to have been established in Scilly, v.c. 1b, and the latter has been noted from time to time as a shoddy weed.

All the specimens of the two supposed species are indistinguishable. There is no comparison in the literature; no authority from South Africa mentions *C. macrantha* and no Australian authority mentions *C. decumbens*. Mr J. R. Laundon of the British Museum (Natural History), Mr R. D. Meikle of Kew (who had first identified *C. decumbens* when it was found in the British Isles) and Dr H. R. Tölken of Pretoria (who has produced a monograph on the South African *C. decumbens*) were consulted on the status of the two species. Scanning electron micrographs of seeds of the two supposed species have convinced Dr Tölken that Australian *C. macrantha* must be included under the older name of *C. decumbens*. Thus, the shoddy plants in the British Isles now named *C. macrantha* need to be renamed *C. decumbens*.

D. McClintock

SCHIZOPETALOUS *ERICA CINEREA* L.

There are two distinct variants of *Erica cinerea* L. with split corollas:

1. Var. *schizopetala* Boulger – this has spreading or pendant, perfect flowers, 4–6 mm long. The corolla is (the usual) heather-purple, which dries to a pale fawn, and is divided right to the base.
2. An un-named variant, such as the horticultural 'W. G. Notley' – this has erect flowers 3–4 mm long, with a dark calyx and corolla, drying to a much darker colour. The corolla is varyingly divided, but normally much less (rarely over $\frac{3}{4}$) than in var. *schizopetala*. The flowers are imperfect, most lacking stamens, anthers and styles, and many with empty calyces.

Specimens of these two varieties were exhibited, together with a bracteomanic form, the mite-induced var. *rendlei*.

D. McClintock

POSTAL FLORA OF THE BRITISH ISLES, 1901–1979

Prior to the reign of Queen Elizabeth II postage stamps were ornamented with laural wreaths or national symbols. With the advent of commemorative issues from 1953, a number of botanical designs have been produced. The exhibit showed the progression of botanical design from 1901 to 1979. Some notable issues have been the *Tenth International Botanical Congress 1964*, *British Wild Flowers 1967* (which used illustrations from *The concise British Flora in colour* by the Rev. W. Keble Martin) and *Spring Wild Flowers 1979* (for which the B.S.B.I. was able to offer members a first-day cover depicting the Society's new emblem, *Hyacinthoides non-scripta* (L.) Chouard).

Y. L. Moscati

TARAXACUM WEBER – NEW SPECIES AND A NEW KEY

Many species of *Taraxacum* Weber have been added to the British flora since the publication of the monograph by A. J. Richards in 1972. (The *Taraxacum* Flora of the British Isles, *Watsonia*, Supplement to Vol. **9**). The exhibit showed the latest edition (version 3) of a punched-card key to 180 species of *Taraxacum*. The key includes records from each vice-county so that the key can be used on a local as well as a national scale. Using data supplied by A. J. Richards, the key and description were produced from computer programs by R. J. Pankhurst, from whom copies of the key may be obtained from the British Museum (Natural History).

A selection of herbarium specimens of the newly discovered species was also exhibited.

R. J. Pankhurst

OPERATION ORCHID – DISASTER, JULY 1979

The fifth year of 'Operation Orchid' (see *Watsonia*, **12**: 197 (1978)) was fraught with difficulties from the outset. Rosettes were affected first by the autumn drought and subsequently in winter and early spring by frost, snow and hungry rabbits.

In March 338 rosettes were counted – 219 less than in 1978, but the plants in two special conservation areas were in prime condition. As the late spring progressed, the nibbled and frosted plants recovered and by late May the indications were that there would be the highest count of flowers yet recorded. The first buds came into flower on June 16th and by June 23rd 166 plants were in bloom; 35 of these were exceptional specimens, and in addition to photographs each was chosen for individual monitoring. On the morning of July 1st further photographs were to be taken, but instead of finding magnificent specimens of *Ophrys apifera* Huds., carefully dug circular holes were found! An area of especially monitored plants had been systematically stripped of even vegetative plants; 62 plants had been lost, 35 of which had had their life history carefully recorded over five years. Even if young plants are beneath the ground, it will be at least six years before such splendid and interesting plants will be seen again. The loss had to be reported to the school children and former pupils, who, since 1974, had worked long and arduous hours in rain, fog, biting wind and hot sun to record the progress of this unique population.

St Christopher's School, Burnham-on-Sea

THE GUERNSEY BAILIWICK, 1979

Specimens were exhibited of the more important discoveries in the four islands of the Guernsey Bailiwick during 1979:

GUERNSEY: *Myosoton aquaticum* (first record), *Lythrum junceum* (second record since 1924), *Ammi visnaga* (first record for the Channel Islands), *Mimulus moschatus* (first record), *Bromus tectorum* (first record).
ALDERNEY: *Lampranthus roseus* (first wild record), *Eryngium campestre* (first record), *Phalaris tuberosa* (first record for the Channel Islands).
SARK: *Potentilla anglica* (first confirmed record), *Agrimonia eupatoria* (second record since 1892), *Epilobium hirsutum* (first record), *Lamium album* (first record), *Asperula arvensis* (first record), *Lagurus ovatus* (second record since 1892).
HERM: *Galium* × *pomeranicum* (first record).

P. Ryan

SEEDLING ELMS

Elm trees in Leics., v.c. 55, produced large amounts of fruits in 1979, and samples were taken to determine viability. Seedlings were raised from most taxa (but not from *Ulmus procera* Salisb.), belying their reputed sterility, although the degree of fertility varied. Despite the late, cold spring of 1979 there were in fact no hard, late frosts, which probably accounts for the unusually high fertility.

Seedlings and older plants of Huntingdon Elm, *U.* × *vegeta* Lindl., which proved highly fertile, were exhibited. The seedlings will be grown on for some years to determine whether they exhibit any segregation, which would be evidence for the suggested hybrid origin of many elm taxa.

A. N. Scott & C. A. Stace

PLANT RECORDS FROM KIRKCUDBRIGHTS., AND PAINTINGS OF PLANTS

The exhibit included records from Kirkcudbrights., v.c. 73, including *Carex* × *boenninghausiana* Weihe.

Paintings of British orchids and dock aliens, and drawings of *Rubi* from Surrey, v.c. 17, and Scotland, were also shown.

O. M. Stewart

THE GENUS *ATRIPLEX* L. IN BRITAIN: COASTAL SPECIES AND HYBRIDS

The coastal species of *Atriplex* L, particularly the members of the *A. prostrata* aggregate (*A. hastata* complex), are notoriously difficult to identify. The species are extremely variable, and the taxonomy of this group is further complicated by the frequent occurrence of self-perpetuating hybrid derivatives.

The exhibit consisted of herbarium specimens, line drawings by B. U. Borluk, and distribution maps of taxa now known to be present on the coasts of Britain. These are: *A. prostrata* Boucher ex DC. (= *A. hastata*), *A. glabriuscula* Edmondston, *A. longipes* Drejer, *A. praecox* Hülphers, *A. littoralis* L., *A. patula* L., *A. laciniata* L., *A. glabriuscula* × *A. longipes*, *A. glabriuscula* × *A. praecox*, *A. glabriuscula* × *A. prostrata*, *A. longipes* × *A. prostrata*, *A. littoralis* × *A. patula*, *A. littoralis* × *A. prostrata*, and a taxon tentatively referred to *A. kattegatensis* Turesson.

The identification of the hybrids is based on hybrid plants synthesized experimentally by me at Manchester (1975–1979), on those made by Mats Gustafsson at Lund, Sweden (1972–1975), and on studies of segregation in wild and experimental hybrids.

The distribution maps of the taxa were based on my field studies (1974–1979) and on specimens sent to me at Manchester by participants in the *Atriplex* Survey (1977–1979). With very few exceptions, each record is represented by a herbarium specimen deposited in **MANCH** or **OXF** (Shetland Collections).

P. M. Taschereau

FRITILLARIA MELEAGRIS L.: BIRD DAMAGE TO FLOWERS IN E. SUFFOLK

There are four main stations of *Fritillaria meleagris* L. in E. Suffolk, v.c. 25, three of which are managed by the Suffolk Trust for Nature Conservation. The largest colonies are at Framsden and Mickfield, where observations have been made over several years on both damage and total losses of fritillary flowers caused by pheasants and pigeons. The exhibit showed a selection of parts of fritillary flowers illustrating the various types of damage.

P. J. O. Trist

APIUM REPENS (JACQ.) REICHB. F.

The great variability of *Apium nodiflorum* (L.) Lag. and its common occurrence throughout the British Isles in wet places has made it difficult for British botanists to distinguish *A. repens* (Jacq.) Reichb. f. as a separate species. A living plant was exhibited from Chippenham Fen, Cambs., v.c. 29, where it was found growing in a fen ditch near to some typical *A. nodiflorum*, which was more or less rooted. The putative *A. repens* material was in a floating mass, with small, pedunculate umbels rising above the surface. The plants produce poor pollen and do not have ripe fruits; they may be hybrid *A. nodiflorum* × *A. repens*.

Herbarium sheets of Continental material of *A. repens* were shown, together with plants collected from Oxon., v.c. 23; the former apppear to be 'good' *A. repens*, whereas the latter are not so distinct from *A. nodiflorum*. However, the Oxford plants are fertile with a chromosome number of $2n = 16$, whilst *A. nodiflorum* has $2n = 22$. The Chippenham Fen plants have $2n = 19$, supporting its possible hybrid status.

S. M. Walters

The following also exhibited:

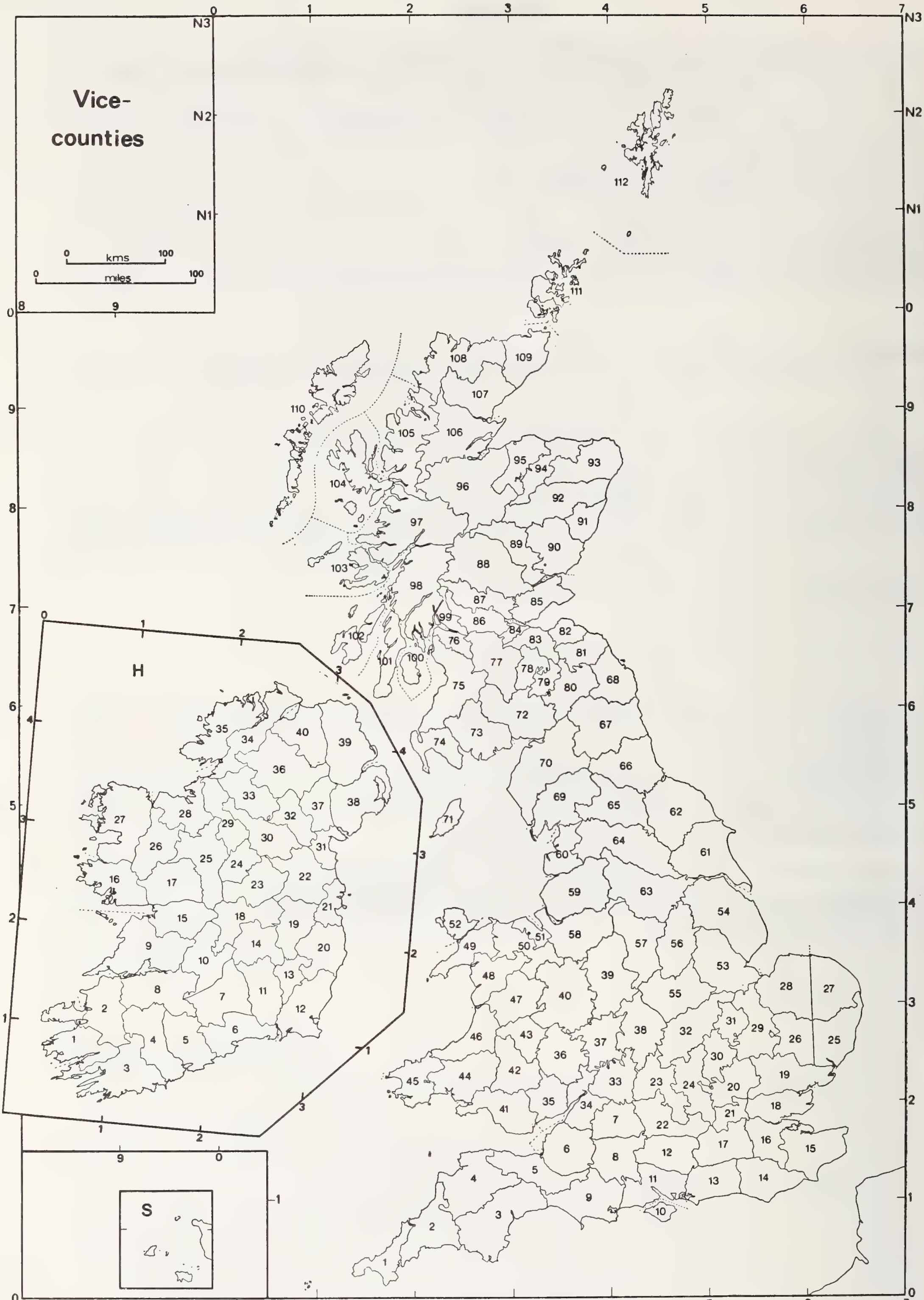
R. J. Banks. Ecological botanical paintings.
A. Brewis. Flora of Hampshire. *Veronica anagallis-aquatica* × *V. catenata* in Hants.
M. Briggs. The B.S.B.I. in the news.
R. M. Burton. *Solidago* × *niederederi* Khek in Britain.
E. J. Clement & M. C. Foster. More alien news.
M. E. Collinson & P. R. Crane. Plant fossils from the Reading Beds, southern England.
R. W. David. *Carex ornithopoda* Willd. in Britain.
A. N. Gibby. Postage stamps of botanical interest.
M. Gibby. Defend Wastwater.
U. M. S. Preston. A note on Dr Houston.
C. Turner. *Chelidonium majus* L., a native British plant?

M. WILLIAMS. Wild flowers and butterflies (in water colour) of Shropshire.
M. J. P. SCANNELL. (a) Publications from the National Botanic Gardens, Glasnevin, Dublin.
(b) *Polypodium australe* Fée from v.c. H31.

In the lecture hall the following members gave short talks illustrated by colour-slides:
K. BOWEN. Slides of Crete and Greece.
M. BRIGGS. B.S.B.I. Carnian Alps meeting 1979.
S. L. M. KARLEY. Bryant's Bittercress.
J. L. MASON. Flowers of Cameroun.
R. J. PANKHURST. Flora of the Outer Hebrides.
C. SAUNDERS. Bee orchids.
A. G. SIDE. Effects of the 1978 storm on plants of the North Kent coast.

BOTANICAL SOCIETY OF THE BRITISH ISLES, COMMITTEE FOR SCOTLAND, AND THE BOTANICAL SOCIETY OF EDINBURGH, EXHIBITION MEETING, 1979

An Exhibition Meeting was held at the Royal Botanic Garden, Edinburgh, on Saturday, 3rd November, 1979, at 12.00 hours. The following exhibits were shown.
R. W. M. CORNER. Plants from S.E. Scotland.
R. W. DAVID. *Carex rariflora* (Wahlenb.) Sm. in Scotland.
J. H. DICKSON & GLASGOW UNIVERSITY JUNIOR HONOURS CLASS. Plants from the Canary Islands.
C. A. DICKSON & M. J. FRASER. *Brassica campestris* in ancient Scotland.
E. DICK & J. H. DICKSON. An unusual habitat of *Pinguicula vulgaris.*
U. K. DUNCAN. Herb. U. K. Duncan: some interesting grasses.
M. J. FRASER. Plant remains from medieval Elgin.
A. J. KENNETH. Flora of Kintyre.
M. E. R. MARTIN. Some plants from Dumfriess., v.c. 72.
C. W. MURRAY. Recent additions to the flora of Skye.
C. N. PAGE. Field studies of British ferns.
D. & M. PARISH. Wild flowers – a photographic guide.
F. PERRING. Local Floras.
A. J. SILVERSIDE. *Mimulus* L. in the British Isles.
O. M. STEWART. (a) Records from Kirkcudbrights., v.c. 73.
(b) Flower paintings.
A. McG. STIRLING. (a) Some recent Dunbarton records.
(b) *Geranium purpureum* Vill. in Scotland.
(c) Items from the herbarium of the late J. H. Penson.
D. ROBINSON. Pollen analysis from Tormore, Machrie Moor, Isle of Arran.
E. C. WALLACE. Scottish plants.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INSTRUCTIONS TO CONTRIBUTORS

Papers and Short Notes concerning the systematics and distribution of British and European vascular plants as well as topics of a more general character are invited.

Manuscripts must be submitted in duplicate, typewritten on one side of the paper only, with wide margins and double-spaced throughout. They should follow recent issues of *Watsonia* in all matters of format, including abstracts, headings, tables, keys, figures, references and appendices. Note particularly use of capitals and italics. *Only underline where italics are required.*

Tables, appendices and captions to figures should be typed on separate sheets and attached at the end of the manuscript. Names of periodicals in the references should be abbreviated as in the *World list of scientific periodicals*, and herbaria as in Kent's *British herbaria*. Line drawings should be in Indian ink, preferably on good quality white card, but blue-lined graph paper or tracing paper is acceptable. They should be drawn at least twice the final size and they will normally occupy the full width of the page. Lettering should be done in Lettraset or by high-quality stencilling, though graph axes and other more extensive labelling are best done in pencil and left to the printer. Photographs can be accepted only in exceptional cases.

Contributors are strongly advised to consult the editors before submission in any cases of doubt. Manuscripts will be scrutinized by the editors and a referee and a decision communicated as soon as possible. Authors receive a galley proof for checking, but only errors of typography or fact may be corrected. 25 offprints are given free to authors of papers and Short Notes. Further copies may be purchased in multiples of 25 at the current price.

The Society takes no responsibility for the views expressed by authors of articles.

Papers and Short Notes should be sent to Dr C. A. Stace, Botanical Laboratories, Adrian Building, The University of Leicester, LE1 7RH. Books for review should be sent to Dr N. K. B. Robson, Dept. of Botany, British Museum (Natural History), Cromwell Road, London, SW7 5BD. Plant records should be sent to the appropriate vice-county recorders. Reports of field meetings should be sent to Dr S. M. Eden, 80 Temple Road, Cowley, Oxford, OX4 2EZ.

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Patron: Her Majesty Queen Elizabeth the Queen Mother

Applications for membership should be addressed to the Hon. General Secretary, c/o Department of Botany, British Museum (Natural History), Cromwell Road, London, SW7 5BD, from whom copies of the Society's Prospectus may be obtained.

Officers for 1980-81

Elected at the Annual General Meeting, 10*th May* 1980

President, Mr R. W. David

Vice-Presidents, Professor J. P. M. Brenan, Mr J. F. M. Cannon, Mr D. H. Kent, Mr P. C. Hall

Honorary General Secretary, Mrs M. Briggs

Honorary Treasurer, Mr M. Walpole

Honorary Editors, Dr S. M. Eden, Dr N. K. B. Robson, Dr C. A. Stace, Dr D. L. Wigston

Honorary Meetings Secretary, Miss J. Martin

Honorary Field Secretary, Miss L. Farrell

Honorary Membership Secretary, Mrs R. M. Hamilton

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Recent issues (Vol. 13 part 1 onwards) are available from the Hon. Treasurer of the B.S.B.I., 68 Outwoods Road, Loughborough, Leicestershire.

Watsonia, **13**, 173–179 (1981).

Presidential Address, 1980

GENTLEMEN AND PLAYERS

R. W. DAVID

I must begin this address by once again expressing my sense of obligation to members of the Botanical Society of the British Isles, as well as my surprise, that they should have elected me to the Presidency of the Society. One has only to look at the list of our past Presidents to become immediately aware of how great an honour this office represents. To pick out a number of individual names would be invidious. We may, however, note that, among professional botanists, of the three authors of the first serious Flora of the British Isles to appear for a hundred years, two, T. G. T. and E. F. W., have served us as President; while the senior editor of the Flora that looks likely to stand next to it on the shelves is my immediate predecessor, Professor D. H. Valentine. Alternating with these illustrious professionals have been those amateur botanists who have had a national, and sometimes an international reputation – men such as G. C. Druce and J. E. Lousley. To these two names I should like to add one other who is, to all our satisfactions, still extremely active: John Dony, who alone has fathered two county Floras and, I suspect, godfathered a great many more.

I have mentioned the alternation of professional and amateur botanists as Presidents of the B.S.B.I. This has become, since the last war, a tradition in our Society, appears to be particular to it, and is, I believe, a symptom and symbol of its special nature and aims. It is this feature and this special nature that I want to examine today, and all the more because there have been signs that some of our members have begun to doubt whether, under modern conditions, it is still possible for professional and amateur to have a common botanical interest. Fifty or a hundred years ago, say these doubters, it was the amateur botanists who in England, and perhaps in some other European countries, were enlarging the boundaries of botanical knowledge. And certainly the roll of honour (which becomes so familiar to anyone regularly reading the signatures on papers, determinations, herbarium labels, and those enchanting (and revealing) discussions in the Exchange Club distributor's annual reports) is rich in amateurs. There are those who seemingly trudged all over Britain to the most inaccessible places, and hardly ever missed a plant: the two Lintons, Augustine Ley, and my particular hero E. S. Marshall, in whose footsteps I have lately found myself regularly following and whose specimens are always so perfectly mounted, his opinions so clear and sensible, and his directions (written in that beautifully neat yet lively hand) so abnormally intelligible and accurate. Then there are the monographers of critical groups: Pugsley on *Euphrasia* and *Fumaria*, Kükenthal on *Carex*. Today, however, or so it has seemed to many, the application to botany of research techniques only to be learnt by those in professional training, and of scientific apparatus only available in the more affluent laboratories, has made it impossible for the amateur to play a comparable part. How many amateurs have access to an electron microscope, or to the chemical equipment necessary for sophisticated soil-sampling? How many could manipulate advanced mathematical formulae, or even prepare a squash for the microscope, let alone count the chromosomes in it? Worse still, the amateur has difficulty even in understanding what the professional is saying and doing. To many, the more elaborate papers in recent editions of *Watsonia* hardly seem to be about plants at all, or at least not about plants as they themselves know them. Do professional and amateur any longer speak the same language? Do they have any common ground? Are gentlemen and players still playing in the same match?

One comparatively recent development I find very reassuring, and that is the increasing emphasis, among professionals, on what I may broadly term ecology. 'Ecology' means, in rough translation, the home-life of a plant; that is, the plant alive and at home, its habits, its diet, the company it keeps. These are the things – the living plant and its home – that matter to the amateur botanist. Indeed I sometimes suspect that the home may matter as much as or more than the plant, for one thing that makes the amateur take to botanising is that attractive plants so often grow in attractive places. (I know that I can hardly ascribe that motive to the increasing number of us whose greatest pleasure is raking over rubbish-dumps, but it is still true, I think, of the majority). It is, predominantly, in the field that the amateur works and the growing plant that he studies. He acquires an eye for country, and can spot, a mile off and more, what will be a good place for plants or the only possible place for a particular plant. He acquires an eye also for the characteristic stance of a plant; what another of my distinguished predecessors, David McClintock, borrowing the term I believe from aircraft recognition, calls its 'jizz'. All amateurs know that every plant has got its jizz, which may be a shape, or a trick of growth, or a peculiarity of colour or texture. These peculiarities almost wholly disappear in the dried and mounted specimen, however well it is mounted. They cannot be exactly measured and are extremely hard to describe with any precision. Yet experience will programme them securely into the computer that is the human brain, and when next the plant is presented to the same observer his brain will furnish a determination that is much more certain, though much less demonstrable, than one obtained from any key or written diagnosis. Whenever one does meet with that sort of recognition in botanical literature – and it is extremely rare to do so – how refreshing it is! Another of my heroes is the Alsatian, Dr F. W. Schultz. The work of Schultz with which I am most familiar, his papers on the *Carex muricata* aggregate, were written in about 1870, when he was old and ill. He rambles, and there is little order in his observations. He wasn't very clever with nomenclature, and almost all his names have turned out to be illegitimate, or nude, or invalid. Yet when he tells how the stands of his *Carex leersii* could be picked out from the neighbouring *Carex spicata* on account of their greyer, more matt appearance, and instantly picked out even by the 'Nichtbotaniker', the non-botanist who accompanied him on his expedition, then I stand up and cheer. You won't find such details in any textbook description. You would, indeed, find it very difficult to formulate them at all succinctly, and if you succeeded, nine out of ten botanical editors would cut them out with the comment 'this is fancy – we want measurements'.

I am, as you see, suggesting that this kind of perception is something that the amateur botanist is in a particularly good position to cultivate, and that he often cultivates it to a very high degree. I am also insisting that, although it is often neglected or discounted, because of the impossibility of exactly defining or quantifying its observations, it is an extremely valuable instrument. It would of course be very naive to suppose that professionals do not also possess it. We may occasionally be tempted to imagine an era when the professional botanists spent their time poring over herbarium sheets (and, oh!, what a hash some of them made of them!) while the amateurs roamed the fields. That time and that distinction, if they ever existed, are long since past. Anyone who has had the privilege of watching such a professional as Clive Jermy at work in the field will witness that he is not only acutely aware of the jizz of his plants but can give reasoned explanations for each quirk of appearance or behaviour. Yet I would still maintain that the way of looking at plants that I have been trying to describe comes more naturally to the amateur, because his view of plants is more open, less circumscribed by the requirements of a particular research programme. All plants are to him objects of wonder, and the amount of attention that he gives to each is solely determined by his appetite.

Now if I am right that the amateur has, or could have, a particular contribution to make to botanical study, and that this contribution is particularly valuable, how can he best make that contribution under present conditions of ever-increasing specialisation and sophistication? If I am to attempt to answer that question I must come down from my theoretical clouds and go into detail and illustration. These I can only produce from my own personal experience, and I must therefore beg your indulgence for a certain amount of autobiography, and particularly (since the group of plants of which I have most experience is by many considered a dull one) I must apologise for a certain amount of Caricology. And while I am apologising I must add that some of the opinions that I shall now voice are very much personal and not at all Presidential. If any of you should find them offensive to your own susceptibilities, please remember that they are anything but official, and that the last thing I want to do is to give offence – only stimulate, which is sometimes best achieved by a little exaggeration.

I want to use my own experience to illustrate the nature of the amateur botanist and some of the possible stages in his development. As Dr Walters has reported in a very indulgent note in *B.S.B.I. News*, I came to botany through my mother. She was a keen, but almost wholly untrained, amateur who belonged to an age when young ladies celebrated the finding of a plant by what was known as 'painting in', or more properly painting over its portrait in the volume of illustrations that accompanied Bentham and Hooker's *Flora*. On my fourth birthday I was given a copy of that book and a box of water-colours, and that spring my mother, with very limited assistance from myself, painted in for me the daisy and the dandelion. I am not ashamed to say that I kept up this practice until all the illustrations in the book, except for the fourteen extinctions, had been coloured; or that I later acquired Butcher and Strudwick and 'did' them too. This activity has some advantages as well as enormous disadvantages. It does quickly familiarise one with the main characters of the different families of flowering plants. The need to copy makes one at least look at each plant, and the result can, very occasionally, have a scientific use. From my Bentham and Hooker I was able to prove that the *Veronica* I found in Cornwall in the twenties was not *V. anagallis-aquatica* but *V. catenata*, because I had painted its face pink and not blue. And my poor mother's firm belief that as a girl in Skye she had been shown *Pinguicula alpina* was disproved (though I never told her so) by her own book, which showed the mauve flowers of *P. lusitanica* and not the white of *P. alpina*. On the other hand Bentham and Hooker, besides being appallingly uncritical, bred in its users, or at any rate in its colourists, an ambition that I now regard as extremely unhealthy – the passionate desire to see every plant native to Britain. This desire is, fortunately, unrealisable. The list is not, as Bentham and Hooker might suggest, finite, and new plants are continually being discovered – or invented. My little dandelion has been fractured into a hundred or two microspecies and I am certainly not going to start painting *them*. Fortunately I had realised, even before dandelions were split, that the task I had set myself was as dreary and unprofitable as that of the giant who has to bale out the allegedly bottomless Dozmary Pool, using only a limpet-shell with a hole in it. I still blush to remember the silly escapades in which it involved me, the wild dashes to 'see' a new plant with no time to look at it properly when I 'saw' it. Obviously, if my botanising was not to be wholly superficial, it had got to be practised more deeply, and therefore less widely, than I had been practising it. Some form of specialisation was indicated.

My first narrowing of the field took the form of localisation. My family had long had a house in Cornwall where all our holidays were spent, and in the mid 1950s I became the Society's recorder for E. Cornwall, v.c. 2. This was of course the period when the mapping scheme was getting under way, and a happy time I had of it, often collaborating with Oleg Polunin, my opposite number in W. Cornwall, v.c. 1. However, square-bashing is not all that great an improvement on plant-chasing. True, one is then concerned not with the single plant in total isolation but with the distribution of a species, perhaps even with its associations with others. But this study can remain extremely superficial. Many of my Cornish records were made driving a car along country lanes, with my brother sitting beside me and crossing off on the recording card the names that I called out to him as I drove. Let me here introduce two of my heretical opinions; the first being that, what I may irreverently call the 'Woof' technique (how many different plants can I tick off in a day or a month or a year), is sometimes useful enough while we are serving our apprenticeship to botany, but is one that we ought to outgrow. My second doubt is about grid-square recording and especially tetrad recording. Mind you, the making of the *Atlas* was a pricelessly valuable enterprise, providing an essential basis for almost all botanical investigation in Britain; and it is true that recording by tetrad does thicken up this basic knowledge, indicating, for example, whether a dot in a ten-kilometre square represents a single casual plant or a number of colonies. All too often, however, the tick that signifies the presence of a plant in a tetrad is all that the observer has recorded about it. If we botanists are to be something more than chasers or tickers we must again narrow and deepen our study.

Now, I am not for one moment denying that field records provide invaluable and often *the* essential data for all sorts of investigations, or that the collection of field records is an operation for which the amateur botanist is, or can be, particularly well fitted. That, indeed, is the very burden of my song. What I am saying is that, if our records are to be of real value and if their collection is to continue to give us full satisfaction, we must be stricter in asking ourselves 'what kind of record is worth making?' Now that we have the framework of information in the *Atlas*, I suggest that it is no longer enough to know that a particular plant can be found in a particular square. We ought now to be addressing ourselves to the question of why is it there, how long has it been there, and perhaps even how long it is likely to remain there? This means taking at least as much interest in the habitat as in the plant. Probably it means shifting our emphasis from plant-recording to what may be called site-or habitat-recording.

Two developments are likely to urge us further in this direction. The first is the increased concern for conservation. Anyone who has been in the least involved in conservation knows that it is an operation requiring not just a laisser-faire policy but extremely vigorous action. There is in Cambridge a churchyard with a surprising flora including several rather unusual plants. The two ladies who have assumed the guardianship of this little Eden were recently outraged at finding another neighbour weeding and pruning in it. But the weeder and pruner was right and the good ladies wrong:

conservation does not mean abstaining from all intervention and trusting that a beneficent Nature will look after herself. She will; but often not in the way that we should prefer, as is well illustrated by what happened when the rabbits, those excellent managers of certain habitats, were wiped out by myxomatosis. In Cornwall what were to us charming dells full of primroses and uncommon ferns are now impenetrable and almost ineradicable thickets of that more aggressive competitor, the blackthorn.

Conservation, that is the maintenance of what we may regard as the ideal plant community for a particular locality, means continuous and laborious management, and this, to be successful, must be guided by reasonably exact knowledge: first, of what *is* the ideal community, and second, how its individual members will react to particular stimuli. Some of the necessary information will be derived from laboratory experiments, some from growing tests in botanic gardens, but much of it comes, and must continue to come, from records. We have today an institution, the Nature Conservancy Council, expressly charged with acquiring that knowledge and, in its light, selecting and managing the sites that, in the national interest, are to be conserved. The Council is, I believe, by far the greatest user of the Biological Records Centre at Monks Wood; but the bare information that a particular species occurs in a particular tetrad does not do much to further the Council's objects. For though the Council will certainly assist in protecting an endangered rarity, what it is primarily concerned with is the preservation not of particular plants but of particularly rich or particularly characteristic habitats. It needs the data that will enable it to identify these habitats, or that can warn that a particular wood, marsh, or meadow under threat has a special value, in which the presence of a rarity is only one factor.

The second development to which I have referred is the extraordinary and ever-growing sophistication of information retrieval systems. The modern computer can not only store an almost infinite number of facts and, when required, re-present them almost instantaneously; it can also assemble, compare, and analyse the data that it holds in ways that would be too complicated and time-consuming for what I may call the 'steam' investigator. These remarkable capabilities have excited botanical research-workers, who are beginning to dream of all sorts of earth-shaking discoveries that might be made by setting the computer to work combining and recombining all the collected data. The dream is fair enough, but the dreamers, it seems to me, sometimes forget that however sophisticated the analysis the results will be only as good as the original data. Indeed, if that is incomplete or inaccurate the more sophisticated the analysis the more misleading will be the results.

Let me illustrate the present difficulties of both the Nature Conservancy Council and the research scientists. If every plant record that any of us had ever contributed contained an 8-figure grid reference, the conservator wishing to assess the quality of a certain site or the scientist wishing to correlate the plants of a certain habitat with other factors (climate or soil character or insect life) would merely ask the computer to print out the list of all the plants with that particular grid reference. But it is only the rarer plants for which we bother to write out individual record cards, and even then we often do not put in the full reference. The great majority of our records are on composite field cards, and refer to a 10 kilometre square or at best to a tetrad. These are invaluable in giving a very general overall picture of a plant's distribution, more comprehensive and more readily comprehensible than was available to earlier generations, but useless to the investigator who wants to go deeper. When the computer prints out for him the plants recorded for his reference point, all he will get will be the rarer plants, which will give him only the vaguest indication of the nature and quality of his site, and may be positively misleading when it comes to any attempt at analysis or correlation.

Now it would be absurd to expect our members to record, individually and with an 8-figure grid-reference, every common plant that they see, down to '*Belli per*' and '*Veron hed*'. I do it for sedges, even for *Carex nigra*, but there are only 76 of them in Britain and even so it is an awful chore which I am constantly resolving to abandon. How else can we provide plant records that offer a more realistic, because less selective, account of the plant coverage? I think it can only be by concentrating more on particular sites or habitats. Rather than as it were entering the competition for the maximum number of different plants we can find in a purely arbitrary area, be it one square kilometre or one hundred square kilometres of undifferentiated ground, I should like us, in the light of the results of our previous square-bashing, to proceed now to pick out, in our district or vice-county, those sites likely to be of particular interest botanically. There will be copses, little areas of marsh, outcrops of limestone or of sand, disused quarries and corners of fields used as stackyards; and each of you will think of many more special preserves of this kind. These should be intensively examined and all plants recorded, with of course the full grid reference for the spot and as complete an indication as may be possible of the peculiar nature of the habitat. Such an activity would, I believe, give infinitely more satisfaction than any chasing or ticking, and this satisfaction would include the knowledge that our work was going to be of real use to others—that we, non-professionals though we may be, were making an effective contribution to botanical research.

Having pleaded for an improvement in the quality of plant-records submitted, I must say something about what happens to them at the receiving end. Many of us have been anxious about the state of the Biological Records Centre at Monks Wood since Frank Perring left it. The Institute of Terrestrial Ecology, the organisation that has charge of the Centre, has admitted that the records are in something of a mess. The reason for this is a perfectly valid one, and may even be considered creditable. When the mapping scheme was first set up, the system chosen for recording and then representing the data in printed form was a comparatively cheap and simple one. There was every good reason for this. It was vital to get some positive results, and to get them early. If more complicated equipment had been selected, the enterprise might have dragged on without any conclusion in sight, while everybody's enthusiasm drained away; and if more expensive equipment had been chosen this pioneer operation could probably not have been funded at all. But in an age of invention, cheap and simple tends to become quickly obsolete. In time it became clearly essential to introduce a more sophisticated system. Here, perhaps, a mistake was made and the pace of change underestimated. Instead of moving at once to full computerisation (and some of us have painful experience of how shattering that move can be), an intermediate system was chosen. All too soon, however, and before the records in the first system had been fully transferred to the second, it was realised that, if the data were to be readily available and fully used, only the most advanced equipment would serve. This is now installed and in operation; but the records in not one but both the two earlier systems, both incompatible with the new, have to be manually translated into the new terms. This is bound to be a long process, but it is progressing steadily. B.S.B.I. representatives, in several very helpful meetings with senior officers of both the Institute of Terrestrial Ecology and the Nature Conservancy Council, have been assured that the Institute puts the highest value on its biological records, will make vigorous efforts to bring them back into order in reasonable time, and will so staff the Centre that the records can be maintained in that condition. The Society is now discussing with the Institute and with the Conservancy Council how we can best help to increase and improve the input. We hope shortly to put forward proposals for what I believe will be a simpler and more certain system for the organisation of recording and for communication between our local recorders and the Biological Records Centre. Our Records Committee must be deeply involved in the detailed planning; an early task will be to devise a record card that, while encouraging the submission of more ecological information about the plants recorded, is not dauntingly complicated. Having been close to despair, I now find the prospect extremely encouraging, and am confident that a new and fruitful era of recording will soon be initiated.

Not only is it desirable that we should make our plant records more comprehensive, we must also make them more accurate. We are used to making fun of the phrase 'I've seen it in print, so it must be true', yet in practice we too often seem to accept it at its face value. I have actually heard people say 'but there is a dot in the *Atlas*, the record must be correct'. Would that it were so; but unfortunately recorders, editors, and even printers, are all fallible. And here I want to make a special plea to amateur members of this Society. The joy of discovery is very great, so great that there is a risk that we come to regard our discoveries as something intensely personal. We may be reluctant to share them, jealous of anyone else who claims them as his own, and bitterly resentful if they are questioned. But science, of which botany is a part, is very much a public activity. It is central to the whole concept and ethos of science that an investigator's findings should be published, should be scrutinised by his peers, and should not be admitted as part of the common store of knowledge until, and unless, accepted by a consensus of scientific opinion. If we are to be anything more than *dilettanti* we must conform to that ethos.

Where plant records are concerned, there is, I know, the vexed question of secrecy. This is not the place to discuss the pros and cons of keeping secret the location of a rare plant. In each case there are many and various considerations to be weighed. With the exception of orchids, that curious family that seems to inspire so many evil temptations (I am sure that the Tree of Knowledge was an uncharacteristically shrubby member of the Orchidaceae), my own view is that more plants have been lost through excessive secrecy than through too wide a publication of their whereabouts. Be that as it may, my general point here is that we should rather welcome our discoveries and determinations being questioned (and, one hopes, confirmed) than seek to keep them private, which means that they can never have more than a purely personal value. And if any fear the shame of having a determination contradicted, let them examine any major herbarium. They will find that there is no botanical authority, however august, who has not been guilty of the grossest errors.

Lest this sounds superior and condescending let me at once confess that my own errors have been innumerable and awful. I will relate one of them, because the relation may clear me of the suspicion of being superior, because I think that the incident is instructive, and because I have here an opportunity to catch the error before it breeds. For errors are like mink or coypu: once loose upon the world they multiply, they do enormous damage, and they are almost impossible to exterminate. In my third and last botanical avatar I have tried to cultivate a much deeper knowledge of a much narrowed field: the sedges. The first sedge whose British distribution I studied was *Carex montana*, to which I was drawn because that distribution is so odd. Where it occurs it is usually in millions, but when you reach the boundary of such a massed colony you will find that it ceases abruptly and you may not come on the plant again for a hundred miles. Hanbury and Marshall's *Flora of Kent* lists *Carex montana* for that county; and in going through the British Museum covers I lighted upon the voucher specimens for this record – four tufts mounted at the bottom of a composite sheet and labelled 'Bysing and Thornden Woods, September 1875'. *Carex montana* is an early-flowering sedge and because these specimens were collected so late they were completely without flowering stems. Yet three of them had the woody rhizomes, bristly with old leaves and with a strong tinge of crimson, which are taken to be characteristic of this species. I therefore republished the record in my Short Note in *Watsonia*. Inspired by this, the Kent Field Club mounted an expedition to Bysing Wood, and in time I was sent a series of flowering stems from hopeful collectors. All but one of these were obviously the related *C. pilulifera*, but one, very dark with large pear-shaped utricles, was so promising that, although it was then August, I myself dashed off to the wood where, among abundant *C. pilulifera*, I stumbled almost at once upon two large tussocks that seemed to me to have most of the right characters for *C. montana*. The flowering stems were pretty bedraggled, the basal sheaths not quite so red as I would have liked, but I showed specimens to a colleague and we agreed that *on balance* the plants could only be *C. montana*. I so informed the Kent Field Club. A note was published in their *Bulletin*, and I undertook the following season to lead a search to discover just how widely the plant was spread. Arriving early at the rendezvous, for a check-up, I saw from five yards away that my plants were not *C. montana* but *C. pilulifera*, and I had made an almighty boob.

The discovery raised doubts about the Hanbury and Marshall specimens. On re-examination, one of them seemed clearly to be *C. pilulifera*, but the other three still looked very like *C. montana*. I then remembered that Clive Jermy had told me that under the electron microscope the epidermis of another pair of sedges, *C. rostrata* and *C. vesicaria*, could be seen to be utterly different the one from the other, and I asked him to examine by this method the Hanbury and Marshall specimens, together with proven specimens of both *C. montana* and *C. pilulifera*. He did so, and reported that *C. montana* carried a few very fine hairs and *C. pilulifera* a wholly distinct array of overlapping scales; and that *all* the Hanbury and Marshall specimens accorded in this respect with *C. pilulifera*. It therefore seems clear that *C. montana* has never been in Kent at all.

There are several morals to this tale. Never wholly believe what you read in books, never make a pronouncement on incomplete or unseasonable material, never pronounce on a balance of probability, and (since specimens both provoked and settled this enquiry) always take a specimen of anything unusual and be prepared to show it to others. This final recommendation is the last of my heresies, and I can sense the conservationists shuddering. I would not apply it to *Cypripedium* – there are cameras for such as that. But there are times when knowledge is, in my view, more important than conservation, and may indeed be the key to it. And though one is repeatedly shocked by the sheet upon sheet of specimens of a rarity that were taken by Victorian botanists, I can think of no plant that has become noticeably scarcer as the result of botanists' depredations. The depredations of gardeners, and especially of fern-fanciers, are quite another matter.

I have talked mostly about the gentlemen, because it would be impertinent of me to preach to the players (except perhaps out of the corner of my mouth). Also, I have concentrated on recording, because it is a botanical activity particularly fitted to the amateur, because it is the one in which I have myself been most deeply involved, and because it is the one for which I see a new and expansive phase about to open. There are, of course, many other ways in which the amateur can make his special contribution to botany. There is, for example, the study of critical groups: our expert batologists and rosarians are today all amateurs. And I would like, in conclusion, just to touch on two others, because in so doing I can pay tribute to two close friends and admirable botanists whose loss, the one recent, the other just over a year ago, the Society now mourns.

John Raven, who possessed, in perhaps the highest degree that I have ever known, that botanical eye for a plant or for a habitat that I described earlier, had turned his attention from the plants that were there to the plants that were not there. From a detailed examination of the *Atlas* he had compiled lists of plants which, from their distribution elsewhere, he might have expected to find in his part of the Scottish Highlands but had not seen there. From his detailed knowledge of the terrain he predicted where they might be, and proceeded to search for them. The first intriguing results, both positive and negative, of this investigation were published in the last issue of *Watsonia*, alas just too late for John to see them in print. Alan Ward, of Sheffield, suffered in later life a whole series of health disabilities, including heart trouble and tuberculosis, which somewhat restricted his activities; but for twelve years or more he continuously surveyed the 100 yards of lane behind his house at Baslow, noting the flowering times of each species of plant present, and other behavioural phenomena. Whether any use has been made of his notes I do not know. His most positive discovery was that the 30 or so taxa present at the beginning of his survey had dwindled by the end of it to 20, largely as a result of the disappearance from neighbouring cornfields of weeds that had originally seeped through the hedge into the lane – a local illustration of a national trend. What I am sure of is that this sort of apparently elementary observation is potentially as valuable a basis of discovery as Mendel's equally parochial experiments with peas. And this adds to my conviction that, even in this age of scientific sophistication, the amateur botanist, with sufficient standards, honesty, and perseverance, can not only enjoy himself as much as ever he did, but can also make a real, and quite distinctive, contribution to botanical knowledge. Not only are gentlemen and players still in the same game—they are on the same side.

A newly discovered *Limonium* in East Sussex

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ABSTRACT

Limonium companyonis (Gren. & Billot) O. Kuntze is recorded from a single site in E. Sussex, v.c. 14. Its incompatibility type and chromosome number are reported, with reference to other W. European *Limonium* species.

INTRODUCTION

While carrying out a survey of the *Limonium binervosum* (G. E. Sm.) C. E. Salmon group around the coast of Britain in the summer of 1979, a *Limonium* species, unlike any of the known native species, was discovered by me growing on the chalk cliff at Rottingdean, E. Sussex, v.c. 14. It grows there with *L. binervosum* and appears to be competing effectively with it. Another interesting species at this site is *Frankenia laevis* L.

This 'new' *Limonium* species (Fig. 1), which may have been mistaken for *L. binervosum* in the past, differs from *L. binervosum* in the characters indicated in Table 1.

TABLE 1. COMPARISON OF *LIMONIUM BINERVOSUM* AND THE NEWLY DISCOVERED SPECIES FROM ROTTINGDEAN, E. SUSSEX

Character	'New' species	*L. binervosum*
Inflorescence	much branched from low down, with lower branches sterile	few branches low down and few or no sterile branches
Spikes	up to 6 cm	3 cm
	1–2 spikelets per cm	>3 spikelets per cm
Leaves	broadly obovate with a sharply attenuate base and a rounded or retuse apex	narrowly obovate to spathulate with an acute or obtuse apex
	lateral veins branching conspicuously from midrib	lateral veins inconspicuous
Calyx	becoming uncinate in fruit	remaining tubular in fruit
Over-wintering	leaves tending to die off	leaves remaining evergreen

BREEDING SYSTEMS IN *LIMONIUM*

The genus *Limonium* Mill. has a world-wide distribution, but has its highest concentration of species in the western Mediterranean region. In this region agamospermy is particularly prevalent. Of 15 species of *Limonium* described by Boissier (1848) from the Iberian Peninsula and southern France, 10 have since been shown to be agamospermous. More recently Erben (1978) has listed 32 agamospermous species from the same region out of the total of 55 species. All these agamosperms belong to subsections *Densiflorae* Boiss. and *Dissitiflorae* Boiss., both in section *Limonium*.

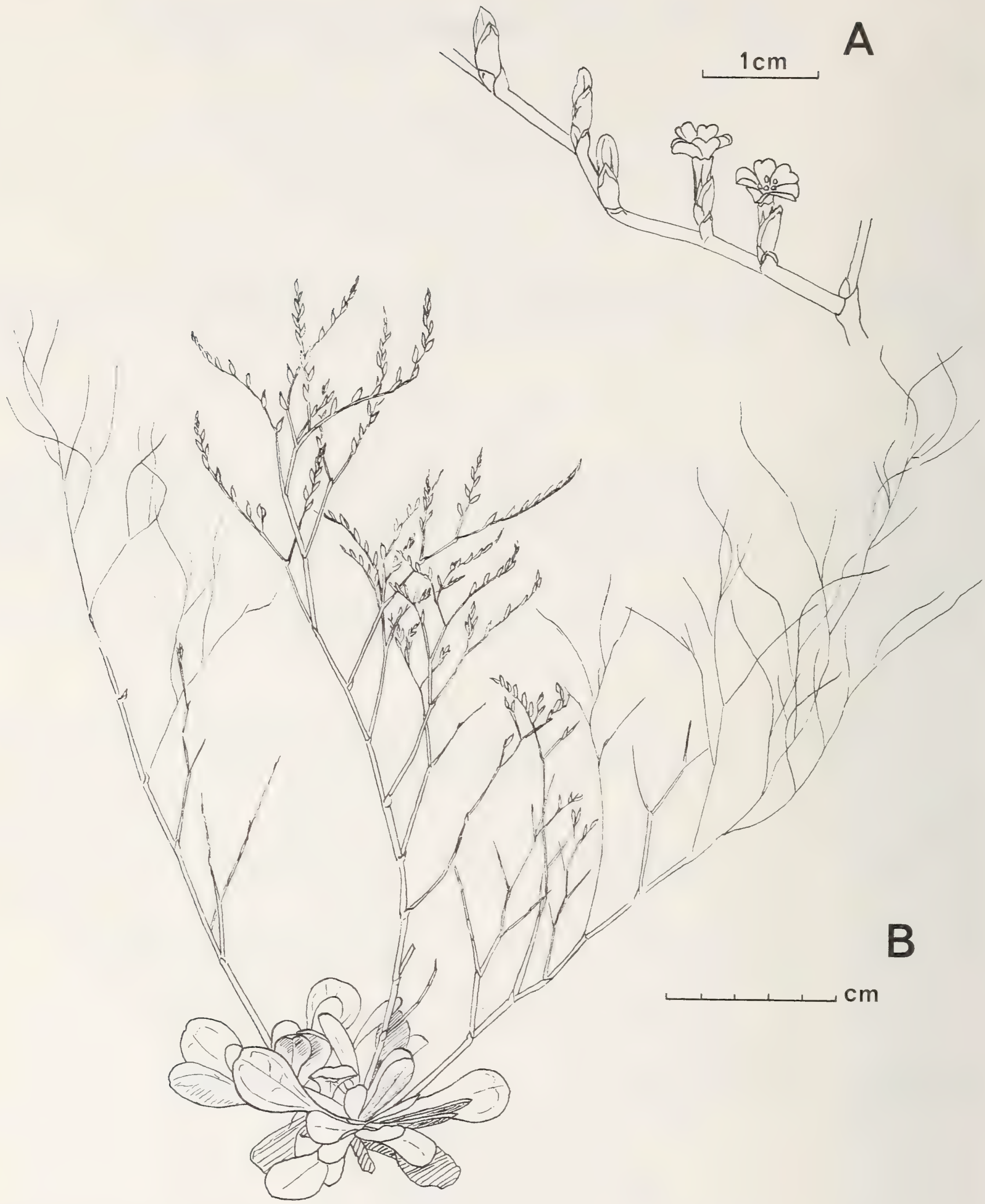

FIGURE 1. *Limonium companyonis* (Gren. & Billot). O. Kuntze drawn, after nine months cultivation in Leicester, from a cutting collected from Rottingdean, E. Sussex, v.c. 14. A, portion of a spike in flower, B, whole plant in bud. Spikelets are drawn only for the central main stem.

In section *Limonium* sexual species are either dimorphic or monomorphic. Dimorphic species have self-incompatible flowers with either 'A' pollen and 'Cob' stigmas or 'B' pollen and 'Papillate' stigmas (Baker 1948), as in *L. vulgare* Mill. Monomorphic species have the self-compatible pollen-stigma combination 'A'/'Papillate', as in *L. humile* Mill.

Seven different situations are known among the agamospermous taxa:

1. 'A'/'Cob' in all colonies.
2. 'B'/'Papillate' in all colonies.
3. 'A'/'Cob' *and* 'B'/'Papillate' in all colonies.
4. Colonies variously with 'A'/'Cob', *or* 'B'/'Papillate', *or* these two mixed.
5. 'B'/'Cob' in all colonies.
6. Colonies variously with 'B'/'Cob' *or* 'A'/'Papillate'.
7. Colonies variously with Male sterile/'Cob' *or* Male Sterile/'Papillate'.

All plants of the Rottingdean colony examined have 'A'/'Cob', the first situation listed above. Elsewhere in the genus this is known only in the *L. binervosum* group, in the *L. duriusculum* (Girard) Fourr. group, and in three other isolated species.

In section *Limonium* sexual species have chromosome numbers of $2n = 16$, 18, 36 or 54, while agamospermous taxa have numbers of $2n = 25$, 26, 27, 33 34, 35 or 36. The Rottingdean colony has been found to have $2n = 35$ (counts from three seeds and one mature plant). This number is elsewhere known only in the *L. binervosum* group and in *L. geronense* Erben, a species placed by Erben (1978) next to the *L. duriusculum* group.

The Rottingdean plant is clearly agamospermous, as is shown not only by its self-incompatible pollen-stigma combination and its chromosome number, but also by its extremely low pollen fertility ($<1\%$ by aceto-carmine staining).

IDENTITY AND ORIGIN OF THE ROTTINGDEAN TAXON

In all respects, including the 'A'/'Cob' pollen/stigma combination, this new species for Britain agrees with the description and herbarium material of *L. companyonis* (Gren. & Billot) O. Kuntze, an agamosperm in the *L. duriusculum* group, which is otherwise confined to a short stretch of the Mediterranean coast near Narbonne, France. It is very rare now, and doubts have been raised (Erben *in litt*. 1980) as to its continued existence. Final confirmation that the British plant is in fact identical with *L. companyonis* must await cultivation experiments and chromosome counts, if and when French living material can be found. This is especially important in the case of agamospermous taxa, which often differ from one another only in very minor characteristics.

It is interesting to speculate as to whether the Sussex *L. companyonis* is native or an introduction from France. A natural distribution of a few sites in southern France and one site in Britain would seem unlikely if it were not for the examples of *L. bellidifolium* (Gouan.) Dum. and *L. auriculae-ursifolium* (Pourr.) Druce, which have similar disjunct distributions (Lincolnshire, v.c. 53 & 54, Norfolk, v.c. 27 & 28, and Mediterranean France in the former case, and north-western France, the Channel Isles and Mediterranean France in the latter). If introduced, it is now thoroughly naturalised at Rottingdean, with large plants growing from the vertical chalk face of the cliff, facing the sea. However, it is very restricted to less than a hundred metres of the cliff, whereas the *L. binervosum* plants here grow in scattered colonies for many hundreds of metres to both east and west. Furthermore, the top of the cliff here adjoins a hotel car park and terrace, in which some of the plants grow, along with *L. binervosum* and *Frankenia laevis*. No old herbarium material of either *L. companyonis* or *Frankenia laevis* from this site has been found in **BM**, **BTN** or **K** and, while *L. binervosum* is listed from Rottingdean by Wolley-Dod (1937), neither *F. laevis* nor *L. companyonis* is mentioned. The *L. companyonis* from Rottingdean must probably be viewed for the present as an interesting and valuable enigma of doubtful origins rather than a long-unrecognized native species.

ACKNOWLEDGMENT

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New species of *Taraxacum* from the British Isles

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ABSTRACT

Of the 68 species of *Taraxacum* recorded in the British Isles since publication of *The* Taraxacum *flora of the British Isles* in 1972, eleven are species new to science, and descriptions or diagnoses of them are given in this paper.

INTRODUCTION

Since I published *The* Taraxacum *flora of the British Isles* (Richards 1972a), which can be seen more clearly in hindsight as an exploratory attempt to describe the *Taraxacum* species of these islands, a gratifying interest in the genus has become evident among amateur British botanists. Over the last eight years I have been sent annually more than 2,000 specimens from over 30 collectors per year, and the result is that we have now a much more complete knowledge of the taxonomy and distribution of the genus in Britain. There are now more than 25,000 individual records, and the number of species recorded has increased to exactly 200 at the time of writing (132 were described in *The* Taraxacum *flora*).

Recording of individual species is variable, both geographically and between species. For instance, there are now over 400 10km square records for *T. faeroense* (Dahlst.) Dahlst., and an examination of the distribution map suggests that a final total would not be more than 50% greater. In other species recording is much more sketchy, particularly in section *Taraxacum* (*Vulgaria*) Dahlst.

In vice-counties such as S. Northumb., Cheviot, Denbighs., Flints., Cheshire and E. and W. Kent, in which species have been collected systematically, cover is mostly good. However, recent taxonomic changes, especially in the relatives of *T. hamatum* Raunk. and of *T. lingulatum* Markl., mean that even in these areas some widespread species are under-recorded. Although general cover across the country has notably improved, we still have a poor knowledge of the species in some vice-counties, and it may be productive to list these here. Well-collected material from the following vice-counties would be more than usually welcome: 3, 4, 5, 6, 7, 8, 9, 10, 13, 14, 18, 19, 25, 26, 31, 32, 33, 34, 35, 36, 37, 38, 39, 43, 44, 53, 54, 63, 86, 87, 93; all Ireland *except* H9, H15–H17, H27, H38–H40.

One striking recent development has been original and critical taxonomic research on *Taraxacum* by several British amateur botanists, and it is hoped that this work will grow, for our knowledge of the genus is still far from complete. A visit by the Danish authority Hans Øllgaard to Newcastle in May 1979 yielded no less than 17 species additional to the British Isles. It is likely that nine or ten of these will prove to be impermanent casuals, and most of the others may be localized adventives, but with over 1,000 species available on the Continent for occasional introduction, and the widespread importation of grass seed for new planting schemes, etc., the number of species that might be recorded in the future is extremely high.

In contrast, it is likely that the number of new native species or thoroughly established adventives that remain to be discovered is relatively small and, as the taxonomy of groups of critical species begins to settle, we can expect greater taxonomic stability.

In view of the fluidity of *Taraxacum* taxonomy over the last eight very fruitful years, I have not found it useful to publish accounts of species new to our flora, or taxonomic revisions of species previously recorded. Demand from interested botanists has been met by R. J. Pankhurst of the British Museum

(Natural History), who has a computer-based data store of the British and Irish *Taraxacum* species and their characters, which is updated and amended annually. This has enabled the production of an artificial 'polyclave' key, and printed descriptions of species new to our flora, and can be obtained from him as reported in *B.S.B.I. News*, **24**:9 (1980).

Recent visits by Øllgaard in 1979 and by the Swedish specialist C. I. Sahlin in 1978 have shown that there is a consensus about the identity and nomenclature of nearly all the British species and, however many casuals and adventives may be recorded in the future, maybe the time has come to describe changes to our knowledge of the permanent *Taraxacum* flora of the British Isles. It is intended that this should come about through the account of *Taraxacum* in the forthcoming *Flora of Great Britain and Ireland*. In this, it is hoped that 10km square distribution maps can be published. These have already been prepared in an interim state for over 60 species.

In the meantime, it has been suggested that undiagnosed British species (i.e. those new to science), almost all native endemics that have been discovered since 1972, should be described, and this is achieved in the following accounts.

DESCRIPTIONS OF NEW SPECIES

1. **Taraxacum arenastrum** A. J. Richards, **sp. nov.** (Plate 1A)

Planta subhumilis, tenella sed basi reliquiis foliorum defunctorum vestita. Folia patentia vel suberecta, subglabra, viridia, immaculata, ad 80 mm longa; lobi laterales 4–5, valde recurvati, acuti, vix dentati, interdum ad apicem angustum retroversum subabrupte contracti, lobus terminalis anguste protractus vel valde mucronatus; petiolus brevis, exalatus, subpurpureus vel interdum viridis. Scapi folia aequantes, araneoso-pilosi, virides. Involucri squamae exteriores 6–9 mm longae, 2–3 mm latae, erectae, virides, pallide marginatae, vix corniculatae. Calathium 25 mm diametro, pallide luteum, ligulis stria violacea subtus notatis; styli exserti, lutei vel subsordidi, polliniferi vel epolliniferi. Achenium 2.8–3.0 mm longum, angustum, castaneo vel obscure rubrum, superne breviter spinulosum, alibi laeve, in pyramidem cylindricam 0.7–0.8 mm longum abrupte abiens; rostrum 7–8 mm longum; pappus albus.

Plant small and rather delicate, but thickened at the base with the remnants of dead leaf-bases. Leaves spreading or suberect, more or less glabrous, mid-green, not exceeding 80 mm; lateral leaf lobes 4–5, strongly recurved, acute, scarcely dentate, often contracted from a broad base to a very narrow downwards-pointing tip; terminal lobe with a narrow attenuate apex, or at least markedly mucronate; petiole short, or up to 1/4 length of leaf, unwinged, somewhat purple, or green. Scapes equalling leaves, aranose, dull green or coppery. Exterior bracts erect, 6–9 × 2–3 mm, green, with well marked white margins, scarcely corniculate. Capitulum *c.* 25 mm diameter, pale yellow; ligules striped violet; styles exserted, yellow or somewhat discoloured; pollen present or absent. Achenes 2.8–3.0 mm, chestnut or dark red, shortly spinulose above but otherwise smooth, narrow; cone abruptly demarcated, narrow, 0.7–0.8 mm; rostrum 7–8 mm; pappus white.

HOLOTYPUS: Carlingheugh Bay, near Arbroath, Angus, v.c. 90, 17.5.1844, W. L. Trevelyan, **K**.

Sand-dunes, and chalk and limestone grassland, usually near the sea. Apparently local and rare. Vice-counties 1, 28, 50, 52, 58, 67, 74, 90, 101, H9. Native. Britain, and probably northern France.

This characteristic little species of section *Erythrosperma* H. Lindb. f. shares some features with *T. commixtum* Hagl., such as a deep reddish achene, erect exterior bracts with a white margin and little corniculation, yellowish styles, and usually the presence of pollen. It differs in being smaller in capitulum diameter, bract length and general stature; and in the leaf shape, which shares the expanded lobe bases of *T. lacistophyllum* (Dahlst.) Raunk. with the recurved apices of *T. laetum* (Dahlst.) Dahlst.

2. **Taraxacum scoticum** A. J. Richards, **sp. nov.** (Plate 1B)

A *T. fulvo* Raunk. involucri squamis exterioribus patentibus, 5–6 × 2–3 mm, pallide marginatis; stylis valde polliniferis; achenis 3.2–3.5 mm longis; differt.

Differs from *T. fulvum* Raunk. in its spreading exterior bracts which are wider (5–6 × 2–3 mm) and have pale margins, presence of pollen, and longer achenes (3.2–3.5 mm).

HOLOTYPUS: Chanonry Point, Fortrose, E. Ross, v.c. 106, GR 28/73.55, 13.5.1972, M. McC. Webster, **OXF**. Isotypus: **CGE**.

Scattered in a number of sandy localities in northern England and Scotland. Vice-counties 56, 67, 69, 83, 101, 106. Native. Two stations in Denmark (Jylland).

T. scoticum is very closely related to *T. fulvum* in section *Erythrosperma*, and closely resembles that species in vegetative characters. It is also similar to the Scandinavian *T. falcatum* Brenner, which has smaller, straw-coloured achenes, and lacks pollen.

3. **Taraxacum webbii** A. J. Richards, **sp. nov.**

Planta mediocris, fere glabra. Folia suberecta, pallide viridia, immaculata, 50–120 mm longa, linearia vel angustissime spathulata, haud lobata, margine integra vel brevissime sinuato-dentata, apice acuta vel subobtusa, integra; petiolus purpureus, angustus, foliis 2–3-plo brevior. Scapi folia aequantes, virides, glabri. Involucri squamae exteriores ad 6 mm longae, 4 mm latae, involucrum adpressae, laeves, virides, ad apicem purpurescentes, valde marginatae, margine albo 1 mm lato clare discriminatae. Calathium ut pallide luteum videtur, ad 30 mm diametro, planum, ligulis stria purpurea subtus notatis; styli exserti, sordide lutei, epolliniferi. Achenium 4.0–4.3 mm longum, 1.0–1.2 mm latum, stramineo-brunneum, superne breviter tuberculatum, alibi laeve, in pyramidem conicam subbrevem (0.5 mm longa) subabrupte abiens; rostrum breve, 5–6 mm longum; pappus albus.

Plant medium-sized, almost glabrous. Leaves ascending to erect, pale green, linear or narrowly spathulate, lacking lobes, entire or with short teeth arising from a slightly sinuate leaf-margin; apex entire, acute or subobtuse; petiole purple, narrow, 1/3 or 1/2 length of leaf. Scapes equalling leaves, green, glabrous. Exterior bracts up to 6 × 4 mm, ovate or ovate-lanceolate, adpressed to involucre, not corniculate, mid-green with a purple suffusion towards the apex, strikingly bordered, with a very distinct white border 1 mm wide. Capitulum apparently pale yellow, flat, not exceeding 30 mm diameter; ligules striped purple below; styles exserted, dirty yellow; pollen absent. Achenes 4.0–4.3 × 1.0–1.2 mm, straw-brown, shortly tuberculate distally, the remainder smooth, with a short (0.5 mm) conical cone; rostrum short, 5–6 mm; pappus white.

HOLOTYPUS: 0.5 km south of Ballyvaughan, Co. Clare, v.c. H9, GR M20, rough grassland subject to winter flooding, with *Potentilla fruticosa*, 18.5.1972; achenes collected 31.5.1975, D. A. Webb, **TCD**.

Subsequently found in squares M31 and R26 in v.c. H9, and in square M24 in v.c. H26. Native. Apparently endemic.

This attractive species of section *Palustria* Dahlst. resembles *T. austrinum* Hagl. in leaf shape and style colour, but differs in the wider exterior bracts with white borders, and much larger achenes, as well as by possessing pollen. *T. palustre* (Lyons) Symons, which is not uncommon in this area, is closely related, but differs in the narrower leaves which are entire or with only 2–3 teeth, in the larger capitulum of a darker colour, and especially in the exterior bracts, which have a relatively indistinct margin which is scarious, not white. *T. webbii* seems to be even more closely related to the Baltic species *T. decolorans* Dahlst., which has exterior bracts strongly suffused with purple, more dentate leaves, and narrower exterior bracts. The styles in the latter are a pure yellow.

4. **Taraxacum maculosum** A. J. Richards, **sp. nov.**

T. maculigerum sensu A. J. Richards in *Watsonia,* **9** (suppl.): 50 (1972), *non* H. Lindberg f. in *Acta Soc. Fauna Flora fenn.,* **29(9)**: 35 (1907).

A *T. maculigero* H. Lindb. f. notis sequentibus differt: squamae exteriores patentes ad suberectae, pruinosae, ad 10 mm longae et 3.5 mm latae; styli semper epolliniferi; achenium 3.4 ad 3.6 mm longum ad apicem spinulosum. $2n = 32$.

Differs from *T. maculigerum* H. Lindb. f. in its patent to suberect, pruinose exterior bracts which are up to 10 mm in length and 3.5 mm in width, lack of pollen, and achene (minus cone) 3.4–3.6 mm and spinulose above.

HOLOTYPUS: Langdon Beck, Co. Durham, v.c. 66, GR 35/852.309, altitude 350 m, 16.6.1965, A. J. Richards, **OXF**. $2n = 32$.

Distribution in the British Isles as given for *T. maculigerum* H. Lindb. f. in Richards (1972a).

It has recently been pointed out to me (C. I. Sahlin *in litt.* 1979) that *T. maculigerum* H. Lindb. f., as described from Finland, has shorter, narrower, more recurved exterior bracts and shorter achenes (not exceeding 3.2 mm minus the cone) than British material so named. Also, eastern Scandinavian material, including the type, always has pollen; British material always lacks pollen. Gustafsson (1935) found that material from eastern Sweden is triploid ($2n = 24$); that from Britain is tetraploid ($2n = 32$) (Richards 1972a). Swedish material that I have seen has narrower, less lobed leaves than is common in Britain. That figured in van Soest (1975) from the Netherlands is typical of Swedish material, and is further stated to possess pollen.

The distributional ranges of these two species of section *Spectabilia* Dahlst. are as yet unclear. *T. maculigerum* appears to be absent from the British Isles, but present in the Netherlands, Sweden and Finland. Plants lacking pollen and which are probably referable to *T. maculosum* occur in Denmark and western Sweden. There is a suggestion that in western Scandinavia the two species may overlap.

5. **Taraxacum subnaevosum** A. J. Richards, **sp. nov.** (Plate 1C)

Planta mediocris, subtenella. Folia suberecta, viridia vel luteoviridia, supra sparse atro-punctata, ad 140 mm longa; lobi laterales 3–4, recurvati vel subpatentes, acuti, margine distali subconvexi et denticulata vel interdum integri; interlobia denticulata; lobus terminalis longus vel sublongus, hamatus, integer vel denticulatus, acutus; petiolus angustus, subdentatus, viridis vel subpurpureus; nervus medianus viridus. Scapi folia saepe superantes, subtenelli, sparse araneoso-pilosi. Involucri squamae exteriores 6–9 mm longae, 1.5–2.2 mm latae, recurvatae, pallide virides, vix marginatae. Calathium diametro c. 30 mm, ligulis stria cano-purpureo subtus notatis; styli exserti, sublutei vel subsordidi, epolliniferi. Achenium 3.1–3.3 mm longum, stramineo-brunneum, superne breviter spinulosum, alibi sublaeve, in pyramidem subcylindricam 0.6–0.9 mm longum abiens; rostrum 6–7mm longum pappus albus.

Plant medium-sized, rather delicate. Leaves suberect, dull green or yellowish-green, sparsely spotted with small black spots on the adaxial side, up to 140mm; lateral leaf-lobes 3–4, recurved or subpatent, acute, subconvex and denticulate or more rarely entire on the distal margin; interlobes denticulate; terminal leaf-lobe long or rather long, hamate, acute, entire or denticulate; petiole narrow, more or less dentate, greenish or purplish; midrib green. Scapes usually exceeding leaves, narrow, sparsely aranose-pilose. Exterior bracts 6–9 mm × 1.5–2.2 mm, recurved, pale green, scarcely bordered. Capitulum *c.* 30mm diameter; ligules striped grey-purple; styles exserted, yellowish or occasionally darker; pollen absent. Achenes 3.1–3.3 mm, straw-brown, shortly spinulose above, the remainder more or less smooth; cone 0.6–0.9 mm, subcylindrical; rostrum 6–7mm, pappus white.

HOLOTYPUS: Dirlot, by the Thurso river, Caithness, v.c. 109, GR 39/1.4, 5.6.1973, A. McG. Stirling and A. G. Kenneth, **OXF**. Isotypi: **herb. A.G. K., herb. A.McG.S.**

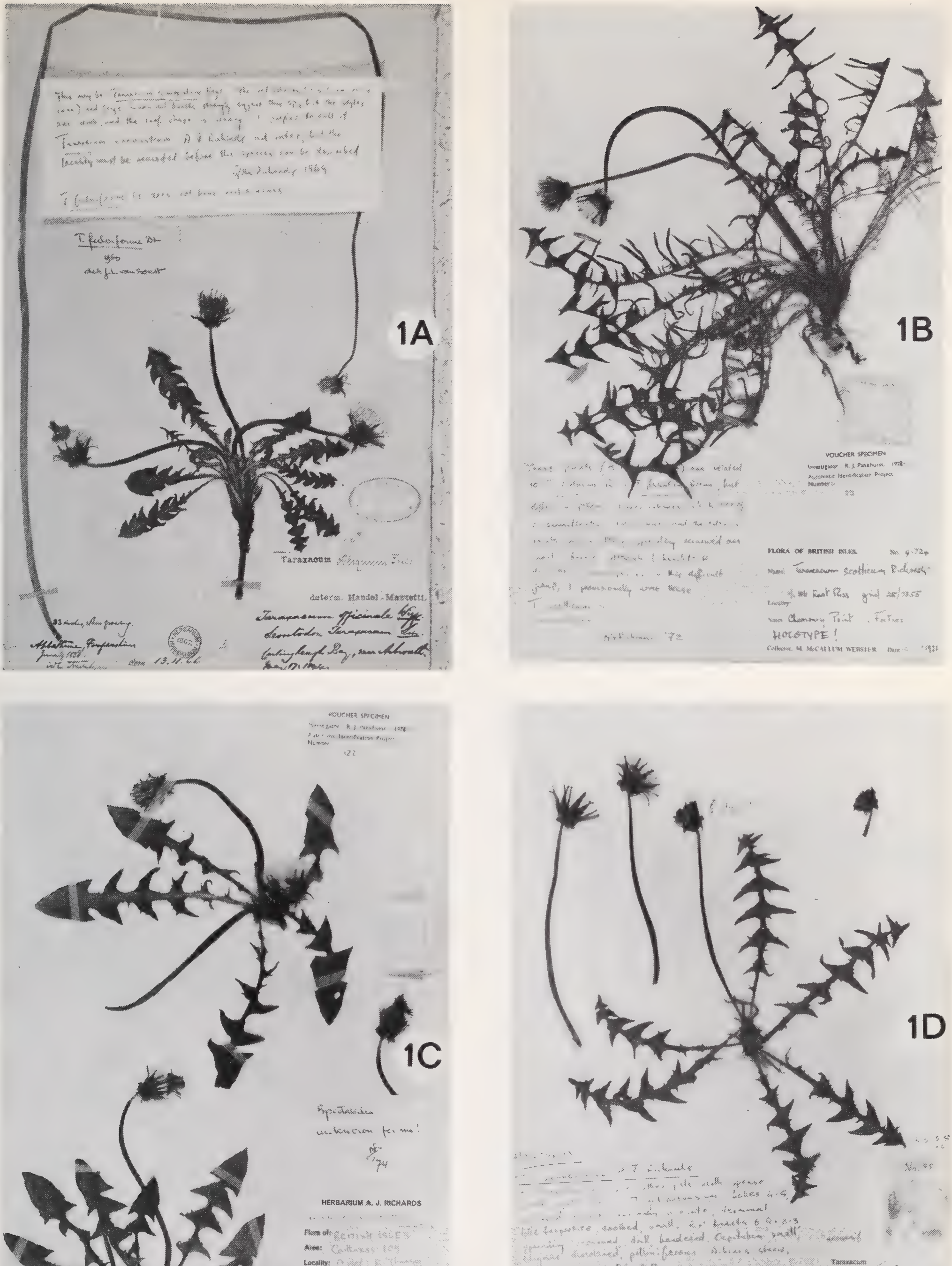

PLATE 1. Herbarium specimens of holotypes of A. *Taraxacum arenastrum* A. J. Richards, B. *T. scoticum* A. J. Richards, C. *T. subnaevosum* A. J. Richards, D. *T. cornubiense* A. J. Richards.

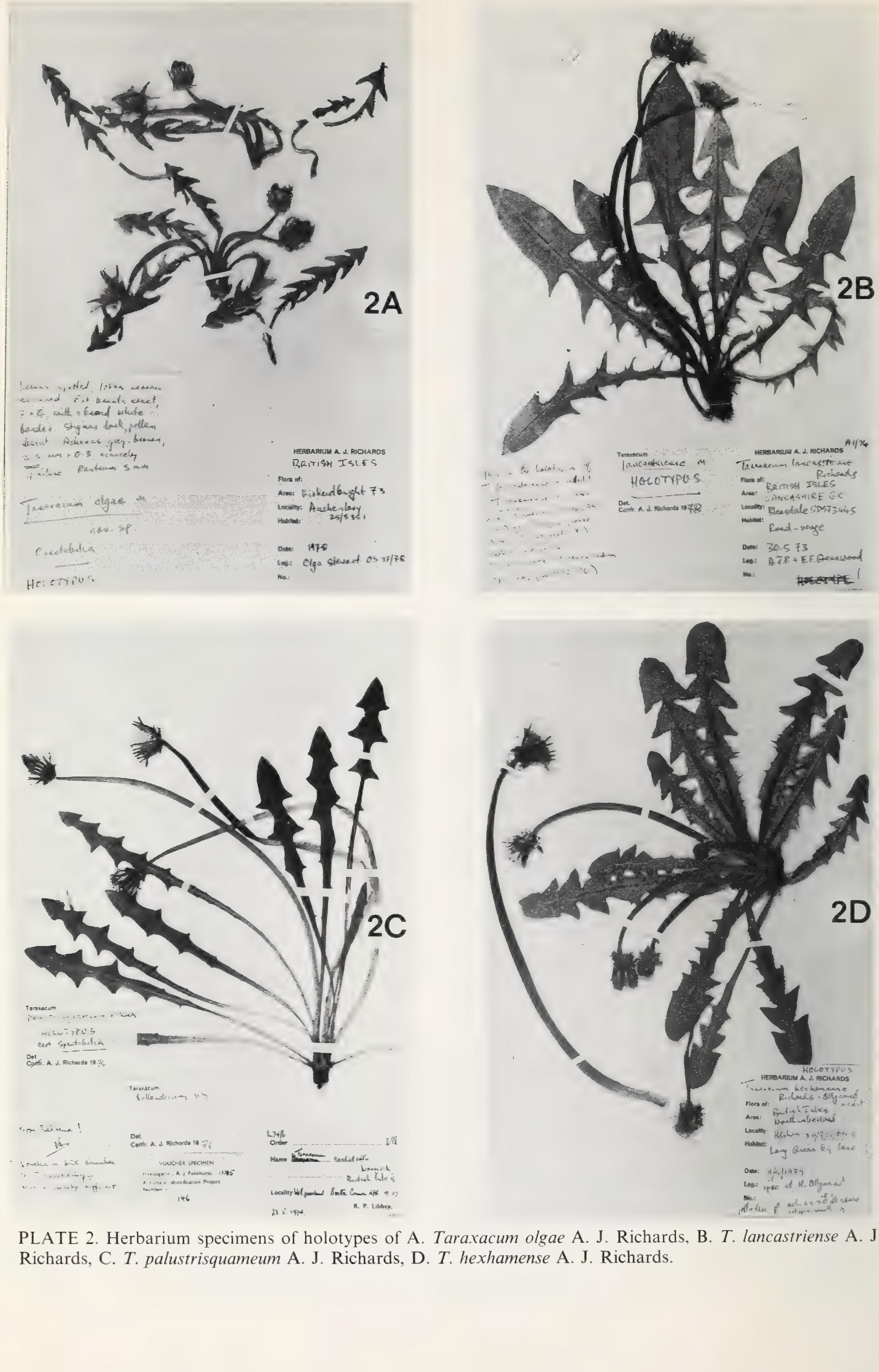

PLATE 2. Herbarium specimens of holotypes of A. *Taraxacum olgae* A. J. Richards, B. *T. lancastriense* A. J. Richards, C. *T. palustrisquameum* A. J. Richards, D. *T. hexhamense* A. J. Richards.

Subsequently found to be frequent and widespread in some areas of northern England and Scotland, and now recorded from the following vice-counties: 57, 67, 68, 70, 72, 74, 79, 82, 85, 89, 90, 94–96, 99, 104–106, 109. Native. Apparently endemic.

Taraxacum subnaevosum takes a somewhat central morphological position among three related species described here (the others being *T. olgae* and *T. cornubiense*), but is the commonest and most widespread of them. These three species can be placed in section *Spectabilia* subsection *Naevosa* (M. P. Christ.) A. J. Richards (Richards 1972b). In this group, they are most closely related to the Lusitanian *T. lainzii* v. Soest, which shares with them the small, delicate form and sparsely scattered punctate spots on the leaves, but has darker, less lobed leaves than any of the present three species. *T. pseudomarklundii* v. Soest, from northern Spain and France, is also related. There appear to be no close relatives of these plants in Iceland, Scandinavia or Holland, and all three are likely to be endemic to the British Isles. *T. subnaevosum* is additionally characterized by its rather large, hamate terminal leaf-lobe, yellowish stigmas, absence of pollen, and pale, narrow, recurved exterior bracts.

6. **Taraxacum cornubiense** A. J. Richards, **sp. nov.** (Plate 1D)

Planta mediocris, subtenella. Folia suberecta, viridia, supra sparse atropunctata, ad 120 mm longa; lobi laterales 4–5, recurvati vel subpatentes, acuti, margine distali convexi et denticulati; interlobia denticulata; lobus terminalis brevis, ad apicem protractus, saepe unilateraliter subdivisus; petiolus angustus, subdentatus, subpurpureus. Scapi folia subaequantes, subtenelli, sub involucro araneoso-pilosi. Involucri squamae exteriores 7–9 mm longae, 1.7–2.6 mm latae, patentes vel subrecurvatae, subobscure virides, pallide marginatae. Calathium diametro c. 30 mm; styli exserti, sordidi, polliniferi. Achenium 3.6–3.8 mm longum, stramineum, superne tuberculatum vel breviter spinulosum, alibi sublaeve, in pyramidem subcylindricam 0.7–0.9 mm longum abiens; rostrum 7–9 mm; pappus albus.

Plant medium-sized, rather delicate. Leaves suberect, dull green, sparsely spotted with small blackish spots on the adaxial side, up to 120 mm; lateral leaf-lobes 4–5, recurved or subpatent, acute, subconvex and denticulate on the distal margin; interlobes denticulate; terminal leaf-lobe short with an acute extenuate apex, often subdivided into two acute sublobes on one side only; petiole narrow, more or less dentate, dull purplish. Scapes more or less equalling the leaves, narrow, aranose under the involucre. Exterior bracts 7–9 × 1.7–2.6 mm, spreading to recurved, rather dark green below, with a rather indistinct pale border. Capitulum *c.* 30 mm diameter: styles exserted, discoloured; pollen present. Achenes 3.6–3.8 mm, straw-coloured, tuberculate to shortly spinulose above, the remainder more or less smooth; cone 0.7–0.9 mm, subcylindrical; rostrum 7–9 mm; pappus white.

HOLOTYPUS: St Agnes, W. Cornwall, v.c. 1, GR 10/7.4, old railway track, 12.5.1974, L. J. Margetts, **OXF**. Isotypus: **herb. L. J. M.**

Native. Apparently endemic.

Taraxacum cornubiense has been collected on only one occasion, but the collector informs me that it is probably rather frequent in West Cornwall. Like *T. olgae* and *T. subnaevosum* it belongs to a group of rather small and delicate members of section *Spectabilia* which have leaves similar in size, colour, shape and marking. The small sparse spots are characteristic for this group. It differs from *T. olgae* and *T. subnaevosum* in its large achenes and possession of pollen. *T. olgae* has quite different involucres, and *T. subnaevosum* has paler, more tenuous and more recurved exterior bracts. In the latter species, the styles are nearly yellow.

7. **Taraxacum olgae** A. J. Richards, **sp. nov.** (Plate 2A)

Planta mediocris vel subhumilis. Folia erecta vel patentia, viridia vel luteo-viridia, atro-punctata vel atro-maculata, ad 120 mm longa; lobi laterales 3–4, recurvati, acuti, distaliter convexi, integri vel paulo denticulati; interlobia dentata vel saepe dentum unicum et magnum ferentia; lobus terminalis brevis, integer, ad apicem paullo protractus; petiolus subexalatus, interdum dentatus, pallide purpureus; nervus medianus subpurpureus vel viridis. Scapi folia subaequantes, adscentes, araneoso-pilosi, subpurpurei. Involucri sqamae exteriores 6–9 mm longae, 2–4 mm latae, erectae, pruinose-virides, conspicue albo-marginatae. Calathium diametro c. 30 mm, ligulis stria purpurea subtus notatis; styli exserti, sordidi vel etiam subnigri, epolliniferi. Achenium 2.6–3.0 mm longum, stramineo-canum, superne lato spinulosum, alibi laeve, in pyramidem conicam 0.5–0.8 mm longam abiens; rostrum 6–7 mm longum; pappus albus.

Plant medium-sized to rather small. Leaves erect or patent, green to yellowish-green, rather sparsely marked with small blackish spots on the adaxial side, up to 120 mm; lateral leaf-lobes 3–4, recurved, acute, subconvex on the distal margin, entire or somewhat denticulate; interlobes dentate, or often with a single large tooth; terminal lobe short, entire, with a slightly extenuate apex; petiole more or less unwinged, sometimes dentate distally, pink to dull purple; midrib dull purplish to green. Scapes ascending, more or less equalling leaves, aranose-pilose, more or less purplish. Exterior bracts 6–9 × 2–4 mm, erect, pruinose-green, conspicuously white-bordered. Capitulum *c.* 30 mm diameter; ligules striped purple; styles exserted, dark or even blackish in colour; pollen absent. Achenes 2.6–3.0 mm, straw-grey in colour, with broad-based spines above, the rest smooth; cone 0.5–0.8 mm, conical; rostrum 6–7 mm; pappus white.

HOLOTYPUS: Auchenlay, Kirkudbrights., v.c. 73, GR 25/52.51, May 1978, Olga Stewart 37/38, **OXF.** Isotypus: **herb. O.S.**

This is the only known collection.

Taraxacum olgae has been collected on only one occasion, but the material is fairly full and informative, and has so many individual features as to merit recognition at this stage. The leaf shape, colour and spotting are very near those of *T. subnaevosum* A. J. Richards, and the small size of the achenes is also shared by that species. However, the involucres of the two species are quite different, and they have different stigmas and styles. The exterior bracts of *T. olgae* closely resemble those of *T. unguilobum* Dahlst., an unspotted species with reddish achenes, which also lacks pollen. The dark style colour is remarkable, and not otherwise encountered in British species of section *Spectabilia*.

8. **Taraxacum clovense** A. J. Richards, **sp. nov.**

Planta subrobusta. Folia erecta, viridia, saepe laeta viridia, lanceolata, immaculata, 100–280 mm longa; lobi laterales 2–3(–4), subrecurvati, breves, acuti, margine distali subconcavi, integri; interlobia integra; lobus terminalis longus, acutus, integer vel denticulatus; petiolus angusto alatus, integer, lamina aequantis viridis. Scapi folia subaequantes, virides. Involucri squamae exteriores 9–14 longae, 3–4 latae, patento-erectae vel suberectae, virides, in paginam superiorem pruinosae, pallide marginatae. Calathium diametro c. 40 mm, obscure luteum; styli exserti, sordidi, polliniferi. Achenium grande 4.8–5.3 mm longum, stramineo-brunneum, fere laeve, in pyramidem subnullam sensim abiens; rostrum 7–9 mm longum; pappus albus.

Plant rather robust. Leaves erect, green, or often pale green, unmarked, lanceolate, lobed in the mature condition, 100–280 mm; lateral leaf-lobes 2–3(–4), slightly recurved, short, acute, entire and straight-sided to somewhat concave on the distal margin; interlobes entire; petioles long, green, entire and narrowly winged, to half the length of the leaf. Scapes green, about equalling the leaves. Exterior bracts 9–14 × 3–4 mm, green, pruinose on the upper surface, erecto-patent to suberect, with a pale border. Capitulum *c.* 40 mm diameter, deep yellow; styles exserted, discoloured; pollen present. Achenes large, 4.8–5.3 mm, straw-brown in colour, almost smooth, almost imperceptibly narrowed into a very short cone; rostrum 7–9 mm; pappus white.

HOLOTYPUS: Glen Clova, Craig Maud, Angus, v.c. 90, GR 37/243.767, damp moor grassland by the Burn of Dounalt, 500 m, 5.7.1977, R. J. Pankhurst, **BM**.
PARATYPUS: as above, at 37/245.763, 8.7.1977, R. J. Pankhurst, **BM**.

Native. Apparently endemic.

With its green, unmarked leaves and deep yellow capitula, *T. clovense* is clearly a member of section *Spectabilia* subsection *Crocea* (M. P. Christ.) A. J. Richards (Richards 1972b). The few British members of this high-arctic section are all confined to the Scottish Highlands, and until now all were known elsewhere, in Greenland, Iceland or Lapland. With its very large smooth achenes, which almost lack a cone, *T. clovense* presents a most distinct facies which enables me to say with some confidence that this represents the first Scottish endemic in this group; similar achenes are not known in any of the large number of species described from Iceland and Lapland.

By far the most widespread British species in subsection *Crocea* is *T. ceratolobum* Dahlst. (including *T. croceum sensu* Dahlst., and Richards (1972a)). Sahlin (*in litt.*) has shown that Dahlstedt's type of *T. croceum* represents a local endemic of northern Sweden. *T. clovense* resembles cliff plants of *T. ceratolobum* which are also found in Glen Clova (and elsewhere), although the leaves of the former are usually longer and the leaf-lobes fewer, but the achenes are remarkable, and unique in the genus.

9. **Taraxacum lancastriense** A. J. Richards, **sp. nov.** (Plate 2B)

T. angliciforme Dahlst. nom. nud.. *Rep. botl Soc. Exch. Club Br. Isl.*, **10**: 26 (1933). *T. cambriense* A. J. Richards *in sched., non in Watsonia,* **9** (suppl.): 98 (1972).

Ut in diagnosi *T. cambriensis* supra descripta, sed foliis interdum paullo maculatis; involucri squamis exterioribus ad 9 mm longis et 4 mm latis; achenio 2.8–3.0 mm longo, valde lato, pallide brunneo, ad apicem breviter spinuloso, alibi rugoso, in pyramidem 0.4 mm conicam abiens; differt.

Characters as for the type description of *T. cambriense* (above), but with the leaves sometimes a little spotted; the exterior bracts to 9 × 4 mm and the achene 2.8–3.0 mm long, rather wide, pale brown, shortly spinulose at the apex, the remainder rugose, with a conical cone of 0.4 mm.

HOLOTYPUS: Bleasdale, W. Lancs., v.c. 60, GR 34/573.445, road verge, 30.5.1973, A. J. Richards and E. F. Greenwood, **OXF**. Isotypus: **LIV**.

Known from vice-counties 35, 41, 42, 44, 60, 64, 67. Native. Apparently endemic.

The distinctive material collected by the correspondents of G. C. Druce from several localities in South Wales in the 1920s gave rise to the published name *T. angliciforme* Dahlst., which, however, unfortunately lacks a diagnosis. This material does not show ripe achenes. When choosing a holotype for *T. cambriense* I therefore turned to more modern material in the form of specimens from Pembrokeshire (T. A. W. Davis 69/1188). I am most grateful to A. O. Chater for pointing out that these specimens do not agree with *T. cambriense* as I understood it, but are in fact forms of *T. nordstedtii* Dahlst. As these are quoted as the holotype, *T. cambriense* must regrettably be considered a synonym for *T. nordstedtii*.

After describing *T. cambriense*, I became aware of related material from calcareous uplands in northern England, which, however, usually appeared to be larger, to sometimes show light spotting on the leaves, and to have achenes quite different from those of the type of *T. cambriense* (= *T. nordstedtii*), being small, brown, and rugose throughout. Later discovery of Welsh '*T. cambriense*' with achenes showed that these closely resembled those of my scheduled species *T. lancastriense*, and it became clear that the two are the same. *T. lancastriense* therefore becomes the correct name for the bulk of the material hitherto known as *T. cambriense*, and the name is formalized above.

10. **Taraxacum palustrisquameum** A. J. Richards, **sp. nov.** (Plate 2C)

Planta subhumilis vel alta, subtenella. Folia adscentes vel erecta, viridia, angusto lanceolata, interdum sparse atropunctata, remote dentata vel breviter lobata, 100–250 mm longa; lobi laterales 2–3, patentes, subdeltoides, acuti, breves, integri, margine distali concavi; interlobia integra; lobus terminalis acutus, integer; petiolus angustus, integer, folia aequantis albus. Scapi folia paulo superantes, virides, glabri. Involucri squamae exteriores 6–9 mm longae, 3–5 mm latae, acuminato-ovatae, erectae vel ad involucrum subadpressae, subobscure virides, paullo late marginatae margine pallida vel alba vel rosea. Calathium c. 35 mm diametro, ligulis stria purpurea subtus notatis; styli exserti, sordidi, epolliniferi. Achenium 3.1–3.5 mm longum, stramineum, ad apicem breviter spinulosum, alibi laeve, in pyramidem 0.5 mm longam subsensim abiens; rostrum 8 mm longum; pappus albus.

Plant rather dwarf to tall, slender. Leaves ascending to erect, green, occasionally with small sparse blackish spots on the adaxial surface, narrowly lanceolate, entire with remote teeth or shortly lobate, 100–250 mm; lateral leaf-lobes 2–3, patent, subdeltoid, acute, short, entire, concave on the distal margin; interlobes entire; terminal leaf-lobe acute, entire; petiole narrow, entire, white, half the length of the leaf or more. Scapes somewhat exceeding the leaves, green, glabrous. Exterior bracts 6–9 × 3–5 mm, acuminate-ovate, erect to subadpressed to the involucre, rather dark green, rather broadly pale, white- or rose-bordered. Capitulum *c.* 35 mm diameter; ligules striped purple beneath; styles exserted, discoloured; pollen absent. Achenes 3.1–3.5 mm, straw-coloured, shortly spinulose at the apex, otherwise smooth, gradually ending in a conical cone of 0.5 mm; rostrum 8 mm; pappus white.

HOLOTYPUS: Bootton Common, E. Norfolk, v.c. 27, GR 53/9.1, wet grassland, 23.5.1974, R. P. Libbey L74/6, **OXF**. Isotypus: **herb. R. P. L.**

Subsequently recorded by R. P. Libbey and E. L. Swann from the following 10 km squares in vice-counties 27 and 28: 52/99, 53/70, 63/00, 63/11, 63/14. Native. Apparently endemic. It appears that *T. palustrisquameum* is restricted to grass-fens in Norfolk, where it may be locally frequent; an old collection from a boggy meadow in Liverpool (J. Dickinson, *c.* 1850, **LIV**) might refer to this species, but the material is inadequate.

Although I refer this species to section *Spectabilia*, *T. palustrisquameum* has much in common with species in section *Palustria* Dahlst. in leaf shape, habit, habitat, and the ovate, adpressed, broadly bordered exterior bracts. In particular it is closely related to *T. anglicum* Dahlst., from which it is separated by white rather than purple petioles and the lack of pollen. Also, it frequently has sparse black spots on the leaves, a condition which is unknown in section *Palustria*. However, in common with other lowland fen species, it occupies an intermediate position between sections *Palustria* and *Spectabilia*, and this can also be said of *T. anglicum*. Other related species include *T. litorale* Raunk., which is smaller and darker with scarcely bordered, narrower bracts; *T. lancastriense*, with broader leaves and longer bracts; and the Dutch *T. reichlingii* v. Soest, which looks very similar, but has pollen, scarcely bordered bracts, and purple petioles. In addition, *T. hollandicum* v. Soest in section *Palustria* is closely related, but has short obtuse bracts which are strictly adpressed to the involucre and have wide and very distinct borders.

11. **Taraxacum hexhamense** A. J. Richards, **sp. nov.** (Plate 2D)

Planta robusta. Folia erecta, viridia clara vel saepe viridia laeta, immaculata, lanceolata, ad 300 mm longa; lobi laterales 3–4(–5), patentes, paulo lati, subdeltoides, integri, acuti vel obtusi, margine distali concavi vel sigmoidei, margine proximi convexi; interlobia integra vel minute et regulariter denticulata; lobus terminalis integer vel I-subdissectus, galeatus, obtuso-apiculatus, saepe longus; petiolus alatus, nervusque laminae 2/3 partibus brevior vel etiam brevior medianus clariter rubro-purpureus. Scapi folia superantes, ad basin purpureus, supra araneoso-pilosi. Involucri squamae exteriores 8–11 mm longae, 2.4–3.5 mm latae, recurvatae, pallide virides, in paginam superiorem paulo e purpurea suffusae, vix marginatae. Calathium diametro *c.* 40 mm; styli exserti, sublutei ad subsordidi, polliniferi. Achenium 2.7–2.9 mm longum, subrufo-stramineum, ad apicem breviter spinulosum, alibi laeve, in pyramidem conicam 0.4 mm subsensim abiens; rostrum 7 mm; pappus albus.

Plant robust. Leaves erect, clear green, often pale, unmarked, lanceolate, up to 300 mm; lateral leaf-lobes 3–4(–5), patent, rather wide, subdeltoid, entire, acute or obtuse, the distal margin concave or sigmoid, the proximal margin convex; interlobes entire or minutely and regularly denticulate; terminal lobe entire or I-subdissected, helmet-shaped, obtuse-apiculate, often rather long; petiole winged, to 1/3 the length of the leaf, together with the midrib a clear red-purple. Scapes exceeding the leaves, purple at the base, aranose-pilose above. Exterior bracts 8–11 × 2.4–3.5 mm, recurved, pale green, sometimes suffused purplish, scarcely bordered. Capitulum *c.* 40 mm diameter; styles exserted, yellowish or faintly discoloured; pollen present. Achenes 2.7–2.9 mm, rather reddish-straw-coloured, shortly spinulose above, the remainder smooth; cone 0.4 mm, poorly demarcated; rostrum 7 mm; pappus white.

HOLOTYPUS: Hexham, S. Northumb., GR 35/920.643, long grass by unmetalled lane, 11.5.1979, A. J. Richards and H. Øllgaard, **OXF**. Isotypus: **herb. H. Ø.**

Also found in a private garden between a path and hedge at 35/927.642. Probably native. Apparently endemic.

Taraxacum hexhamense was first noticed by the Danish Taraxacologist, H. Øllgaard, on a visit to my home, in a nearby lane, and was later also detected in my garden. It is a distinctive and rather elegant species which has yet to be discovered away from west Hexham, where it is plentiful in a limited area. It belongs to a group of species of section *Taraxacum* (*Vulgaria* Dahlst.) centred on *T. hemicyclum* Hagl., all of which share smooth, pure green, unmarked leaves with scarcely dentate lobes; rather short, pale, recurved exterior bracts; short achenes; and pink or purple petioles. Among other British species, *T. sagittipotens* Dahlst. & Ohlsen is perhaps the closest relative, while *T. copidophyllum* Dahlst., *T. privum* Dahlst. and *T. semiglobosum* H. Lindb. f. are also similar. From all these, *T. hexhamense* is readily distinguished by the subdeltoid lateral leaf-lobes with sigmoid distal margins and the large helmet-shaped terminal leaf-lobe. It also appears that the achenes have a slight reddish hue, most unusual amongst members of section *Taraxacum*.

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Taraxacum records for the Lower Welsh Dee and Lower Mersey regions

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ABSTRACT

Records of 95 taxa of *Taraxacum* and assessments of their relative abundance are presented for an area of north-eastern Wales and north-western England in the vicinity of Chester.

INTRODUCTION

An attempt has been made in recent years by one of us (T.E.) to determine the relative abundance of species of *Taraxacum* (dandelion) in the vicinity of Chester within the 100km square 33 of the national grid. The area comprises most of Flints., v.c. 51, the eastern tongue of Denbs., v.c. 50, below the southern boundary of Flints., an approximately equal sized part of western Cheshire, v.c. 58, on the opposite side of the Dee, and the portion of northern Cheshire below the southern bulge of the Mersey Estuary eastwards of Chester. A little selective sampling was also carried out on social visits to places bordering or beyond the main area, notably in northern Salop, v.c. 40, and S. Lancs., v.c. 59.

In the districts visited, all the apparently different taxa of dandelions were collected from selected small, productive localities. In view of the abundance of the genus throughout the region, the 500 or so specimens collected may not be regarded as an adequate sample, but, from what is known of the species distribution in Britain, the data seem to agree adequately with the relative status of the agamospecies in other parts of the country.

Knowledge of the British taxa has increased markedly since the publication of *The* Taraxacum *flora of the British Isles* (Richards 1972). Much of this advance has been due to the help, collaboration and visits to Britain of H. Øllgaard from Denmark and C. I. Sahlin from Sweden. Øllgaard's research into the *T. hamatum* group in section *Taraxacum (Vulgaria)* has been particularly valuable. All the specimen sheets relating to the present communication have been reviewed in the light of recent opinions. All specimens have been seen by A. J. R.

Two species which have not previously appeared in the literature (*T. arenastrum* A. J. Richards and *T. maculosum* A. J. Richards) are described in a separate paper (Richards 1981), and a further species (*'sp. nov.'*) is to be described elsewhere by H. Øllgaard.

RELATIVE FREQUENCY

The numbers of species recorded here in the various vice-counties are: Salop, v.c. 40, 16 spp.; Denbs., v.c. 50, 65 spp.; Flints., v.c. 51, 59 spp.; Monts., v.c. 47, 6 spp.; Cheshire, v.c. 58, 68 spp.; and S. Lancs., v.c. 59, 20 spp. Omitting a few as yet unnamed specimens, the total number of species is 95. This is

47·5% of the 200 species recorded for the British Isles at the time of writing. Denbighshire and Flintshire are now combined as the administrative county of Clwyd.

Regardless of vice-county boundaries, there are about 470 10km square species records and about 570 5km square records. The latter is regarded as the smallest meaningful square for assessing the distribution and frequency data presented here. Even so, the categories of abundance listed below must be somewhat arbitrary:

Very common —	more than 18 5km squares per species (3 species): *T. hamatiforme, T. polyodon, T. subhamatum.*
Common —	13 to 18 5km squares (11 species): *T. alatum, T. ekmanii, T. euryphyllum, T. hamatum, T. kernianum, T. lacistophyllum, T. lamprophyllum, T. oxoniense, T. pseudohamatum, T. raunkiaerii, T. spectabile.*
Widespread or locally common —	8 to 12 5km squares (16 species): *T. boekmanii, T. brachyglossum, T. bracteatum, T. cophocentrum, T. cordatum, T. croceiflorum, T. expallidiforme, T. exsertum, T. hamatulum, T. lingulatum, T. naevosiforme, T. nordstedtii, T. rubicundum, T. sellandii, T. stenacrum, T. xanthostigma.*
Infrequent —	4 to 7 5km squares (24 species): *T. ancistrolobum, T. argutum, T. atrovirens, T. aurosulum, T. britannicum, T. crispifolium, T. dahlstedtii, T. fasciatum, T. fulviforme, T. fulvum, T. glauciniforme, T. hamiferum, T. insigne, T. lacinulatum, T. landmarkii, T. latissimum, T. longisquameum, T. oblongatum, T. piceatum, T. polyhamatum, T. porrectidens, T. procerum, T. subcyanolepis, T. sublaciniosum.*

Scarce or rare species total 41 and, as the recorded species number is 95, the numbers in each category are almost the same as percentages of the recorded total.

Although a number of the species have been recorded on only a few occasions elsewhere in Britain, it would be unwise to conclude that they are therefore rare. Obscure types having *dent-de-lion* or *löwenzahn* leaf-shapes, similar to that of the common *T. hamatum,* may be overlooked, whereas species with distinctive leaf-shapes, such as *T. exsertum,* may be relatively over-represented. *T. exsertum* was first collected in the area in 1977 and was the 4th British record, but this species has since been found in eleven other 5km squares in this area, and it is currently (1980) known in 17 vice-counties.

COLLECTING

The weather in several recent springs has not been conducive to the study of the genus *Taraxacum.* For several decades one expected to see the first golden flush of massed roadside dandelions in the lowland of north-western England by the first or second week-end in April. In some recent years this event has been delayed for three or four weeks, and an unusually hot spell has sometimes followed, resulting in very rapid growth of summer leaves and fruiting. Under such conditions, it is difficult for the amateur, with limited spare time, to obtain many taxonomically reliable specimens. Early collection in a hesitant spring can also present problems, as apparently unretarded plants may have few capitula and these may be biometrically unrepresentative.

HABITAT PREFERENCES

Most of the taxa now reported belong to Section *Taraxacum,* whose commonest members are prevalent in a variety of open, grassy places. They thrive best with limited competition, as is evident from their temporary profusion shortly after the laying of new pipe-lines, the construction of new roads and so on.

Sheltered south- or west-facing, high, sloping road banks in rural lowland areas often yield a number of taxa as the banks are spared many of the factors that can adversely affect fields or verges, such as excessive grazing, puddling, farm machinery, artificial fertilisers, concentrated animal manure and winter road-salt. Sunken country lanes whose banks are reinforced by creviced stonework and where the hedges lie back from the bank tops are often very productive. The communities there may be relatively old and stable. Two such sites come to mind, at Duddon in Cheshire, v.c. 58, with eleven species in about 200 metres (*T. naevosiforme, T. ancistrolobum, T. aurosulum, T. dahlstedtii, T. ekmanii, T. exsertum, T. longisquameum, T. polyodon, T. atrovirens, T. hamiferum, T. polyhamatum*) and at Tallarn Green in Denbs., v.c. 50, with nine species along a similar distance (*T. expallidiforme, T. latissimum, T. lingulatum, T. raunkiaerii, T. stenacrum, T. sublaciniosum, T. valdedentatum, T. boekmanii, T. oblongatum*).

Waste places are often fruitful, but undue attention to such sites might give an unbalanced list in favour of adventives. Several botanically interesting, local wastes were, unfortunately, reclaimed before their *Taraxacum* specimens received attention. Light industries have been developed at the site of the disused colliery at Llay in Denbs., v.c. 50, but much of the heaped spoil of barren shale remains. This had little vegetation and although dandelions are not abundant they are surprisingly varied (*T. dahlstedtii, T. dilatatum, T. exsertum, T. fasciatum, T. lacerabile, T. linguatum, T. piceatum, T. stenacrum, T. sublaciniosum, T. hamatum, T. kernianum*).

Although renowned for their Orchidaceae, the waste lime beds at Plumley in Cheshire, v.c. 58, have only a small dandelion population and individual plants are seldom typical of their taxon. High alkalinity, mineral imbalance, toxic deposits in the wetter places and a substantial rabbit population are possible adverse factors. The species noted, however, are probably all among those more adaptable to such situations (*T. argutum, T. glauciniforme, T. oxoniense, T. nordstedtii. T. spectabile, T. ancistrolobum, T. bracteatum, T. cophocentrum*).

Damp, lowland fields on marl or calcareous glacial clay usually contain two or three members of the six most frequent species of section *Spectabilia*. Flush areas below glacial sand are preferred.

The broad line of exposed Carboniferous limestone through eastern Clwyd has a good association of species of section *Erythrosperma* in several districts. Despite large-scale quarrying, chemical dressings, spoil from once extensive lead mining and intensive sheep grazing, there are still areas of lightly-grazed, unmodified grassland. In one small district near Eryrys can be found *T. arenastrum, T. argutum, T. brachyglossum, T. canulum, T. fulviforme, T. fulvum, T. glauciniforme, T. lacistophyllum, T. oxoniense, T. rubicundum* and *T. silesiacum*.

There are several large holiday caravan sites by the coastal dunes in north-western Flints. and the once rich flora, especially of the inner dunes and slacks, has been seriously affected and eroded. Because of these changes this habitat has received little attention in this survey.

SPECIES LIST

In the following list of records, the species are given in alphabetical order in the sections *Erythrosperma, Spectabilia* and *Taraxacum*, followed by the *T. hamatum* group of section *Taraxacum*. All but a few records are from the 100km square 33. Consequently the 5km square references are given in abbreviated form, e.g. the four 5km squares of the 10km square 33/4.6 are given as 46SW, 46NW, 46SE and 46NE respectively. The few South Lancashire exceptions are from 100km square 34, and are so indicated, e.g. Westleigh, 34/60SW.

Section *ERYTHROSPERMA*

T. arenastrum A. J. Richards. DENBS., limestone grassland, Maeshafn, 25NW (1977).

T. argutum Dahlst. DENBS., limestone grassland, Eryrys, 25NW. FLINTS., limestone turf, Craig Fawr, 08SE. CHESHIRE, sandstone, Aldford, 45NW; waste lime beds, Plumley, 77NW.

T. brachyglossum (Dahlst.) Dahlst. Sand dunes, sandy inner estuary margins, thin grassland among exposed limestone. DENBS., Eryrys, 15NE; Llangollen, 24SW; Maeshafn, 25NW. FLINTS., Tremeirchion, 07SE; Prestatyn, 08SE; Cilcain, 16NE; Whitford, 17NW; Pantasaph, 17NE; Talacre, 18SW; Shotton, 27SE. CHESHIRE, Denhall, 27NE.

T. canulum Hagl. DENBS., limestone grassland, Eryrys, 15NE (1978).

T. fulviforme Dahlst. Sandy or calcareous, short grassland. DENBS., Eryrys, 15NE; Trefor, 25SW. FLINTS., Pantasaph, 17NE. MONTS., Llanymynech, 22SE. CHESHIRE, Denhall, 27SE; Saighton, 46SW.
T. fulvum Raunk. Limestone turf. DENBS., Bryn Alyn, 15NE; Worlds End, 24NW. FLINTS., above Meliden, 08SE; Whitford, 17NW.
T. glaucinum Dahlst. FLINTS., inner dunes, Prestatyn, 08SE (1972). Contrary to the statement in *The* Taraxacum *Flora of the British Isles*, this species has no pollen.
T. glauciniforme Dahlst. Limestone sites. DENBS., Bryn Alyn, 15NE. FLINTS., Craig Fawr, 08SE. MONTS., Llanymynech, 22SE. CHESHIRE, waste lime beds, Plumley 77NW.
T. lacistophyllum (Dahlst.) Raunk. Sandy banks and well-drained limestone sites. DENBS., Bryn Alyn, 15NE; Moel Arthur, 16NW; Llanarmon, 25SW. FLINTS., Meliden, 08SE: Pantymwyn, 16NE; Pantasaph, 17NE; Cymau, 25NE; Shotten, 27SE; Sealand, 36NW; Sealand, 37SW. MONTS., Llanymynech, 22SE. CHESHIRE, Thurstaston, 28SW; Lea-by-Backford, 37SE; Duckington, 45SE; Great Barrow, 46NE.
T. oxoniense Dahlst. Dunes, dry banks and calcareous grassland. Unusually robust forms with little or no pollen from three widely separated, sandy road banks have been omitted. DENBS., Llangollen, 24SW; Llanarmon, 25SW; Pant Du, 25NW. FLINTS., Prestatyn and Meliden, 08SE; Pantymwyn, 16SE; Rhydymwyn, 16NE; Halkyn, 17SE; Pantasaph, 17NE; Talacre, 18SW and 18NW; Cymau, 25NE; Shotton, 27SE. MONTS., Llanymynech, 22SE. CHESHIRE, Burton, 37SW; waste lime beds, Plumley, 77NW.
T. proximiforme van Soest. Next to scrub border near limestone quarry. FLINTS., Pantasaph, 17NE (1978).
T. rubicundum (Dahlst.) Dahlst. A delight in spring in lightly-grazed areas of the limestone hills. DENBS., Bryn Alyn, 15NE; Llangollen, 24SW; Llanarmon, 25SW; Pant Du, 25NW. FLINTS., Marian Ffrith, 07NE; Craig Fawr, 08SE; Halkyn, 17SE; Cymau, 25NE. MONTS., Llanymynech, 22SE.
T. silesiacum Dahlst. DENBS., Eryrys, 25NW. FLINTS., Craig Fawr, 08SE. MONTS., Llanymynech, 22SE. Often with *T. rubicundum*, possibly under-recorded.
T. simile Raunk. FLINTS., Craig Fawr, 08SE.

Section *SPECTABILIA*

T. adamii Claire. FLINTS., flushed sandy bank, Broughton, 36SW.
T. britannicum Dahlst. In damp places – riverside, grassy hillsides and hollows on limestone. DENBS., Eryrys, 15NE; Esclusham, 24NW; Worthenbury, 44NW. FLINTS., The Leet, 16NE; Llanfynydd, 25NE.
T. euryphyllum (Dahlst) M.P.Chr. In wet grassland on river plains or on glacial clay. DENBS., Maeshafn, 15NE; Eglwyseg, 24NW; Rossett, 35NE; Gresford, 35NW; Worthenbury, 44NW. FLINTS., R. Terrig, 25NW; Leeswood, 25NE; Leeswood, 26SE. CHESHIRE, Puddington. 37SW; Bridge Trafford and Elton, 47SE; Aston, 57NE; Church Minshull, 66SE. S. LANCS., Pennington, 69NW.
T. faeroense (Dahlst.) Dahlst. FLINTS., upland meadow, Llanfynydd, 25NE. CHESHIRE, damp lowland pasture, ? introduced, Frodsham, 57NW.
T. laetifrons Dahlst. FLINTS., scrub bank, Cymau, 25NE.
T. landmarkii Dahlst. Flushed slopes and riverbanks. DENBS., Marford, 35NW; Higher Kinnerton, 36SW. CHESHIRE, Heronbridge and Eccleston, 46SW; Beeston, 55NW; Sutton Locks, 57NW.
T. maculosum A. J. Richards. Scarce in lowland sites. DENBS., sand quarry, Llay, 35NW; on damp limestone detritus, Eryrys, 25NW. CHESHIRE, Dee meadows, Eccleston, 46SW; Gowy meadows, Hockenhull, 46NE.
T. naevosiforme Dahlst. On wet fields, verges and banks. SALOP, Bagley, 32NE. DENBS., Eglwyseg, 24NW; Sutton Green, 44NW. FLINTS., Llanfynydd, 25NW; Bretton, 36SE. CHESHIRE, Eccleston, 46SW; Tarvin, 46NE; Duddon, 56SW; Frodsham, 57NW.
T. nordstedtii Dahlst. Wet places. FLINTS., Meliden, 08SE; The Leet, 16NE; Nercwys, 25NW; Northop, 26NE. CHESHIRE, Dee meadows, Chester, 46SW and 46NW; Tarvin, 46NE; Caughall, 47SW; Quoisley, 54NE; Alvanley, 57SW; Frodsham, 57NW; Plumley, 77NW.
T. pseudolarssonii A. J. Richards. CHESHIRE, roadside verge, Thornton-le-Moors, 47SW (1979).
T. spectabile Dahlst. In wet fields on base-rich clay or in ill-drained meadows on river plains; common in Cheshire. DENBS., Eglwyseg, 24NW; Rhydtalog, 25SW; Gresford, 35NW; Rossett, 35NE. FLINTS., R. Terrig, 25NW; Llanfynydd, 25NE; Hartsheath, 26SE; Northop, 26NE; Higher Kinnerton, 36SW. CHESHIRE, 36NE, 46SW, 46NW, 46NE, 47SW, 47SE, 54NE, 57NW, 77NW.

T. stictophyllum Dahlst. DENBS. Next to shaded upland stream below limestone, near Llangollen, 24NW (1978).
T. unguilobum Dahlst. FLINTS. Rock face, Cilcain, 16SE.

Section *TARAXACUM* (*VULGARIA*)

T. aequilobum Dahlst. CHESHIRE, Caughall, 47SW; Bradley, 57NW.
T. alatum H.Lindb.f. SALOP, Oswestry, 23SE; Bagley, 32NE; DENBS., Rossett, 35NW: Higher Wych. 44SE. FLINTS., Leeswood, 25NE; Kinnerton Green, 36SW; Higher Kinnerton, 36SE. CHESHIRE, Chester, 36NE; Hoole Bank, 46NW: Waverton, 46SE; Dunham-on-the-Hill, 47SE: Wrenbury, 54NE: Reaseheath, 65SW. S. LANCS., Winwick, 59SE; Pennington, 69NW.
T. altissimum H.Lindb.f. CHESHIRE, Thornton-le-Moors, 47SW (1979).
T. ancistrolobum Dahlst. DENBS.. Gresford, 35NE; FLINTS., Northop, 26NE; Kinnerton, 36SE. CHESHIRE, Waverton, 46SE; Duddon, 56SW: Plumley. 77NW. S. LANCS. Pennington. 69NW.
T. aurosulum H.Lindb.f. DENBS., Gresford, 35NE. FLINTS.. Northop, 26NE: Bagillt. 27NW. CHESHIRE. Little Barrow, 46NE; Duddon, 56SW.
T. brachylepis Markl. DENBS., Bodfari, 16NW.
T. bracteatum Dahlst. DENBS., Bersham, 34NW: Gresford, 35NW: Eglwys Corner. 44SE. CHESHIRE. Bridge Trafford, 47SE; Quoisley, 54NE: Frodsham, 57NW: Church Minshull, 66SE: Plumley, 77NW.
T. cophocentrum Dahlst. In glades, limestone scrub or below wooded road banks. Depauperate in open situations. DENBS., Ruabon, 24SE; Gresford, 35SE: Worthenbury, 44NW. FLINTS., Pantymwyn, 16SE. CHESHIRE, Eccleston, 46SW; Waverton, 46SE; Plumley, 77NW. S. LANCS., Winwick, 59SE.
T. cordatum Palmgr. DENBS., Bodfari, 16NW: Llanarmon. 25SW: Rhosymadoc, 34SW. FLINTS., Talacre, 18NW; Llanfynydd, 25NE; Leeswood, 26SE: Shotton. 37SW. CHESHIRE. Chorlton Hall, 47SW; Reaseheath, 65SW; Church Minshull, 66SE.
T. crispifolium H.Lindb.f. DENBS., Sutton Green. 44NW. FLINTS.. Coed Talon. 25NE. CHESHIRE. Lower Wych, 44SE; Hampton Green, 54NW. S. LANCS., Winwick, 69SW.
T. croceiflorum Dahlst. SALOP, Lyneal, 43SW. DENBS.. Borras. 35SE. FLINTS.. Leeswood. 25NE. CHESHIRE, common in the west of the county, 36NE. 37SW. 47SE. 54SW. 54NW. 54NE. 55NW. 57NW. 58SE.
T. dahlstedtii H.Lindb.f. DENBS., Llay, 35NW. FLINTS. Pantasaph. 17NE: Talacre. 18SW: Queensferry, 36NW. CHESHIRE, Duddon, 56SW; Aston, 57NE.
T. dilaceratum M.P.Chr. DENBS., Gresford, 35NE (1979).
T. dilatatum H.Lindb.f. DENBS., Cross Keys, 16NW; Llay, 35NW.
T. ekmanii Dahlst. SALOP, Lyneal. 43SW. DENBS.. Cross Keys. 16NW: Gyfelia. 34NW: Gresford. 35NE. FLINTS., Cilcain, 16NE: Boughton, 36SW: Sealand. 36NW: Sealand, 36NE. CHESHIRE, Shotwick, 37SW; Lower Wych, 44SE; Chester. 46NW: Caughall. 47SW: Dunham Hill and Bridge Trafford. 47SE; Oscroft, 56NW; Duddon, 56SW. S. LANCS., Winwick, 69SW.
T. exacutum Markl. CHESHIRE, Great Barrow, 46NE (1979).
T. expallidiforme Dahlst. DENBS.. Cross Keys. 16NW: Llangollen. 24SW: Ruabon. 24SE: Tallarn Green, 44SE. FLINTS., Tremeirchion. 07SE: Rhuallt. 07NE: Leeswood. 26SE. CHESHIRE. Lea-by-Backford, 37SE.
T. exsertum Hagendijk, van Soest & Zevenbergen. DENBS.. Llangollen. 24SW: Gyfelia. 34NW: Llay, 35NW; Borras, 35SE. FLINTS., Llanasa, 18SW: Leeswood. 25NE: Queensferry and Sealand. 36NW. CHESHIRE, Sealand, 36NE: Waverton, 46SE: Duddon. 56SW. S. LANCS.. Winwick, 59SE: Ince Moss. 34/50SE.
T. fasciatum Dahlst. DENBS., Sutton Green, 44NW. FLINTS.. Treuddyn, 25NW; Rhydymwyn, 26NW; Leeswood, 26SE; Queensferry, 36NW. CHESHIRE, Bridge Trafford, 47SE.
T. haematicum Hagl. CHESHIRE, old herb-rich wet meadow, Hockenhull, 46NE.
T. huelphersianum Dahlst. CHESHIRE, Little Barrow, 46NE.
T. incisum H. Øllgaard. CHESHIRE, old canalside meadow, Caughall 47SW.
T. insigne Ekman. DENBS., Maeshafn, 15NE: Eglwyseg, 24NW: Bryn Alyn, 25NW; Sutton Green, 44NW. CHESHIRE, Burton, 37SW; Duckington, 45SE.
T. lacerabile Dahlst. DENBS., colliery wastes, Llay, 35NW (1978).
T. lacinulatum Markl. CHESHIRE, Tushingham. 54SW: Hampton Heath, 54NW; Wrenbury, 54NE. S. LANCS., Winwick, 69SW.

T. laeticolor Dahlst. Inner margins of Dee Estuary. FLINTS., Shotton, 27SE. CHESHIRE, Denhall, 27NE; Burton, 37SW.
T. lamprophyllum M.P.Chr. SALOP, Prees, 53SW; Prees Heath, 53NE. DENBS., Bodfari, 16NW; Worthenbury, 44NW; Higher Wych, 44SE. CHESHIRE, Burton and Shotwick, 37SW; Duckington, 45SE; Alder Green, 45NE; Chorlton, 47SW; Bridge Trafford, 47SE; Hampton Green, 54NW; Beeston, 55NW; Cotebrook, 56NE; Church Minshull, 66SE.
T. latissimum Palmgr. SALOP, Lyneal, 43SW. DENBS., Borras, 35SE; Tallarn Green, 44SE. CHESHIRE, Lea-by-Backford, 37SE; Church Minshull, 66SE.
T. pannulatiforme Dahlst. DENBS., colliery wastes, Llay, 35NW. FLINTS., field bank, Leeswood, 25NE. CHESHIRE, meadow, Quoisley, 54NE.
T. lingulatum Markl. DENBS., Ruabon, 24SE; Tallarn Green and Eglwys Corner, 44SE; Sutton Green, 44NW; Trefalun, 45NW. FLINTS., Bretton and Kinnerton, 36SE. CHESHIRE, Waverton, 46SE; Heronbridge, 46SW; Hampton Heath, 54NW; Beeston, 55NW; Reaseheath, 65NW. S. LANCS., Pennington, 69NW.
T. longisquameum H.Lindb.f. DENBS., Sutton Green, 44NW. CHESHIRE, Duckington, 45SE; Dee banks, Chester, 46SW; Duddon, 56SW. S. LANCS., Ince Moss, 34/50SE.
T. melanthoides Hagl. DENBS., old meadow, Dee flood plain, Trefalun, 45NW.
T. ordinatum Hagendijk, van Soest & Zevenbergen. DENBS., Gresford, 35SE.
T. ostenfeldii Raunk. CHESHIRE, marl cliff, Aston, 57NE (1976).
T. pannucium Dahlst. SALOP, Bagley, 32NE (1978).
T. piceatum Dahlst. DENBS., Rhosymadoc, 34SW; Llay, 35NW; Worthenbury, 44NW. FLINTS., Queensferry, 36NW. CHESHIRE, Quoisley, 54NE.
T. polyodon Dahlst. DENBS., Ruabon, 24SE; Llangollen, 24SW; Ruabon area, 34SW. FLINTS., Cymau, 25NE; Nercwys, 26SW; Leeswood, 26SE; Queensferry, 36NW. CHESHIRE, common in the west of the county, 36NE, 45NW, 45NE, 46SE, 46NE, 47SW, 47SE, 55NW, 55NE, 56SW, 56NE, 65SW, 66SE. S. LANCS., Winwick district, 59SE and 69SW.
T. porrectidens Dahlst. FLINTS., Talacre, 18SW; Northop, 26NE. CHESHIRE, Chorlton Hall, 47SW; Beeston, 55NW.
T. privum Dahlst. DENBS., Bersham, 34NW. FLINTS., 25NE.
T. procerisquameum H. Øllgaard. DENBS., Gresford, 35NE (1979).
T. procerum Hagl. FLINTS., Queensferry, 36NW. CHESHIRE, Eccleston, 46SW; Caughall, 47SW. S. LANCS., Winwick, 59SE.
T. raunkiaerii Wiinst. DENBS., Llangollen, 24SW; Gresford, 35SE; Tallarn Green, 44SE. FLINTS., Cilcain, 16NE. CHESHIRE, Burton, 37SW; Coddington, 45NE; Eccleston, 46SW; Willington, 56NW; Tilstone Fearnall, 56SE; Mouldsworth, 57SW; Woodhouses, 57NW; Reaseheath, 65SW. S. LANCS., Burtonwood, 59SE.
T. reflexilobum H.Lindb.f. CHESHIRE, Sutton, 58SE (1976).
T. sellandii Dahlst. SALOP, Prees, 53SW; Prees area, 53NW. DENBS., Bersham, 34NW; Cross Lanes, 34NE. FLINTS., Higher Kinnerton, 36SW. CHESHIRE, Coddington, 45NE; Helsby, 47SE; Cotebrook, 56SE; Sutton, 58SE; Reaseheath, 65SW. S. LANCS., Winwick, 69SW; Ince, 34/50SE.
T. semiglobosum H.Lindb.f. S. LANCS., Pennington, 69NW (1977).
T. stenacrum Dahlst. DENBS., Llay, 35NW; Gresford, 35NE; Sutton Green, 44NW; Eglwys Corner, Higher Wych and Tallarn Green, 44SE. CHESHIRE, Coddington, 45NE; Little Barrow, 46NE; Frodsham, 57NW; Church Minshull, 66SE.
T. subcyanolepis M.P. Chr. DENBS., Ruabon, 24SE. FLINTS., Penyffordd, 26SE. CHESHIRE, Chorlton, 47SW; Tushingham, 54SW; Woodhouses, 57NW.
T. sublaciniosum Dahlst. DENBS., Eglwyseg, 24NW; Llay, 35NW; Tallarn Green, 44SE; FLINTS., Rhuallt, 07NE. CHESHIRE, Wrenbury, 54NE; Beeston, 55NW.
T. tarachodum Hagendijk, van Soest & Zevenbergen. SALOP, near Oswestry, 23SE (1979).
T. tanyphyllum Dahlst. CHESHIRE, old meadow, Bridge Trafford, 47SE (1978).
T. tenebricans (Dahlst.) Dahlst. DENBS., Worthenbury, 44NW. CHESHIRE, Heronbridge, 46SW; Aston, 57NE.
T. trilobatum H.Lindb.f. DENBS., Llangollen, 24SW (1978).
T. undulatiflorum M.P.Chr. DENBS., Rossett, 35NW. FLINTS., Leeswood, 26SE.
T. valdedentatum Dahlst. DENBS., Tallarn Green, 44SE. CHESHIRE, Waverton, 46SE.
T. xanthostigma H.Lindb.f. DENBS., Rhosymadoc, 34SW; Gyfelia, 34NW; Gresford, 35SE. FLINTS.,

Rhuallt, 07NE; Nercwys, 26SW. CHESHIRE, Duckington, 45SE; Quoisley, 54NE; Cotebrook Common, 56NE.
T. sp. nov. (to be described by H. Øllgaard). FLINTS., roadside dump, Queensferry, 36NW (1979).

The *T. hamatum* Group

T. atrovirens Dahlst. SALOP, Trefonen 22NE. DENBS., Llay, 35NW. FLINTS., Kinnerton Green, 36SW. CHESHIRE, Duddon, 56SW; Cotebrook, 56NE. S. LANCS., Burtonwood, 59SE.
T. boekmanii Hagl. DENBS., Gresford, 35SE. FLINTS., Ffrith and Llanfynydd, 25NE; Queensferry, 36NW. CHESHIRE, Chester, 36NE; Mollington, 37SE; Lower Wych, 44SE; Chorlton Hall, 47SW; Dunham Hill, 47SE. S. LANCS., Winwick, 69SW.
T. hamatiforme Dahlst. Very common. SALOP., 53SW. DENBS., 34NE, 34SE, 35NW, 44SE. FLINTS., 17NE, 25NE, 26SW, 26SE, 36SW, 37SW. CHESHIRE, 36NE, 37SW, 45SE, 45NE, 46SE, 46SW, 46NW, 47SE, 47SW, 55NW, 56SE, 56NW, 57SW, 65SW.
T. hamatulum Hagendijk, van Soest & Zevenbergen. SALOP, Oswestry, 23SE. FLINTS., Talacre, 18SW; Treuddyn, 25 NW. CHESHIRE, Eccleston, 46SW; Chorlton, 47SW; Mouldsworth, 57SW; Woodhouses, 57NW; Aston, 57NE. S. LANCS., Winwick, 59SE; Westleigh, 34/60SW.
T. hamatum Raunk. SALOP, Colemere, 43SW. DENBS., Gyfelia, 34NW; Llay, 35NW; Gresford, 35SE. FLINTS., Coed Du, 16NE; Llanasa, 18SW; Cymau, 25NE; Shotton, 27SE. CHESHIRE, Mollington, 37SE; Churton, 45NW; Saighton and Waverton, 46SW; Caughall, 47SW; Thornton-le-Moors, 47SE; Quoisley 54NE; Alvanley, 57SW; Catten Hall, 57NW.
T. hamiferum Dahlst. DENBS., Bersham, 34NW; Bowling Bank, 34NE. FLINTS., Talacre, 18NW. CHESHIRE, Duddon, 56SW.
T. kernianum Hagendijk, van Soest & Zevenbergen. DENBS., Tan-y-craig, 24NW; Llay, 35NW; Gresford. 35SE; Eglwys Corner, 44SE. FLINTS., Llanfynydd, 25NE; Penyffordd, 26SE; Higher Kinnerton, 36SE; Saltney, 36NE. CHESHIRE, Waverton, 46SE; Little Barrow, 46NE; Hampton Green, 54NW; Beeston, 55NW; Bradley, 57NW; Reaseheath, 65NW.
T. oblongatum Dahlst. DENBS., Llangollen, 24SW; Ruabon, 24SE; Ruabon, 34SW; Tallarn Green, 44SE. FLINTS., Hendre and Rhydymwyn, 16NE. CHESHIRE, Caughall, 47SW; Reaseheath, 65SW.
T. polyhamatum H. Øllgaard. SALOP, Lyneal, 43SW; Prees, 53SE. FLINTS., Llanfynydd, 25NE; Sealand, 36NW; Saltney Ferry, 36NE. CHESHIRE, Duddon, 56SW.
T. pseudohamatum Dahlst. SALOP, Oswestry, 23SE. DENBS., Llangollen, 24SW; Gyfelia, 34 NW; Gresford, 35SE; Higher Wych, 44SE. FLINTS., Meliden 08SE; Cilcain, 16NE; Llanfynydd, 25NE; Northop, 26NE; Sealand and Queensferry, 36NW; Saltney, 36NE. CHESHIRE, Backford, 37SE; Chester, 46NW; Sutton, 58SE. S. LANCS., St Helens, 59SW; Burtonwood and Winwick, 59SE.
T. quadrans H. Øllgaard. CHESHIRE, Hampton Heath, 54NW.
T. subhamatum Chr. SALOP, 53SW, 53NE. DENBS., 24SW, 25SW, 34NW, 35SE, 44NW. FLINTS., 07NE, 25NW, 25NE (three sites), 36NW. CHESHIRE 36NE (two sites), 37SW, 37 SE (two sites), 47SW, 47SE (two sites), 54NE (two sites). 55NW. S. LANCS., 69SW, 69NW.

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The artificial synthesis of *Solanum* × *procurrens* Leslie (*S. nigrum* L. × *S. sarrachoides* Sendtn.)

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ABSTRACT

The artificial synthesis of the hybrid *Solanum* × *procurrens* Leslie from the parental species *S. nigrum* L. and *S. sarrachoides* Sendtn. is described, and a comparison made between the natural and the artificially derived hybrid. The fertility of the original parental populations, and the possible occurrence of natural amphiploids, are discussed, and additional records of the hybrid are given.

INTRODUCTION

In the Autumn of 1975 A. C. Leslie found several plants of a putative *Solanum* hybrid in mixed populations of *S. nigrum* L. subsp. *nigrum* and *S. sarrachoides* Sendtn. at Gamlingay, Cambridgeshire. These plants were later confirmed as interspecific hybrids, and formally described as *Solanum* × *procurrens* Leslie (Leslie 1978).

The hybrid nature of these plants was established from living and herbarium specimens collected from the mixed Gamlingay populations. The progeny grown from seeds collected from the plants of *S. nigrum* and *S. sarrachoides* proved to be hexaploid ($2n = 72$) and diploid ($2n = 24$) respectively, and both the original plants and their offspring displayed high pollen stainability and seed set values (Table 1). The hybrid plants were morphologically intermediate, tetraploid ($2n = 48$) and completely sterile. In contrast to the parental taxa, potential pollen fertility was extremely low and, though the plants developed large numbers of berries, these contained abortive ovules (Leslie 1978; Table 1). The contents of over 30 berries were examined, and only one potentially well-developed seed was found, which proved to be inviable. Although such data confirmed the probable hybrid origin of these plants, it was thought that the artificial synthesis of similar progeny would verify their hybridity beyond dispute.

ARTIFICIAL SYNTHESIS OF THE HYBRID

METHODS

The methods used for berry and seed harvesting, seed sowing, pollination, pollen stainability assessments, and cytological preparations follow those given in Edmonds (1977). The pollen stainability data were recorded from 500 grains per accession, and the numbers of seeds/berry were averaged from five berries per accession (Table 1).

Seeds harvested from the parental taxa at Gamlingay in 1975 were sown in the spring of 1976 following pre-treatment with 2000 p.p.m. gibberellic acid. When mature, plants of *S. nigrum* (C115) and *S. sarrachoides* (C114) were transferred to an insect-proofed glasshouse where, following emasculation, they were reciprocally pollinated.

RESULTS

When *S. nigrum* was used as the maternal parent (i.e. C115 × C114), 75% of the pollinations were successful, with the resultant berries setting 12–32 ($\bar{x}$ 25·3) seeds/berry. All pollinations were successful when *S. sarrachoides* was used maternally (i.e. C114 × C115), but the resultant berries only contained abortive seeds.

TABLE 1. FERTILITY DATA OF PARENTAL AND HYBRID ACCESSIONS

	Chromosome number	Germination No.	Germination %	% Pollen stainability	Seed set Range	Seed set Average
Original collections						
S. nigrum (Edmonds 41)	—	—	—	88·6	5–29	17·0
S. sarrachoides (Edmonds 40)	—	—	—	98·8	17–19	17 8*
Hybrid	2*n* = 48	—	—	0·6–1·6†	0	0‡
Experimental accessions						
S. nigrum (C115)	2*n* = 72	23/28	82·1	69·0	42–58	48·2
S. sarrachoides (C114)	2*n* = 24	17/26	65·4	99·6	16–23	19 8*
Artificial hybrid C115 × C114 (M1473)	2*n* = 48	17/25	68·0	4·8	0	0

* + 1–2 sclerotic granules † Average of three plants 0·96% ‡ 30 berries examined.

The F_1 hybrids (M1473) derived from the successful crosses were grown in 1977 (see Plates 3 & 4). These plants were tetraploid and sterile, as expected; their germination, pollen stainability, berry and seed set data are recorded in Table 1. Artificial selfing of these plants failed to result in any berry set, but 50% of the sib-mated pollinations were successful, though the resultant berries again only contained abortive ovules.

The plants exhibited the following characters. Stems sprawling in excess of 2m, ascending to *c*. 60cm, moderately pubescent with ascending or appressed and occasional glandular multicellular (> 3-celled) hairs. Leaves lanceolate to ovate-lanceolate, sinuate-dentate with 2–6 lobes. Inflorescences simple extended cymes with 7–9 flowers, generally extra-axillary; peduncles to 20mm, many subtended by small leaves; pedicels to 10mm. Corolla *c*. 7mm diameter, white to pale purple with conspicuous yellow and brown basal star. Anthers *c*. 2·3mm long, pollen 20·7–35·4 ($\bar{x}$ 26·1) μm diameter; filaments *c*. 1·9mm long. Styles *c*. 3·9mm. Berries purple/black, dull, broadly ovoid, *c*. 4 × 3mm, parthenocarpic, with 1–2 sclerotic granules, on patent to reflexed pedicels, bases surrounded by adherent/accrescent calyces, shed with pedicels.

A table comparing the more important characters exhibited by the parents with those of the hybrid is given in Leslie (1978).

DISCUSSION

Morphologically, the artificially derived tetraploid plants were virtually identical with the natural hybrids collected at Gamlingay (Plates 3 & 4). Plants of the artificial hybrid grown in the experimental field displayed the vigorous sprawling habit observed in the natural populations (see Leslie 1978). Though some of the features described above differ slightly from those recorded by Leslie (1978), natural hybrid plants transplanted from Gamlingay to the University Botanic Garden displayed very similar characters and dimensions, and the differences are probably due to personal interpretation of the more subjective characters. The leaf margins of the experimental plants were all sinuate-dentate, whereas this character varied from plant to plant in the natural populations, those of some plants being sinuate rather than sinuate-dentate. This reflects the variability of this character in both parental taxa (see Leslie 1978), and probably demonstrates the polytopic origin of the hybrid plants at Gamlingay.

The ease with which this hybrid could be synthesized confirmed previous experimental work, where, out of 25 attempts to cross accessions of *S. nigrum* and *S. sarrachoides*, 23 were successful, resulting in prolific seed set (Edmonds 1977, 1979 and unpublished). Some of these successful crosses involved *S. nigrum* as the maternal parent and others *S. sarrachoides*. They also included many morphological variants of *S. nigrum*, involving accessions with different habits, leaf margins and berry colours of both subsp. *nigrum* and subsp. *schultesii* (Opiz) Wess. The morphology of the hybrid progeny derived from all these crosses was extremely similar to that observed in M1473 and, when the eglandular-haired subsp. *nigrum* was used parentally, the pubescence of the resultant progeny was identical with that

PLATE 3. Artificial synthesis of *Solanum* × *procurrens*. A. *S. nigrum* (C115), female parent. B. Sterile tetraploid derivative (M1473). C. *S. sarrachoides* (C114), male parent.

PLATE 4. A. Glasshouse herbarium specimen of M1473. B. Part of holotype plant of natural *Solanum* × *procurrens*. C. Field herbarium specimen of M1473.

observed in the Gamlingay hybrids. The pubescence of hybrids derived from the use of the glandular-haired subsp. *schultesii* parentally was generally much denser, with the majority of the multicellular hairs being glandular and spreading.

The two failures encountered during these previous attempts at inter-specific hybridization both involved *S. nigrum* subsp. *nigrum* maternally, and neither cross resulted in any berry set. The development of berries with abortive ovules when *S. sarrachoides* was used maternally was therefore rather unexpected. Genome disharmony, largely caused by the incorrect balance in ploidy levels between the embryo and endosperm, was most probably responsible for these empty berries. Although such disharmony is probably more easily overcome when the female parent is of the higher ploidy level, as is the case here, this does not explain my earlier results where two crosses involving the hexaploid *S. nigrum* maternally failed completely, and where the reciprocal crosses involving *S. sarrachoides* maternally were successful (see Edmonds 1977, 1979). It must be assumed that the Gamlingay populations of *S. sarrachoides* constituted a strain of this species that was more genetically isolated from *S. nigrum* than the accessions of this species that had been previously used successfully as the maternal parents in similar crosses. Although these observations might suggest that the Gamlingay hybrids had arisen through the pollination of *S. nigrum* by *S. sarrachoides*, there is no proof that these naturally-occurring hybrids had arisen in this way; it is possible that they arose from the reciprocal cross, or from a combination of both types of crosses.

The plants of *S. nigrum* at Gamlingay did not seem to be as fertile as expected from previous work on this species. Although the pollen stainability of the plant collected at Gamlingay (*Edmonds 41*) was 88·6%, this fell to 69·0% the following year in the plants (C115) raised from the seed extracted from this plant. Such a low value was unexpected in this species, where pollen stainability values are usually in excess of 90% (see Edmonds 1977). Similarly, the potentially viable seed numbers/berry were low for typical *S. nigrum*, ranging from 5–29, and the berries also contained many empty seeds – an extremely unusual occurrence in this species. However, in the following year, the plants obtained by selfing C115 set berries which contained potentially viable seed numbers that were more typical of this taxon (ranging from 42 to 58 ($\bar{x}$ 48·2) in experimentally selfed berries). Moreover, the pollen stainability values of the plants grown on from this selfed seed in 1978 increased to 94·8%. Repeated selfing therefore seemed to restore the fertility of these *S. nigrum* plants. The fertility of *S. sarrachoides*, on the other hand, remained stable, setting characteristic numbers of seeds/berry, with the pollen stainability even increasing slightly in the experimental accession (Table 1).

It is possible that the pollen from *S. sarrachoides* and/or from the tetraploid hybrid (where the occasional grain is potentially functional) was 'contaminating' the *S. nigrum* population at Gamlingay. Such mixed pollination might have caused the low seed numbers and the development of occasional empty seeds observed in *S. nigrum*, and the dramatic increase in viable seed set in the experimentally-selfed berries of this species (Table 1) might be considered to support this hypothesis. However, it is difficult to explain the low pollen fertility recorded in the offspring (C115) of the original plant (*Edmonds 41*) collected at Gamlingay. Unfortunately, the sample size was much too small for any conclusions to be drawn, and a satisfactory explanation would require extensive field sampling of *S. nigrum* at Gamlingay.

The species of the section *Solanum* are largely autogamous, but cross pollination can and does occur in this species group and natural inter- and intra-specific hybrids have now been reported for a number of the component species (Edmonds 1979). That cross pollination was probably occurring at Gamlingay is demonstrated by the fact that artificial selfing of the experimental hybrid failed to produce any berry set, whereas 50% of the sib-mated flowers resulted in berry set. Many of the natural hybrid plants bore abundant berries, which could well have arisen through cross pollination.

Although Leslie (1978) failed to trace any published records of this hybrid, it is probably quite widespread in mixed populations of *S. sarrachoides* and *S. nigrum*. *Solanum sarrachoides* sometimes occurs as a component of wool shoddy, which is locally spread on light sandy agricultural soil in south-eastern Britain. New strains of this species are therefore probably being introduced to these areas from its native habitats in South America. The species can be highly successful on these soils, and has become an established alien in a few places. It also occurs more widely as a casual alien on refuse tips and other waste places. In all areas where the distribution of this species overlaps with that of the native *S. nigrum*, hybridisation is likely, though not inevitable. According to Leslie (pers. comm.), large mixed populations of these two species can produce abundant hybrids (as at Gamlingay), a few hybrids, or none at all (as in some Surrey populations).

In addition to the records listed by Leslie (1978), this hybrid has now been positively identified from the following sites (Leslie pers. comm.):

Market garden field , Maulden, Beds., v.c. 30, GR 52/062.374, September 1977, H. J. M. Bowen, comm. J. G. Dony ('One large plant').
Market garden field, between Broom and Biggleswade, Beds., v.c. 30, GR 52/182.435, 23 October 1977, E. J. Clement ('very numerous' , 'both parents abundant').
Sugar beet field, Milton, Cambs., v.c. 29, GR 52/472.631, 17 November 1977, G. M. S. Easy, conf. A. C. Leslie ('a single, large plant' ; 'mixed populations of parents quite common about Milton').
Market garden field, near Flitwick, Beds., v.c. 30, GR 52/026.358, Summer 1978, C. G. Hanson and B. Wurzell ('quite frequent' , 'both parents abundant' , 'field record').
Dumped soil by road, Kennett, Cambs., v.c. 29, GR 52/701.682, 21 September 1979, G. M. S. Easy, conf. A. C. Leslie (**herb. A. C. Leslie**), ('a single plant' , 'only *S. nigrum* present').

It is highly probable that the critical examination of *Solanum* collections in various European herbaria will reveal specimens of *Solanum* × *procurrens*, as yet unrecognized. The only positive herbarium record that I have so far encountered was collected in Sweden, as long ago as 1958 (*A. Nilsson s.n.*: *S. nigrum* L. × *S. nitidibaccatum* Bitter 'Flora Suecia; Scania, Saxtorp. Flygeltofta. 1 planta bland föräldraarterna.' [one plant among the parents]. 26.7.1958, **H**.).

The discovery of this hybrid at Gamlingay was of considerable interest, since my previous experimental work on the derivation of *S. nigrum* had demonstrated that this hexaploid might contain a set of genomes from the diploid *S. sarrachoides* (Jardine & Edmonds 1974; Edmonds & Glidewell 1977; Edmonds 1977, 1978, 1979). This hypothesis was partly based on the fact that although *S. sarrachoides* seemed to be completely isolated genetically from all other species in the section *Solanum*, it could be easily hybridized with *S. nigrum*. Moreover, amphiploidy had been readily induced in a similar tetraploid hybrid between *S. nigrum* subsp. *nigrum* and *S. sarrachoides* (Edmonds 1979). The resultant octoploid plants were extremely vigorous, and moderately fertile, spontaneously setting large numbers of berries. These berries contained moderate numbers of seeds in the F_2 generations, but relatively few in the F_3 generations.

In 1976, spontaneous fertile branches arose on two otherwise sterile plants of another artificial tetraploid hybrid between *S. nigrum* and *S. sarrachoides*, though, this time, the maternal parent was the glandular-haired subsp. *schultesii* (Edmonds unpublished). Morphologically the F_2 and F_3 generations subsequently raised from this spontaneous amphiploidy were very similar to the artificially-induced octoploids. The stem and leaf hairs were denser, and largely glandular and spreading, however, thereby reflecting the indumentum-types of the two parents.

The fertility of these spontaneous octoploid plants was generally higher than that recorded from their artificially-induced counterparts. This was particularly true of the F_3 generation, where germination, pollen stainability and seed set values remained comparable to those recorded from the F_2 generation plants. The decrease observed in the pollen and seed fertility of the artificially-derived octoploids was provisionally attributed to the duplication of similar genomes in the hybrid, causing meiotic disturbances in both the pollen mother cells and the embryo sac mother cells; these unbalanced segregations possibly became accentuated in the F_3 generations through successive inbreeding (Edmonds 1979). This hypothesis may need partial revision in view of the higher fertility observed in the spontaneous octoploid progeny, as reported here. The increase in fertility noted in the subsequent generations of these plants could be due to the involvement of the glandular-haired *S. nigrum* subsp. *schultesii*. However, since this is probably closer genetically to the glandular-haired *S. sarrachoides* than is the eglandular-haired subsp. *nigrum*, which had been used as the maternal parent in the artificially-induced octoploids, more meiotic disturbances might be expected in such progeny. It would obviously be of interest to study the fertility of artificially-induced octoploids derived from hybrids between the subsp. *schultesii* and *S. sarrachoides* in order to clarify this point.

It is possible that such spontaneous amphiploidy may occur naturally, and that similar fertile branches may occasionally arise on otherwise sterile plants of *S.* × *procurrens*. Any seed germinating from such a source could give rise to vigorous octoploid plants, which would probably be mistaken for *S. nigrum*, and especially for the subsp. *schultesii*. The general morphology of the artificially-derived octoploids is illustrated in Edmonds (1979), where details of flowering and fruiting inflorescences are also included. Though such amphiploids may establish themselves as natural octoploid populations, they would probably be at a competitive disadvantage to the parental species, since their overall fertility is comparatively low. Moreover, since *S. nigrum* subsp. *nigrum* is much more common than subsp. *schultesii*, especially in Britain, any octoploids would probably be similar to the less fertile artificially-derived hybrids described above.

The only anomaly in the suggestion that the hexaploid *S. nigrum* might contain a set of genomes from *S. sarrachoides* arose from the apparent reproductive isolation of this species from all other diploids in the section *Solanum*. However, this anomaly has recently been overcome, following the successful hybridization of *S. sarrachoides* with the diploid *S. douglasii* Dunal (Edmonds unpublished). The fact that *S. sarrachoides* can spontaneously hybridize with *S. nigrum* in areas where the distributions of these species overlap, despite the differences in their ploidy levels, lends considerable support to the common genome hypothesis (see Edmonds 1979).

The question of the correct name for the diploid parent of *Solanum* × *procurrens* still remains a problem (see Leslie 1976, 1978). Leslie showed that most British alien material named *S. sarrachoides* Sendtn. is, in fact, *S. nitidibaccatum* Bitter, whilst *S. sarrachoides* Sendtn. emend. Bitt. is a much rarer plant, and that if these two taxa are subsequently recognized as distinct species then *S.* × *procurrens* strictly refers to the hybrid between *S. nigrum* subsp. *nigrum* and *S. nitidibaccatum* (Leslie 1978). I have recently obtained seed of *S. sarrachoides* Sendtn. emend. Bitt. from two British localities. This seed appears to be viable, unlike previous accessions of this taxon that I obtained. It is therefore hoped that hybridization studies between this material and *S. nitidibaccatum* Bitter, together with additional work on the variation of the South American representatives of these taxa, will help to resolve their taxonomy in the near future.

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The distribution of *Juncus filiformis* L. in Britain

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ABSTRACT

A field survey of *Juncus filiformis* sites in the English Lake District was carried out in 1978. The results show that this area is still a stronghold for the species. Information concerning other localities in Britain is collated and the spread of *J. filiformis* to various reservoirs discussed.

INTRODUCTION

Juncus filiformis L. is widely distributed in northern and subarctic Eurasia, extending well into southern Europe; it is also present in North America and in Patagonia. On the Continent it occurs in a variety of habitats including dune slacks, dry meadows, streamside mires and wet heaths, as well as, in the Alps, meadows, screes and lake shores (Richards 1943). In Britain, however, it is a very local species, found only on the edges of lowland lakes and reservoirs. In view of this restricted ecological range, Richards suggested that *J. filiformis* may be represented by only a single ecotype in this country.

Records of *J. filiformis* from the English Lake District date back to the seventeenth century, when it was first found at the north end of Windermere by D. Newton (Ray 1688). Since then this inconspicuous species has been recorded from a number of other lake shores in the district. As few of these records are recent, it was decided to carry out a survey of all previously known sites and also suitable sites around other lakes. The results of this survey, undertaken in 1978, are presented below. Elsewhere in Britain the species is known from a few widely scattered localities in England and Scotland including a number of recently discovered reservoir sites. An attempt has been made to draw together information concerning these sites.

BRITISH LOCALITIES

In the Lake District *J. filiformis* was found by all the lakes from which previous records exist except Tarn Hows. New localities were discovered at a number of lakes and it was recorded for the first time at Rydal Water. However, searches of several other lake shores including Ennerdale Water, Wastwater, Brothers Water, Ullswater and Haweswater Reservoir were unsuccessful. The details of the Lake District localities and all other British stations that I have been able to trace are listed below. The most recent records are given and the location of herbarium specimens is mentioned only when they are the source of such records. For the Lake District localities surveyed in 1978, estimations of population size, based on the number of discrete tufts present, are indicated by letters: A = 1 to 20, B = 21 to 100, C = 101 to 500, D = 501 to 1000, E = over 1000.

Leics., v.c. 55.

Blackbrook Reservoir: 43/460.170, scattered along margin and abundant in places, 1970 (P. A. Candlish & A. L. Primavesi, field record).

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Mid-W. Yorks., v.c. 64.

Fewston Reservoir: 44/185.539, open ground liable to inundation, 1977 (W. A. Sledge, field record); 44/19.54, 1965, **BM**, below outflow where it enters Swinsty Reservoir (F. Houseman pers. comm. 1979).

Stocks Reservoir: 34/73.56, stony shore line, 1978 (P. Jepson, field record).

Co. Durham, v.c. 66.

Tunstall Reservoir: 45/06.41, alluvial mud of inflow, 1970 (Burnip 1972), possibly present for a number of years (Graham *et al.* 1972).

Grassholme Reservoir: 35/927.216, about 50 plants, 1978 (R. Hobbs, field record).

Westmorland, v.c. 69.

Windermere: Bowness-on-Windermere (Baker 1885); 35/373.032, north end of lake in fringe marsh community (C); 35/369.029, Brathay Bay in fringe marsh community (B).

Elterwater: 35/3.0, pasture by River Brathay below lake, 1942 (Wallace 1944); 35/332.042, north shore of middle basin on stony margin and in fringe marsh community (B).

Rydal Water: 35/361.062, east end of lake in fringe marsh community (B).

Grasmere: 35/334.070, north-west corner of lake in closed marsh community, up to 15 m from shore (B).

Esthwaite Water: 34/35.97, North Fen in small area on acidic peat (W. H. Pearsall in Richards 1943); 34/356.968, bay north of Strickland Ees in closed marsh community, 3m from shore (B).

Coniston Water: 34/2.9, 1950 (Biological Records Centre), unlocalized but presumably refers to south end of this lake; 34/313.978, north end of lake on stony margin and in fringe marsh community (B).

Tarn Hows: 34/33.99, 1951 (G. Wilson, field record).

Cumberland, v.c. 70.

Thirlmere: 35/322.131, south end of reservoir over a large area periodically submerged, some plants over 100m from water's edge when visited (E).

Derwentwater: 35/26.20, Barrow Bay on gravelly lake margin, 1919, **BM**; 35/2.2, St Herbert's Island, 1846, **CGE**; 35/260.190, south end of lake on stony margin and in closed marsh community, covering a large area, up to 200 m from shore (E); 35/266.195, south-east corner of lake in open community on stony shore (A); 35/268.215, Calfclose Bay on stony margin and in fringe marsh community (C); 35/265.221, Strandshag Bay on stony lake shore and in fringe marsh community (C); 35/257.233, north end of lake on stony margin and in closed marsh community, up to 10 m from shore, with willow and alder carr developing (D).

Bassenthwaite Lake: east shore, 1933, **BM**; 35/222.273, on west shore around Blackstock Point and Hursthole Point on stony margin and in fringe marsh community (E); 35/212.292, west shore opposite Bowness Bay on stony margin and in marsh community, up to 15 m from shore, with willow and alder carr developing (D); 35/200.309, in marsh community, up to 5 m from shore, with willow carr developing (C); 35/201.320, Banks Point and north shore on stony margin and extending back through fringe marsh community into more closed vegetation, up to 5 m from shore (E).

Buttermere: 35/190.152, south-east end of lake in an open community on stony shore (A); 35/176.164, north-west end of lake on stony margin and in closed marsh community, up to 7 m from shore (C).

Crummock Water: 35/166.171, south-east of lake in closed marsh community, up to 50 m from shore (E).

Loweswater: 35/130.212, south-east end of lake in closed marsh community, up to 10 m from shore (D).

Dacre Bank: 35/4.2, 1946, **CLE**.

Renfrews., v.c. 76.

Auchendores Reservoir: 26/3.7, south and west shore on alluvial mud, 1969 (Conacher & Ribbons 1973).

Fife, v.c. 85.

Loch Leven: 37/1.0, at four stations near the loch margin, 1975 (G. H. Ballantyne, field record).

Stirlings., v.c. 86.

Loch Lomond: 26/424.905, south of Balmaha in a small area by loch shore, 1971 (E. T. Idle, field record).

Kincardines., v.c. 91.
Loch of Loirston: 38/9.0, 1968 (Biological Records Centre).
S. Aberdeen, v.c. 92.
Belhelvie Links, undated specimen in **OXF** which is mounted with other plants collected in 1833 and 1886, unlikely to still occur in this area due to lack of suitable habitat (C. H. Gimingham pers. comm. 1979).
Moray, v.c. 95.
Kincorth, margin of a pool (Burgess 1935).
Easterness, v.c. 96.
Loch Mhor: 28/5.2, margin of loch near Farraline, 1976 (Webster 1978).

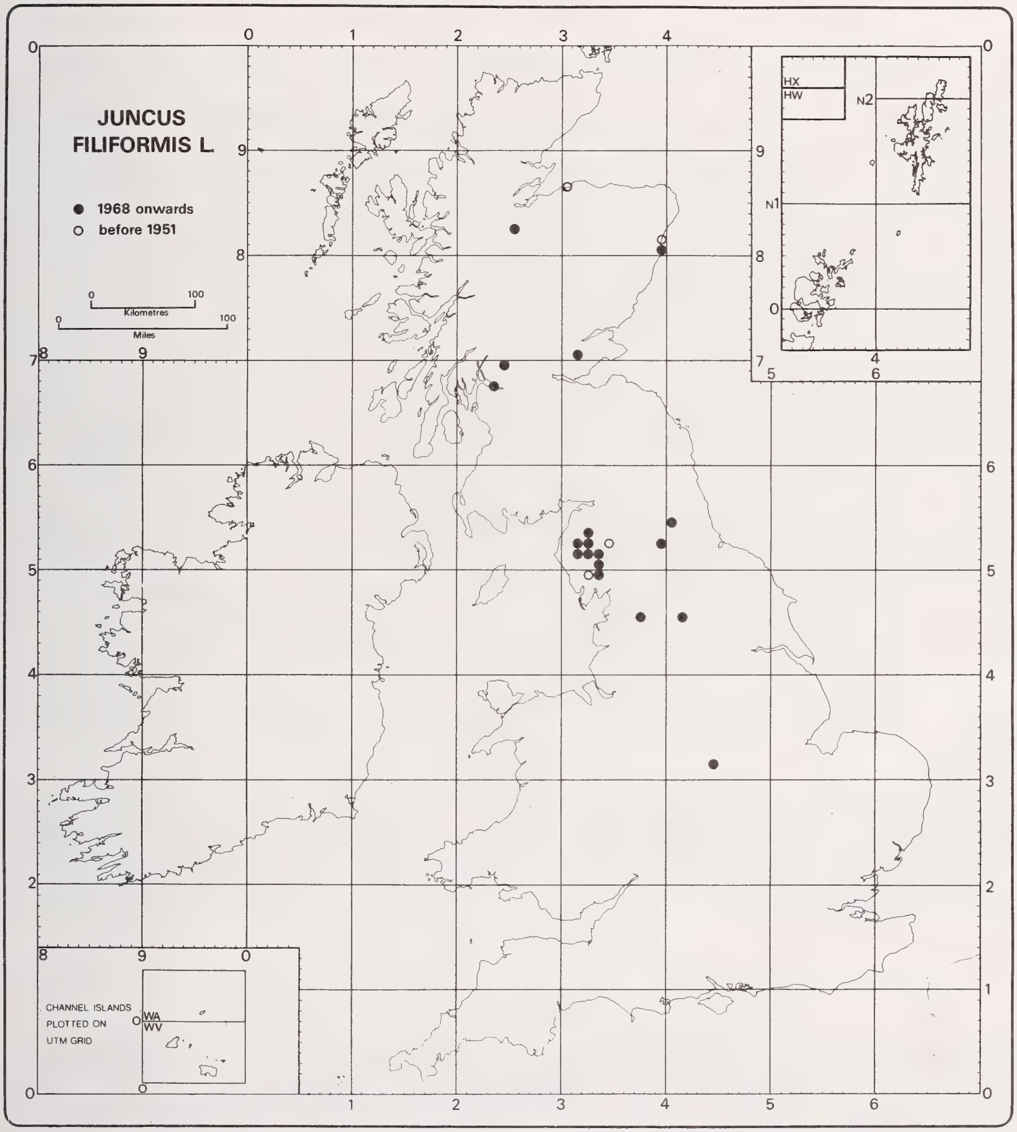

FIGURE 1. Distribution map of *Juncus filiformis* in the British Isles.

The distribution of *J. filiformis* in the British Isles is shown in Fig. 1. In addition to the localities listed above, several very doubtful or erroneous sites have been reported. Errors from Middlesex, v.c. 21, Cheshire, v.c. 58, Mid Perth, v.c. 88, and Orkney, v.c. 111, were mentioned by Watson (1883). A record quoted by Conacher & Ribbons (1973) for Llyn Helyg, Flints., v.c. 51, in fact refers to *J. tenuis*. Home (1898) reported that specimens from a hill-top near Countess Crag in S. Northumb., v.c. 67, were thought by Dr Hardy to be *J. filiformis;* this is a most unlikely locality. A record from a site near St Andrews, Fife, v.c. 85, attributed to J. H. Wilson in Young (1936), is considered to be a probable misidentification by MacLeay (1953). Finally, A. McG. Stirling (pers. comm. 1979) considers that a record for Dunbarton, v.c. 99, in P. Ewing's *Glasgow catalogue of native and established plants* (1892), must be considered doubtful as no further details can be traced.

HABITAT

In the Lake District, *J. filiformis* occurs in a variety of lake-side habitats ranging from exposed sections of lake shore to closed marsh communities sheltered behind reedswamp. Of its associated species, the following were recorded at over 40% of the sites: *Achillea ptarmica, Agrostis stolonifera, Caltha palustris, Carex curta, C. nigra, Deschampsia cespitosa, Eleocharis palustris, Filipendula ulmaria, Galium palustre, Juncus acutiflorus, J. effusus, Leontodon autumnalis, Lythrum salicaria, Mentha aquatica, Molinia caerulea, Phalaris arundinacea, Polygonum hydropiper, Prunella vulgaris, Ranunculus flammula, R. repens, Rumex acetosa* and *Senecio aquaticus.*

J. filiformis most commonly occurs in the open turf of a fringing marsh community, generally 0–2 m from the open water, where it is exposed to frequent wave action. At some localities (e.g. south-east end of Buttermere and Calfclose Bay on Derwentwater), it also grows on the gravelly beach with short-lived species such as *Juncus bufonius, Poa annua* and *Spergula arvensis* often present. Occasionally it is found submerged and associated with *Littorella uniflora* (e.g. south end of Thirlmere). Apart from these habitats, *J. filiformis* also occurs, sometimes in abundance, in relatively species-rich mire communities extending well back from the shore. At the south end of Derwentwater, for example, it is present over a large area on alluvial material up to 200m from the water's edge. The vegetation at these sites is often grazed by sheep and/or cattle which prevents the development of a shrub or tree cover; where alder or willow carr has been allowed to develop, *J. filiformis* does not usually occur under dense shade. An interesting site has been described by W. H. Pearsall (in Richards 1943) where *J. filiformis* occurred on acidic peat in Esthwaite North Fen. In 1978 it was not found in the North Fen and, as there have been various changes in the vegetation over the last 50 years, notably the extension of woodland (Pigott & Wilson 1978), it is possible that this rush has been shaded out.

In other parts of Britain the species occurs in similar habitats to those outlined above. Most sites are liable to frequent submergence, particularly during the winter months, though, where it grows by reservoirs, periods of inundation will be dependent on human water demand as well as climatic conditions.

In addition to lakes and reservoirs, there are also two records of *J. filiformis* occurring by small ponds. One is in Moray where Burgess (1935) reported it from a 'margin of a pool' at Kincorth. The other refers to a specimen in **CLE** collected by W. F. Atkinson in 1946 from Dacre Bank in Cumberland. The only likely habitat at Dacre Bank was a small farm pond which has now been drained. Although neither of these records has been confirmed in recent years, the species should be looked for at similar sites.

DISCUSSION

Altogether there are recent (post-1967) records of *J. filiformis* from 15 lakes and 7 reservoirs in Britain, of which 11 of the lakes are in the Lake District. Although *J. filiformis* may now no longer deserve inclusion among the species of rare or threatened British plants listed by Perring & Farrell (1977), it nevertheless requires attention from conservation bodies. Many of its localities in Cumbria are popular recreation areas where heavy trampling and disturbance could threaten its survival and at Bowness-on-Windermere various building developments may well have caused its extinction.

TABLE 1. RESERVOIRS WITH RECENT RECORDS OF *JUNCUS FILIFORMIS*

Reservoir	Date of construction	Date of first record
Blackbrook, v.c. 55	1906	1965 (Candlish)
Stocks, v.c. 64	1932	1978 (Jepson)
Fewston, v.c. 64	1879	1959 (Biological Records Centre)
Grassholme, v.c. 66	1915	1978 (Hobbs)
Tunstall, v.c. 66	1879	1970 (Burnip)
Auchendores, v.c. 76	1880	1969 (Conacher & Ribbons)

The arrival of *J. filiformis* at a number of reservoirs in England and one in Scotland suggests that it can be dispersed over relatively long distances. These reservoirs (listed in Table 1) were all established in areas where no large body of standing water previously existed, so that *J. filiformis* was unlikely to have been present before construction. On the other hand, at Thirlmere, its only reservoir locality in the Lake District, it was known to occur (Baker 1885) before the water level was raised by 50ft in 1894. Perring & Farrell (1977) suggest that its seed may be carried by birds and this would seem to be the only means by which this species could have reached these new isolated sites. The seeds, like those of many other *Junci*, are mucilaginous and sticky when moistened (Ridley 1930, Richards 1943), which could allow them to become attached to the feet and other parts of water birds. Gillham (1970) has suggested that small viscid rush seeds attached directly to the bird are more likely to escape preening than seeds adhering in mud. Internal transport is also possible but, however carried, the occurrence of this rare species at these six sites indicates that seed movement by birds migrating between water bodies in Britain can be an effective method of dispersal. The maximum possible time taken for *J. filiformis* to reach these reservoirs varies from 46 years at Stocks to 91 years at Tunstall. However, these periods were probably shorter since the species was generally well-established when first recorded. It is obviously impossible to determine the distance over which seed has travelled, but Blackbrook, the most outlying site, is 150–200km from its nearest known localities.

As well as these reservoirs, *J. filiformis* has only recently been found at Loch Mhor in Easterness and Rydal Water in Westmorland. In the field it is often very inconspicuous, particularly when overshadowed by associated species. The most distinctive character is the inflorescence, which usually has less than 10 flowers and is generally placed half-way or lower down the apparent stem, although, when heavily grazed, it can have the initial appearance of being terminal. It is quite possible that this slender rush has been overlooked at other sites in Britain.

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Sources of error in local lists*

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ABSTRACT

Examples are given of the many ways in which the compiling of local lists is exposed to error. Because the known hazards are so numerous, it is urged that records be examined more critically. Conventions appropriate to the rectification of errors in print are also reviewed.

INTRODUCTION

'In scientific matters, I consider the correction of a *false* fact . . . more important than the discovery of a *new* fact; inasmuch as *mis*-information is worse than *non*-information.'
(H. C. Watson to C. C. Babington, 17 Dec. 1848: Babington Correspondence, Botany School, Cambridge)

Considering the great amount that has been written over the years on the compiling of local Floras, it is surprising that so little of this has been on the errors that may be encountered. Warren (1875) and Young (1966) are among the few that have published on the subject; and the first of these touches on it no more than marginally. Yet the exposing of mistakes is arguably the single most valuable use to which the special expertise of the local Flora writer or Recorder can be put. Anyone – even the veriest novice, and quite by accident – has the capacity to make additions; but the making of subtractions is an achievement reserved on the whole only for the deeply knowledgeable. The appeal it holds, too, in terms of intellectual gratification is one that is accessible for the most part only to the botanically sophisticated. Demolition is a harsh, unlovely matter: the exploding of a record that has long been in good standing can never compare in popularity with the discovery of a novelty.

Nevertheless it is crucial that compilers of local lists should cultivate the habit of looking backwards as well as forwards. While all are conscious of their elementary responsibility to admit into the store of knowledge only what is certain or at least highly likely, by no means all appreciate sufficiently that this responsibility may not have been discharged all that efficiently by at least some of their predecessors. All workers, however high their reputation, have their taxonomic blind spots. Our understanding of certain groups or species alters over time. The mere accumulation of records in itself provides a steadily finer test of what is to be expected in an area. Much that once seemed unexceptionable may thus, sooner or later, come under suspicion. It is not enough for compilers to watch over the entrance to their lists: they need to conduct searching checks of what has found its way inside already.

SOURCES OF ERROR

To bring home the extent to which errors may creep in, it is only necessary to recall the frightening variety of ways in which we have evidence that they can and do occur. Here are just a few of them.

First, and most obviously, there is misidentification – in the genuine sense. All field botanists, whatever their standard, make mistakes from this cause from time to time. Even the most experienced can be recklessly glib, failing to recognize that they have a wrong idea of certain taxa that they confidently believe they know. Among the more frequent victims of this Higher Confusion are *Arenaria leptoclados, Poa compressa, Potentilla anglica, Sagina ciliata, Trifolium micranthum, Veronica polita*

* Revised version of a paper given at the 1979 Vice-County Recorders' Conference.

and *Viola reichenbachiana*. Records for species such as these, if they come from the otherwise trustworthy, are all too liable to be accepted unblinkingly; yet they are all species notorious for being shakily comprehended, and to pass claims for them without at least some scrutiny can only be unwise.

A particular cause of the Higher Confusion is the natural inclination to rely in the field on just one or two key characters – and these, unfortunately, are not always as dependable as supposed. *Hayward's botanist's pocket book*, which gave the force of codification to what had previously been rough-and-ready, has much to answer for as a result. The use of red twigs as a hallmark of *Salix aurita* is merely one example of how its often ill-chosen streamlining has persistently misled.

In a separate sub-category are misidentifications arrived at by working exclusively from plates. These can be bizarre in the extreme and the correct identity not at all easy to guess at, for the species confused will as often as not be quite unrelated scientifically and the visual resemblance may be largely in the eye of the beholder. Someone who recently startled the British Museum (Natural History) by claiming a garden full of *Orchis militaris* proved to have nothing more exciting after all than *Impatiens glandulifera*. *Cymbalaria muralis* was once misreported in the Isle of Man as *Wahlenbergia hederacea*. More reasonably, one markedly out-of-pattern Manx record of *Mentha pulegium* turned out to be *Calamintha sylvatica* subsp. *ascendens*– rather as in Guernsey *Mimulus moschatus*, 'the locality too secret to be put into print', was found to have done duty for *Parentucellia viscosa* (McClintock 1975).

To novices for the most part are also to be attributed the second class of errors: those arising from the ambiguities in vernacular names. All local Flora writers learn to live with 'Marsh Mallow' (for *Malva sylvestris*, not *Althaea officinalis*) and 'Deadly Nightshade' (for *Solanum dulcamara*, not *Atropa belladonna*.). Other traps, however, are less familiar and a glance through the pages of Britten & Holland (1886) or Grigson (1955) can be a chastening experience in this connection. 'Adder's Tongue', it will be found, may not refer to *Ophioglossum vulgatum* invariably: *Geranium robertianum, Achillea ptarmica, Listera ovata, Orchis mascula* and *Arum maculatum* have all been known as this too. No fewer than 15 different species have gone by the name of 'Bird's Eye'. Even the name 'Lords and Ladies' has been shared by three species.

When those accustomed only to the vernacular names attempt to translate these into their Latin equivalents, further confusion may result. *Erigeron acer* lay unsuspected in the Isle of Man lists for over half a century until the realization dawned (from the congruence of localities) that 'Fleabane' had been converted into this instead of into *Pulicaria dysenterica*. The same Manx botanist who perpetrated that was unaware that 'Bur-marigold' covered more than one species – and unluckily plumped for the wrong one when he looked it up in a Flora. This landed the Isle of Man lists, for the same long period, with their sole record for *Bidens cernua*. Even worse offenders on this score have been Victorian guidebooks, with their pretensions to learnedness but so often with authors unfamiliar with scientific names. One Isle of Man one, presumably mindful of the berries, came up with '*Sambucus edulis*' as the name of the Common Elder. Predictably, a credulous compiler later pounced on this as an almost-correct rendering of *S. ebulus* – and into the Manx lists as that it passed, unchallenged for 60 years. From the same source, even more weirdly, came the double mistranslation of 'Golden Saxifrage' into *Saxifraga oppositifolia*, causing that species to become similarly embedded in the literature by the same uncritical route.

Errors due to genuine misprints, by contrast, have probably always been very few. They might even be non-existent had not British botany come to rely so extensively on vice-county numbers. When a locality appears alongside one of these, any misprint ought not to mislead for very long; but where the number alone is reproduced, as in that notoriously over-hasty work, *The comital Flora of the British Isles*, the result can be lasting uncertainty. Is the '71' that appears therein under *Subularia aquatica*, for instance, a mere printer's slip that was missed – or had G. C. Druce logged a record for that vice-county that no one else has ever been aware of?

Place-names are subject to mistranslation no less than the names of plants. In the days when Floras were written in Latin, Julius Caesar was naturally followed in bestowing '*Mona*' on Anglesey. Unfortunately the Isle of Man was also given this name by Pliny – and the Manx have been the more assiduous in using it. As a result that Anglesey speciality, *Tuberaria guttata*, and another rarity at one time dubiously claimed from there, *Cucubalus baccifer*, have both been credited to the other island as well. Overlooking that a place-name is not unique is probably indeed one of the commonest sources of error of all. Most builders of private herbaria labelled their specimens just for their own personal enlightenment, rarely troubling to ensure that the place-names they employed did not confuse those unfamiliar with the area. When their collections found their way eventually into public institutions, a good deal of guess work went into the clarifying of the labels. Thus a sheet of *Limonium humile* in **BM** labelled 'Douglas' led to this species being claimed as Manx. On closer scrutiny, however, the locality referred to turned out to be the place of that name in Co. Cork. A third Douglas, in Lanarkshire, procured *Vicia orobus* for the Isle of Man in Watson's *Topographical botany*. The fault here, clearly, is being mesmerised by the familiar: that automatic reflex which once led Druce, for example, to refer to the Isle of Wight a Hampshire specimen plainly labelled 'Alum Chine' (a locality in Bournemouth) because he knew only, and that very well, Alum Bay, by the Needles. Even when a gazetteer is used, it does not necessarily follow that the locality will have been identified correctly – if there is more than one place so named and the label provides no guidance. *Cystopteris fragilis* has been 'added' to the Manx flora in the recent *Atlas of ferns of the British Isles* on the strength of a herbarium sheet bearing the name of a locality which is certainly in that island. Unfortunately (though the gazetteer may not have risen to revealing this) there is a place identically so called in Derbyshire too; and as that is an area where this species occurs in comparative profusion, it is far more likely that that is where the gathering came from.

A more obvious cause of misinterpreted labels is the obscurity of the handwriting. Here a legible hand is a greater danger than near-indecipherability (which at least makes the hasty pause). A squiggle at the end of 'Mitcheldean' on one label led Druce to misread this as 'Micheldever' and so locate the specimen in Hampshire instead of Gloucestershire – an error he then compounded by attributing it to the wrong Hampshire vice-county. In a similar instance, cited by Warren (1875), a wrong county record was created by Warwickshire being misread as Warrington. The danger is greater still where a label has been the subject of transcription by an intermediary. In such cases an extra layer of error has the opportunity of seeping in. There is a particularly striking example of this in Syme (1873), where the Belfast botanist Dr William Mateer, not otherwise known to have collected outside Northern Ireland, is credited with a find of *Lolium remotum* in Sussex. Reference to Syme's herbarium (now in **BM**) reveals two gatherings from this collector, one labelled, doubtless correctly, 'flax fields, Bangor, Down', the other – in another hand – with the locality corrupted to 'Bognor, Devon'. Syme, at that date still unfamiliar with English topography, then converted this in turn into 'Bognor Regis, Sussex'.

Unfamiliar territory is frequently the undoing of the over-confident, particularly where this is territory popular for holidays. When on holiday people tend to record with only half an eye, with non-botanist companions to distract them, and usually without the wherewithal for taking and preserving voucher specimens. Unfortunately unusual territory tends not to harbour usual species – and the risk of wrong assumptions is hardly lessened by the south-eastern bias of so many of the standard works of identification. In the Isle of Man, for example, the commonest species of *Arum, Barbarea, Fumaria* and *Lamium* is in each case not the species that English visitors are accustomed to expect. Islands, indeed, are outstandingly treacherous country for the casual, for they frequently lack even near-universal species. *Mercurialis perennis* was once recorded airily by an extremely experienced worker on his very first visit to Man, on the supposition that the green mass carpeting the thickets that flashed past on the drive from the airport could *only* be that species at the time of year in question. Had he troubled to check in his Flora, however, he would have found that it is altogether missing from the island as a native.

In contrast to these examples of mere carelessness it is possible almost to pardon the errors in the next class: those due to mental lapses. When names are mixed up from this cause, the species in question tend to be within the same family: the mere slips of the pen of the knowledgeable have a telltale rationale in contrast to the purely visual connections made by the novice. Thus a distinguished Kew botanist once wrote down *Lepidium campestre* when he undoubtedly intended *Thlaspi arvense*. In Sussex a record of *Vicia sylvatica* is supposed to have been an aberration for *Lathyrus sylvestris*.

A good deal more reprehensible, by comparison, is mixing up one's data. Absent-mindedness, or the ordinary exigencies of the field, may result in entries made on the wrong card or the wrong notebook page. Localities may be jotted down imprecisely and left untransferred to files till the details are faint in the memory. Often, too, no notes may have been taken at all and memory alone relied on. This perhaps is how it comes about that so many of the Sarnian records are attributed to what seems to be the wrong island (though the use of 'Jersey', loosely, for the Channel Isles as a whole has been a source of stumbles as well). Sometimes, even, compilers may trip over their own feet, disbelieving something that they had down right in the first place. Britten & Boulger (1899) miscopied the surname of Miss Charlotte Wilkins, the discoverer of *Simethis planifolia*, as 'Wilson' and on the strength of their own notes insisted that in the published announcement of that discovery, 'Wilkins' had been a slip. Their assertion has been repeated in all innocence by Desmond (1977). Yet there is a letter from Miss Wilkins in the Hooker Correspondence at Kew which proves that the name was reproduced quite correctly at the outset.

Another form of muddle that was at one time prevalent was 'mingling specimens and loose labels from different and even distant localities' – with inevitable dire results (Watson 1847). 'One lady-botanist, of well-known name', was identified by Watson as a particular offender in this respect: by her carelessness, he claimed, she had 'thrown into circulation numerous errors, some of which have appeared in print also.' Watson indeed was inclined to dismiss as untrustworthy – though only in part for this reason – all the labels of the Botanical Society of London for the 1836–40 period, before he joined its counsels and was able to bring its exchanges under his meticulous supervision.

A whole new family of mistakes due to documentary muddle has been brought into being by the Distribution Maps Scheme and the subsequent fashion for tetrad recording. These range from the very elementary – the inverting of grid-references and clerical mispunching – to the comparatively esoteric, such as the differential merging of squares. The only known find of *Viola lactea* in the Isle of Man was made in a spot that falls within a ten-kilometre square consisting almost entirely of sea. Some are content to keep such squares distinct for recording purposes, other prefer to combine them with one or other of those adjoining. Unfortunately, through miscommunication, three different courses were adopted at different times for the Manx square in question, with the result that this one *Viola lactea* record is most misleadingly represented in the *Atlas of the British flora* by a threefold group of dots. But probably the most usual mishap of mapping is crossing off the wrong plant on a record-card accidentally. Young (1966) identified three causes of this: 'bad aim' – that is, landing on the line above or below ('bifocals are a trial', he remarks); over-similarities in the abbreviated names; and abbreviations open to misunderstanding. Pairs of names particularly often confused in his experience were '*Agropyr can*' and '*Agrosti can*', '*Stachys pal*' and '*Stellar pal*', and '*Ornitho per*' and '*Ornitho umb*'. Common misunderstandings were '*Juncus com*' (for *J. compressus*) as the Bentham and Hooker aggregate *J. communis* and '*Crat oxy*' (for *Crataegus oxyacanthoides*) as *C. oxyacantha*, the name once used to cover both the British hawthorns indiscriminately.

These last are a useful reminder of the particular subtle hazard constituted by names that were formerly employed in a wider sense. Far more of these 'buried aggregates' are around in the older literature than is commonly realised, for the time when many of them were in use lies so far back in the past that the fact that other species were later split off is now easily overlooked. Records for *Viola lutea* in maritime situations, from the days before *V. tricolor* subsp. *curtisii* was recognized, are unlikely to cause problems; but any very old ones for *Arctium lappa, Lepidium campestre* and *Oenanthe pimpinelloides* may well deceive the unwary in regions where their 'shadow' species are to be expected.

The hardest discipline for any compiler, indeed, is to avoid being hypnotized by names. Names are a *sine qua non* of records and records are his or her working material. The first impulse is always to grasp this handle, therefore, and use it to ease the record into its appropriate slot in the filing system. Yet the handle may be not merely cracked, but attached even to the wrong piece of ware. So great can be the sheer pleasure of compiling to those so disposed by temperament that the overriding need for taxonomic alertness may come to be overlooked. Arthur Bennett (1901) accepted at least one or two new vice-county records for non-critical species on the strength of voucher specimens which, examination of his herbarium (now in **BM**) has since shown, were incorrectly determined. Perhaps his taxonomic ability lacked the necessary comprehensiveness, possibly he was swamped by the sheer mass of material sent to him, more probably he allowed himself to be dazzled by the namings of the confidently authoritative. Many lesser botanists have erred likewise, accepting too obsequiously the pronouncements of supposed experts. Even that special aura which the national institutions have long possessed in this respect has not alway been deserved, for at times they have overlooked that even routine determination requires the knowledge to discern what is not routine: to recognize the inexplicitly critical.

Finally, and suitably at the bottom of the list, there is the all-too-ample category of fraud pure and simple. This takes on an uncomfortable variety of forms. Lowest in the scale of heinousness – for it *may* only be due to oversight – is the attributing of the wrong provenance to specimens. The likeliest motive for this is commercial profit: it is lucky, therefore, that, even in the heyday of private herbaria, outstanding botanical rarities never acquired auction-room price-tags after the manner of shells or Lepidoptera. Even so, rarity did have pecuniary possibilities for professional collectors and nurserymen, and one or two of the latter at least are under strong suspicion of having succumbed. The one most often accused, rightly or wrongly, is the elder George Don; but James Dickson, similarly respected as a botanist, seems to have been an offender in more than one instance as well. In his series of exsiccatae, *Hortus siccus britannicus*, he was rash enought to distribute specimens of *Tuberaria guttata* bearing the label 'Sandy fields, Isle of Man'. Unluckily for him, this was not only a blind copying of a book error, but his material was glaringly dissimilar from the subsp. *breweri* of all the known stations for the species in Great Britain and Ireland and must therefore have been raised from seed obtained from Channel Isles or Continental populations. In his defence Dickson might have argued that his specimens were intended to be only illustrative of what might be procured in the localities indicated. He could also have pointed to the frequent contemporary vice of copying out the locality from a Flora before obtaining a specimen to grace the sheet reserved for the species in the herbarium (after the manner of many a stamp album). Even so eminent a figure as Professor Robert Graham appears to have stooped to this in the case of *Phyllodoce caerulea*, as from the published accounts of his excursions it seems he never visited any of the places from which his material is localized (Nelson 1977). It is conceivable, too, that some collectors who brought back plants from the wild to join the cultivated stocks in their nurseries or gardens became muddled about what came from where, in all innocence. This is the charitable explanation some have put forward to account for the highly dubious localities attributed to some of his specimens (one or two of species not otherwise known from the British Isles) by the very respectable William Andrews, Chairman for many years of the Natural History Committee of the Royal Dublin Society (Corry 1883, Salmon & Baker 1926). The distribution through the Botanical Society of London by the Plymouth botanist, John Banker of *Allium triquetrum* labelled '*Leucojum aestivum*' and purporting to be from the Isle of Dogs (Syme 1869) is rather more credibly explained in these terms too. At the same time it should not be forgotten that the extra leverage that the submitting of valued desiderata produced in the share-outs of the exchange clubs provided a motive for cheating that was quasi-commercial.

Other, more undoubted forms of fraud range from counterfeiting of records, by planting specimens in the wild and then supposedly discovering them – of which there have been several well-known cases – to that special form of plagiarism which consists in passing off as one's own the records of other workers. Of this T. H. Cooper, the nominal author of early lists for Sussex and Nottinghamshire, has recently been unmasked as a particularly brazen exponent (Allen 1979). So far as is known, though, only one British botanist has descended so low as to fabricate the very specimens themselves. In Jersey there survives a collection in which several of the *Rubus* species, apparently in desperation, have seemingly been concocted from halves of two different ones (the species concerned being unlikely to have been growing intermingled in nature) in an ingenious effort to match authenticated exsiccatae or plates.

This long recital of woes and slips is more than sufficient to demonstrate how thin may be the ice that we are accustomed to place our weight on – and how pertinacious may need to be its testing. Yet the compiler's responsibility does not end just with the identifying of erroneous data. For any error that happens to have been published must also be put through the ritual of exposure publicly. The conventions of scholarship demand that print must be answered by print. It is unacceptable for compilers to suppress by omission: to expect their readers to take on trust that they have combed the literature with proper thoroughness and have found good reasons for not including every earlier published record that fails to find a place in this latest work. However blatant the errors, however obscure the publications they appeared in, it is difficult to see how this fundamental canon can be disregarded, costly though it may be today to correct even the careless trivia of an earlier age of inexpensive print.

At the same time, if the public exposure is to be adequately effective, the deed should surely be performed unmistakably. Records that are not to be relied on should be indicated as such quite clearly – for which purpose the time-honoured square bracket is conveniently available. One recent local Flora snares the unsuspecting reader into long and engrossing accounts of not a few species which turn out only at the end to have no claims to have occurred in the area at all in the first place. The task of rooting out error is beset with difficulty enough without the compiler himself hiding away his own successes in an undergrowth of ambiguity.

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A guide to finding the localities of British plant records

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ABSTRACT

An account is given of the problems encountered while attempting to trace the localities for a large number of herbarium specimens from Britain, and a guide is presented on how this may be done.

INTRODUCTION

In the course of a pilot project to find the feasibility of producing a computerized catalogue of a herbarium, it was decided to find the grid references for all specimens and add them to the herbarium labels. This would allow the data to be used by the computer to plot distribution maps, which would not be possible from locality names alone. The sample chosen was some 12,000 specimens of British Caryophyllaceae in the British Herbarium at the British Museum (Natural History). These were chosen as they were the next group due to be remapped by the Biological Records Centre. Much experience was gained in the matter of finding localities on the map, as very few of the specimens were already provided with grid references. Writers of county Floras and recorders in general must also face this problem on occasion, and it is hoped that the following guide will prove useful.

GAZETTEERS

The principal and most useful gazetteers are those published by the Ordnance Survey (1953, 1972), with which grid references can be found directly. Even so, these gazetteers are based on a map series of quarter-inch scale which does not include some of the place names on the commonly used one inch, $2\frac{1}{2}$-inch or 1:50,000 scale maps. An alternative is the new Bartholomew gazetteer (Mason 1977). Neither of these includes Ireland. The more recent editions are not necessarily more useful than the older ones. Some famous botanical localities are omitted, e.g. the Ordnance Survey does not give Cwm Idwal, and the reference given for Clova is not the 'right' one. The Ordnance Survey has two ways of labelling 100 km squares, by two letters or two numbers. The difficulty with the use of numbers is that the British Isles are more than 1000 km long from north to south, so that the second digit repeats. The Ordnance Survey get over this by adding a letter N for the far north, e.g. N30 for Orkney as opposed to 30 for part of Dorset. The Biological Records Centre recommends the use of numbers for labelling the 100 km squares, and uses its own numbering scheme for the northern squares, and for the Irish national grid (Heath & Scott 1972).

If the locality to be found is in Wales, then there exists the ideal gazetteer (Ellis 1968). This is based on the one-inch Ordnance Survey maps, together with other sources, and has proved to be better than any other reference. Certain county Floras give lists of localities with grid references, and these have also proved very useful. Those used include Floras for Wiltshire (Grose 1957), Essex (Jermyn 1974), Berkshire (Bowen 1968), Bedfordshire (Dony 1953), Gloucestershire (Riddelsdell *et al.* 1948), Staffordshire (Edees 1972), Rutland (Messenger 1971), Moray (Webster 1978) and Kintyre (Cunningham & Kenneth 1979). All these date from after 1947, when the national grid system was introduced.

Other gazetteers exist which do not give grid references, but which give localities as a distance and direction from some prominent town or other landmark. The exact locality can then be found with the aid of a map. The best of these, in spite of its age, is that of Bartholomew (1887), which has the advantage that Ireland is included. More specialized street maps, such as those for the London area, can also be useful. The census index of place names (H.M.S.O. 1955) only covers England and Wales, and gives only the names of settlements, omitting rivers, mountains and other features. The index quotes the name of the next larger administrative unit (parish or town, etc.), and so can give a hint as to where to search on a map for the exact locality. This is still useful, in spite of the name changes brought about by the Local Government Act of 1972. Finally, the publications of the English Place-name Society, from 1924 onwards, have helped in difficult cases. Volumes are available for only certain counties so far, but are well indexed and cover a long period of history.

One problem which no gazetteer can help with is that of homonyms, unless there is other evidence. An obvious example is the English place name Newton, of which there are more than 30, with more than one per county in some instances. Synonyms also occur, but are not common. Instances where settlements have changed their names are rare, but there are difficulties with English translations or transliterations of names in Gaelic or Irish. Examples of where this has caused difficulty are Angel's Peak (same as Sgor an Lochain Uaine, Cairngorms) and Conival (same as Coinne-Mheall, Sutherland).

MAPS

If gazetteers and other reference books are of no help, it may be worthwhile to search on a map, provided there are some other clues. If one knows the county or district name, this may give a start, or if the plant has a definite habitat, such as coast, mountain or riverside, this can restrict the search. Apart from the currently available maps of various scales, it may be better, especially for older specimens, to use older editions. The Ordnance Survey maps of the 19th century (e.g. 1898 edition) have been valuable in this respect. Many development features, such as reservoirs, roads, airfields, housing estates and the like can obliterate localities and their names, and useful landmarks for naturalists of earlier times, especially railways and railway stations, can have been destroyed.

Once a locality has been found, it is fairly easy to allocate it to the correct Watsonian vice-county by using the guide and maps prepared by Dandy (1969). One should be aware that political county boundaries have changed repeatedly, and are often different from the Watsonian boundaries.

INDIRECT METHODS

Duplicate specimens from the exchange clubs have proved to be badly or illegibly labelled from time to time, and on several occasions it has proved worthwhile to look up the club report, e.g. of the Botanical Exchange Club, or the Watson Botanical Exchange Club, in order to get more details. This can be done if the approximate year is known, but care must be taken as they often contained mistakes.

Badly labelled specimens also have sometimes been better cited in Floras, and this has sometimes enabled the label to be interpreted and expanded. Cases of this have occurred in Herb. Alfred French, cited by Druce (1927), and with the herbarium of Hugh Davies, cited by Davies (1813), both at the British Museum (Natural History).

One reason why specimens may have incomplete locality information is that the collector never anticipated that his or her material would be kept for posterity, and used local names which were of places close to home e.g. 'in the churchyard'. If this is the case, and if one can discover where the collector used to live, then the locality can be looked for on a suitable map. For example, some of the collections of D. Martha Higgins are labelled 'London Road'. This is not very helpful, unless one knows that she lived at Luton. Similar examples are of I'Anson from Darlington and E. Hodgson from around Ulverston. Some information about who collected where is to be found in the herbarium index by Kent (1957).

Finally, it sometimes happens that another specimen can be found, taken by the same collector at the same place and time, where the latter is more completely labelled, and which will help to locate the former. Such a find is largely a matter of luck, unless a computerized herbarium catalogue is available.

Sometimes the problem is not that the locality cannot be found, but that it cannot be read! Practice and familiarity will help, but large institutions such as the British Museum (Natural History) have collections of botanists' handwriting samples to help solve problems of illegibility.

REMAINDER

A card index was made of all the localities which were not in any gazetter but which have somehow been located nevertheless. These amount to about 3% of all specimens examined. There is also a residue of untraced localities, amounting to about 70 in 10,000, or 0.7% of the total. It may be possible to resolve some of these by appealing to the general knowledge of botanical colleagues and friends. Another possibility is to approach local government planning departments, or a county archivist (if there is one), in cases where the county of origin is known. In most of these there is no indication of the county, so that it is not possible to approach a local person. Some of the localities must be permanently untraceable, such as the classic example of the sheet which is labelled 'on hill in Scotland'.

It might be supposed that the older specimens caused the most difficulty, but this is not necessarily the case. One 18th-century specimen of Davies was localisable to within 100m, whereas a specimen collected in Wales in 1950 has remained untraced. In the latter case, the collector himself has been asked, and cannot recall the locality! The moral for modern collectors is always to quote a grid reference.

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Short Note

THE DISTRIBUTION OF *CAREX ERICETORUM* POLL. IN BRITAIN

Carex ericetorum is a plant of open, generally calcareous heaths. It ranges from the eastern Pyrenees and southern Alps to Norway and northern Russia, and extends well into Siberia. Like the related *C. montana* L., it reaches its north-western limit in England, but its distribution here, as in the rest of Europe, is more northern and eastern than that of its ally.

In Britain this sedge has a curious history. A specimen gathered near Cambridge in 1833 (not 1838 as originally stated) was not correctly determined until 1861 (Sowerby 1863). Subsequently a specimen sent in 1829, as *C. pilulifera* L., to Sir W. C. Trevelyan from Mildenhall Heath, West Suffolk, was found to be *C. ericetorum*, and it is probable that Sir J. Cullum's '*Carex montana*' from Newmarket Heath in 1775–76 was also this species (Bennett 1910). By the end of the nineteenth century it had been discovered in half-a-dozen more places in East Anglia and was regarded as very much a plant of that region. A new chapter opened in 1944, when E. C. Wallace found it in Yorkshire, and it is now known in a dozen northern and north-western localities. It is highly probable that it occurs in many more but has been passed over as *C. caryophyllea* Latourr., its regular associate in almost all its British stations. When in flower the two are instantly distinguishable, for the purplish, slim, more regularly cylindrical male spike, and the rounded female glumes of *C. ericetorum*, purple with a broad, scarious, often ciliate margin, are very different from the tawny, markedly clavate male spike and acute, unbordered female glumes of *C. caryophyllea*. In the vegetative state I have so far failed to find any certain distinctions. In northern populations the leaves of *C. ericetorum* tend to be broader than those of *C. caryophyllea*, coarser in texture (often with a distinctly rugose surface), of a darker and duller green, and with a broader and more regular scarious margin; but these characters are not so evident in the south.

C. ericetorum requires a higher lime-content in the soil than does *C. caryophyllea*, and in East Anglia is found only in the more calcareous patches of the Breck. It is as sensitive as is *C. montana* to disturbance of the woody rhizomes, and has evidently been lost in some of its old sites as a result of agricultural improvement or of trampling by more frequent visitors. All known British stations have been surveyed since 1970 and are listed below, the present numbers of the sedge in each being indicated by the letters A = 1 to 20, B = 21 to 100, C = 101 to 1,000, D = over 1,000. Where the plant has not been refound, the date of, and authority for, its last known sighting are given. The authenticity of the specimens cited is confirmed by me.

W. Suffolk, v.c. 26: 52/7.6, Risby (B); 52/7.7, Icklingham (B); Eriswell, Foxhole Heath, main area ploughed *c.* 1960 but the sedge lingers on roadsides (B); Elveden, Weather and Horn Heaths, to 1917, **BIRM**, **BM**, **CGE**, **K**, **OXF**; 52/7.8, Lakenheath Warren (D); 52/9.8, Knettishall Heath (B).

W. Norfolk, v.c. 28: 52/7.8 and 7.9, Weeting Breck (D); 52/7.9, Foulden Common (B); Cranwich (Petch & Swann 1968), apparently extinguished by scrub; 52/7.9 and 8.9, Grimes Graves (C); 52/8.8, Jubilee Wood, Croxton, 1968, Miss D. M. Maxey in Breckland Survey; may be the same as Santon, 1880, **BM**; Thetford, 1947, **CGE**, **K**; 52/8.9, Bodney Warren (B); 52/9.8, Garboldisham, Devil's Dyke, 1975 (E. L. Swann *in litt.* 1977), relict from a larger colony ploughed *c.* 1965; 53/7.0, Gooderstone Common (B); 53/8.0, Cockley Cley (Petch & Swann 1968), apparently destroyed by disturbance of the road-verge; may be the same as 'near Swaffham', 1924, **BIRM**, **CGE**, **OXF**; 62/0.8, East Harling, destroyed by pig-farming *c.* 1970.

Cambs., v.c. 29: 52/4.5, Gogmagog Hills, to 1892, **BIRM**, **BM**, **CGE**, **K**, **OXF**; 52/5.5, Fleam Dyke, 1965, **CGE**; West Wratting (A); 52/6.6, Newmarket, Devil's Dyke (A); may be the same as 'Newmarket Heath', 1904, **OXF**.

S. Lincs., v.c. 53: 43/9.4, Ancaster (A).

N. Lincs., v.c. 54: 44/9.1, Broughton (A).

Derbys., v.c. 57: 43/5.7, Markland Grips (A).

W. Lancs., v.c. 60: 34/4.7, Silverdale, 7 places (A, A, A, A, B, B, B).

S. W. Yorks., v.c. 63: 43/5.8, Anston Stones (A); 44/4.1, unlocalized and unconfirmed record, 1950, C. M. Rob, in Biological Records Centre almost certainly refers to Wentbridge below; 44/5.0, Brodsworth (A); 44/5.1, Wentbridge (B).

Mid-W. Yorks., v.c. 64: 44/3.4, Hetchell Crags (Tennant 1959) last seen *c*. 1976 (S. Warburton *in litt*. 1978); Linton Common, 1946 (Lousley 1950), site built on *c*. 1965; 44/3.6, Burton Leonard (B); 44/4.4, Jackdaw Crag Quarry, 1946 (Shaw 1947), quarry enlarged and site destroyed *c*. 1965.

N. W. Yorks., v.c. 65: 35/8.2, Cronkley Fell (D).

Co. Durham, v.c. 66: 35/8.2, Widdybank Fell (C); 35/8.3, Cow Green (B), site submerged *c*. 1970; 45/3.3, Thristlington (Heslop-Harrison 1954), a doubtful record never confirmed and site now threatened by quarrying.

Westmorland and Furness, v.c. 69: 34/4.7, Arnside, 2 places (B, C); Hazelslack (B); 34/4.9, Scout Scar (C); 35/5.1, Long Scar Pike (B); 35/6.1, Orton: in 1967, having just seen the sedge at Scout Scar, I gathered a single stem on the lowest terrace of Orton Scar. This was determined by A. C. Jermy, who commented (*in litt.*): 'good ericetorum . . . besides the character of ciliate glumes the darker colour of the ♂ glumes is a good indicator'. Unfortunately the specimen was not preserved and the plant has not been refound despite repeated search of the terraces, which are heavily cropped by sheep; but the record is in some sense corroborated by the discovery of the sedge in 1978 in Crosby Gill (C).

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R. W. DAVID

Book Reviews

Landscape history and habitat management. Edited by J. MacConnell. Pp. 48. South Essex Natural History Society, Leigh-on-Sea, 1980. Price £1·50 plus 25p. postage & packing from the editor, 17 Canonsleigh Crescent, Leigh-on-Sea, Essex.

Although this booklet consists of eight papers from a 'Symposium on Land Use and Habitat Management in South Essex', its contents are of great relevance to botanists and conservationists throughout the British Isles. The longest papers are one on 'Woodlands and their Management' by O. Rackham, into which is packed an immense amount of historical and explanatory information linked with very practical advice on management, and one on 'Coastal Sites and Conservation' by D. H. Dalby, giving a clear account of the development of and human pressures on salt marshes and mud flats. The shorter papers include two of primarily local interest, on 'The Essex Landscape' and on 'Biological Conservation', but also papers on ponds, hedgerows and churchyards which should do much to encourage interest in and conservation of these often neglected but very numerous, accessible and rich habitats. Hooper's method of dating hedges by the number of woody species they contain is mentioned; workers in other parts of the country should be recommended to follow Hooper's own advice that the applicability of the method needs checking by historical research whenever it is used in a new area. F. J. Bingley's approval of controlled grazing by sheep in churchyards should be welcomed in parishes where the rest of the 'flock' is not strong enough to support his optimum management of three cuttings a year. The final paper is a guide to surveying the landscape and wild life in a parish, as stimulating and practical as the rest of the papers. The whole booklet cannot be too strongly recommended to all who want to learn about and help preserve the vegetation and other features of the landscape.

A. O. Chater

Aspects of the structure, cytochemistry and germination of the pollen of rye. J. Heslop-Harrison. Pp. 47, with 18 black & white plates. Supplement No. 1 to *Annals of Botany*, Vol. 44, 1979. Academic Press, London. 1980. Price £7·80 (paperback).

Although the grasses are by far the most important group of plants from the economic point of view, there are still many vital aspects of their biology that we understand hardly at all. One area of ignorance that has been forcibly attacked in recent years is reproductive biology, and Professor Heslop-Harrison has been prominent here. This monograph is an extended report of recent work on the changes that rye pollen undergoes as it germinates. These changes are far-reaching and astonishingly rapid; within two or three minutes of the beginning of hydration, for example, the membranes of the grain have been completely reorganized. To follow such speedy but subtle processes requires sophisticated equipment and, most of all, brilliant experimental technique. This is exactly what Heslop-Harrison excels at, and the result is a paper that links morphology at the ultrastructural level with physiology and cytochemistry to explain the working of the pollen grain at this most critical stage.

This is not an easy read; there are no concessions here to readers who are not fully conversant with the subject matter. It is, nevertheless, an elegant record of a wide-ranging investigation with very important results. There are few papers for which the cynical question 'So what?' is immediately answered. This is one of them.

G. C. S. Clarke

Atlas Florae Europaeae: Distribution of vascular plants in Europe, **4**: *Polygonaceae*. Edited by J. Jalas & J. Suominen. Pp. 71, with 94 maps. Published by the Committee for Mapping the Flora of Europe and Societas Biologica Fennica Vanamo, Helsinki. 1979. Price *c*. £9·85.

This is the fourth volume in the series undertaking the task of mapping the flora of Europe using the 50 km square unit of the U.T.M. grid maps as the basis for occurrence. This, the second volume for Dicotyledones, maps *c*.100 taxa of Polygonaceae, including several aliens for which European maps have not previously been available. As in the preceding volumes, helpful introductory notes explain the mapping techniques used and deviations therefrom. All deviations from *Flora Europaea* (Vol. I, 1964) regarding taxa included are noted, as are nomenclatural differences. The treatment of generic segregation in this family mostly follows *Flora Europaea*; but, though *Fallopia* is used *in lieu* of *Bilderdykia, Aconogonum* is not (for *P. molle* and *P. polystachyum*, cf. H. Hara, *The flora of eastern Himalaya*, p. 631, 1966). Under the entries for individual taxa are further useful notes on taxonomy and nomenclature which give recently published views and facts; the distributional information is also updated. References up to 1978 are cited.

The enormous labour of compiling and checking that lies behind these splendid maps makes invidious any mention of omission or error, but I feel obliged to point out that, on Map 419 (*Polygonum molle*), the entry from Lincs. refers in fact to the hairy variant (var. *pubescens*) of *P. polystachyum* (A. P. Conolly in *Watsonia*, **11**: 306, 1977). Surprisingly there is no map for another alien, *P. campanulatum*, which surely has as much justification for inclusion as *P. amplexicaule*. It is disappointing that taxonomic grounds precluded the mapping of segregates of *Rumex acetosella*.

All concerned with plant distributions, as well as taxonomists, will need to consult these volumes. One can but congratulate the team on this splendidly produced volume and await the speedy continuation of the series, which alas to date has covered only about a quarter of the first volume of *Flora Europaea* in the eight years of publication.

A. P. CONOLLY

Plants and islands. Edited by D. Bramwell. Pp. x + 459, with 84 text-figures. Academic Press, London. 1979. Price £24·00.

Plants and islands is not an all-embracing treatise on island phytogeography; it is not in the style of S. Carlquist's *Island life* (1965) and *Island biology* (1974), nor does it deal directly with the theories argued by R. H. MacArthur & E. O. Wilson's *The theory of island biogeography* (1967). It is the published papers of an International Symposium with the same title held in Las Palmas de Gran Canaria in 1977 to 'celebrate the 25th aniversary (*sic*) of the foundation of the Jardín Botánico "Viera y Clavijo" '. Naturally, considerable emphasis is given to the Macaronesian flora and, in particular, to that of the Canary Islands; consideration of these topics takes up five of the 23 chapters. All 23 are prefaced by a summary in Spanish; they are arranged in four sections respectively entitled Origins, Endemism and Evolution, Special Topics, and Conservation. Flowering plants take precedence; but there are papers on the lichen flora of New Zealand (Galloway), the fern flora of the Antilles (Tryon), and the evolution of *Dryopteris* in Macaronesia (Gibby). Geographically there is a world-wide range, though little from northern areas. Oceanic islands take prominence by design; Continental shelf islands are excluded.

The volume 'deals with the inter-relationship between plants and islands', but over-riding all themes is the dire need for conservation. As Bramwell comments in the Preface and Introduction, 'the vast majority of island biota are . . . under serious pressure from the activities and influence of Man who is destroying their natural ecosystems at an alarming rate'; moreover, a 'disproportionately large number of the world's endangered species are insular endemics'; and, although some extinctions may be inevitable, there is urgent need for drastic action at international level if at least some of the world's island specialities are to be saved. Melville outlines some of the disastrous results of Man's introductions: of goats, of crops (and attendant forest clearance) and of invasive weeds; Synge and Lucas the respective rôles of Botanic Gardens and of the I.U.C.N; and van der Werff and Rauh the need to preserve vegetation types.

Man apart, the infinite variety in the present floral complement of the world's islands sets problems of assessing factors affecting constitution and relation to other floras, problems of how islands got their flora and the manner of its change with time: the evolution of endemic taxa both *in situ* and prior to immigration. These are the themes expounded in the sections on Origins and on Endemism and Evolution. Moore, with examples from Cool Temperate islands, looks at environmental stability and instability in relation to evolution of new floras and extinction of others; Greuter sees the evolution of the Aegean island floras in the setting of climatic fluctuation, land and sea-level changes and past orogenic events, and emphasises fossil evidence of past ranges. Except for Sunding (on the Macaronesian flora) and Cardona & Contandriopoulos (Endemism in West Mediterranean islands), few contributors either seem aware of the need to consider this fossil evidence or refer to the geohistorical background. Studies backed by modern taxonomic methods, incorporating chemical data or cytological work, are particularly interesting. Borgen gives the results of an extensive karyological investigation of Canary Island taxa; while Green, in an account of the New Hebrides *et al.*, indicates how sound taxonomy and new exploration can change ideas of geographical affinity, fill gaps in previous wide disjunctions and remove endemic status. The importance of ecological diversity, as the major influence on species diversity and in providing the localized microhabitats for evolution of endemics, is stressed throughout.

The section on special topics is the most stimulating; here the highlight must be Guédès's controversial and provocative plea for a halt to our ready acceptance that primitive angiosperms can be represented by living forms (*Degeneria* or other Magnolioid tropical plants) or as originating millenia ago on geologically recent islands. Ehrendorfer considers strategies concerned with arrival by long-distance dispersal, establishment of founder populations, and insular evolution as it affects the breeding system, pollination, and floral and seed biology. Mabberley discusses conceptions and misconceptions about pachycaul plants, criticizing the glib assumption that they are the prerogative of islands and belong to predominantly herbaceous families; and Aldridge outlines possible lines of evolution in the woody endemic Canary Island species of *Sonchus*, based on anatomical and morphological evidence.

It has been difficult to choose papers for comment because so many claim it; the more provocative are a challenge to ready acceptance of orthodox notions, the more factual will serve as a handy source of data. Although the volume is well-produced and edited, a number of errors have still crept in; several mar Humphries' account of Macaronesian endemics, the most serious relating to figures and tables, e.g. the table on p. 173; and an error in the figure on p. 335 leads to difficulty in comprehension of the text. This most worthy book is strongly recommended to all taxonomists, biogeographers and those concerned with floras and evolution of taxa. It will surely be cited as frequently as D. H. Valentine's *Taxonomy, phytogeography and evolution* (1972). One is left with the sad realization of man's destructiveness, but also with the challenge to save an iota of island biota for posterity.

A. P. CONOLLY

The experimental biology of ferns. Edited by A. F. Dyer. Pp. 657, with numerous black & white photographs and diagrams. Academic Press, London. 1979. Price £37·50.

The sixteen contributors to this volume have done a signal service to the science of pteridology. As the title implies, the emphasis in most of the chapters is on experimental work. Bower, who dismissed the gametophyte generation as 'far behind the sporophyte as a source of trustworthy material for phyletic argument', might have been surprised to see that over half the book is devoted to the gametophyte or the spore. This emphasises a recent trend in experimental work away from the fern sporophyte towards the gametophyte.

The diversity and ubiquity of ferns, and their ability to colonize unfavourable habitats, are emphasised in the two chapters by C. N. Page. Three years after Krakatau had erupted, 11 species of ferns had established themselves, and 50 years later the number of species exceeded 60. In a chapter on cytogenetics, T. G. Walker points out the often neglected fact that the tolerances of gametophytes and sporophytes of the same species are not identical. E. J. Klekowski gives a lucid survey of fern genetics, and there is a scholarly discussion of life cycles of ferns and heterosporous plants by P. R. Bell. He is concerned among other things with the various barriers that are set up around cells or groups of cells, which may allow preparation for the next phase of growth.

A fascinating account by J. M. Pettitt of spore wall morphogenesis, with particular reference to *Botrychium*, leads J. Heslop-Harrison to ask in his excellent introductory chapter what purpose the sculpturings of the various wall layers may have. The ultrastructure of gametophyte cells is well described by D. G. Cran, but proves disappointing, in that protonemal cells largely resemble the cells of angiosperm leaves. A. F. Dyer himself contributes a chapter on the culture of fern gametophytes, which is largely technical but contains an abundance of useful advice; together with M. A. L. King he also provides a detailed, well illustrated account of cell division in the protonemata of *Dryopteris pseudomas*, arguing persuasively that fern gametophytes furnish excellent material for further studies of relationships between cell division and development. In a consideration of various aspects of differentiation in gametophytes, D. L. Smith reviews histochemical work; and both he and G. P. Howland & M. E. Edwards, in the following chapter, discuss the effects of hormones and other factors on spore germination and early stages of development, and also the problem of the transition to two-dimensional growth. The unique ability of antheridiogens to induce a specific type of development – antheridia – is recounted in all its remarkable complexity by U. Näf, in a chapter which breaks little new ground. Complex, too, are the events of gametogenesis, fully described and illustrated by P. R. Bell.

Opposing viewpoints on the organization of sporophyte shoot apices, and on leaf determination, are presented by R. A. White but not really resolved. Finally, W. W. Fletcher & R. C. Kirkwood deal with the biology and control of bracken, now known to have carcinogenic in addition to various other toxic properties.

This book forms a very useful and up-to-date survey of experimental work on ferns, which will be helpful to pteridologists and others if only for the large number of references that it contains. The editor has succeeded in welding the various contributions into a viable whole. Presumably it is the publishers who must accept responsibility for the appalling reproduction of electron micrographs and some light micrographs. Although the book is printed on glossy paper, which no doubt contributed to its high price, many micrographs are so dark as to be virtually indistinguishable. Where the background is a uniform dark grey, presumably this can only be attributable to the printing.

The reader is left not only with admiration for many of the contributed chapters, but with considerable respect for the ferns themselves; restricted they may be to some extent by having one foot on land and the other in water, but they have not failed to make the most of their ecological, developmental and evolutionary opportunities.

E. G. Cutter

Orchids of Britain. A field guide. David Lang. Pp. iii + 213, with 32 colour plates, 10 text-figures and 49 distribution maps. Oxford University Press, Oxford. 1980. Price £9·50.

My first reaction on seeing this book was 'Oh no, not another book on orchids!', as in recent times we have been fairly saturated with popular field guides to our native orchid flora. My second reaction was one of surprise that Mr Lang had entitled his book *Orchids of Britain* and yet also dealt in some detail with the Irish species, even to the extent of providing distribution maps for them at the back of the book!

This book is based on 28 years of field work by a veterinary surgeon and naturalist. It is obviously aimed at a wide audience; but, laudably, a reasonable attempt at a scientific layout is made. The book opens with a brief introduction, which includes references to conservation and on how to use the book. Its first part deals with the structure, life-history and general ecology of the British and Irish orchids, though regrettably no key to the identification of the species is given. This would, I feel, have greatly enhanced the value of the book. A useful summary of the classification used throughout the text follows, a classification which, I am glad to say, uses a rational approach to the plethora of Dactylorchids. The first part closes with a discussion of hybridization and hints on the identification of hybrids.

The bulk of the text consists of detailed descriptions of each orchid species, the diagnostic features of which are illustrated in fine colour plates. The descriptions are adequate and, though the author includes many of his own observations on habitats, biology and distribution, I could not help feeling that much of his material was second-hand and relied greatly on the texts of others. This is especially so for the Irish species, and he is decidedly evasive on their ecology. For example, *Ophrys insectifera* is recorded as occurring in Ireland 'strangely in some damp, marshy areas'. To all those familiar with the species in Ireland it is a fen and lake-margin plant. In short, data on the ecology of the Irish species are lacking except inevitably for the orchid flora of the Burren region. An irritating feature is the lack of proper citation of references in the text and bibliography and, in some parts of the text, the total absence of references dealing with pollinator visits.

The Dactylorchids are tackled with courage, each species being given a reasonable, though sometimes inaccurate, synonymy. However it is apparent that the author has not done as much homework as he might have. There are several inaccuracies with regard to the descriptions of many of the taxa, notably *D. fuchsii* and its allies. The misconception about *D. fuchsii* subsp. *okellyi* having 'slender leaves which are normally unspotted' is again repeated, whilst the author seems uncertain of the status of the Hebridean variant of *D. fuchsii*, calling it a variety on page 22 and elevating it to subspecific rank on page 117. Under the Marsh Orchids *D. incarnata* subsp. *coccinea* is said, in error, to be restricted to duneland habitats, whilst the Irish distribution of *D. incarnata* subsp. *cruenta* is said to lie only in the Burren region. The description of *D. traunsteineri* suffers from the omission of one of its key characters, that of possessing a deltate labellum. One might be prepared to overlook these errors due to the excellence of the plates, all but that of *Platanthera bifolia* being of good quality. The list of hybrids following the species descriptions is a valuable one.

However, it is the distribution maps at the back of the book which greatly detract from the usefulness of this text. Though adequate for Britain they are totally misleading for Ireland. We are told on the front flap that the maps are based on the most recent information from the Institute of Terrestrial Ecology. The vice-county number is figured in bold type if a species has been recorded from there since 1950. Why Mr Lang should have chosen this year as a criterion of assessing distributions is quite beyond me, as the result is little short of horrific. For example, though *Epipactis palustris* is recorded from 32 Irish vice-counties in the *Census catalogue of the flora of Ireland*, the maps in this book show it from only 19. *Neottia nidus-avis* has been omitted from 17 vice-counties, and the remaining maps of the Irish distributions are, likewise, seriously in error. Inconsistently, several post-*Census catalogue* records are included, yet the six new vice-county records for *Dactylorhiza traunsteineri* published in the *Irish Naturalist's Journal* in 1973 are ignored. These maps create a situation of utter confusion and make them worthless to anyone interested in the distributions of the native Irish species.

Most people wanting a general account of our orchid flora will find something of interest in this work, and the publishers are to be congratulated on what is obviously a well produced book. However the more serious botanist, looking for a succinct and accurate summary of the systematics, distributions and biology of our native orchids must, I regret, look elsewhere.

T. G. F. CURTIS

Wildlife introduction to Great Britain. A report by the 'Working Group on Introductions' of the U.K. Committee for International Nature Conservation. Pp. 32. Published on their behalf by the Nature Conservancy Council, London. 1979. Price £1·20, including postage.

The publication of this report should be warmly welcomed. It provides a concise and readable appraisal of a highly contentious issue, that of the introduction, reintroduction and restocking of species. It should perhaps be required reading for anyone about to debate the subject! Its strength lies in its lucid summary of the present *status quo*. There are chapters contrasting the possible benefits and potential hazards of introductions in general. There are also some very useful annexes, listing the present introductions policies of I.U.C.N., S.P.N.C., and W.W.F.; giving a summary of the species introduced and naturalized in Great Britain; and giving details–readily available for the first time so far as I know–of the legislation at present covering introductions to Great Britain. The chapter on evaluation is perfectly reasonable, stressing the need to keep the problem in perspective and for adequate assessment of the risks involved for both commercial and conservation interests. This is all good background material and will be particularly useful to anyone approaching this thorny area for the first time. However, the report will no doubt be criticized by those more familiar with the debate for not breaking enough new ground. The important questions are 'Who is to decide?' and 'How are they to control it?' The main recommendation under Policy Guidelines is for the setting up of an introductions authority to monitor the deliberate introduction of alien species and reintroduction of species now extinct here–easy enough to float the idea, but we are not given enough specific details.

The report covers a field much wider than the purely botanical; it is perhaps inevitably more concerned with beavers and Dutch Elm Disease. British field botanists don't really show a marked desire to naturalize alien plants widely (or do they?!), so that the argument for them centres more closely on the problems of re-introduction and restocking within this country. Unfortunately these are passed over rather lightly in the report as being relatively more acceptable – 'less emotive', and are deliberately excluded from consideration by the suggested Introductions Authority, being consigned instead to 'the best expert opinion available'. We still need something more definitive in this area.

D. Donald

The flora of County Carlow. Evelyn Mary Booth, assisted by Mary J. P. Scannell. Pp. 172. Royal Dublin Society, Dublin. 1979. Price £6·50 (boards); £3·50 (paper), including postage.

The publication of *The flora of County Carlow* is a landmark in Irish botany. It is the first Irish county Flora to be published for over 25 years; the first Irish county Flora compiled by a woman; and, perhaps more surprisingly, the first Flora of an inland Irish county.

It seems imperative to try to describe where Co. Carlow is, because shortly after this *Flora* was published no less than three eminent British botanists within the space of a week asked this of me. The answer is that it is in the south-eastern quarter of Ireland, about 50 miles south-west of Dublin and some 40 miles due north of Waterford. It is one of the smaller Irish counties and roughly triangular in shape, being 30 miles from north to south and some 16-20 miles wide in the north but only about 3 miles wide at its southern tip, and it has an area of 346 square miles. For the purposes of the *Flora* the county has been subdivided into five natural divisions based on the five physiographic regions of soils.

Introductory chapters include an excellent account of the history of botanical recording, accounts of the climate and geology and soils by specialists, a description of the botanical districts, sites of interest, trees and woodlands, and a list of common names. Then follows the main part of the *Flora* in the form of a traditional inventory of the native flowering plants and ferns and established aliens, accompanied by habitat notes and distributions within the county using the five districts described. There are short chapters by invited botanists on mosses, lichens, fungi and algae. The volume concludes with a very full bibliography as well as topographical and generic indices.

This *Flora* is a delightfully presented, simple work incorporating everything that is essential to a local Flora and providing that little bit more introductory information than is found in the otherwise excellent recently produced Welsh county and Isle of Man checklists. Pretentious innovations such as computers, vegetation analysis and complex correlations with dot maps and whatever, that have become the almost accepted style and fashionable expensive fare of many recent British local Floras, are absent. This in no way detracts from the usefulness of this contribution but, in fairness to the sophisticates, is a measure to some degree at least of our comparatively poor knowledge of the flora of Ireland. To me the perfect level of detail has been struck for a county that, in my view like all counties in the British Isles, is botanically interesting but cannot be said by any stretch of the imagination to be inspiring. In addition, it is to many geographically obscure. In my opinion this volume should be a model for treatment of the flora of a number of similar areas throughout the British Isles. For example the sporadic occurrence of *Blackstonia perfoliata* is excellently indicated, the decrease in *Primula veris* and the note and local name for *Chrysanthemum segetum* are delightful examples of the author's personal touch. Great emphasis has been placed on introductions and established aliens, which seems very desirable in a country and county which is undergoing rapid changes in agricultural methods and in industrialization. The large patch of *Cicerbita macrophylla* by the Dublin to Waterford road which caught my attention and fascinated me as a schoolboy 25 years ago is faithfully included as the only record in the county.

For the critical groups the aid of specialists has been enlisted wherever possible; some eleven dandelions are included, and the sedges, pondweeds and eyebrights are well treated. There is an interesting note on the birches of the county by Professor D. A. Webb. However, little attempt is made to deal with *Rosa* and *Rubus*. It seems to me rather unfortunate that the 'mainland' batologists cannot be persuaded to assist their Irish colleagues with the task of relating the generally rather few Irish brambles to their British counterparts.

One hesitates to offer any criticism, but one or two omissions are notable. The absence of *Berberis vulgaris* (admittedly now very probably extinct but certainly present in the recent past, as the *Atlas* bears witness) is surprising. *Geranium pratense* is not mentioned, though recorded in the 1972 *Census catalogue*; and perhaps more obscure and justifiably omitted is a record in the *Atlas* for *Bryonia dioica* as an introduction. The Charophytes, that unloved and apparently unwanted group, have been omitted (Praeger mentions some five species for Carlow), but this is in the traditions of most contemporary local Floras.

The consistency of the use of descriptive distributional terms is perhaps questionable; but one's concept of the meaning of rare, occasional, local, frequent, abundant and common is often highly individual and is a universal problem. A particular example is *Sorbus aria*, which is reported from four of the five divisions and given as 'rare', while *Asplenium billotii* is known from one locality only and is likewise 'rare'.

These are minor points in a splendid Flora which can be recommended to all at a modest price, and praise and hearty congratulations are extended to Miss Booth and her able assistant Miss Scannell on their achievement.

I. K. FERGUSON

The biology of flowers. Eigl Holm. Translated by Joan Tate. Edited and adapted by Ronald Melville. Pp. 140, with numerous illustrations by Thomas Bredsdorff. Penguin Nature Guides, London. 1979. Price £2·25.

This is an informative book which I found full of new or forgotten snippets of information on the many and varied mechanisms of pollination and fertilization. It is written in a non-technical style which, unfortunately, avoids the term incompatibility and any mention of endosperm formation, and presents a far from clear account of colour perception by insects. About a third of the book is in fact devoted to insect pollination mechanisms, with particular emphasis on honey- and bumble-bees. There are a number of minor errors: for example, the impression is given that the pollination system of *Primula* is simply a mechanical one and not an incompatibility system as in *Lythrum*; and we are told that *Cypripedium* survives in two areas in England, and (probably a mistake in translation) that *Agave* and *Rosa rubiginosa* are natives of the Mediterranean area and New Zealand respectively! The diagram (p. 135) of types of pollination mechanism within a single family fails to mention the family (Polemoniaceae). *Pinus* is included in the flowering plants.

A major difficulty in using the book is the uniform type of the headings, yet the Contents page indicates a two-tier hierarchy and in reality there are three. This is very confusing. Furthermore, certain topics are discussed more than once, self-pollination for example, and very distracting is the way in which the text is interrupted by usually two pages of description for each of the 18 species used as examples.

The book is marvellously illustrated; in fact it is well worth buying for the illustrations alone, which are both beautifully painted and faithfully reproduced.

G. HALLIDAY

Wetmoor Nature Reserve – a guide. Edited by George Hendry, illustrated by Liz Pleydell-Pearce. Pp. 56. Gloucestershire Trust for Nature Conservation, Church House, Standish, Stonehouse, Glos. 1979. Price £1·00 (£1·20 including postage).

This Handbook, the third in the series of Gloucestershire Trust Reserve handbooks, is a very handsome production, with delightful stylised illustrations (drawn by Liz Pleydell-Pearce) that have attracted an award for her from South West Arts. An extremely interesting and authoritative narrative of this 'Damp Oakwood' reserve, its fascinating history, geology, wildlife and management, is followed by check-lists of the flora and fauna in 20 Appendices prepared by specialists, mainly from the University of Bristol.

Wetmoor Nature Reserve, now in the north of the new county of Avon, was bought by the Gloucestershire Trust in 1967 with the help of the World Wildlife Fund when Wetmoor was part of Gloucestershire. It lies in the heart of the ancient forest known as Lower Woods, the last intact oakwoods in the Vale of Berkeley, which extend for about 750 acres on both sides of the Little Avon River. The woods are on heavy poorly-drained clay, which is indicated by their ancient name of *Horwudu* (Horwood), the muddy wood. They have been managed for centuries as coppice-with-standards and controlled grazing. The trees are predominantly Pedunculate and Sessile Oak (*Quercus robur* and *Q. petraea*) and there is much Wild Service-tree (*Sorbus torminalis*). Of the 193 species of vascular plants recorded perhaps the most interesting to the botanist are *Epipactis purpurata* and *Agrimonia procera*. Some 68 species of lichen have been determined and, although there are no rarities recorded, the abundance of species intolerant of atmospheric pollution indicates that pollution levels in the Reserve are relatively low.

The map shows the whole of the Lower Woods S.S.S.I.; it is a pity that it does not include the National Grid or mark the boundaries of the Reserve area, which consists of three distinct woods totalling 750 acres.

I recommend all who are interested in our countryside and the scientific study of a particular habitat to purchase a copy of this informative and attractive Guide.

S. C. Holland

Vegetation dynamics. John Miles. Pp. 80, with 29 text-figures. Outline Studies in Ecology. Chapman & Hall, London. 1979. Price £1·95.

The dynamic approach to plant ecology is certainly stressed in this book, the view being that succession is a continuous process in which there are relatively stable patches; but even this stability conceals a flux of changing distributions. As a concomitant of this approach, process rather than classification is emphasised. In fact, many of the traditional classificatory concepts are at last being questioned in an introductory work. Thus, not only is the climatic climax discarded, but also the whole concept of succession being a deterministic sequence of clear-cut communities leading to a particular climax is regarded as of limited applicability. Instead, what actually happens in any particular case is shown to depend greatly on probabilistic properties of the site, such as the amount and type of buried seed and of seed 'rain'. It is emphasised that dominant species of the later stages of succession are usually present early on, but are slow-growing; and so the facilitation by one species of the invasion of another, as in Clements's classical description, is held to be much less important than was formerly supposed.

As is to be expected with this approach, the processes of succession are treated in a separate chapter, which is the longest in the book and precedes consideration of actual examples. It contains a lot of interesting material in discussions of propagule dispersal, colonization, establishment and competition, including in the last an account of allelopathy, a topic which, despite methodological problems, merits more serious consideration than it usually receives.

The chapters discussing vegetational changes on various time-scales are, in general, very good; particularly commendable is the inclusion of a section on short-period fluctuations. However, I would have expected more on phenological changes. The prevernal species of deciduous woodland are not even mentioned in a section which refers to the less familiar phenological changes in American prairie grassland and tropical rain forest. Secondary succession has a comparatively large amount of space devoted to it, which is particularly welcome considering the ubiquity of examples available for study. The author stresses the danger of extrapolation from an observed situation in space to a sequence of changes in time and refers to more critical recent work which has led to the rejection of the classical descriptions of the lithosere, hydrosere and hummock/hollow cyclical changes in *Sphagnum* bog.

This is a thoughtful, stimulating introduction to the subject at advanced undergraduate level, usefully including over 300 references and, thankfully, an index.

D. R. Larner

Flowerpot gardening. Grete J. Hertz. Pp. 22, with numerous coloured illustrations. Longman, London. 1980. Price £2·75 (cased).

The publishers claim that the text of this book 'not only explains the basic facts and botanical principles which often puzzle small children but also gives clear, easy to follow instructions on how to grow their own plants.' The book is well illustrated, and the horticultural instructions appear to be sound as well as clear and easy to follow – although I doubt if many children under ten would have sufficient patience to carry them out entirely unaided.

Unfortunately the botanical explanations are peculiar. A cress seed is said to contain a germ – 'the germ is the beginning of a new plant. It grows a root, a stalk and two leaves'. The small girl in the book is told that the white roots of an overlooked potato are really the potato germ. 'It has lain in the dark and become a seed potato'. Nasturtium/*Tropaeolum* (without an initial capital) is used to illustrate the fact that plants have Latin as well as common names. Chives next to a window is described as 'stretching towards the light', and plants are said to change air and water into food with the help of the energy from the sunlight – 'Part of the air is not used by the plant, mainly oxygen'.

It is a great pity that the book contains such ambiguities and inaccuracies. Many children are interested in science and, during their education, will doubtless make their own mistakes. They should not be given anyone else's.

A. LEE

The Guinness book of wild flowers. Mary Briggs. Pp. 160, with numerous coloured illustrations. Guinness Superlatives, London. 1980. Price £3·95.

Here is another book of which one might ask 'what use is it to B.S.B.I. members?' But, here again, so well has the author, our own good friend the Hon. Gen. Sec., done her work, that I think all of us would enjoy seeing it, quite apart from its value in fostering enthusiasm. The writing is fresh, the book attractively finished and unusually well bound, and better use could not have been made of its pages. The first 48 discuss, inevitably somewhat briefly, but competently, various aspects of plants, keeping records, the history of our flora and world-wide distribution. Introduced species get 10 pages; conservation 2½ (but this is followed, at the end, by another 1½ and by the Code). There are notes on Societies and Nature Reserves (and, again at the end, a list of N.N.R.s and a map of them). There is a glossary and an index.

The main part of the book is devoted to 50 species, each of which gets a two-page spread. They are a good mixture of the rare and endangered and the common and attractive, their higgledy-piggledly sequence at the insistence of the editor. On the right is a handsome bled-off colour photo, usually well reproduced (one of the most attractive is one of Mary's own); on the left a drawing supplementing it, a short description, comments and a map. This purports to show how the distribution has altered since 1900, usually by severe contraction. To produce even one such map demands a vast amount of detailed research, and some of their detail may be valid only in a general way. A very regrettable feature, and in a book sponsored by Guinness of Dublin, is that the Irish Republic is left blank (the Channel Isles are omitted too). What a loss to biological completeness – and to Irish sales.

It is amazing how Mary has fitted this into her multifarious duties. But when she writes as she has here, it is no wonder that she is in demand to lead tours, give lectures, etc. This should fan well any incipient interest in wild flowers.

D. McCLINTOCK

Discovering botany. P. Francis Hunt. Pp. 96, with numerous coloured illustrations. Longman, London. 1979. Price £4·95.

How many B.S.B.I. members need to discover botany? In one way, none; but, since the majority are amateurs, my guess is that many will profit from reading this illustrated book in its perhaps somewhat over-simple language. As so often, only half the page is text, the rest pictures, in this instance only every other opening in colour. Its 44 two-page spreads range from the evolution and structure of plants through bacteria, viruses, algae and fungi to various groups and aspects of higher plants and to growing them. It ends with extinction and conservation, in that order! Although most of this is basic and elementary, Peter Hunt has managed fresh angles and thoughts; there is no doubt he has done the job well as, I may say, one would expect of him.

But no book is error-free, and one rarely knows whether the author or, more often, the publisher or printer, is to blame. Here, for example, a Daisy is given a parachute fruit, the photo of Sea Kale is captioned Sea Cabbage, that of Reed is with the Sedges, while that of Hemp has talk of colchicine underneath it. 'Sacred Lotus (leaves) float on the water', and here many of them, as usual, stand well above it. What is a liverwort? – 'a flowerless plant without veins that reproduces by spores'. What is a moss? – 'a flowerless plant without veins that reproduces by spores'. Surely any competent editor should have eliminated such obvious marring, jarring discordant details?

D. McClintock

The flora of Wiltshire. Donald Grose. Wiltshire Archaeological and Natural History Society, Devizes. 1957. Reprint. Pp. iv + 824, with 11 plates and 41 (mostly distribution) maps. E.P. Publishing Limited, Wakefield. 1979. Price £17·50.

This was the first Flora produced on the flowering plants and ferns of Wiltshire since that of the Rev. T. A. Preston of 1888 and contained all the known Wiltshire records up to and including 1955. A feature of the *Flora* is a 97-page account of the vegetation of the county, with habitat studies very similar in pattern to those of J. G. Dony's *Flora of Bedfordshire* published four years earlier. Reprinting of the *Flora* was considered in 1975, but this was not done and the work is now scarce. E.P. Publishing have now made the *Flora* once more available in the now familiar and uniform format in their continuing series of reprints and in the much criticised 4-page-to-1 facsimile: an attempt no doubt to keep down costs but tiring when read by those without excellent eyesight, although the printing is very clear indeed.

New to the 1957 edition are an appreciation of R. E. Sandall, who was Chairman of the *Supplement to the Flora of Wiltshire* (1975) Committee, and an appreciation by him of Donald Grose.

G. A. Matthews

Flora Europaea, Volume 5. Alismataceae to Orchidaceae. Edited by T. G. Tutin, V. H. Heywood, N. A. Burgess, D. M. Moore, D. H. Valentine, S. M. Walters and D. A. Webb, with the assistance of A. O. Chater and I. B. K. Richardson. Pp. xxxviii + 452, with 5 maps. Cambridge University Press, Cambridge. 1980. Price £37·50.

'Well begun is half done'. So runs the maxim, but I have reached that period of life when the end seems more important than the beginning, and the serene prospect of safe arrival vastly more satisfying than the excitement of departure. No doubt the editors of the fifth and final volume of *Flora Europaea* share my feelings, and in the circumstances one may forgive the small immodesty of their initial utterance, that 'the publication of this final volume . . . represents a landmark in European floristics'. Even their sternest critic may allow that vaunt to pass unchallenged, for the achievement is impressive, the more so because many wise heads were shaken 20 years ago in prophecy of premature and pathetic demise, with shelves of unfinished folios to remind us of the vanity of human wishes, and to lend substance to such gloomy predictions. Indeed, the appearance of the present volume seemed so long delayed that I began to think the gloom of the Jeremiahs might yet be marginally justified. But, to my surprise, I find, on examining the neat history of the project published in this volume, that all five volumes appeared regularly at four-year intervals, something of a triumph for contributors, typists, editors and printers alike in an age when the emphasis too often falls on the first syllable of deadline.

I detect no signs of exhaustion in this fifth and final contribution. It is, on the contrary, a more sprightly and confident work than Volume 1, despite the fact that the monocotyledons, with which it is exclusively concerned, are, as a whole, a very tricky lot, the petaloid ones especially taunting us with the distinctions which, however obvious to the eye, have a horrid way of vanishing as we commit them to paper. *Colchicum, Gagea, Tulipa, Fritillaria, Muscari, Ornithogalum, Allium, Narcissus, Iris* and *Crocus* – not to mention the impossible Banana – master these and I believe the *longueurs* of *Gramineae* (no less than 148½ pages of them) and the subtleties of *Juncaceae* or *Cyperaceae* will hold no terrors. It would be hyperbole to suggest that mastery is complete in Volume 5; the rather frequent appearance of those bold-faced innumerates ('whose taxonomic status is obscure') shows that at least something remains to be done by another generation of European taxonomists. But the ground has been cleared, and the final assault can be made from a base-camp of commonsense. I was glad, incidentally, to note that the genus *Muscari* has regained its former territory, though my pleasure was somewhat damped by the subsequent discovery that several good old grasses now cavort under strange generic disguises, as transitory, one hopes, as some of the creations that have been deposed. Maybe I grow old, but surely there must be an end to the genera of grasses and ferns, or will we move on to the final stage, where all, save perhaps *Poa*, are re-named and monotypic? And, lingering on the same subject, isn't it about time the cyperologists woke up, with 180 European sedges in a single clutch, the Bulrush (properly so called) back in *Scirpus*, and *Cyperus* replete with swallowed segregates? Let others dwell on the dubious attractions of the *Orchidaceae* – they are not for me – but when, on my next sojourn abroad, yet another blue-eyed enthusiast thrusts an uprooted *Ophrys* before my averted eyes, I promise to secure the sale of at least one volume of *Flora Europaea*.

It *is* a *magnum opus*, and a landmark in European floristics, and, on second thoughts, it would have been false modesty on the part of the editors not to have said so.

R. D. Meikle

The flora of Aldabra and neighbouring islands. F. R. Fosberg & S. A. Renvoize. Pp. 358, with 55 text-figures and 2 maps. *Kew Bulletin*, Additional Series VII. Her Majesty's Stationery Office, London, 1980. Price £15·00.

Fifteen years ago few people were aware of the island of Aldabra and the wealth of biological resources to be found there. During the intervening period, however, there have been radical changes, and the scientific importance of this outpost of the independent Republic of Seychelles is now widely recognized. Indeed, there can be few islands for which there is such a vast array of information available concerning the biota and the recent geological history. While this revolution was orchestrated by The Royal Society of London, the news media also played a valuable role in publicizing the atoll. Indeed such highlights as the giant tortoises and the extensive breeding colonies of sea-birds became familiar sights to television viewers. Yet it is ironic that, although the isolation of Aldabra was adequate to ensure the survival of these natural resources for centuries, their future conservation is dependent on the enforcement of formal legislation.

The involvement of The Royal Society with Aldabra in 1966 marked the start of a period of intense activity, and with the construction of a permanent research station it was possible to undertake research projects which extended over a long time span. Here the detailed studies of the populations of giant tortoises, covering more than a decade, provide a clear example of the unique opportunities that the island offers. Although the direct involvement of the Society has now finished, both the conservation and research functions are being continued by a recently constituted body, the Seychelles Islands Foundation.

Botanical investigations have made important contributions to the understanding of the island ecosystems. They have included such diverse topics as the detailed analysis of the physiology of blue-green algae and the purely descriptive accounts of the vegetation. The publication of this Flora of the vascular plants and mosses of Aldabra and adjacent islands fits, therefore, into an established framework. It also marks the completion of the inventory stage for an important group of organisms, besides providing the taxonomic framework for more detailed investigations. The work reflects the complementary expertise of the two main authors, one with a broad knowledge of the islands and their floras and the other with a more specialized experience in the western Indian Ocean. An account of the six mosses (only three of which are identified to species) is contributed by C. C. Townsend.

The format of the Flora follows a conventional layout, with the introductory chapter setting the scene and scope of the work. Here, and also in the subsequent taxonomic accounts of the species, a number of interesting points are raised which obviously require further research or discussion. One of particular interest to this reviewer is the suggested incompatibility between the geological data and the large number of endemic species recorded. (The stratigraphical evidence indicates that the present terrestrial biota colonized the atoll during the last 80–100 ka.). Encapsulated within such comments is a wide range of questions regarding the nature of endemic taxa and the evolution of island biotas. Interestingly, Taylor *et al.* (*Phil. Trans. Roy. Soc., B*, **286**: 47–66 (1979)) have analysed the faunal record and found considerable concordance between the interpretation of the geological evidence and the data for land snails and reptiles.

The taxonomic treatment of the 280 species and varieties of angiosperms, pteridophytes and mosses constitutes the bulk of the volume, and this section will be used by a wide readership possessing many different skills. These individuals will not necessarily have a deep knowledge of botany or taxonomy. It is, therefore, gratifying to note the conservative treatment of some genera, for example *Pandanus*, where the six endemic taxa recently described by St John have been placed in the synonymy of a more variable and widespread species.

It is, however, as an identification guide that the Flora will possibly receive its widest use. How successful will it be? The authors have ensured that the work will be authoritative, and the inclusion of keys and illustrations will contribute to its success; but it is unfortunate that not every species is illustrated. Moreover, it is questionable whether the relevant information is presented in a manner which will be of the greatest benefit to the users of the Flora. For example, in a Flora of a restricted geographical region the inclusion of family and generic diagnoses would appear to be unnecessary. Surely this type of information is available or should be available in broad revisionary studies covering wide geographical regions. Here it increases the cost of the publication besides obfuscating pertinent local data. Furthermore, the value of the detailed species descriptions would be enhanced if the diagnostic characters were clearly indicated. Such criticisms are not peculiar to this Flora; indeed such problems are encountered in many taxonomic works. There is always a need to identify clearly the readership and their requirements. Certainly the inclusion in this Flora of the Seychellois vernacular names and an index to them is a step in the right direction.

J. F. PEAKE

Tropical botany. Edited by K. Larsen & L. B. Holm-Nielsen. Pp. xii+454, with 76 text-figures. Academic Press, London. 1980. Price £22·50.

In recent years, reviews have appeared in *Watsonia* of many books concerned with plants of regions remote from the British Isles of the B.S.B.I.'s title, because it is the belief of the editors that British and Irish botany can no more be treated in isolation from that of the rest of the world than can other aspects of the life of these islands. These thoughts were brought to my mind again when I read the Proceedings of a Symposium entitled 'Tropical Botany', which was held at the University of Aarhus in August, 1978. The contents of this book show very clearly, not only how the botany of the tropics differs from that of temperate regions, but also how important the tropics are in the study of botany as a whole.

After two important historical papers, respectively by Raven (on plate tectonics and southern hemisphere biogeography) and van der Hammen (on the history of the Eastern Andes of Colombia as revealed by pollen analysis), there are general papers on the tropics of Asia (Ashton), Africa (Brenan) and lowland South America (Prance) and on tropical islands (Fosberg). In defining tropical floristic botany, Fosberg underlines my opening comments by pointing out how, viewed from a tropical perspective, the temperate-centred view of the plant world has certain peculiarities. The herbaceous habit is often thought of as the norm; and its predominance in the temperate zone has fundamentally influenced ideas (e.g. the primitiveness of the Ranunculaceae and Alismataceae or the predominance of herbs in certain families such as Rubiaceae), techniques (e.g. collecting in vascula and pressing in books) and teaching and research methods (e.g. the teaching of plant anatomy and the study of plant physiology and plant genetics). Seasonality is obvious and basic, and is related to temperature. In contrast, a visit to the tropics reveals the predominance of woodiness in Dicotyledonous families and even in some Monocotyledons (e.g. palms, bamboos), and seasonality becomes as much a matter of humidity as of temperature.

As a result of the vastly greater diversity of plant life in the tropics and the small proportion of botanical work done there, tropical taxonomy is still mostly at the alpha stage. This fact, along with repeated references to the present threats to tropical vegetation by economic exploitation, led to the passing by the Conference members of a resolution strongly urging official bodies to provide (i) adequate funding and staff, in order to ensure the rapid completion and publication of such tropical Floras as are now being prepared, (ii) facilities for training more taxonomists for work in tropical developing countries, and (iii) funds for specialists to visit these countries.

The scope of the other contributions varies from broad phytogeographic or floristic surveys to considerations of single genera in one country, but geographically they are confined to Asia and America. Apart from Brenan's introductory paper, Africa is ignored. Although they vary also in 'weight', all are worth reading, whether or not you already have an interest in tropical botany. Together the contributors have provided a vivid picture of plant life in the tropics, its history, its present state, and its doubtful future.

N. K. B. Robson

Shetland's living landscape: a study in island plant ecology. David Spence. Pp. 152, with 41 black & white photographs, 13 figures (including 4 maps) and 15 tables. The Thule Press, Stornoway. 1979. Price £6·50.

In this book Professor David Spence of the Botany Department, St Andrews University, has presented in compact and pleasantly readable form an authoritative account of the plant ecology of Shetland based to a large extent on his own observations and research, yet incorporating, with due acknowledgment, much important work done by others.

As an up-to-date publication on its subject it is of particular interest at this time because of the effects of developments associated with the oil industry on Shetland's landscape, as well as the continuing pressure of sheep-grazing on the vegetation.

After a chapter on climate, soil and land use, the main part of the book deals with Shetland's non-marine plant communities in relation to their physical environments, emphasizing the special or unique interests of some of the communities and individual species.

Other chapters deal with the effects of the harsh climate, settlement and agriculture on these communities and their use as bird habitats. Then the author gives a review of five thousand years of vegetation change and a chapter on conclusions and their lessons. This is followed by a series of tables containing annotated lists of species belonging to the plant communities referred to previously.

The bibliography includes an ample selection of books and papers; and then comes an index of botanical names (with English names opposite), followed by a general index.

The photographs illustrate a good number of the more interesting plant associations and several of the most attractive flowering plants, but it is unfortunate that some of the photographs are rather poorly reproduced, and perhaps it may be regretted that a few pictures in colour could not be included.

A few minor mistakes and omissions may be noticed in the text; but these hardly detract from the general excellence of the book, which should be of great value to ecologists and of benefit to many others interested in the plant life of Shetland.

J. G. Roger

Grasses. A guide to their biology and classification. Anonymous. Pp. 24, with 11 text-figures. Her Majesty's Stationery Office, London. 1980. Price £1·00.

This booklet was produced at the Royal Botanic Gardens, Kew, whose name appears on the front cover and map on the back cover. The map is said to show House 15, which is mentioned in the text, but it is in fact not labelled! The text, however, is intended as an introduction to grasses in general, not a guide to grasses in Kew Gardens, although there are a few confusing references to the latter.

For the most part the information given is accurate, but the impossibility of covering the breadth of the subject even at a very elementary level in such a small publication is illustrated by a number of over-simplifications, which might well mislead anyone with little previous knowledge. For example, there is an implication that stolons occur in tropical species and rhizomes in temperate ones; Figure 2 could be taken to mean that a ligule or an auricle were mutually exclusive features of grass leaves; weedy species of grass are said to be 'invariably annuals'; apomixis is said to be 'never absolute and there is always some sexual reproduction', although apomictic individuals 'are usually more vigorous than sexual plants'; and the table on p. 16, giving supposed differences between grasses, sedges and rushes, will misinform rather than help.

Less excusable is the statement, on p. 14, that *Triticum dicoccoides* is a wild diploid hybrid; it is in fact an AABB allotetraploid.

The systematic section, in which five subfamilies and 20 tribes are covered, occupies the last eight pages. An up-to-date classification is adopted, although some will be surprised to find Danthonieae and Molinieae included in Arundineae, and Agrostideae kept apart from Aveneae; *Agrostis* is listed under both Poeae and Agrostideae. The map of the distribution of Chloridoideae (which includes *Spartina*) omits Europe and North America, and a number of other quibbles could be mentioned in this section as well.

The book contains some interesting and useful information, but it is difficult to imagine who will buy it and what the purchaser will gain from it.

C. A. STACE

Bryophyte systematics. Systematics Association Special Volume, No. 14. Edited by G. C. S. Clarke & J. G. Duckett. Pp. x + 582, with 352 text-figures and 24 tables. Academic Press, London. 1979. Price £40·00.

This volume, the preface tells us, 'brings together the papers presented at the international symposium on bryophyte systematics . . . organized by the British Bryological Society and the Systematics Association . . . on 16–19 August 1978'. For members of a society such as the B.S.B.I., some of whom may be toying with the idea of taking up mosses but would perhaps make a distinct 'move' if they picked up the present volume, it is good also to read in the preface that: 'The new tools which are available to the modern bryologist . . . have in no way superseded the traditional approaches . . . the links that have always existed between professional and amateur bryologists are no less important today than they have been in the past. There will never be a substitute for the man who knows his plants in the field'. To this the reviewer gives a hearty 'Hear, hear!!'.

The book contains 21 chapters covering practically every aspect of bryophyte systematics – history, evolutionary speculation, experimental taxonomy, cytotaxonomy, spore morphology, sporogenesis, peristome studies, rhizoid characters, histology (conducting tissues), chemotaxonomy, climatic adaptation in relation to systematics, and others. The review of such an assembly of riches in the sense of a critical appraisal of each contribution is a virtual impossibility. Many of the contributors (such as Hébant with his conducting tissues studies) are effectively innovators of new lines of research of which they remain the chief or sole exponents. Certainly the work will be an excellent 'launching pad' for innumerable ideas for research workers and supervisors seeking for projects for their students; the 'average' botanist will have to dip in here and there where he finds material to interest him. In some cases (such as the papers on sporo- and spermatogenesis) he will need a fairly strong digestion to get further than the abstract. There are essays on the phylogeny of mosses and hepatics, with Rudolph Schuster getting in his usual twinkling-eyed dig at the mosses as 'by contrast, in an evolutionary sense, dull . . . one is tempted to paraphrase Gertrude Stein and state "a moss is a moss is a moss" '. These are readable enough, even if the tongue steals gradually into the cheek in support of Watson's criticism of the 'Age of Speculation', for which Schuster takes him to task. It is strange to find the 'Historical review of Japanese bryology' written by a Finn, Timo Koponen, when Japan has such an impressive assembly of bryologists of its own; but no doubt it is a long way to come to Bangor, and in any event the thing is well done and very readable. Anyone who has been in a rain-forest area and wondered at the 'mini-ecology' of the epiphyllous liverworts will read Gradstein's account of the genera of the *Lejeuneaceae*, which is exceedingly interesting–as is Argent's paper on the 'Systematics of tropical mosses', with its laudable *cri du coeur* for bryophytes to be collected by bryologists and not picked up incidentally by those collecting phanerogams. He cites Touw's estimate of 7,000 'good' species of moss in the world compared with the 18,000 valid species in *Index Muscorum*–but no bryologist who has had to name tropical mosses is long unaware of the multitudes of 'bad' species described. Edwards's studies on the peristome, which one hopes are to continue, pay tribute to the careful work of Philibert, supporting conclusions of the latter which have since been criticised. Finally in this brief selection, Crundwell's paper on 'Rhizoids and moss taxonomy' provides hope for the botanist looking for something to apply to his native plants and needing only equipment which he may already have, or at least be able to afford.

As usual with Academic Press publications, this book is beautifully produced–clearly printed on good quality paper and well bound. Many of the contributions are much more clearly off-shoots of current research projects by the various authors than the chapters in Verdoorn's famous *Manual of bryology*, which the editors mention in a tentative kind of comparison; but in these days of increasing specialization this is almost inevitable.

C. C. Townsend

Topics in plant biology. Edited by O. T. Solbrig, S. Jain, G. B. Johnson & P. H. Raven. Macmillan Press, London. 1979. Pp. xvii+589, with black & white frontispiece and 81 text-figures. Price £14·00.

Symposia are always to be approached with trepidation. Sometimes the contributors do not seem to know of each other's existence. Frequently the links between their contributions are so tenuous as to be invisible. Perhaps the latter is sometimes nothing more than a reflection of the reader's lack of imagination. In this tribute to G. L. Stebbins on his 70th birthday the first fault has been painstakingly avoided, while the range of ideas covered so exactly matches the interests of the reviewer that he is not well placed to detect the second.

The linking theme of this stimulating book could be said to be 'Adaptation': approached from many different directions but with a firm ecological undercurrent throughout. We are left in no doubt that an adapted plant is adapted only to a particular environment, and that selection leads to compromises between conflicting environmental demands.

It is particularly useful to have in one volume discussions of the adaptive significance of some of the more 'difficult' characters, old and new. Leaf shape seems to depend on balancing mechanical support, vascular supply, efficient packing for light interception, and an appropriate coupling of leaf and air temperature. Patterns of root growth may be related to the cost-efficient tapping of zones of undepleted nutrients, which will dictate annual or throw-away roots according to the relative costs of maintenance and replacement. The C_4 pathway in photosynthesis, well known to be of generally tropical distribution, is shown to relate primarily to temperature in the grasses but more closely to aridity in the dicotyledons. Plasticity is treated as a character in its own right, and it is discussed as a viable alternative strategy to adaptive polymorphism in circumstances of rapid or unpredictable environmental change. Many contributors make good use of a cost-benefit approach, usually only informally; but where quantitative rigour is attempted, the models never depart far from real data and ecological sense.

It might be argued that all this was not really population biology but adaptive physiology; but this would be a carping criticism, and not so much a reflection on the book as a comment on the difficulty of finding the appropriate few words for its title. There is in fact plenty of material on populations in the narrower sense. In particular there are useful discussions of the problems of transferring population concepts from animals to plants. The great flexibility of plant size at maturity, for instance, requires a highly sophisticated approach to demography if this is to be amalgamated with population genetics. Several contributors stress the importance of the seedling stage of growth, and suggest that whether or not an adult plant is to be found at a particular site depends largely on its competitive properties as a juvenile. Breeding systems and population structure are discussed as functions of the behavioural ecology of pollinators. There are recurrent suggestions throughout that we might all have been observing and measuring the wrong things.

Other topics include seed dormancy and seedling mortality, carbon balance and water usage, enzyme polymorphisms as adaptive systems, plant and organ longevity, and the differentiation of a recently arisen species.

In terms of level the book is right for final year undergraduates with a reasonable botanical background, and ought at the same time to provide their teachers with a refreshing dose of new ideas. There is an adequate index and an enormous collective bibliography running to 90 pages, affording the research worker easy access to a wide range of both original and review material.

D. A. Wilkins

Obituaries

CHARLES EDWARD HUBBARD
(1900–1980)

A member of the Society since 1947 and made an Honorary Member in 1973, Charles Hubbard died on the 8th May, 1980, two weeks short of his 80th birthday. In the field of taxonomy and nomenclature, the name of Hubbard will always be associated with the grasses of the world. His contribution to this study was great, and, although retired for 15 years, he continued to work at the Kew Herbarium some five afternoons a week until his health broke in 1977. His final attentions were directed to the identification of bamboos and turf-grasses.

Charles Edward Hubbard, C.B.E., D.Sc., F.L.S., the son of Charles Edward Hubbard, was born at Appleton, Norfolk, on the 23rd May, 1900. His father was head gardener to Queen Maud of Norway and divided his time between the gardens at Appleton and the Royal Gardens at Bygdo in Norway. He encouraged young Charles to join him in his country rambles in search of plants to add to the gardens, and thus the seeds of the boy's botanical interest were sown.

He was educated first at West Newton School on the Royal Estate and later at King Edward VII Grammar School, King's Lynn. He decided on a career in horticulture and in 1916 started work in the gardens at Sandringham under Thomas Henry Cook. Here he received both practical and theoretical training in most branches of horticulture and subsequently passed the Royal Horticultural Society's examination in horticulture. In 1918–19 he had a short spell in the Royal Air Force and then returned and stayed at the Sandringham Gardens until April 1920, with the exception of five months in 1919 when he had the opportunity to assist his father in the replanning of the gardens of the King of Norway, near Oslo. In 1920, he entered the Royal Botanic Gardens, Kew, as an Improver Gardener, and he later became a Student and was posted for six months to the Temperate House. The opportunity of caring for a vast collection of plants aroused his interest in their classification. After two and a half years in the gardens, he was posted as Temporary Technical Assistant in the Herbarium. In this new field he served with other ex-student-gardeners including E. Nelmes, P. J. Greenway, W. E. Trevithick and C. F. Wilson. While helping the work of the professional botanists, Charles Hubbard soon gained an insight into the methods of identification and classification and how to use the library. During these early years at Kew, he attended evening classes, first at Richmond and later at the Chelsea Polytechnic (from 1923 to 1929).

In 1924, he travelled through south and central Spain with the Rev. E. Ellman and returned with some 1200 specimens for the Kew Herbarium. In the following year, he became Assistant to Dr Otto Stapf, a world authority on the Gramineae, and it was at this time that Charles Hubbard started to play his part in the naming and classification of grasses. In 1929 he was appointed Temporary Assistant Botanist at Kew, and in the following year, at the request of the Queensland Government Botanist, he went to Australia for a year to revise the nomenclature and to re-arrange the collection of Australian grasses in the Brisbane Herbarium. While there he made extensive collections of grasses from Queensland and other parts of Australia. He returned to Kew in 1931 and continued to assist Dr Stapf with the preparation of the account of grasses for the *Flora of Tropical Africa*.

In 1935, with the rank of Botanist, he was placed in charge of the Gramineae section of the Herbarium. During the 1939–45 War, Hubbard, together with F. Ballard, V. S. Summerhayes and W. B. Turrill, was evacuated to Oxford, where he helped to care for the part of the Kew collections temporarily housed in the Bodleian Library for safe keeping. While there, Hubbard served in the Home Guard from 1941–44 and, in his leisure hours, searched for interesting plants in the byways of Oxfordshire. In 1947 he was appointed Principal Scientific Officer; he was promoted to Senior P.S.O. in 1955, and two years later made Keeper of the Herbarium and Library. He was appointed Deputy Director of the Royal Botanic Gardens in 1959, a position he held jointly with that of Keeper until his 'official' retirement in 1965.

His publications were mainly devoted to grasses and include a number of studies of new genera and species, mainly from Africa and Australia. Besides accounts of the grasses of Mauritius and of the Fiji Islands, which he completed with the help of R. E. Vaughan and V. S. Summerhayes respectively, he wrote two handbooks on East African grasses. He published about 150 papers on grasses, mainly in his earlier years. This writing was curtailed by his promotions, which diverted him from taxonomy to administration. Above all, Charles Hubbard will be remembered by our members for his Pelican book *Grasses*, which is a guide to the structure, identification and distribution of the grasses found in the British Isles. The first edition of 1954 was followed by a second in 1968. The product of many years of field observations and plant examinations, his text was complemented by the expert drawings of Miss J. Sampson.

He took great interest in various botanical societies; besides being a distinguished member of the B.S.B.I., his memberships included those of the Linnean Society of London, British Ecological Society, International Association of Plant Taxonomists, British Grassland Society, Systematics Association, Royal Horticultural Society and the Kew Guild.

He served on the Council of the Linnean Society from 1950 to 1953 and was Vice-President of the B.S.B.I. from 1964 to 1967, during which time he was Acting President following the death of E. F. Warburg; he was Treasurer of the British Ecological Society, and from 1960 to 1965 served on the Scientific Committee of the Royal Horticultural Society. In recognition of the many facets of his work and contributions to science, Charles Hubbard received many honours. For his work on the classification of grasses he was awarded the O.B.E. in 1954 and created C.B.E. in 1965. In 1960 the University of Reading conferred on him the Honorary Degree of Doctor of Science. He was awarded the Linnean Gold Medal in 1967. The Royal Horticultural Society twice honoured him, with the Veitch Memorial Medal and with a gold medal in 1970 for a special exhibit of 150 species of British grasses.

Hubbard revised the nomenclature of a number of foreign and British grasses. His name is immortalized in the British Gramineae by the hybrid *Festuca rubra* L. × *Vulpia membranacea* (L.) Dum. = ×*Festulpia hubbardii* Stace & Cotton. It so happens that the genus *Festuca* was one of his favourites; he pressed descriptions of fescues to observe on his friends, and I gained the impression that he was not satisfied with our British list of fescues when compared with the longer European list.

Many people of all walks in botany will remember Charles Hubbard as a man who was kind and generous with his time and knowledge. In the field he had a gentle approach to correction; and when he realised he had a party of new disciples to the study of grasses, he would take infinite pains in demonstrating the intricacies of identification. Equally in his correspondence, in reply to the vast number of inquiries he received, he took much trouble in describing important characters in detail and giving references to reading. His enthusiasm for the vast family of the Gramineae never waned. Undoubtedly, he could have left an even greater record of the study of our British grasses. Notes on specimens and their habitats were carefully filed. His son John has recently estimated, from a cursory glance around his father's study, that there are about 10 feet of notes on grasses! This collection was probably destined for a third edition of his *Grasses*.

His own perfectionism prevented him from completing work until he was fully satisfied with his conclusions. In retirement, he admitted that he was always much in arrears of work, a situation which was also partly caused by his generosity to individuals. From the largest botanical institutions down to the single amateur grass enthusiast, all received attention from him. He could have written more to his own credit and to that of science; but he was anything but selfish, and delighted in helping anyone in the study of grasses. Both amateur and professional botanists all over the world are the poorer by his passing.

Our deepest sympathy goes out to his widow, Florence, and his son, John.

Information and assistance is acknowledged from Dr W. D. Clayton, Dr J. G. Dony, J. C. E. Hubbard, E. Milne-Redhead and E. L. Swann.

P. J. O. Trist

JOHN EARLE RAVEN
(1915–1980)

John Raven died in Cambridge on 5th March, 1980, aged 65 years. He had been a member of the B.S.B.I. since 1943. The son of Canon Charles Raven, President 1951–1955, and descended through his mother from the Wollastons, of whom no less than seven were Fellows of the Royal Society between 1723 and 1829, John was a naturalist by heredity, at first a lepidopterist and then, with his father, visiting and painting every plant in the British flora as then understood, a botanist. When I first met him, in the late 1940s, he was working his way through the *Hieracia*, and I am indebted to Mr P. D. Sell for the appended note on that particular exercise.

A brilliant classical scholar at Marlborough and later at Trinity College, Cambridge, John became a university lecturer in ancient philosophy and a Fellow first of Trinity and later of King's. As lecturer, as part-author of what is still the standard edition of the pre-Socratic philosophers, and as sole author of an introductory book on Plato, he showed an outstanding gift for lucid exposition; while his knack of instantly establishing easy relations with every kind of person made him a first-rate tutor of his College and won him numberless friends, so that, wherever his botanical trips took him, he always found hosts and companions. One of these was Dr S. M. Walters, whose temperament and stride both matched John's, so that collaboration produced that almost ideal volume, *Mountain Flowers*, in the New Naturalist series. John's contribution is remarkable for its sense of immediate experience and enjoyment. Another regular companion was Dr R. C. L. Burges of Birmingham, and it was John and 'Doc' who first really instructed me in field botany. To be in their company on the hills was exhilarating, for to their knowledge and flair they joined unfailing high spirits, and discovery and good jokes went hand in hand.

Though John always wore spectacles, he must have possessed extraordinarily keen sight, with an 'eye' for plants and for country that I have never known equalled. On a later expedition, to the Dolomites, as we drove rapidly along a mountain road, John cried out 'Stop!', and explained that on the cliff we had just passed he had spotted a *Phyteuma* that he did not know. When we walked back 200 yards, it was so. Again I have seen him, in an unfamiliar glen, fix, like a pointer, on a particular slope or cleft; and, if he said 'It will be there' , it always was. With this instinct went a great power of deduction and of strategical planning, which enabled him, by a reconstruction of E. S. Marshall's route on the day when he found *Agropyron donianum* in Sutherland, to rediscover the plant. A more bizzare demonstration of these powers was the investigation, pursued with determination and gusto, that proved beyond reasonable doubt that many of the rarities reported from the Hebrides were not native there.

In 1954 John married Faith Hugh Smith and thereby won a settled place in the Highlands that he loved. Morvern with its hills and indented coastline, its wooded cliffs and moorland lochans, concentrates in narrow compass a remarkable variety of habitats and a rich assemblage of species. John busied himself with cataloguing them and made a number of exciting discoveries, notably of *Spiranthes romanzoffiana*. When the British Museum's survey, *The island of Mull*, was published, he was intrigued by the discrepancies between the flora of the island and that of the mainland, and set himself, with his usual careful planning of the operation, either to find the missing plants in Morvern or to explain their absence. The first-fruits of this investigation were published, alas too late for John to see them in print, in *Watsonia*, **13**: 1–10 (1980).

By this time almost continuous ill-health had severely limited his own activity, and he enlisted many botanical friends as his scouts. Armed with plant-lists and explicit instructions on just where to look, Mark Hill, Nick Jardine, Michael Braithwaite, Max Walters, Peter Sell, Elizabeth Young, Joan Clark or I would be launched at a particular peak or remote glen, and on our return John's warm and humorous interest in all our adventures made our debriefing highly enjoyable. Then there were the botanical courses for which the vast house at Ardtornish provided an ideal centre. These courses were sometimes professional, as for the Cambridge Botany School or a party of Scandinavian bryologists, but more often miscellaneous and amateur; and if they included some to whom many of the Scottish plants were new, John would make it his personal duty and take endless pains to introduce the novice to the plant, for nothing pleased him more than to pass on his own enjoyment. When the class was all together, John would clamber rather laboriously up the lower slopes, shouting or signalling directions to his disciples foraging above; or, poised on the edge of a bog, his long lean figure characteristically crooked, would point out twice as many plants of *Hammarbya* as any of the rest of us had spotted.

John collected very few specimens, but many of the difficult plants he sent to experts to name have ended up in the Cambridge University Herbarium (**CGE**). In addition he invited Peter Sell to Ardtornish in 1970 and 1976 with the particular object of collecting voucher specimens of his discoveries, so that 255 sheets of Morvern plants are now in the Cambridge herbarium. His card index is to be duplicated, so that the records can be made available to all the interested parties. The possibility of publishing John's paintings of the *Hieracia* is also being studied.

By his marriage John Raven became a gardener, and his book, *A Botanist's Garden*, describes the two gardens, in Cambridgeshire and in Morvern, that he and Faith spent much time and care in developing. The process included the introduction of a number of 'new' garden plants, especially from Crete, Corfu, and northern Italy. As the book's title indicates, John was first and foremost a plantsman, an appreciator of the special characteristics of particular plants. Like all good plantsmen he had his likes and dislikes: *Bergenia* was an abomination, *Helleborus, Euphorbia*, and *Artemisia* firm favourites. But his faculty for planning made him also skilled in garden design, and he took pride in being retained as consultant on municipal planting in Newcastle.

His last six months were made wretched by a persistent and debilitating virus; but in January, after a check-up in hospital, the doctors declared that it had almost burnt itself out, and John, full of hope and plans for the future, went off with Faith and two friends for a very happy holiday in Sicily. His sudden collapse, soon after his return, was quite unexpected, making our sense of loss all the more intense.

R. W. David

P.D.S. adds: I first really got to know John Raven in the summer of 1953 when we went on a hawkweed trip, in company with his father, R. C. L. Burges, and Philip Oswald, which started in Gloucestershire, zig-zagged its way across Wales, scoured the Yorkshire limestones, and ended up at Teesdale. H. W. Pugsley's *Prodromus of the British Hieracia* had appeared in 1948. John had learnt his hawkweeds by looking them up in the field in Pugsley's listed localities. I had learnt mine by going through authentic specimens in the Cambridge herbarium. One would have thought that this would have brought about some differences of opinion, but the expedition was remarkable for the agreement we achieved and for the speed in which we found the species we were looking for. Most of this was due to the careful planning John put into the trip, his unparalleled facility for picking out species by 'non-botanical' characters, and by his intuitive interpretation of the terrain which led us unerringly to all the best spots. By the end of the trip we had seen 64 species, and this excluded all the leafy ones which were not yet in flower. Even more impressive was that father and son had between them painted nearly all the plants. Canon Raven would paint the leaves and stem while John was left the more arduous task of doing the details of the inflorescences. Evening after evening I would be tested out on whether I could identify the painted species from a distance of several feet, but so well were the characteristics of the hawkweeds depicted that no difficulties arose. By the end of the following summer nearly all the described species of *Hieracium* recorded for the British Isles had been found and painted. John's study of the *Hieracia* did not continue, but when from time to time he brought gatherings of hawkweeds into the Cambridge herbarium I had usually only to confirm, not name, them. In 1967 he joined Dr Cyril West and myself in describing a new species, *H. pseudanglicoides*, which he had first recognized as new many years before.

Reports

VICE-COUNTY RECORDERS' CONFERENCE, ROGATE FIELD CENTRE, WEST SUSSEX

5th–8th OCTOBER, 1979

INTRODUCTION

This conference attracted a far larger number of Recorders than might have been expected for the far south of the British Isles. Over 70 people assembled at the Rogate Field Centre, including representatives of all four countries of the British Isles. The Centre was ideal for the conference: the staff were most helpful, the food enjoyable and the charges reasonable. The lecture room was comfortable and the rain, when it came, did not hamper the excursions.

The programme was divided between two distinct themes. Saturday was devoted to papers on the determination of difficult taxa likely to be encountered in preparing maps for the revision of the *Atlas of the British flora*, whilst the Sunday was concerned with the organization of recording at County level.

The summaries of the papers which follow have been kindly supplied by the authors. In several cases, however, no summary is included where a full account is already available or in preparation.

FRIDAY, 5TH OCTOBER

By tradition the opening paper on the first evening is given by the Recorder of the host vice-county. Mary Briggs gave a fascinating talk on the flora of East and West Sussex, superbly illustrated by her own photographs. We were all left anxiously awaiting the forth-coming publication of the *Sussex Plant Atlas*, which took place in 1980.

SATURDAY, 6TH OCTOBER

R. W. David (Carex muricata *agg.*). The revision of this group will be incorporated into the new edition of *British Sedges* being prepared for publication by A. O. Chater, R. W. David and A. C. Jermy.

A. C. Jermy (*The pondweed families*) circulated two lateral keys, one on the grass-leaved and the other on broad-leaved species, which had been drawn up by N. T. H. Holmes. With the help of herbarium specimens (which were exhibited throughout the Conference) the general growth form of all species and their hybrids was illustrated. The grass-leaved species were illustrated by drawings of the diagnostic venation of the leaf-tip. In this group the free or tubular nature of the stipules is important; this was demonstrated in fresh or in moistened herbarium material by cutting the stem just above the node at the point of the leaf insertion. The cut stem can then be drawn from within the closed stipular sheath or moved laterally between the unfused (i.e. free) stipules. A plea was made to record ecological data and to study populations throughout the year, especially if they were thought to be hybrids. Little is known about pollen viability in many species or how pollination occurs. Although in many species of *Potamogeton* wind disseminates pollen and spreads it on the water surface, contact with the stigma is made in aqueous medium. It is likely that *Najas* and *Zannichellia* are both apomictic; certainly no male flowers of *N. marina* have been recorded in Britain, yet the species sets ample seed. Pollution of water courses is leading to habitat destruction or deterioration, and should be monitored.

N. T. H. Holmes (Ranunculus, *section* Batrachium). Early in 1979 Dr Holmes issued *A guide to identification of* Batrachium Ranunculus *species of Britain* as No. 14 of the Nature Conservancy Council's Chief Scientist's Team Notes. These were made available to all Recorders.

D. E. Allen (Cardamine pratensis *agg.*) argued that though infraspecific variation in this species received taxonomic recognition in Britain as early as 1880, it attracted little interest until the existence of numerous chromosome 'races' began to be reported from various parts of Europe. Ranging from diploids all the way up to dodecaploids, many of these seem to be distinct morphologically, ecologically and geographically. Above the diploid level barriers to crossing are reportedly weak, even to the extent that a fertile hybrid has been induced between an aneuploid with $2n = 30$ and a euploid with $2n = 56$. Hybrids are perpetuated in nature by the proneness of the species to reproduce from adventitious shoots in moist conditions. About a third of the 'races' appear to occur in the British Isles. In the 1950s the author attempted to discriminate these employing a traditional taxonomic approach; but eventually work was suspended in the growing suspicion that in at least some cases plasticity is so great that external characters and chromosome number do not reliably coincide. A sizeable experimental programme is needed to test this. Seven taxa have tentatively been recognized. Three, all rare and local – in Sussex, the Welsh mountains and western Ireland respectively – are perhaps identical with known Continental diploids. Much more widespread are a shade-loving tetraploid, a putative hexaploid of short marshes and a heptaploid of meadows and reedswamp. An octoploid of bogs is mainly confined to the Highland zone. Two other entities, one western, one on the South Coast, may also prove to merit taxonomic recognition. The taxa seem best treated as subspecies, but their nomenclature remains problematic.

M. G. Daker (*The genus* Fumaria) stated that eleven taxa of the genus *Fumaria* may be recognized in Britain today. The classification below the species level given in the literature is perhaps best ignored, since it is based on rather trivial differences that have probably arisen through persistent inbreeding. It is important, however, to recognize the two subspecies of *F. officinalis*, which can be separated on morphological grounds and also differ in chromosome number (subsp. *officinalis* $2n = 32$; subsp. *wirtgenii* $2n = 48$). It should also be noted that *F. muralis* subsp. *muralis* has not been reported with any certainty for many years, and specimens identified as *F. muralis* nearly always belong to the very variable subsp. *boraei*. Certain characters used for identification can be misleading. Good characters include: length of flower and wings of upper petal, sepal size and serration, fruit shape and texture, raceme and peduncle lengths, numbers of flowers per raceme, and pedicel curvature. Leaf characters are of little value. Although *Fumaria* is normally inbreeding, artificial hybrids can be made, and a close relationship between *F. martinii* and *F. muralis* subsp. *boraei* is indicated by the ease with which fully fertile hybrids may be made between them. The genus is especially interesting in that *F. purpurea* and *F. occidentalis* are both endemic species, and the possibility that *F. occidentalis* is an allopolyploid between *F. capreolata* and *F. bastardii* is strongly supported by using these two species to synthesize an apparently fertile plant very similar in appearance to *F. occidentalis*.

D. H. Dalby (*The genus* Cochlearia) said that *Cochlearia* species are phenotypically highly plastic, and present particular problems in identification. Fresh material (with information on flower size) and completely ripe fruit are really necessary for accurate identification. He considered five species to be valid, of which *C. anglica* and *C. danica* present few problems. *C. micacea* is restricted to high altitude in the northern Highlands, and is distinguished by its relatively smooth pods, dense deep green leaf rosettes and its unique chromosome number ($2n = 26$). *C. scotica* is provisionally recognized; it is a strictly coastal species in Ireland and northern and western Scotland, and is obviously close to *C. officinalis*, but it differs in flower size, leaf size and shape, and in habitat. *C. officinalis* itself presents great problems, and is interpreted here as including two subspecies: *officinalis* (the tetraploid plants from more southerly coastal areas and from a few inland sites in Scotland), and *alpina* (the diploid inland populations). This conforms with taxonomic custom in treating morphologically indistinguishable cytotypes with differing environmental preferences as subspecies rather than species. Finally he argued that two new species named by Pobedimova are synonyms; *C. islandica* (British material) is *C. officinalis*, and *C. atlantica* is a mixture of *C. officinalis* and *C. scotica*.

D. E. Allen (*It must have been that*) gave a highly entertaining talk on botanical recording errors and their origins (see pp. 215–220).

SUNDAY, 7TH OCTOBER

Mrs J. E. Smith (*The organization and work of the Surrey Flora Committee*) stated that the name 'Surrey Flora Committee' embraces both the Committee members and helpers. It is not a society with a subscribed membership. It was formed in 1957 with the objective of producing a new *Flora of Surrey* (published 1976). Although originating from B.S.B.I. members, the S.F.C. is an independent body of botanists. They issue an annual newsletter, arrange field meetings and assist beginners. With general recording for the *Flora* complete they agreed to record S.S.S.I.s for the Biological Sites Recording Scheme. All subsequent recording work has been on a site basis. Today the work involves conservation, from that of rare British species to large areas of ecological importance. The Committee works in very close co-operation with the Surrey Trust for Nature Conservation, the Nature Conservancy Council, the Forestry Commission, the National Trust and the Ministry of Defence. It has become the body to which all requests for botanical information within the county are referred. It supplies material for public enquiries and undertakes vegetation surveys for the N.C.C. The successful continuation of the S.F.C. and its many commitments is attributed to the fact that helpers have never refused to undertake any task. Moreover, as an independent body, immediate action can be taken when necessary.

E. G. Philp (*The organization of the mapping of the flora of Kent*) explained that in 1970 it was decided to map the vascular plants of Kent on a tetrad basis and that during that year preparations were made so that mapping could start on 1st January, 1971. A provisional list of plants to be found in the county was drawn up and recording cards to suit the Kentish flora were designed and issued with a duplicated booklet, containing instructions to recorders along with keys to critical groups. From the start the Kent Field Club was involved and volunteers to help with the mapping were invited from among its members. This caused certain problems in that some of the volunteers did not send back any records for their allocated tetrads, while others were not able to identify the plants that they found. From the Kent Field Club side the exercise was well worth while in that it helped with the recruitment of new members, gave a purpose and theme for a large number of field meetings, and provided instructions so that many members were able to improve their botanical knowledge. However, the bulk of the volunteers were capable botanists and, with over 256,000 records in and checked, a start has been made on writing up and preparing the results for publication of an *Atlas of the flora of Kent*. Some of the many problems of mapping the 1044 tetrads were discussed and illustrated. These included the varied geology (the boundary two-thirds of which is coastline, ranging from London Clay mud round to the shingle beaches at Dungeness), the large amount of development (such as new motorways, power stations, factories and housing estates), and changes in farming practice (removal of hedgerows and widespread use of herbicides). The problems of introduced species were also discussed.

J. R. Packham (*The organization of the Shropshire Flora Project*). A full account of this project is given in J. R. Packham *et al.* (1979). Preparing a new Flora of the Shropshire region using a federal system of recording. *Watsonia*, **12**: 239–247.

D. A. Wells (*The relationship between the B.S.B.I. Recorder and the Nature Conservancy Council*) described the former Nature Conservancy (N.C.) as consisting of two parts, the Conservation (Regional) Branch and the Research Branch. In 1973 these were separated by Act of Parliament and the Conservation Branch became the Nature Conservancy Council (N.C.C.), grant aided by the Department of Environment (D.O.E.). The Research Branch remained as a component of the Natural Environment Research Council (N.E.R.C.) and was renamed the Institute of Terrestrial Ecology (I.T.E.). Biological Records Centre (B.R.C.), formerly a section within the old Research Branch of N.C., thus now forms part of I.T.E.. The N.C.C. is the official government agency for fostering conservation of wild-life through site-safeguard and an advisory role. It acquires and manages National Nature Reserves (N.N.R.s). Areas of nationally high biological value outside N.N.R.s, together with areas taking account of regional and local variations, are scheduled as Sites of Special Scientific Interest (S.S.S.I.). These are notified to appropriate County Planning Departments, government and public bodies, and to their owners. Consultative procedures now exist between these bodies and N.C.C. over any proposals affecting S.S.S.I.s. N.C.C. has a commissioned research fund, some of which goes to the conservation of the British flora, notably part-funding of B.R.C. plus contracts to Universities and individuals to collect data on rare or local species on a county basis. This information is made available to the Vice-County Recorder (V.C.R.). The N.C.C. works through a three-tiered system based on *administrative boundaries* and not Vice-County boundaries:

(a) G.B. Headquarters based at Belgrave Square, London and Godwin House, Huntingdon.
(b) Country Headquarters with England at Banbury, Scotland at Edinburgh, and Wales at Bangor.
(c) Regional Offices with eight in England, four in Scotland, and three in Wales.

The Regional Officer (R.O.) is responsible for N.C.C. policy within his/her region and has Assistant Regional Officers (A.R.O.s) responsible for day to day matters within a county (district(s) in Scotland). Many V.C.R.s already have excellent liason with A.R.O.s, but with the influx of new A.R.O.s and the longer term prospect of staff mobility it is felt by both B.S.B.I. and N.C.C. that a formal system of notification of change in personnel is necessary. N.C.C. has agreed that R.O.s will notify change of A.R.O.s to the V.C.R. and B.S.B.I. will inform R.O.s, through *B.S.B.I. News*, of changes of V.C.R.s. It should be remembered that N.C.C. covers plant, animal, geological and geomorphological conservation, so that some A.R.O.s are not trained botanists but have expertise in another science. These A.R.O.s in particular will benefit from botanical guidance from V.C.R.s. One of the duties of an A.R.O. is to liaise, not only with farmers, planners, etc., but also with experts such as V.C.R.s in order that N.C.C. may be fully informed about sites with rare species. N.C.C. is consulted very early in the planning process and can feed in information before major decisions, which may affect a site, are taken. It is imperative that N.C.C. is aware of *all* sensitive sites. Having exchanged records between V.C.R. and A.R.O., field records of *Red Data Book* species should be sent to Lynne Farrell at N.C.C., P.O. Box 6, Huntingdon, who will see that they are entered into the B.R.C. system. Full confidentiality for records of highly sensitive species will be maintained.

P. J. Reynolds (*Celtic Fields–the fifth dimension*) reviewed the archaeological evidence from agricultural cultivation, including ards and hoes, carbonised seed, seed impressions and harvesting techniques, in order to examine a working hypothesis for farming practice of the pre-Roman Iron Age in this country. Experiments seeking to establish crop yields per acre of the prehistoric type cereals of Emmer and Spelt wheats were reported. The problems essentially posed by competitive weed flora, many species of which are now virtually extinct in the United Kingdom, have led to a full-scale research programme for their propagation and preservation. All examples were drawn from the current research programmes at the Butser Ancient Farm Project Trust. The interim results of these programmes suggest a high level of achievement in the late Iron Age with yields in excess of those of the early 20th Century. Certain well accepted theories, especially of harvesting and storage techniques, and the new archaelogical evidence would seem to be in conflict and in need of careful revision.

FIELD MEETINGS

During the week-end three field excursions were organized. On Saturday Dr Francis Rose led the party to the area north-west of Rogatc in the woods around Hartney Coombe. Noteworthy species encountered included *Lycopodium clavatum* and *Polygonum dumetorum*. On Sunday A. C. Jermy led an excursion to Amberley Wild Brooks, where the wide range of aquatic and marsh plants in the ditches and meadows demonstrated the importance of the site for nature conservation. The presence of *Leersia oryzoides* was of interest to many of the visiting botanists. On Monday those who remained at the Field Centre had a fascinating visit to the Butser Ancient Farm Project under the expert guidance of Dr Peter Reynolds.

F. H. PERRING

ANNUAL GENERAL MEETING, 10th May, 1980

The Annual General Meeting of the Society was held in the Chemical Laboratories Lecture Theatre, University of Cambridge, on Saturday, May 10th, 1980 at 12.15, with 160 members present. Mr R. W. David (President) took the Chair.

The Minutes of the last Annual General Meeting, as published in *Watsonia* **13:** 79–80 (1980), were passed.

REPORT OF COUNCIL

The adoption of the Report of Council for the calendar year 1979, which had been circulated to members, was proposed by Mrs A. Lee, seconded by Miss M. E. Young, and carried unanimously by the meeting.

TREASURER'S REPORT AND ACCOUNTS

The Report of the Treasurer and Accounts had been circulated to members. The Treasurer, presenting the Report, regretted the deficit for the year. This was due in part to a steady increase in printing costs. Mr Walpole commented that Societies such as ours could face difficulty in publishing at all in future years. The Treasurer also stressed the great value to the Society of bequests and donations from members. Adoption of the Report was proposed by Mr P. C. Hall and seconded by Dr J. H. Chapman, and was carried unanimously by the meeting.

PROPOSED AMENDMENTS TO RULES 20 AND 25: ANNUAL SUBSCRIPTION

The Treasurer explained that this was a Bank requirement for collection of subscriptions by Direct Debit, and proposed the following amendments to Rules 20 and 25:

Rule 20, add: "The Society may participate in the Direct Debiting Scheme as an Originator for the purposes of collecting subscriptions and/or any other amounts due to the Society. In furtherance of this object, the Society may enter into any Indemnity required by the Banks upon whom Direct Debits are to be originated. Such an Indemnity may be executed on behalf of the Society by delegated officers of the Council of Members".

Rule 25, add: "Subscriptions may be paid under the authority of a Standing Order Mandate or a Direct Debiting Mandate lodged with the member's Bank and expressed to be in favour of the Botanical Society of the British Isles".

The adoption of the amendments was seconded by Mr R. J. Pankhurst and approved by a large majority.

ELECTION OF VICE-PRESIDENT

The President warmly thanked the retiring Vice-President, Mrs B. H. S. Russell, and proposed from the Chair the Council's nomination, Mr P. C. Hall, who was unanimously elected.

ELECTION OF OFFICERS

Mrs M. Briggs (Honorary General Secretary), Mr M. Walpole (Honorary Treasurer), Drs S. M. Eden, N. K. B. Robson, C. A. Stace and D. L. Wigston (Honorary Editors), Miss L. Farrell (Honorary Field Secretary), and Mrs R. M. Hamilton (Honorary Membership Secretary), had been nominated for re-election. Mrs J. M. Mullin had resigned and Council had nominated Miss J. Martin for election as Honorary Meetings Secretary. The election of these officers en bloc was proposed by Mr E. Milne-Redhead, seconded by Mr D. R. Donald and was carried unanimously. The meeting extended their thanks to Mrs J. M. Mullin for her services to the Society and thanked all the officers for their work during the year.

ELECTION OF COUNCIL MEMBERS

Dr H. A. McAllister, Mr A. O. Chater and Dr A. J. Richards had been nominated and were unanimously elected. Their order of precedence (for Rule 10), as given, was determined by ballot.

ELECTION OF HONORARY MEMBERS

The President proposed from the Chair two Honorary Members nominated by Council: Mrs I. M. Vaughan and Mr T. A. W. Davis, both of whom had served the Society well over a great many years. Their election was carried with warm applause.

ELECTION OF HONORARY AUDITORS

The Treasurer, expressing our gratitude to Messrs Thornton Baker & Co. for their help in auditing the Society's Accounts, proposed their re-election. This was carried unanimously.

ANY OTHER BUSINESS

The Treasurer thanked Professor T. G. Tutin, whose name appeared on both numbers 1 and 2 of the B.S.B.I. Handbook Series, for writing the text of *Umbellifers of the British Isles* very quickly – an example to other contributors.

Mr Milne-Redhead voiced appreciation for *B.S.B.I. News* and to the Editor Mr E. D. Wiggins.

Dr S. M. Walters was thanked for the good local arrangements and Mrs L. Walters was thanked in advance for preparing lunches for the unusally large number of members attending the meeting.

The President expressed appreciation and thanks to all the voluntary officers for the very considerable work that they undertook for the Society, with mention particularly of the Honorary General Secretary and the Honorary Treasurer.

The meeting endorsed and applauded all the above comments, and closed at 12.50.

M. BRIGGS

EXCURSION HELD IN CONNECTION WITH THE ANNUAL GENERAL MEETING

BRECKLAND, 11TH MAY, 1979

The response to the proposal for an excursion, on the day following the A.G.M., was gratifying evidence of the health of the Society and the enthusiasm of its members, but daunting to the organisers, who had the problem of enabling 156 people to view a series of tiny, scarce, and delicate annuals. The plants were, however, enjoyed, and even photographed, without damage to them or to their environment, and for this the Society owes particular gratitude to three persons: first and foremost to Mrs Crompton, who took infinite trouble in planning the strategy of the expedition; second to Mr Edge of H. E. H. Enterprises, who gave permission not only for the cavalcade to visit Chippenham gravel pits, but for those who joined it from outside Cambridge to park their cars there while making the rest of the trip by coach; and lastly to the Clerk of the Weather, who provided continuous sunshine. A warm tribute is also due to the patience, good humour and docility of all those attending.

The party travelled in three coaches with a guide in each – Mrs Crompton, Philip Oswald, and the President. The guides had toured the possible sites earlier in the week, together with John Trist, who was prevented, by an assignment in Crete, from being present on the day but whose knowledge of the Breck was an invaluable assistance. We proceeded in convoy to Chippenham, where *Herniaria glabra*, small, but in strong bud, was seen in some quantity. We were reunited for lunch at Maidscross Hill, where Mr Rutterford kindly came in from Lakenheath and demonstrated the few tufts of *Trifolium suffocatum* in a red carpet of *Crassula tillaea*. A number of other Breck specialities could also be seen there: *Muscari atlanticum* in quantity (on one bank mixed with the garden outcast, *M. armeniacum*, a useful comparison), *Ornithogalum umbellatum, Silene conica* (leaves only), and *Veronica praecox*.

Before and after lunch the coaches separated, so that more restricted sites could be visited in turn without overcrowding. On the Suffolk Trust site at Tuddenham two other rare Veronicas, *V. verna* (native) and *V. triphyllos* (originally introduced but now self-sown), were observed, as well as a superb stand of *Euphorbia cyparissias*. At Foxhole Heath *Carex ericetorum* and *C. caryophyllea* could be compared; also seen were *Festuca caesia, Silene otites* (in bud as well as conspicuous by the dried fruiting stems of the previous year), *Cerastium arvense*, and several mats of *Thymus serpyllum*.

As the coaches returned on schedule to Cambridge, the smiling faces of the passengers bore witness to a good day.

R. W. DAVID

FIELD MEETINGS 1979

ENGLAND

NORTHWICH & WINSFORD, CHESHIRE. 30TH JUNE

About 20 members and friends gathered at the Winsford salt mine, near which is a remarkably diverse series of habitats: heathland occurs on the sandy soils of the River Weaver terraces, which cap slopes where the Middle Keuper Marls are exposed; superimposed on these are old evaporation pits, once used by a now extinct salt industry, and ashes and rubble from old works, which are now overgrown by *Salix* scrub.

In hollows among the *Callunetum* a few healthy plants of *Osmunda regalis* were admired, but close by grew luxuriant masses of *Vicia sylvatica* both in scrub and in the open. This plant in Cheshire is closely associated with the Keuper saliferous beds. In some old pits further halophytic evidence was present in the shape of *Scirpus tabernaemontani*, *Spergularia marina* and *Puccinellia distans*, while nearby a stand of *Carex pseudocyperus* and *Typha angustifolia* was conspicuous.

After lunch the lime-waste beds at Northwich (edaphically similar to dune slacks) provided *Erigeron acer*, *Inula conyza* and *Hirschfeldia incana*, while several thousand spikes of *Dactylorhiza fuchsii*, *D. praetermissa* and their hybrids (many over 1 ft high) were admired. *Gymnadenia conopsea* subsp. *densiflora* appears to have spread considerably in the last few years, but the small colony of *Dactylorhiza incarnata* subsp. *coccinea* appeared to have been submerged under town rubbish. Thousands of *Hieracia* were a colourful sight but the party was noticeably reluctant to attempt their diagnosis.

A. NEWTON

SOMERTON, SOMERSET. 21ST–22ND JULY

A party of 26 members and friends gathered to look at the flora of part of West Sedge Moor, under the leadership of Captain R. G. B. Roe. We were told there has been local controversy over the proposal to lower the water table but the threat has been averted for the present. The alkaline water of the rhynes (pronounced locally 'reens') attracted most members. We soon found *Stellaria palustris, Carex pseudocyperus, Oenanthe aquatica, Scirpus tabernaemontani* and *Samolus valerandi*. Although we saw a whole field of *Thalictrum flavum*, it was difficult to find a flowering specimen due to the activities of grazing cattle. Also in this peaty field were *Carex nigra, C. disticha, Cirsium dissectum* and a white specimen of *Lychnis flos-cuculi*.

After lunch by the side of a calcareous wood, reputed to contain *Lithospermum purpurocaeruleum*, the party moved to Drayton to examine the banks of the River Isle and River Parrett. Both *Sagittaria sagittifolia* and *Butomus umbellatus* were agreed to be superb. Small, partly eaten specimens of *Petroselinum segetum* were found and it was interesting to hear that it is increasing in Somerset. *Oenanthe fluviatilis* was just beyond the reach of the precariously-balanced Captain Roe even with the longest walking stick.

The party met again on the Sunday at the Somerset Trust's 150 acre reserve of Great Breach Wood. This oak wood, noted for its butterflies and fungi, also proved botanically interesting under the guidance of Mr Keylock, chairman of the reserve management committee. He outlined the management policy for the wood, one aim of which was to encourage butterfly species. The ride clearance scheme was shown to be favourable for many plant species. Many leaves of *Primula veris* were seen and other less common species which were found included *Ophioglossum vulgatum, Paris quadrifolia, Ophrys apifera* (including a yellow form), *Lathyrus sylvestris, Rubia peregrina* and *Silaum silaus*. Tree species of special interest were coppiced *Tilia cordata* and *Carpinus betulus*.

After lunch, several sites around Charlton Mackrell were visited. Firstly a dry, calcareous lane for *Astragalus glycyphyllos* and a fine stand of *Sambucus ebulus*, known at this site for 150 years. A steep, calcareous bank yielded a blaze of colour from typical species and was enhanced by *Asperula cynanchica, Prunella laciniata* and *Carduus nutans* (white form). A small quarry in the Blue Lias yielded *Lathyrus aphaca, Anagallis arvensis* subsp. *foemina, Legousia hybrida, Vicia tenuissima, Valerianella eriocarpa, Silene noctiflora* and *Thlaspi perfoliatum*. The final 'find' of the day was *Salvia horminoides* on a dry roadside bank.

It is a pleasure to record the much improved conservation awareness shown by all members, but especially the care taken by the group's photographers.

E. J. ADNAMS

BRATTON, N. WILTSHIRE. 28TH JULY

Twenty one members met on Warden's Down, Bratton, v.c. 7, to visit the best remaining site in Britain of the Tuberous Thistle, *Cirsium tuberosum*. In the absence of Mrs Swanborough, due to serious illness, the party was led by the writer. We were pleased to welcome Miss H. M. Hughes, who discovered the site in 1951.

Pure *C. tuberosum* is found elsewhere only on the Whylye Downs, S. Wilts., v.c. 8, where, however, most plants are referable to the hybrid with *C. acaulon, C.* × *zizianum*. At Avebury, N. Wilts., v.c. 7, only this combination remains and at Nash Point, Glamorgan, v.c. 41, only *C.* × *semidecurrens* (= *C. palustre* × *C. tuberosum*) is now to be found. *C. tuberosum* is extinct in Cambridgeshire. Its continued existence on Warden's Down is largely due to the dominance of uncropped, robust grasses, mainly *Bromus erectus*, which does not favour the growth of *Cirsium acaulon. C. tuberosum* is best separated from intermediates by the truncate nature of the base of the involucre and the presence of arachnoid hairs only on the upper cauline parts. Plants in the hybrid swarms range from acaulescent forms close to *C. acaulon* to plants only distinguished with difficulty from pure *C. tuberosum*.

The introduced crucifer, *Erucastrum gallicum*, a native of central and south-western Europe, was locally abundant on tank-tracks and disturbed soil. An outstanding feature of the typical downland flora was an abundance of *Campanula glomerata*, some up to 75 cm in height. The party saw a fine colony of *Neottia nidus-avis* in a nearby beech-wood, before continuing to Bratton village, where *Torilis arvensis*, which is decreasing in abundance, was seen. *Galeopsis angustifolia* at Seend Station preceded the final stop at Morgan's Hill, where the extraordinary downland site of *Epipactis palustris* was visited. Much *Phyteuma tenerum* and *Thesium humifusum* brought a rewarding and enjoyable meeting to its close.

Our thanks are due to Major R. H. B. Oatts, of the School of Infantry, Warminster, for permission to visit the Army ranges.

A. L. Grenfell

SPURN POINT, S.E. YORKSHIRE. 11TH AUGUST

This was a joint meeting with the Yorkshire Naturalists' Union and 15 persons attended. The aim of the meeting was to look at the various habitats on Spurn Point and observe recent changes due to erosion and the severe flooding of 1978. Habitats examined included short turf, mobile and fixed dunes, river shore, salt marsh and a brackish-water canal.

A single plant of *Glaucium flavum* with several plants of *Salsola kali* were seen by the Spurn road, where they had first appeared in 1978 after flood water had surged over the peninsula and up the road. The hybrid, *Ononis repens* × *O. spinosa*, was also seen on the road-side sand. The party spent some time in the 'Point Camp' examining short turf and bare sand for *Trifolium suffocatum*, which is at its northernmost limit on Spurn, and plants with both flowers and fruits were seen. *Filago apiculata* was also seen here. *Catapodium marinum* was seen in four places on the peninsula, in some of which it is a recent introduction. Disturbance of sand by storms has favoured some species. There was a particularly fine show of *Eryngium maritimum* and *Calystegia soldanella*; *Viola canina* subsp. *canina* and *Phleum arenarium* were also seen.

Following the extensive colonization of the mud-flats by *Spartina anglica* over the last 30 years, a salt marsh is building up and this was examined with interest. A brackish-water canal just north of the Yorkshire Naturalists' Trust Reserve was visited. The most interesting species seen included *Juncus maritimus*, *Carex extensa* and *C. distans*, which appeared by the canal soon after the construction of the new flood bank in 1954.

F. E. Crackles

WALES

MWNT AND GWBERT, CARDIGANSHIRE, 2ND JUNE

A dozen members met at the National Trust car park at Mwnt and then proceeded on to private land along the top of the cliffs to see colonies of *Scilla verna* in full flower; the largest colony covered about an acre. *Sagina maritima* was abundant, especially by the paths, and we also inspected the coastal heath vegetation which had *Serratula tinctoria* on the slopes. After climbing Foel y Mwnt and lunching, the party proceeded to The Patch, Gwbert: 15 acres of sand dune largely occupied by caravans but containing a fine assemblage of plants. On the youngest dunes were *Euphorbia paralias*, *Vulpia fasciculata*, *Phleum arenarium*, *Calystegia soldanella* and large colonies of *Oenothera stricta* and *O. cambrica* (*Anacamptis pyramidalis*, 460 spikes of which were seen here two months later, was not yet visible). Where sea erosion is removing the western part of the dunes, at a rate of 20m in the last 3 years, we found a small colony of *Anchusa arvensis*. Some of the more stable inner parts of the dunes had a rich flora including *Stellaria pallida*, *Trifolium micranthum*, *T. scabrum*, *T. striatum*, *T. arvense*, *Myosotis ramosissima*, *Erodium glutinosum*, *Cerastium semidecandrum*, *Vicia lathyroides* and a prostrate dune form of *Sarothamnus*. Towards the north, where the dunes overlie boulder-clay, *Rosa pimpinellifolia* and *Ulex europaeus* form scrub with colonies of naturalised *Lupinus arboreus*. We saw a total of *c*. 160 species on The Patch before rain intervened. Mr & Mrs Boyes Lee kindly entertained the party to tea nearby.

A. O. Chater

ISLE OF MAN

ISLE OF MAN. 15TH–18TH JUNE

The President and 25 members of the Society attended the meeting. On the morning of the first day flushes and brackish pools were examined on the west coast of the island, near Creglea. Here, *Dactylorhiza maculata* subsp. *ericetorum*, *D. purpurella*, *Eleocharis quinqueflora*, *Pedicularis sylvatica*, *Pinguicula vulgaris, Samolus valerandi, Schoenus nigricans, Triglochin palustris* and the sedges *Carex demissa, C. distans, C. echinatus, C. extensa, C. flacca, C. hostiana, C. nigra* and *C. ovalis* were noted. In the afternoon one of the Manx National Glens, Glen Maye, was explored. The abundance of ferns, including *Asplenium adiantum-nigrum, A. trichomanes, Athyrium filix-femina, Blechnum spicant, Dryopteris dilatata, D. filix-mas, D. pseudomas, Phyllitis scolopendrium, Polypodium vulgare* and *Polystichum setiferum* was a feature. Although not seen by the party, *Polypodium australe* still persists in the Glen. The coastal cliffs north of Glen Maye were also examined and *Adiantum capillus-veneris* and *Vicia sylvatica* were seen. To end the day, spoil from old mine workings at Foxdale was visited and *Botrychium lunaria, Lycopodium selago* and *Ophioglossum vulgatum* were noted.

The second day was spent in the north of the island. In the morning the Curraghs were visited and fine stands of *Carex diandra, Hypericum elodes, Myrica gale* and *Osmunda regalis* were admired. As the party left the Curraghs, marshy meadows were visited and *Listera ovata, Platanthera chlorantha, Salix cinerea* subsp. *cinerea* and *S. cinerea* subsp. *oleifolia* were found. *Dactylorhiza fuchsii, D. maculata* subsp. *ericetorum* and intermediates were also abundant. In the afternoon the party went to the Ayres. In sandy fields *Ornithopus perpusillus* and *Rhynchosinapis monensis* were seen, whilst in the dunes *Dactylorhiza incarnata* subsp. *coccinea* and subsp. *incarnata, Erodium glutinosum, Myosotis ramosissima, Neotinea intacta, Trifolium ornithopodioides, Valerinella locusta* subsp. *dunense* and *Vicia lathyroides* were recorded as of interest. *Chara hispida* (det. Mrs J. Moore), a new vice-county record, was also found in a pond on the Ballakinnag Ayres. In the evening Dr Garrad gave an informal talk on the island's natural history to those members who had come over from England.

The third day of the meeting was spent in the south of the island. The first part of the day was spent at Langness examining coastal flushes and salt marshes. Little of note was seen although *Carex pulicaris* and *Juncus foliosus* were recorded. Later the limestone and brackish pools at Scarlett were examined. *Carex distans, C. extensa, Catapodium marinum, Eleocharis uniglumis, Samolus valerandi* and *Triglochin palustris* were recorded, but the vivid colours of *Armeria maritima, Astragalus danicus, Lotus corniculatus* and *Silene maritima* were a particular feature of the meeting. The afternoon was spent at the Manx Folk Museum at Cregneish and in exploring the marshy fields on the way from the village to the Chasms. In the evening *Carex punctata* at its Onchan site was visited.

On the last day the party divided into two. One group visited the Dhoon Glen and other east coast localities for *Carex laevigata*. The second group walked from Glen Mona to Snaefell, visiting the Snaefell mines on the way. Most of the route was over dry *Calluna*-covered hills and few species were seen. The spoil heaps at the mines were generally too toxic to support vegetation, but in the streamside flushes of the Laxey River *Carex demissa, C. echinata, Drosera rotundifolia, Narthecium ossifragum, Salix aurita* and *Thelypteris oreopteris* were seen. Near the summit *Luzula sylvatica* was noted whilst on the summit plateau *Salix herbacea* was recorded.

E. F. GREENWOOD & L. S. GARRAD

SCOTLAND

EYEMOUTH, BERWICKSHIRE. 6TH MAY

On a day typical of an appalling spring following an execrable winter, a group of 12 enthusiasts met at the Church corner in Eyemouth. It being 11 a.m. on Sunday morning, hailing viciously, and the parking place for worshippers of three denominations, the start was slightly confused. The winter showers finally stopped just after midday, and we drove out of the town to view the local dandelions, the chief object of the expedition. Somebody, very possibly the leader, had decided that this corner of Scotland was sufficiently promising, unknown taraxacologically, and near to England, or more specifically Newcastle, to warrant a visit. In the event it proved to be rather dull with regard to dandelions, and extremely cold.

The first stop, on a roadside, provided material of *Taraxacum huelphersianum*, till then only known from near the coast in north-east England. Other species such as *T. hamatiforme*, *T. hamatulum* and *T. polyodon* very much set the scene for the day, but *T. insigne* and *T. expallidiforme* were not recorded again. The next stop, in a small car-park on the seaward side of Coldingham, provided a sheltered lane with a south-facing bank, on which magnificent specimens of *T. cyanolepis*, with cobalt-blue bracts, were much in evidence. The commonest member of the confusing aggregate of species around *T. hamatum*, here proved to be *T. kernianum* with its very wide exterior bracts; *T. hamatiforme* with bordered bracts, its near relation *T. hamiferum* with unbordered bracts and *T. hamatulum* with short and narrow bracts (scarcely exceeding 2mm in width) were also recorded. A walk along the coast to the village of St Abbs produced the only Sect. *Erythrosperma* (*T. lacistophyllum*) and Sect. *Spectabilia* (*T. euryphyllum*) species of the day, the former characteristically confined to shallow soils on the cliff-ledges. *T. croceiflorum* and *T. ancistrolobum* were added to the list of Sect. *Vulgaria* species.

A general monotony in the *Taraxaca*, which were dominated by *T. hamatiforme*, combined with an all-pervasive and very persuasive numbness in our extremities, suggested a move inland, and we drove to the banks of the Eye Water just west of Ayton. A meadow showed large quantities of *T. raunkiaerii* (surely the commonest dandelion in Scotland and northern England) and *T. hamatiforme*, but the hedge above provided a rarity in the shape of *T. piceatum* with its characteristic heavy-coloured bracts. *T. brachylepis*, a scarcer relative of *T. raunkiaerii*, and *T. oblongatum* were noted in the lane above. A nearby tip produced little in the way of dandelions, except for one as yet unidentified species quite strange to the leader, but had an interesting alien flora including *Allium paradoxum, Cicerbita macrophylla, Paeonia officinalis, Chenopodium bonus-henricus* and a *Knautia* species.

A final port of call was to the little cove at Burnmouth, but scarcely had we noted *T. hamatiforme*, and sheets of very well-developed *Cochlearia officinalis*, which had invaded a rock-garden almost to the exclusion of less salt-tolerent congeners, than the rain returned with a vengeance and we dispersed hurriedly to our cars, and the meeting broke up in weather-borne confusion, much as it had started.

A. J. Richards

APPIN, ARGYLL. 16TH–17TH JUNE

The meeting was held to examine the limestone flora of the area. On Saturday the north end of Lismore Island, in square 17/84, was visited. Ten people made for Loch Baile a 'Ghobainn, while seven rounded the north tip of the island to Port Ramsay. On or near limestone outcrops both parties saw the following species which are locally frequent on Lismore: *Arabis hirsuta, Helianthemum chamaecistus, Geranium columbinum, G. lucidum, Saxifraga tridactylites, Valerianella locusta, Orchis mascula* and *Dactylorhiza incarnata*. In addition the Port Ramsay party saw *Sherardia arvensis* and *Listera ovata*, while the loch party saw *Hippuris vulgaris, Veronica anagallis-aquatica, Potamogeton perfoliatus, Carex paniculata* and *C. diandra*.

On the Sunday Glen Creran, in square 27/04, was visited. Nine people ascended to 2000 ft on Beinn Sgulaird, while six explored Loch Baile Mhic Chailein and its surroundings. The upland party met *Lycopodium alpinum, Botrychium lunaria, Trollius europaeus, Arenaria norvegica, Oxytropis halleri, Potentilla crantzii, Dryas octopetala, Salix herbacea, Gnaphalium supinum* and *Helictotrichon pratense*. Meanwhile the lowland party recorded a much longer list, including *Dryopteris carthusiana, Alisma plantago-aquatica, Eleocharis uniglumis, Scirpus sylvaticus, Blysmus rufus* and *Carex vesicaria*. The weather co-operated well and, apart from the unfortunate loss of a camera on the hillside, all enjoyed the meeting.

A. A. P. Slack

CORRIE FEE, GLEN CLOVA, ANGUS. 30TH JUNE

Approximately 40 people participated in the annual joint meeting between the Alpine Section of the Botanical Society of Edinburgh and the B.S.B.I.

While approaching the corrie, *Alchemilla conjuncta* on the banks of the White Water and *Listera cordata* amongst the tall heather added interest during the walk through the forestry plantation. In the corrie the south-east facing cliffs were searched, and *Oxytropis campestris* was soon encountered in some quantity. Nearby, a few fine specimens of both *Woodsia alpina* and *W. ilvensis* caused a long debate before their true identity was established. Other ferns seen included *Dryopteris abbreviata, Polystichum aculeatum* and *P. lonchitis*. On the more basic rock ledges were *Saxifraga nivalis, Potentilla crantzii, Saussurea alpina* and *Melica nutans*.

By late afternoon the south-east facing cliffs had been searched and the party divided, half returning to the cars while the more intrepid ascended the cliffs on the south side of the corrie. Here *Carex stenolepis* (*C. grahamii*) was in rather immature fruit, whilst *Carex norvegica* was seen on high moist rocks, near a fine colony of *Salix lanata* and *Salix lapponum*.

The weather was fine and dry although rather cold. Unfortunately, in separate incidents, two members of the party were injured on the unstable rocks, which somewhat marred the enjoyment of an otherwise successful day.

R. J. D. McBeath

DUNS, BERWICKSHIRE. 7TH–14TH JULY

The object of the meeting was to record at sites suggested by the Scottish Wildlife Trust, in conjunction with the Nature Conservancy Council, to be of probable botanical interest, but for which no detailed records existed. Suitable sites are to be notified by S. W. T. to their owners as 'Listed Wildlife Sites' to encourage their voluntary conservation. The attendance at the meeting ranged from four to eleven with a total of 21 participants in all, ten from B.S.B.I., ten from S. W. T. and Mr C. O. Badenoch of the Nature Conservancy Council. Not one of the participants lives in Berwickshire.

On Saturday we visited the coast near Cockburnspath. The grassland at Greenheugh Point was a little disappointing, though there were fine displays of *Helianthemum chamaecistus* and *Anthyllis vulneraria*. Difficulty was experienced in distinguishing lush specimens of *Senecio sylvaticus* from *S. viscosus*, though the latter was only found on the beach, where we also found *Stellaria pallida*. Flushes yielded *Oenanthe crocata* and *Eupatorium cannabinum*, both almost exclusively coastal plants in Berwickshire. A small colony of *Asplenium adiantum-nigrum* was found, which is unusual on the coastal rocks. At Reed Point the grassland was richer and *Orchis mascula* was present. The shore was more exciting with colonies of *Glaucium flavum* totalling about 80 plants. Nearby, in a patch of turf at the sea's edge, were *Puccinellia maritima*, *Juncus gerardii*, *J. maritimus*, *Carex extensa* and *Blysmus rufus*. At Rams Heugh there was a huge multicoloured colony of *Centranthus ruber* surrounded by a dense sward of *Anthyllis vulneraria*. *Carex pendula* was recorded at Dunglass Burn.

On a damp Sunday we were welcomed to the grouse moor of Roxburghe Estates, above Longformacus, by the Duke's keeper, who ran an appreciative eye over Mr Howitt's veteran Rolls Royce. Here *Rubus chamaemorus* still grows below 1500ft. In flushes by the Dye Water *Sedum villosum* was frequent and the sedges included *Carex curta* and *C. disticha*. The cleuchs were sampled without any base-rich areas being discovered, but *Listera cordata* was found among *Sphagnum*. A most elegant crested 'sport' of *Athyrium felix-femina* was found, worthy of any Wardian case. The birds, which included Ring Ouzels and Merlins, had been more impressive than the flora.

On Monday the sun re-appeared and we recorded at Duns Castle Wildlife Reserve. The flora of the Hen Pool is well known with *Acorus calamus*, *Nuphar lutea* and both *Typha angustifolia* and *T. latifolia*. The Howitts elucidated the willows, which included a range of introduced hybrids, and we noted the few tussocks of *Carex paniculata*. Some of the party scoured the woodlands and found strong colonies of *Pyrola minor* (relocated after many years) and *Lycopodium clavatum*, an interesting lowland record at 500ft. *Viola lutea* was seen at a hillfort above Langtonlees, the only record for the week of this species, which is so common a few miles further west.

Tuesday morning was spent in Edrington Deans. The upper part was rich in ferns including *Polystichum aculeatum* and *Phyllitis scolopendrium*, and *Campanula latifolia* was plentiful. Fine banks of elm and rowan had a ground flora of *Brachypodium sylvaticum*, *Hypericum hirsutum* and *Primula vulgaris*. Other associates were few except on one steep bank where *Gymnadenia conopsea* and *Listera ovata* grew with *Briza media*, *Carex flacca* and *Trifolium medium*. The burnside had frequent colonies of *Scrophularia umbrosa*. By the Whiteadder Water *Scirpus sylvaticus*, *Butomus umbellatus* and a species of *Thalictrum* were found in an area much invaded by *Heracleum mantegazzianum* and *Impatiens glandulifera*. Grassland at the Dean at Foulden proved pleasing with *Scabiosa columbaria* and *Listera ovata* together with *Helianthemum chamaecistus*, *Thymus drucei*, *Briza media*, *Helictotrichon pratense* and many other associates. A small elm and oak wood by the Whiteadder boasted a bank draped with *Vicia sylvatica*. At Bonkyl Wood, where the formerly fine birch has been extensively felled and the wood drained, *Dryopteris carthusiana* was traced with difficulty. No habitat remains for the *Trollius europaeus* and *Goodyera repens*, formerly recorded there.

Wednesday was spent on the sea cliffs near Burnmouth, in magnificent weather. *Vicia sylvatica*, in full flower, and very plentiful *Helianthemum chamaecistus* with *Geranium sanguineum* combined to give a memorable colour display. *Petroselinium crispum* has been established for many years near the village; it has lost the much dissected leaves of the garden variety but not the smell. Other aliens which are established and spreading here are *Cotoneaster horizontalis* and *Aira caryophyllea* subsp.

multiculmis. Poterium sanguisorba and *Viola hirta* were present in quantity with *Carlina vulgaris, Koeleria cristata* and *Catapodium rigidum*; *Orchis mascula* was locally abundant. Two good colonies of *Ligusticum scoticum* were found and *Catapodium marinum* (second record for v.c. 81) was noted on the rocks. The flushes not only featured *Equisetum telmateia, Eupatorium cannabinum* and *Lythrum salicaria* but also *Pinguicula vulgaris* with *Carex lepidocarpa*. A plutonic outcrop had a distinctive flora with *Calluna vulgaris, Empetrum nigrum, Erica cinerea, Endymion non-scriptus* and *Allium ursinum* covering the northern slopes. *Astragalus danicus* was on the crest with a fine display of *Agrimonia eupatoria* below. *Fumaria micrantha* was found on the railway line by N. Stewart, the first record for v.c. 81. In the evening an excursion was made by invitation to Longformacus to see an important wet meadow with *Trollius europaeus* and *Cirsium heterophyllum*. Miss Blance had paused by Greenlaw moor on her way to the meeting in the morning and arrived with *Selaginella selaginoides* and *Blysmus compressus*.

On the Thursday *Populus nigra* was seen on the way to Eccles. At Eccles we visited some pools thought to be glacial kettle-holes; if so they are much modified. They yielded little but *Carex riparia, C. vesicaria* and many frogs. Then we visited the remains of a series of bogs along a burn towards Coldstream. Bishops Bog has been deeply drained; it is dominated by *Phragmites australis* with *Solanum dulcamara* as its sole associate. *Scrophularia umbrosa* was frequent here and in the lower bogs. Horse Bog has been much drained and planted but there is an area of alder and birch wood of interest, despite some invasion by nettles. Here *Crepis paludosa* was locally dominant, as also was *Carex riparia*, and *Listera ovata* was present. Lithtillum Loch is a pleasant place dominated by stands of *Carex riparia* and by willow carr of *Salix atrocinerea* and *S. alba* with *Dryopteris carthusiana*. *Carex otrubae*, which in Berwickshire is normally restricted to the coast, was recorded here. Haigsfield has been planted with conifers but a small duck-pond remains and *Carex paniculata* and *Listera ovata* were found. *Anagallis arvensis, Lamium amplexicaule, Lycopsis arvensis, Fumaria micrantha* (second record for v.c. 81) and *Matricaria recutita* were recorded from field borders. The *Matricaria recutita* was in a depression with *Alopecurus geniculatus* and *Veronica scutellata* about a mile from where it was recorded almost twenty years ago. There is strong evidence that it is established and not a mere casual. We also recorded it from a field-edge at Burnmouth.

Mr Arblaster of Silverwells entertained us on Friday with his fine rhododendron collection and refreshments before we visited a small birch wood, where *Corallorhiza trifida* was seen in an area invaded by *Montia sibirica*. A neighbour's birch wood where there was much *Sanicula europaea*, yielded *Pyrola minor* but there was no sign of the *Corallorhiza trifida* recently reported there also. In the afternoon we visited Long Moss on Coldingham Common. Here we found an unexpectedly important site with a variety of habitats including a birch wood surrounded by willow carr, *Phragmites* beds, open areas with *Carex curta* and a mass of *Vaccinium oxycoccus*, and a small loch. The woodland proved rich with plentiful *Trientalis europaea, Pyrola minor* and *Dryopteris carthusiana*. Exciting finds were *Corallorhiza trifida, Gymnocarpium dryopteris* and *Listera cordata*. Open ground yielded *Salix repens* and *Platanthera bifolia* with *Dactylorhiza purpurella*. S.S.S.I. status will now be sought for this site. Flushes elsewhere on the Common yielded *Parnassia palustris, Dactylorhiza incarnata, Oreopteris limbosperma, Juncus kochii* (first record for v.c. 81) and many *Carex* species including *Carex dioica*.

On Saturday we visited grassy craigs on plutonic outcrops between Hume and Stitchill. Those at Hume and Lurgie were sun-scorched and species-poor. *Koeleria cristata* was quite plentiful with *Scleranthus annuus*, but *Helianthemum* was absent and even *Thymus* scarce. For variety we pushed through a field edge bright with *Galeopsis speciosa* to Lurgie Loch. This is primarily a wet birch wood surrounded by willow carr and *Carex disticha*, but open areas are dominated by *Molinia caerulea* with holes full of *Eriophorum angustifolia*, and *Carex hostiana* was present. The woodland was found to have widespread *Corallorhiza trifida* and some *Pyrola minor*. In one part Scots pine was regenerating well with *Salix repens, S. pentandra, Erica tetralix* and *Vaccinium oxycoccus*. The *Carex disticha* flushes were white with *Galium uliginosum* but *G. palustre* was also present. *Dactylorhiza fuchsii, D. purpurella, Angelica sylvestris* and *Holcus lanatus* were also present but not plentiful. This site is now a probable S.S.S.I. Further grassy craigs were visited in the afternoon. Hareheugh and Sweethope look superficially similar to Hume and Lurgie but carry a richer flora, with *Helianthemum chamaecistus, Aira caryophyllea* and *Dianthus deltoides*. *Vulpia bromoides* was recorded from Sweethope. The week ended, as it had begun, in sunshine.

As S.W.T. Branch Secretary for the Tweed Valley I would like to thank the B.S.B.I. participants for making this a successful joint venture.

M. E. Braithwaite

CAM CHREAG, MID PERTHSHIRE. 22ND JULY

Thirteen members and guests attended the field meeting at Cam Chreag. The purpose of the meeting was to record on this little-known mountain in Glen Lyon. The party ascended the mountain via a stream running northwards from Gallin. This stream quickly develops into a wooded gorge, the sheltered depths of which supported a rich flora. Among the plants seen were *Orthilia secunda* and *Melica nutans*. Climbing out of the gorge, a stretch of moorland was traversed to the east-facing quartzite crags of Cam Chreag. Quantities of *Chamaepericlymenum suecicum, Trientalis europaeus* and *Rubus chamaemorus* were seen en route. The crags themselves supported a rather dull flora with few alpines, although *Thalictrum alpinum, Juncus trifidus* and *Sibbaldia procumbens* were noted. Of rather more interest were a few micaceous flushes below the crags, in one of which a patch of *Sagina* × *normaniana* was seen. An interesting orchid was spotted on the return journey in a clump of *Gymnadenia conopsea*; this was subsequently determined to be a hybrid between *Gymnadenia* and *Pseudorchis albida*. A total of 200 species was recorded.

J. WINHAM

ULLAPOOL, W. ROSS. 28TH JULY–3RD AUGUST

The object of the meeting was to visit possibly under-recorded 10km squares in the Ullapool area, in the hope of adding further species and to check on critical genera. A total of ten members attended at some time during the week and we were pleased to welcome Professor Ljerka Godicl from Yugoslavia. G.C. Druce, in his remarkably comprehensive 'Flora of West Ross' (1929) gave graphic descriptions of the 'extraordinarily high' rainfall and the rapacity of the midges, and little has changed. However, local landowners were generous in the access they allowed us to their properties and we had no need to employ Druce's ruses to avoid gamekeepers.

After an unnecessary wait for further members who had booked, but were never to appear, we spent the first day in square 29/10, with most of the party following the Allt Claonaidh from the southern end of Loch Lurgainn up to the cliffs of Ben More Coigagh above Lochan Tuath. This was an excellent introduction to the blanket bog of north-western Scotland, with the presence of *Schoenus nigricans* and *Pinguicula lusitanica* showing its similarities to the peatbogs of western Ireland. Wet hollows contained *Drosera* × *obovata* with its parents, while *D. intermedia* occurred very locally on bare peat hummocks. *Cornus suecica* and *Listera cordata* were found on higher ground. Such areas of cliff as we had time to explore were disappointing, dominated largely by *Sedum rosea*. Grassy slopes below the cliffs had *Rhinanthus minor* subsp. *borealis* and *Luzula spicata*. A small colony of *Hammarbya paludosa*, spotted by Helen Jackson, enlivened the return journey. Meanwhile those who had stayed nearer the road had made a fine discovery in *Lycopodiella inundata*.

The Sunday was spent exploring the coast at the mouth of Strath Kanaird (square 29/10). The moorland was disappointing, other than producing two further small colonies of *Drosera intermedia*. The same single plant of *Pseudorchis albida* was independently discovered by almost every member of the party, while the disturbed river-banks, adjacent to farmland, produced several plants of *Senecio* × *ostenfeldii*. However, the gravelly fragments of saltmarsh provided most interest. *Carex scandinavica* and *C. extensa* were locally frequent, while an *Euphrasia* astutely spotted by Miss McCallum Webster had characters suggesting *E. heslop-harrisonii*.

On the Monday we kept in the footsteps of Druce, visiting one of his favoured localities at Dundonnell (square 28/18), where fragments of natural woodland remain. By kind permission of A. Roger, Esq., we first explored the gardens of Dundonnell House, where a fine collection of cultivated plants is to be seen. Naturally we also hunted out the weeds, of which *Veronica agrestis* was unusual for the area. Shrubberies had the typically woodland *Myosotis arvensis* subsp. *umbrata* and, most surprisingly, *Circaea lutetiana*, surely an introduction here. The surrounding woodlands and river-banks contained calcareous rock-faces with *Allium ursinum, Agropyron caninum* and a very old, glabrous-leaved tree of *Malus sylvestris* subsp. *sylvestris*, which Druce had accepted as native. The local ivy had the patently stellate hairs of the diploid, *Hedera helix* (*sensu stricto*), though the newly-discovered tetraploid would undoubtedly have occupied similar west-coast sites further south. *Lathyrus montanus* var. *tenuifolius*, a strikingly distinct plant, was new to most of us. The afternoon saw a move to the nearby saltmarsh at the head of Little Loch Broom (square 28/08). *Cochlearia scotica* was common and convincing, though a few intermediates with *C. officinalis* were found. Some, but by no means all, of the small red oraches were *Atriplex praecox*. *Euphrasia ostenfeldii* was also found in one area.

On the following day, some members returned to Little Loch Broom, working the southern shore (square 28/09). An area of basic ground provided a contrast to previous days and produced *Festuca pratensis*, perhaps the second record for the vice-county, *Platanthera chlorantha* and *Trollius europaeus*. *Vulpia bromoides* and *Corydalis claviculata* were also good finds. Meanwhile, across the loch, others headed for Beinn Ghobhlach. *Lathyrus montanus* var. *tenuifolius* was recorded again and a single plant of *Osmunda regalis* relieved an otherwise tedious walk. The hill itself was very base-poor and unproductive, the main western corrie containing very few alpines: *Alchemilla alpina, Juncus trifidus, Empetrum hermaphroditum* and *Epilobium anagallidifolium*. Mist hindered exploration of the summit ridge, but *Arctostaphylos uva-ursi, Arctous alpinus* and *Juniperus communis* subsp. *nana* were recorded.

The Wednesday was a drier and more relaxed day, with most of the party visiting Tanera More (square 19/90), one of the Summer Isles. A peaty lochan above the shore contained *Isoetes echinospora* and a nearby gulley had *Hymenophyllum wilsonii*. *Dryopteris assimilis* occurred here, almost at sea-level. A fine tree of *Salix caprea* × *viminalis* was seen near the island post-office, but was clearly planted.

On the Thursday, Glen Achall was explored. Though asked by one landowner to avoid an area we would otherwise have recorded, much was still seen. Some stayed on the well-recorded limestone in the lower part of the glen (square 28/19), finding *Carex hostiana* × *lepidocarpa* with its parents. Others risked the dirt road and reached Upper Rhidorroch (square 28/29). A fragment of native pine-wood contained a rich fungus-flora and a known colony of *Goodyera repens*, while ravines in the wood had *Melica nutans* and, surprisingly, *Cotoneaster simonsii*. Calcareous flushes below the wood, with *Platanthera bifolia* and *Schoenus nigricans*, suggested richer ground above, and a few limestone outcrops were eventually discovered. *Asplenium viride* and *Saxifraga oppositifolia* were abundant here, along with *Tofieldia pusilla, Arctous alpinus, Alchemilla filicaulis* (*sensu stricto*) and *Rhinanthus minor* subsp. *lintonii*.

Friday was for clearing up loose ends and the first stop was a return to Strath Kanaird. Examination of a greater number of plants left little doubt that the mystery *Euphrasia* was, indeed, *E. heslop-harrisonii*, though this still remains *sub judice*. Worryingly, the colony is endangered by construction of new farm-roads. With a brief stop at Loch Vatachan (square 29/01), finding *Potamogeton gramineus*, the party continued to the coast at Polbain (square 29/00) where an interesting-looking pond had been seen. This proved to contain a large stand of *Sparganium erectum*, almost unknown in the area. Conversation with local fishermen suggested that this had appeared in the last 20 years, following their commencing to wash their nets in the previously base-poor water. *Carex scandinavica* occurred in wet coastal turf nearby.

With a number of critical plants awaiting certain determination, the results cannot yet be assessed. However at the very least, a number of new 10km square records have been made. We are grateful to the Ullapool Sailing Club for allowing us the use of their premises in the evening and I must thank Mr & Mrs Scouller for placing their local knowledge at our disposal.

A. J. SILVERSIDE

IRELAND

THE MURROUGH, CO. WICKLOW. 26TH MAY

The purpose of this one-day meeting was primarily to assess the impact that drainage has had on this extensive area of fen, which holds a rich and diverse flora. Five members attended. The first stop was at Five Mile Point, south of Newcastle, where the fen and the adjoining marsh were investigated. Several new drainage ditches have been cut in the area, which has lowered the water table considerably and has apparently affected the numbers of *Dactylorhiza incarnata* subsp. *incarnata*, which used to be such a feature of the fen. Due to the lateness of the season little was in flower but *Orchis mascula* was found to be particularly abundant throughout the area. *Dactylorhiza traunsteineri* was just beginning to flower in the fen.

The marshes at Clonmannon, further down the coast, were next investigated and again few species of orchid were obvious. *Glyceria maxima* was noted in the drainage ditches, this being the first record for the species in Co. Wicklow in over a hundred years. The adjoining marsh is rich in species of *Carex* and included *C. acutiformis, C. otrubae*, and *C. elata*. The small sand-dune alongside the nearby railway yielded *Anthriscus caucalis*, and *Cerastium arvense*, being the first post-1930 record for the latter species in Wicklow. On the sand-hills *Primula veris* was abundant though little else of interest was noted.

The site for the rare clovers at Wicklow was next visited. Few plants of *Trifolium subterraneum* and *T. striatum* were in evidence but *T. ornithopodioides* was noted in some quantity along with a few plants of *T. micranthum*. No trace was found of *T. arvense, T. glomeratum* or *T. scabrum* and it is suspected that recent dumping of soil at the site may be responsible for their absence. On waste ground nearby, *Barbarea intermedia* was found, this being only the second Wicklow record for the species.

Finally another site for *Trifolium subterraneum*, across the harbour, was visited but only two plants were noticed and none of the other species of *Trifolium* were in evidence. The results of the meeting were disappointing as few of the rarer species were in flower due to the lateness of the spring. This consequently made it difficult to assess the status of many of the species. However some interesting records were made, making the meeting worthwhile.

T. CURTIS

KINCASHLOUGH, CO. DONEGAL. 16–17TH JUNE

Six members and friends attended this week-end meeting centred in the Rosses. The morning of the first day was spent exploring the sand-hills, dune pasture and dune-slacks of the Kincashlough area, where much of interest was noted. The vegetation of the dunes is akin to the machair type found in the Hebrides and Scotland and consequently is rich in coastal variants. In the dune pasture a curious admixture of species occurs including *Arabis brownii, Ophioglossum vulgatum, Rumex hibernicus* and *Jasione montana*. Alongside these grow *Juniperus communis* subsp. *nana, Draba incana, Poa subcaerulea* and *Dactylorhiza fuchsii* subsp. *hebridensis*. *Empetrum nigrum* was found on boulders nearby. The sand-hills yielded the curious postrate form of *Vicia sepium*.

In the afternoon the area around Lough Mullaghderg was visited, where *Hypericum elodes* was frequent and *Carex serotina* occurred commonly at the margin of the lake shore. *Trifolium medium* was noted on the heathy banks nearby, whilst in the dune pasture alongside the lake *Silene dioica* subsp. *zetlandica* was found, this being the first record for the subspecies in Ireland. The rest of the afternoon was taken up with an investigation of the flora of Cruit Island. The flora was similar to that at Kincashlough but not as rich in species. However, *Rumex hibernicus* was noted in some quantity whilst some very large fronds of *Asplenium marinum* were found growing on rocky bluffs near the sea.

The following day Aranmore Island was visited. The flora has been recorded at approximately 50 year intervals, first by Hart in 1899 and then by Praeger in 1931. It was thus the intention of the party to record as extensively as possible for the purposes of estimating whether any changes in the flora had taken place and if possible to add to the list. The Hart/Praeger list numbers 301 species and of these 173 were recorded on this visit. An additional nine new species were added. Most of the recording took place on our way from Leabgarrow on the eastern side to Rinrawros Point on the north-west coast. At Lough Shore *Carex pilulifera* and *Listera cordata* were added to the flora of the island. Along the road *Sagina subulata* proved to be frequent whilst *Pedicularis palustris* subsp. *hibernicus* was found occurring commonly in the bogs south-east of the lake. The precipitous cliffs east of the lighthouse at Rinrawros Point held *Juniperus communis, Salix repens* and *Empetrum nigrum*; *Rhodiola rosea* was particularly abundant here. This is also the only station for the supposed endemic *Saxifraga hartii*, and a good number of plants were noted growing on the cliffs. No trace was found however, of *Arctostaphylos uva-ursi*, which was said by Hart to be one of the more characteristic species of Aranmore.

Before the boat departed, the sand-hill at Leabgarrow was examined and here *Ranunculus bulbosus*, unrecorded by Praeger, was found in addition to *Dactylorhiza majalis* subsp. *purpurella*. Though only a day had been spent on the island over half the recorded flora had been noted and a few additions had been made to the list. This ended a very satisfactory meeting during which much systematic recording had taken place, all of which was duly recorded on cards.

T. CURTIS

MULLAGHANATTIN, GLENCAR, CO. KERRY. 21ST–23RD JULY

Eight members attended this joint meeting with the Irish Biogeographical Society centred at Glencar, Co. Kerry. The object of the meeting was to record the flora of the north-facing cliffs of the Mullaghanattin range which Praeger never had an opportunity to visit. On the first day the cliffs above Eskabehy Lough were investigated. On the ascent the flora of the lake was examined and *Isoetes lacustris* and *Lobelia dortmanna* were found to be common. Along the stream bed above the lake, *Euphorbia hyberna, Saxifraga hirsuta, S. spathularis* and their hybrid were noted. In addition *Hymenophyllum wilsonii* and *Thelypteris phegopteris* proved to be frequent under many of the damp boulders in the area. In the surrounding bog all three species of *Pinguicula* were found whilst *P. grandiflora* was found in flower in several places on our ascent to the summit. At 1,000ft *Oxyria digyna* was encountered along with the ubiquitous *Epilobium nerterioides*. Throughout, *Hieracium anglicum* was common. Near the summit ridge *Cystopteris fragilis* was found, whilst a large rock outcrop on the ridge yielded an enormous colony of *Salix herbacea*, most of which was in fruit. On cliffs below the summit of Mullaghanattin, *Polystichum lonchitis* was noted, and lower down the cliff a single station for *Asplenium viride* was found.

On the second day the cliffs above Lough Reagh were examined. The flora was similar to that recorded the previous day though some of the rarer species were absent. *Thelypteris phegopteris* and *Hieracium anglicum* were again found to be frequent and *Sagina subulata* was found in many places along the stream leading from the lake, to the base of the cliffs. *Carex pallescens* proved to be quite a frequent member of the moor association in the area and *Taxus baccata* was noted growing by the river. The oak wood at the base of the cliffs was heavily grazed, though *Melampyrum pratense* was noted in some quantity. The cliffs yielded little of interest with the exception of *Hymenophyllum tunbrigense* and a small amount of *Polystichum lonchitis*.

Though no new records were made during the course of the meeting, two comprehensive lists were made of the flora and a gap in our knowledge of the Kerry flora has been filled.

T. CURTIS & C. MHIC DAEID

FIELD MEETING TO PASSO PURA, AMPEZZO, CARNIAN ALPS, ITALY

31ST JULY–14TH AUGUST, 1979

High in the Carnian Alps at 1,400m on Passo Pura stands a mountain chalet, the Baita Torina, built by the Commune of Ampezzo as a "piccolo centro di botanica per lo studio della flora carnica". In particular it is for the study of the vegetation of the area in relation to devastation caused by recent earthquakes, and, in common with other mountain regions in Europe, the decline of agriculture and increase in tourism. We are indebted to Professors Sandro and Erika Pignatti of the Istituto ed Orto Botanico, University of Trieste, for making arrangements for the B.S.B.I. to stay in the Baita, and for assuring us that early August is the best time to see the rich alpine flora there. 20 members were able to take advantage of this exciting opportunity, and we were further assisted by Dr Pierluigi Nimis, from the Institute of Botany, Trieste. Dr Nimis was with us at the Baita for most of our stay, helping with botanical identifications, advising on the house-keeping, and taking us on two excursions further afield.

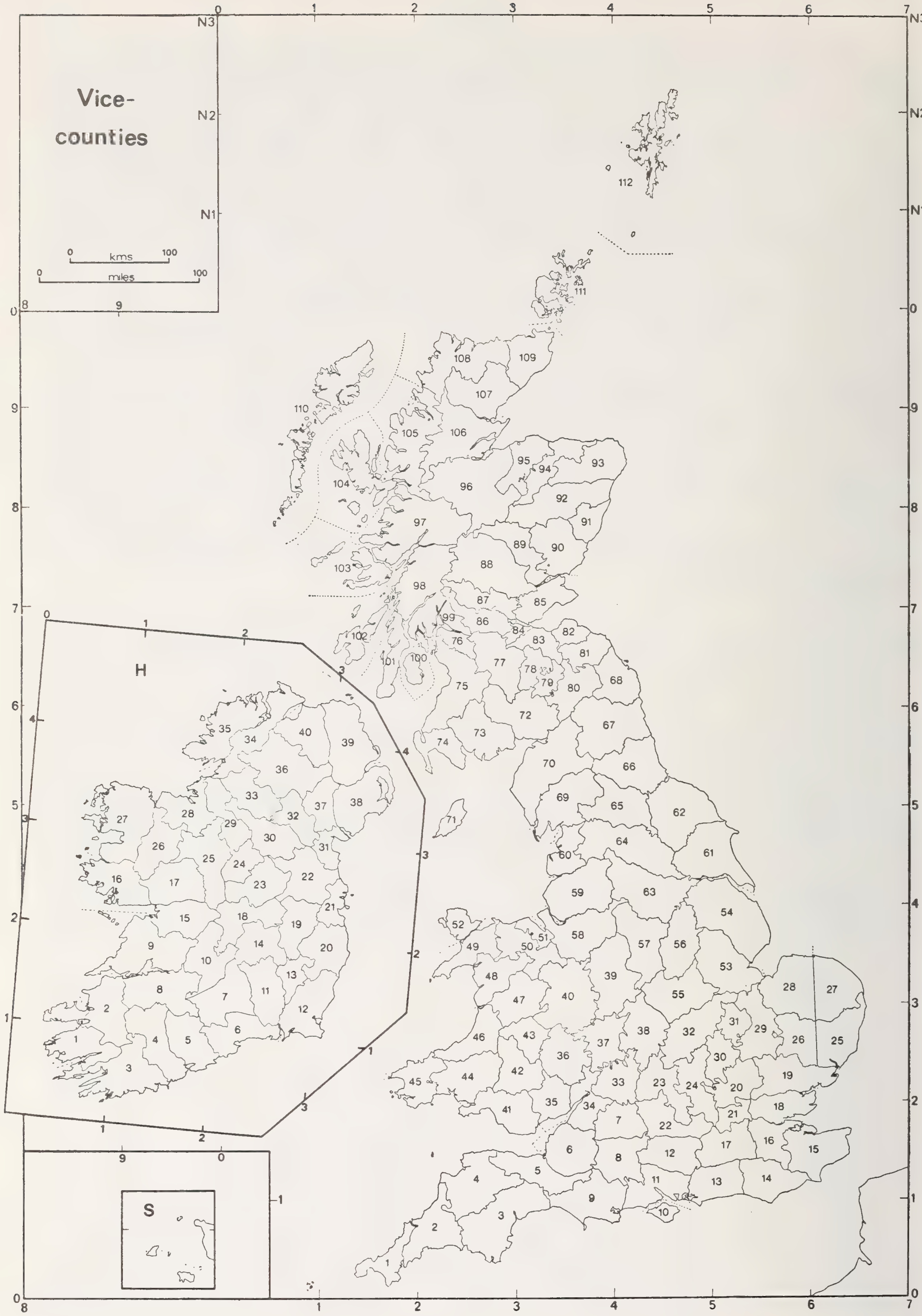
On foot from the Baita we could explore a range of habitats. The Carnian Alps, mainly limestone, lie between the Julian Alps to the east and the Dolomites to the west – the most easterly Dolomite ridges were on the skyline of views framed by our windows. On the doorstep was a very fine *Dryas* heath, with *Ajuga pyramidalis, Salix reticulata, S. alpina, S. glabra, S. retusa, S. serpyllifolia* and *Crepis praemorsa* subsp. *dinarica*. Forests of *Pinus sylvestris, Abies alba, Picea abies* and *Larix decidua* covered the slopes of the valleys to Ampezzo to the east, and to the west to where the valley floor had been flooded for a reservoir. On the lower slopes *Campanula thyrsoides, C. spicata* and *C. caespitosa* were among the many interesting Campanulaceae seen. Abundant throughout the woodland were *Cyclamen purpurescens, Cicerbita alpina, Senecio nemorensis, S. fuchsii, Doronicum austriacum* and *Prenanthes purpureus*, all in full flower. Four species of *Lonicera*, but particularly *L. nigra*, were heavy with fruit. To the south, forestry tracks with beautiful stands of *Aquilegia einseleana. A. atrata, A. atrata* × *A. einseleana* and *Tozzia alpina* led to clearings with *Scorzonera purpurea* subsp. *rosea, Cirsium erisithales* and *Lamium orvala*, and on to scree, upper pastures and to the ridges of Mt. Bruto and Mt. Zauf. These higher slopes yielded *Avenula praeusta, A. versicolor, Chamaeorchis alpina* and many species of *Gentiana*, including *G. pumila*, and *Saxifraga* – in all 15 species of *Gentiana* and 15 species of *Saxifraga* were seen during the meeting. We were mystified here by *Tofieldia calyculata* which had widely branched inflorescences, until we noted '*T. calyculata lusus ramosa*' described on the local list and Dr Nimis translated 'lusus' for us as 'a joke of nature'. To the north and higher than the Baita was limestone pavement overgrown and partially concealed by alpine meadow vegetation, which included *Sibbaldia procumbens, Phyteuma sieberi* and *Traunsteineria globosa*. To the south-east, amongst *Pinus montana* scrub on scree slopes, grew both subspecies of *Spiraea decumbens* (subsp. *decumbens* and subsp. *tomentosa*), *Dianthus sternbergii* subsp. *monspessulanus, Scabiosa graminifolia* and *Cytisanthus radiatus*, the latter being an example of the thermophile, southern elements of the flora. Here, on our first day, Dr Nimis led us to *Physoplexis comosa* in perfect condition amongst rocks above scree on Mt. Tinisa. On almost our last day the discovery of *Epipogium aphyllum* in perfect flower in woods below the Baita, and nearby, leaves of *Cypripedium calceolus* past flowering, and *Gentiana asclepiadea*, just come to flower, set the seal on a meeting filled with botanical interest.

An excellent working library is provided at the Baita, and also a plant list for part of the surrounding area which had been studied by students from the University of Trieste. We took additional reference books including the proofs for the then unpublished *Flora Europaea* volume 5, from which we were able to establish that *Hemerocallis lilio-asphodelus*, growing in a wooded rocky ravine, is native in the south-east alps, and not as we had first assumed (with true British orientation) to be a garden escape – in spite of the remoteness and distance from any garden! In evening identification sessions considerable time was spent on separating the many white (or very pale pink) flowered mat-forming plants around the Baita – *Moehringia muscosa, M. ciliata, M. ciliata* × *muscosa, Silene saxifraga, S. alpina, S. rupestris, Minuartia capillacea, M. rupestris, Gypsophila repens* – and more. The large-flowered *Cerastium* species were particularly puzzling (possibly not all the North Italian species are included in *Flora Europaea*?) but finally *Cerastium carinthiacum* subsp. *austro-alpinum* was confirmed for all gatherings of this mystery plant.

One excursion was to Mt. Canin by cable car, where a landscape of white limestone rock was at first glance apparently barren, but on closer inspection soon revealing treasures in every crevice, e.g. *Linum perenne* subsp. *alpinum, Campanula zoysii, Ranunculus hybridus* and *Potentilla brauniana*. An almighty thunderstorm disconnected the electricity and, with the cable car out of action, an unexpected and adventurous walk down the precipitous and trackless mountain side was successfully negotiated. On the second excursion, to Mt. Coglians, we walked from Collina over the pass to Lago Volaia in Austria, finding good colonies of *Papaver kerneri, Doronicum grandiflorum, Saussurea alpina, Paederota bonarota* and *Primula minima*.

Our party included enthusiasts of Pteridophyta, Cyperaceae and Fungi. *Carex norvegica* on dry rocky slopes and *C. flava* on damp edges of forest streams with intermediate plants between were confirmed on our return; *Asplenium fissum* was frequent, *Cystopteris regia* occasional, with *Polystichum braunii* and *P. aculeatum* × *braunii* among the many exciting records. Our total number of species identified was 724, and we were able to add a number of species to the local lists. All were agreed that it had been botanically very rewarding as well as very enjoyable, and we would particularly record our thanks to Signor Troiero, Sindaco, and the Commune D'Ampezzo for their generous loan of the Baita Torino to this Society for the meeting, and to the Institute of Botany, University of Trieste, and to all who welcomed us and helped with local arrangements for this mountain meeting.

M. BRIGGS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Gagea bohemica (Zauschner) J. A. & J. H. Schultes in the British Isles, and a general review of the *G. bohemica* species complex

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and

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ABSTRACT

The discovery of *Gagea bohemica* (Zauschner) J. A. & J. H. Schultes in Britain and details of its habitat are described. The *G. bohemica* species complex in Europe and western Asia is reviewed, and a map showing its distribution is given. The many taxa of the complex which have received specific status in the past are considered to be best treated merely as taxonomically worthless variants of the variable *G. bohemica*.

DISCOVERY IN BRITAIN

In 1968 R. F. O. Kemp (Kemp 1968) recorded the discovery of *Lloydia serotina* (L.) Reichenb. at Stanner Rocks, near Kington, Radnorshire, v.c. 43. One plant had been accidently collected with the moss, *Dicranum scoparium*, in April 1965. In April 1974 R. G. Woods searched the site for this species, and found a single shrivelled flower with white petals amongst many hundreds of non-flowering specimens. Comparison of this flowering specimen with the photograph of Mr Kemp's specimen, which also had faded petals, confirmed that the two were similar, but both plants were hairy, a feature not known in *Lloydia serotina*. Another visit to Stanner rocks by R. G. Woods in mid-January 1975 revealed a single flowering plant, but with bright yellow flowers. A thorough search of the site failed to reveal any other flowers amongst large numbers of non-flowering specimens. This yellow-flowered plant was similar to the shrivelled white-flowered specimen seen the previous year, and a return visit in February confirmed that the yellow petals turn white with age.

Its yellow flowers indicated that the plant belonged to the genus *Gagea*, not to *Lloydia*, though it was clearly not the then only known British species, *Gagea lutea* (L.) Ker-Gawler; later the plant was tentatively identified as *Gagea bohemica* (Zauschner) J. A. & J. H. Schultes. In March 1978 D. McClintock and E. M. Rix met R. G. Woods at Stanner Rocks, and together they found about 25 specimens in full flower among many thousands of non-flowering plants. The identification of the plant as *G. bohemica* was confirmed.

Growing at Stanner Rocks with a range of rare plant species which also show a disjunct distribution, *Gagea bohemica* appears to be a native species previously undetected in the British Isles. Its small leaves, which resemble seedlings of *Allium* species, appear above ground in late August and shrivel in most years by late April. Less than one per cent of the population flowers each year. In mild winters, flower buds open in early January. Some flowers appear to be removed by grazing animals and no fruits have ever been found.

This species is confined to pockets of shallow soil on south and east facing dolorite cliffs which are subjected to summer drought. Commonly associated species include *Allium vineale, Aphanes arvensis, Arabidopsis thaliana, Erophila verna, Jasione montana, Sedum fosteranum* and the mosses *Dicranum scoparium, Hypnum cupressiforme* var. *lacunosum* and *Polytrichum piliferum*.

Other well known rarities on Stanner Rocks also have Continental and West Asiatic affinities, e.g. *Lychnis viscaria, Veronica spicata* and *Scleranthus perennis*.

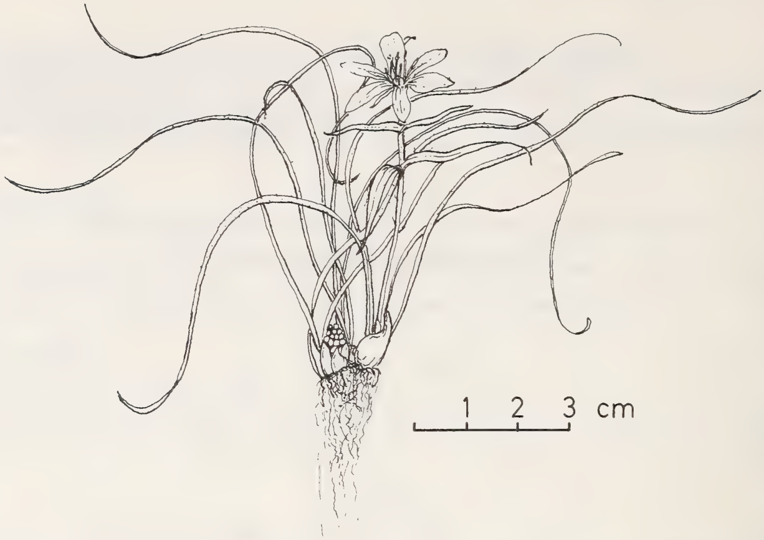

FIGURE 1. *Gagea bohemica*: specimen from Stanner Rocks, Radnorshire, March 1978.

DESCRIPTION OF SPECIMENS FROM STANNER ROCKS

A set of specimens for deposition in **BM**, was collected on 4th March, 1978, when the plants were in full flower; the following description is based on these, as is the drawing in Fig. 1:

Bulbs 2, in a pale chestnut-brown papery tunic. Basal leaves 2–4 on a flowering bulb, 40–90mm long, 1mm wide, filiform, D-shaped in section, glabrous or with short crisped hairs. Stems 15–30mm, sparsely woolly on the pedicels above, almost glabrous below, usually 1-flowered, rarely with up to 4 flowers, with 4 cauline leaves, and with 1–2 bracts per flower. Cauline leaves narrowly lanceolate, 15–40mm long, 2–4mm wide, long ciliate. Flowering stems often replaced by a group of *c*.25 bulbils, white at flowering time, later becoming dark brown, each covered with a reticulate tunic. Perianth-segments usually 6, often 7–8, 12–18mm long, 2–4mm wide, narrowly oblong-lanceolate, obtuse, bright yellow and shining inside, greenish outside. Filaments *c*.8mm; anthers *c*.1mm after dehiscence. Style 5–6mm, filiform, glabrous. Ovary obovate; no capsules seen on any plants at Stanner Rocks.

GAGEA BOHEMICA SENSU LATO

The primary cause of the taxonomic difficulties of the genus *Gagea* is the superficial similarity of most of the species. Nearly all are small (up to 10cm) with linear leaves, a branched and usually hairy flowering stem, and yellow flowers with narrow perianth segments. Qualitative characters used to subdivide the genus include bulb type, seed type (both of which are often absent on herbarium specimens), bulbil production, stem indumentum, and cauline leaf number and position.

G. bohemica is easily recognized by the following combination of characters: Basal leaves 2 or more, filiform; stems 5–60cm, the pedicels not greatly elongating in fruit; cauline leaves lanceolate, long acuminate, tapering from below middle; perianth segments 8–18mm, blunt.

The distribution of *G. bohemica* sensu lato is shown in Fig. 2, which is compiled from herbarium specimens in **K**.

Variability in height of stem, flower size and indumentum have led to a proliferation of different names for plants of *G. bohemica* sensu lato. The following list gives in each case an indication of the type and, where appropriate, the basionym.

FIGURE 2. The distribution of *G. bohemica* sensu lato, compiled from herbarium material in **K**. There are also unconfirmed records for Spain and N. Africa, and many probably accurate localities within the general range of territories recorded in the Figure.

G. bohemica (Zauschner) J. A. & J. H. Schultes, *Syst. Veg.*, **7**: 549 (1829)
Ornithogalum bohemicum Zauschner
Lectotype: 'Bohemia-Schmidt 336', Herb. Willd. 6590 (**B**), selected by Heyn & Dafni (1977).
G. saxatilis (Mert. & Koch) J. A. & J. H. Schultes, *Syst. Veg.*, **7**: 549 (1829)
Ornithogalum bohemicum var. *saxatile* Mert. & Koch
Type: W. Germany, 'm. Donnersberg, Palat.', Koch (**B**).
G. szovitsii (A. F. Láng) Besser in J. A. & J. H. Schultes, *Syst. Veg.*, **7**: 550 (1829)
Ornithogalum szovitsii A. F. Láng
Type: U.S.S.R., 'circa Odessa, frequens', Szovits (**K**).
G. billardieri Kunth, *Enum. Pl.*, **4**: 242 (1843)
Type: Turkey, 'circa Ephesum', Tournefort.
G. busambarensis (Tineo) Parl., *Fl. Palerm.*, **1**: 379 (1846)
Ornithogalum busambarense Tineo
Type: Sicily, 'Busambra, sotto l'Agughia', Tineo.
G. nebrodensis (Tod. ex Guss.). Nyman, *Syll. Fl. Eur.*, 372 (1855)
Ornithogalum nebrodense Tod. ex Guss.
Type: Sicily, 'Madonie al Pizzo de la Casa' Todaro (**K**).
G. andegavensis F. Schultz in *Flora*, **45**: 460 (1862)
Type: France, near Angers, Maine-et-Loire.
G. corsica Jordan & Fourr., *Brev. Pl. Nov.*, **1**: 58 (1866)
Type: Corsica, monte Ospedale, E. Revelière.
G. saxatilis subsp. *australis* A. Terr. in *Bull. Herb. Boiss.*, sér. 2, **4**: 112 (1906)
Type: Sicily, 'Busambra, solto l'Agughia', Tineo.
G. zauschneri (Pohl) Pascher in *Engler's Bot. Jahrb.*, **39**: 307 (1906)
Ornithogalum zauschneri Pohl
Type: 'Bohemia-Schmidt 336' (**B**).
G. callieri Pascher in *Feddes Repert.*, **2**: 166 (1906)
Type: Crimea, 'Sudak, Callier 206 It. Taur. 1896' (**B**,**K**).
G. velenovskyana Pascher in *Feddes Repert.*, **2**: 166 (1906)
Type: Bulgaria, 'ad Philippopol. Stribrny' (**LE**).
G. lanosa Pascher in *Feddes Repert.*, **2**: 166 (1906)
Type: Greece, 'prope Athenas, Orph. 119' (**K**).
G. aleppoana Pascher in *Feddes Repert.*, **2**: 166 (1906)
Type: Syria, Aleppo. Hausskn. 937 (1867) (**B**,**K**).
G. smyrnaea O. Schwarz in *Feddes Repert.*, **36**: 70 (1934)
Type: Turkey, 'Smyrna, Yamanlardag prope cacumen Karacam', Schwarz 369 (**B**).
G. bohemica subsp. *gallica* (Rouy) I. B. K. Richardson in *Bot. J. Linn. Soc.*, **76**: 356 (1978)
G. bohemica var. *gallica* Rouy
Type: France, near Angers. Maine-et-Loire.

FORMER TREATMENTS OF THE GROUP

Previous treatments of the *G. bohemica* group have differed greatly in the status given to the different segregates.

Terraciano (1906), in an account of the oriental species of *Gagea*, gave as a synopsis of his view of the European members of the group:

G. saxatilis
subsp. *saxatilis*
α *typica*; β *gallica*; γ *helvetica*; δ *hispanica*;
subsp. *australis* Terr.
α *sicula*; β *corsica*
subsp. *szovitsii* (A. F. Láng) A. Terr.
subsp. *bohemica* (Zauschner) A. Terr.

These subspecies and varieties were defined geographically rather than morphologically.

Pascher (1907) discussed at length the different taxa, and described four species from eastern Europe and the Middle East. He acknowledged the presence of intermediates between these local species and between *G. saxatilis* and *G. bohemica*.

Stroh (1936), in a review of the whole genus, reduced some of Pascher's names to subspecific and some to varietal rank. His treatment can be summarized as follows:

G. nebrodensis
G. bohemica
  subsp. *zauschneri* (Pohl) Pascher ex Stroh
    var. *lanosa* (Pascher) Stroh; var. *velenovskyana* (Pascher) Stroh
  subsp. *aleppoana* (Pascher) Stroh
  subsp. *saxatilis* (Mert. & Koch) Pascher ex Stroh
    var. *gallica* (Rouy) Stroh; var. *australis* (Terr.) Stroh; forma *corsica* (Jordan & Fourr.) Stroh
G. szovitsii
G. callieri
G. smyrnaea

Heyn & Dafni (1977), in a paper on *Gagea* in Israel, united all the above species, subspecies and varieties, as well as *G. saxatilis* and *G. szovitsii*, under *G. bohemica*. We agree with this possibly rather drastic treatment.

Richardson (1979) recognized within *G. bohemica* sensu lato three species in Europe, but expressed doubt about their status. He retained *G. bohemica* and *G. saxatilis* as separate species, and raised var. *gallica* to subspecific rank under *G. bohemica*. *G. nebrodensis* was also made a subspecies of *G. bohemica*, and *G. callieri* was included in *G. szovitsii*, the third species recognized.

DISCUSSION

Three main characters have been used to distinguish the taxa in *G. bohemica* sensu lato: stem height, flower size, and the amount and distribution of indumentum. Measurements of these characters were made, mainly using herbarium specimens in **K**. The results (Fig. 3) show an absence of any disjunctions or correlations.

The difficulty of distinguishing taxa on flower size is increased by the fact that the first flower in an inflorescence to open tends to be larger than the others, and that the perianth segments elongate

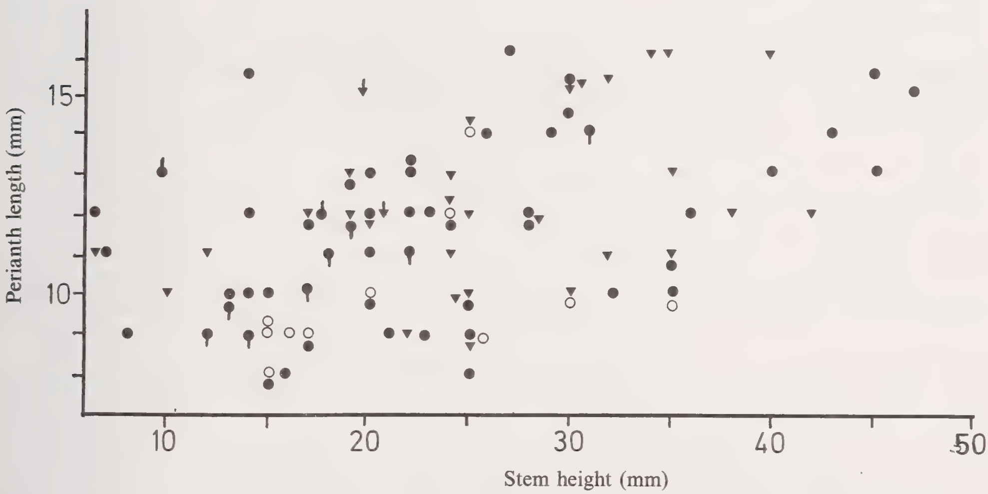

FIGURE 3. Scatter diagram based on herbarium material in **K**, showing relationships between stem height, perianth length and indumentum. Plant glabrous ○; only pedicels hairy ▼; stem hairy throughout ●. Specimens from type locality of *G. saxatilis*; specimens from Stanner Rocks.

slightly during anthesis. There is also often some shrinkage on drying, especially if pressure has not been heavy. The robustness of the individual plant also affects the size of the flower as well as the height of the stem. For instance, on one sheet from Ankara, Turkey (7 specimens), perianth segment length varied from 11 to 16mm, while stem height varied from 5 to 34mm. Similar variation in perianth length is found in many collections, whereas variation in stem height is usually less than in this instance.

Stem indumentum is also variable within collections, and glabrous individuals were seen from Hungary, Czechoslavakia, Sicily, and Turkey.

Richardson (1979) distinguished *G. saxatilis* from *G. bohemica* and *G. szovitsii* on capsule shape. We were unable to evaluate this character as fruits were not present on the majority of the specimens.

A further character, short crisped hairs on the basal leaves, formed the basis of *G. andevagensis* and *G. bohemica* var. *gallica*. The specimens from western France, especially from near Angers, often have these crisped hairs, but we have not seen more than the occasional hairy specimens among other Continental or Asiatic material. The plants from Stanner Rocks are variable in this character; some have glabrous basal leaves and some have crisped hairs on them, but these hairs are never as dense as those on some of the French specimens. This suggests that the British plants have a closer connection with those from western France than with the largely non-hairy plants from western Germany, south of Mainz, or with those from elsewhere.

In our opinion none of the variation is worth recognizing taxonomically, and all the names listed above are best considered merely as taxonomically worthless variants of *G. bohemica*.

ACKNOWLEDGMENTS

The authors would like to thank A. O. Chater for his valuable comments and for correcting the references and type citations, R. F. O. Kemp for the loan of the photograph of his original specimen, D. McClintock and Dr H. Heine for their helpful comments, and Mrs L. Banks for making the illustration (Fig. 1).

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The natural history of *Quercus ilex* L. in Norfolk

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ABSTRACT

The introduction and spread of *Q. ilex* L. in Britain and, in particular, Norfolk is described. In Norfolk about 5,800 grow in just over 700 sites, predominantly in large gardens and parkland, and more commonly near the coast. In investigating the relationships of tree height, girth and age, it was found that height and the regression coefficient of height/girth appeared to be reasonable indicators of tree age. Although there is large variation in leaf-size and -shape, it seemed that a characteristic leaf-shape could be recognized for each tree. Acorns are produced in good quantities in some years but suffer very high loss when not buried. Acorn production and germination and tree growth is not substantially different for holm and native oaks. Regeneration occurs in at least 33 Norfolk sites and the absence of management appears to be the crucial factor for naturalization.

INTRODUCTION

The holm oak, *Quercus ilex* L., is a characteristic evergreen tree of the Mediterranean region (Rikkli 1963, Polunin & Huxley 1965); Walter (1973) describes it as the typical tree species of Mediterranean sclerophyllous forest or maquis. It was well known to the Romans, being commonly referred to in their writing as *Ilex*. It was the first of the alien oaks to enter Britain, at least as early as 1500–1550 as two acorn-bearing trees were recorded in London in 1581 (Appendix 1).

In this study we tried to locate every holm oak in Norfolk, and to trace their probable spread through the county and the extent of their naturalization. In Norfolk Holkham is pre-eminent for its holm oaks which form an out-standing feature of the estate. A popular story, probably apocryphal, tells of their origin from acorns packed around statues imported from Italy by the first Lord Leicester in the mid-eighteenth century. Elsewhere in the county they occur in lesser numbers and an interesting side-light on their occurrence is their association with the use of the name Green Oak for farms (e.g. GR 62/108.878 near Winfarthing) or roads (e.g. GR 53/915.006 at Watton).

Today it is common (mainly in parks and gardens) through most of Britain, being considerably more widespread than indicated by the *Atlas of the British flora* (Perring & Walters 1962). It is often claimed (e.g. Webster 1918, Edlin 1970, Bean 1976) that it particularly thrives near the sea and is abundant in many coastal areas (Clapham 1975). Although the occurrence of holm oak can only be traced back to the early sixteenth century (see above), a Roman origin would not be surprising in view of their high esteem for it (Virgil, Pliny (Evelyn 1664)) and the strong likelihood of their introduction of other trees such as sycamore and chestnut. In Appendix 1 historic records of *Q. ilex* plantings are listed chronologically. This is as an incomplete list as many British sites have not been recorded. In some cases the date of planting or the time since planting is stated in the literature, but in most cases a conservative estimate of age and planting date is made from tree dimensions; such estimates probably err on the side of lateness of planting.

Appendix 1 indicates little active distribution of the tree in the seventeenth century but a wide and rapid planting during the eighteenth century throughout England, Wales and southern Scotland. This appears largely related to the burgeoning of landscape gardening at this time. Gardening and tree planting books of the period (e.g. Bradley 1739, Meader 1779) show it to be a familiar and readily available tree at that time. Bradley (1724, quoted in Miller 1807) says 'that within the compass of six years (1724) many millions of them have been raised in England from acorns brought from Italy and Virginia (*sic*)'. By the end of the eighteenth century it grew in at least 22 counties of England and Wales and seven of Scotland, this rising to at least 27 in England and Wales and 13 in Scotland in the first decades of the nineteenth century.

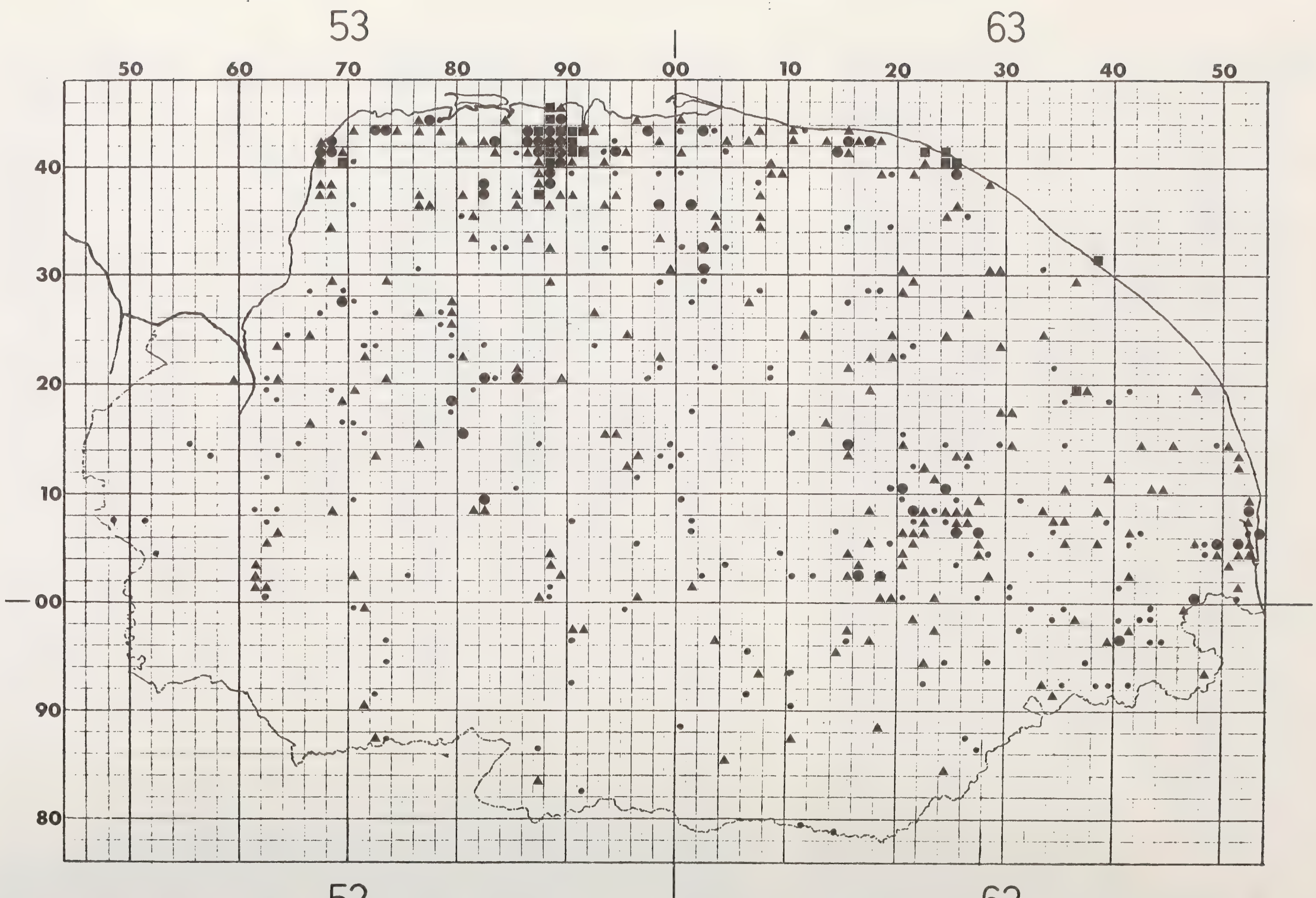

FIGURE 1. Distribution of *Q. ilex* in Norfolk. Numbers Km^{-1} (•) 1, (▲) 2–10, (●) 11–100, (■) > 100.

DISTRIBUTION AND DIMENSIONS

Most recording in this investigation was made during the winter, when *Q. ilex* is relatively easy to see and identify at a distance with binoculars. An estimated 5,824 *Q. ilex* were found at 701 sites in Norfolk. Most sites (86·7%) are large gardens, estate parkland or churchyards. They occur throughout the county. but less frequently in Breckland and the Fens (Fig. 1). There are strikingly large numbers (2,326) of *Q. ilex* in the Holkham estate. The greatest density is in the area within 5Km of the coast which, including Holkham, contains a mean number of $6{\cdot}48\mathrm{Km}^{-2}$. This far exceeds the mean density of $0{\cdot}30\mathrm{Km}^{-2}$ for the remaining, inland area of the county.

The heights of all *Q. ilex* were estimated by eye. At five sites heights were measured trigonometrically with a Suunto hypsometer and girths at breast height (1·5m, Mitchell 1974) also taken. The sites were chosen because the dates of planting are known or can be inferred. The avenue at Temple Woods was planted in 1921 from acorns from Sidestrand Hall (E. Anderson pers. comm. 1976); the trees at How Hill were planted probably in 1903 or 1908 (How Hill Invoices record 200 and 50 bought at these times); Earlham Cemetery was opened in 1857 and the trees were planted about this time (recorded 1884 O.S. map); the clump at Bale church existed at 1838 (Tithe Apportionments Map) and was probably planted about 1800; the Avenue at Holkham was planted between 1780–1800 and the Obelisk Wood in 1729–30 (Holkham Estate Records). The trees grow mostly in the open as singletons or in small clumps or avenues, but at How Hill they grow in close canopied mixed deciduous woodland, and in the Obelisk Wood they are well-spaced in a relatively open mixed oak and beech wood.

A parabolic relationship $H = 1{\cdot}5 + 11{\cdot}76\,D - 1{\cdot}74\,D^2$ (Trorey 1932, Ker & Smith 1955) between tree heights (H) and girths (D) could be fitted to the combined data (excluding Earlham) of Fig. 2. Here, however linear regressions have been calculated and plotted for each stand, both separately and together for single-stemmed and multi-stemmed trees at Earlham and similarly for the Avenue clumps and Obelisk Wood at Holkham (Table 1). There are good correlations between tree heights and girths at Temple Woods, Earlham, Bale and Holkham, but not at How Hill.

A wide variability of heights and girths of trees of the same age is obvious (Fig. 2). Ranking the sites according to age (Table 2) reveals little correlation between girth and age. Mitchell (1974) suggests that girth is usually a fair indicator of age and gives the mean growth in girth of most trees with a full crown as one inch (2·5cm) a year. At Holkham six tree-stumps were found and annual rings counted. Fig. 3 shows a good correlation of their basal girth and age ($r = 0{\cdot}975$, $p < 0{\cdot}001$). The mean growth in basal girth for each year of the six Holkham trees was 2·19cm which is equivalent to an annual increment in girth at breast height of 1·47cm (Fig. 4).

Mean and maximum heights seem to tie in with age better than girth for the different sites (Table 2). Also the slopes (b) of the linear regressions of heights on girths decrease with age of stand and may prove to be a useful indicator of stand-age. Though little reliance can be put on height as a precise measure of age, it has been used as a rough guide to relative ages of *Q. ilex* at different Norfolk sites (Fig. 5).

REGENERATION

Regenerating *Q. ilex* was seen at 33 sites – this is probably an underestimate as observation was restricted at some places. Most regeneration was from acorns but in nine cases regrowth was from shoots at the base of the trunk. Walter (1973) remarks on this property of the species in its native habitat – 'Elsewhere the trees are cut down every twenty years, while still young, and they regenerate by means of shoots from the old stump.' Multistemmed *Q. ilex* are common in Norfolk and probably developed in response to damage by man or natural coppicing agents.

For regeneration from seed there are three stages for successful seedling establishment – acorn production, germination, seedling growth and survival. *Q. ilex* can produce similar quantities of acorns in Norfolk to native oaks, and just as irregularly. 1973, 1975 and 1979 were good acorn years at Holkham (GR 53/882.390), Bale (GR 63/010.368), Cromer GR 63/223.417) and Wells (GR 53/918.434) (where 1977 was also). Nearly all of these abundant acorns were lost to herbivores. Elwes & Henry (1906–13, p. 1285) in referring to *Q. ilex* say 'It ripens seed freely in warmer parts of England and reproduces itself where conditions are suitable but pheasants are so fond of the acorn that few get a chance to grow.'

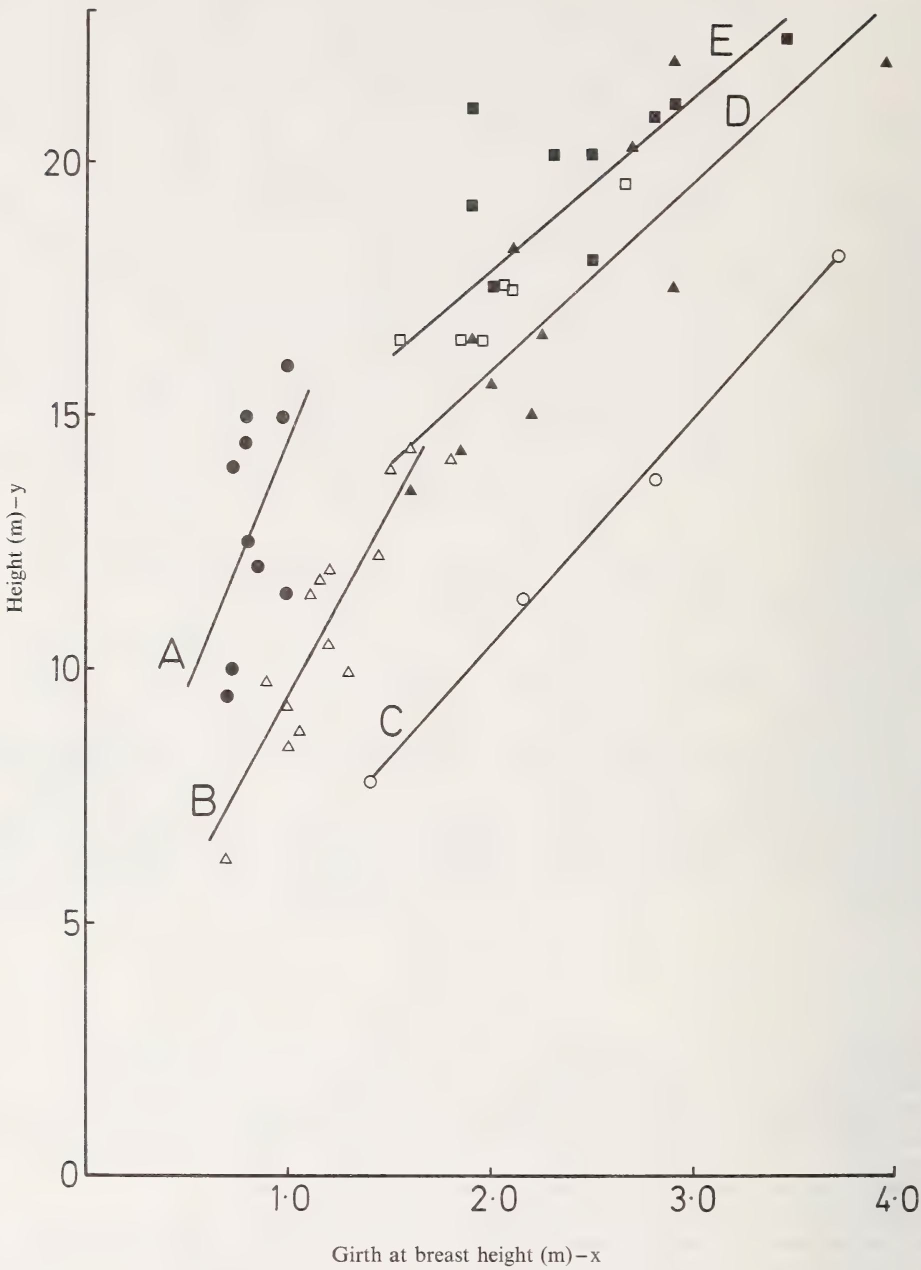

FIGURE 2. Linear regressions of tree heights (y) on girths (x) at breast height, A (●) How Hill (y = 9·8x + 4·6), B (△) Temple Woods (y = 7·3x + 2·2), C (○) Earlham single stemmed (y = 4·5x + 1·6), D (▲) Bale (y = 3·7x + 8·5), E (□) Holkham the Avenue (■) Obelisk Wood (y = 3·4x + 11).

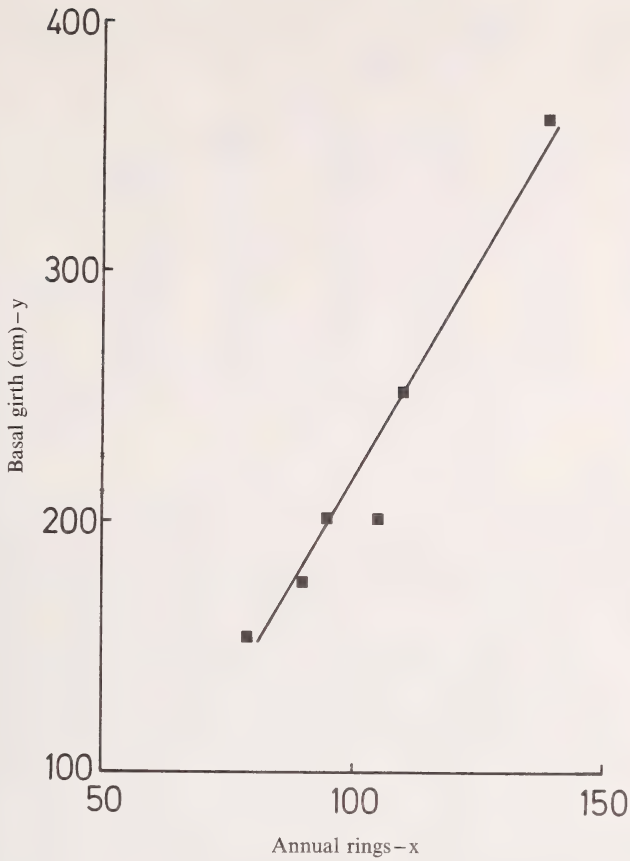

FIGURE 3. Linear regression of basal girths (y) on age determined by annual ring counts (x) for 6 tree-stumps from Holkham ($y = 3{\cdot}43x - 127{\cdot}5$, $p < 0{\cdot}001$, $r^2 = 0{\cdot}951$).

TABLE 1. RESULTS OF ANALYSIS OF HEIGHT AND GIRTH AT BREAST HEIGHT

Site & Grid Reference	n number of measured trees	r correlation coefficient & probability	b regression coefficient	a intercept	F goodness of fit & probability
Temple Wood GR 63/255.383	14	0·888 $p<0{\cdot}001$	7.34	2.20	44.97 $p<0{\cdot}001$
How Hill GR 63/372.190	10	0·467 n.s.	9·83	4·65	2·24 n.s.
Bale GR 63/010.368	11	0·844 $p<0{\cdot}005$	3·71	8·54	22·78 $p<0{\cdot}005$
Earlham combined GR 63/213.087	10	0·602 $p<0{\cdot}1$	2·75	7·66	4·56 $p<0{\cdot}1$
E. multistemmed	6	0·317 n.s.	1·31	12·16	<1 n.s.
E. singlestemmed	4	0·998 $p<0{\cdot}001$	4·46	1·59	666·8 $p<0{\cdot}005$
Holkham combined	15	0·828 $p<0{\cdot}001$	3·44	10·96	13·17 $p<0.005$
H. Obelisk Wood GR 53/885.420	9	0·632 $p<0{\cdot}1$	2·74	13·08	4·94 $p<0{\cdot}1$
H. The Avenue GR 53/883.415	6	0·929 $p<0{\cdot}01$	3·97	11·1	25·37 $p<0{\cdot}01$

n.s. = not significant

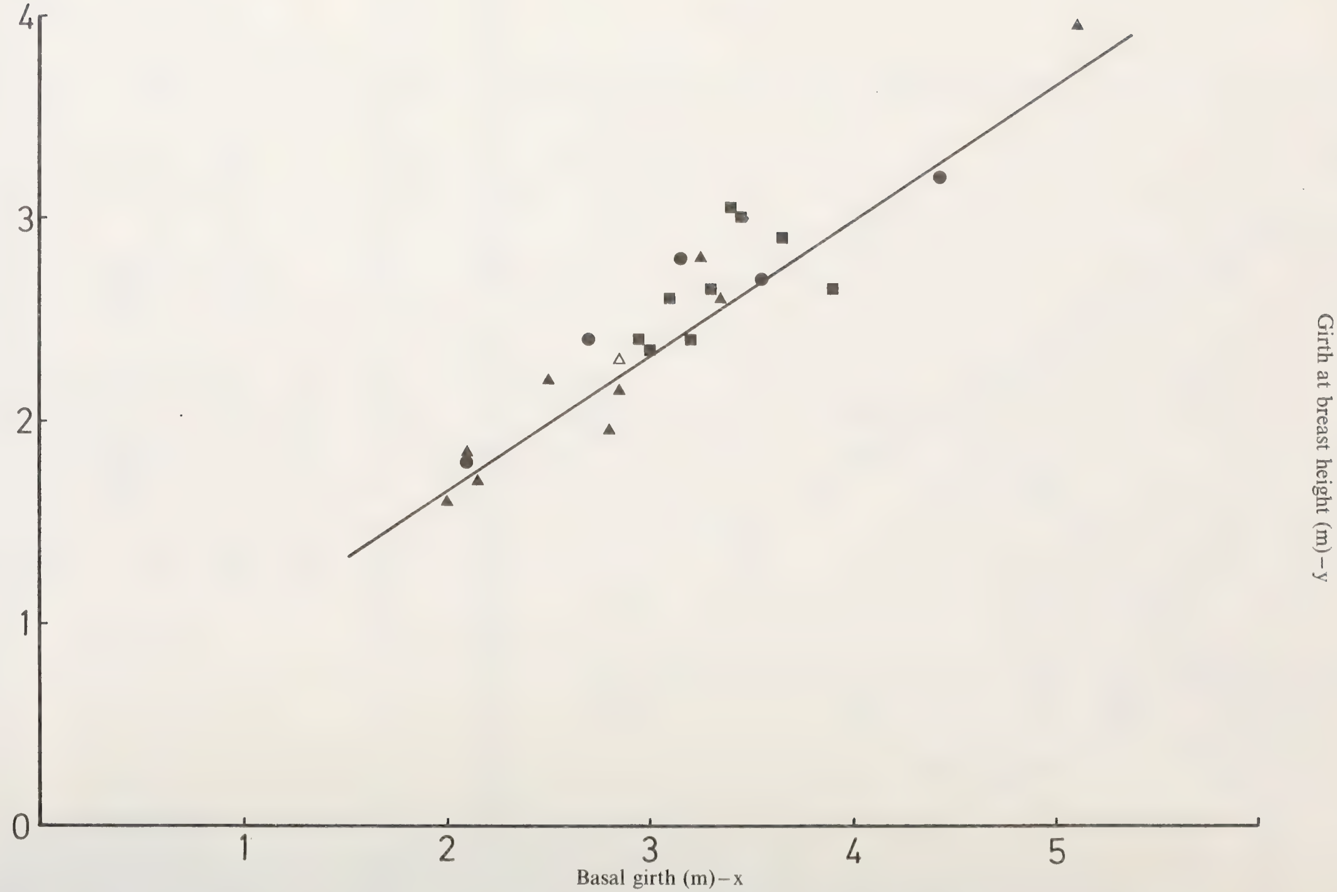

FIGURE 4. Linear regression of girths (y) at breast height on basal girths (x); (●) Holkham Triumphal Arch, (■) Lady Ann's Drive, (▲) Bale, (△) Goodwick ($y = 0{\cdot}669x + 0{\cdot}31$, $p < 0{\cdot}01$, $r^2 = 0{\cdot}868$).

TABLE 2. SIZE STATISTICS OF AGE-RANKED *Q. ILEX*

Site	Estimated age years	Mean gbh (cm)	Maximum gbh (cm)	Mean height (m)	Maximum height (m)	Ratio mean height to mean gbh	Regression coefficient b
Temple Wood	58	119·3	180	10·95	14·4	15·2	7·34
How Hill	~70	84·9	100	13·00	16·0	9·3	9·83
Earlham (single stemmed)	~120	251·2	370	12·79	18·2	5·1	4·46
Bale	~180	239·2	395	17·4	22·0	7·3	3·71
Holkham (The Avenue)	~190	202·5	265	17·37	19·6	8·6	3·97
Holkham (Obelisk Wood)	~250	255·6	345	20·09	22·5	7·9	2·74

gbh = girth at breast height

For native oaks 8 to 92% of acorns have been taken on the tree (Ovington & Murray 1964, Tanton 1965) and 88·6% on the ground within 24 hours in experimental conditions (Shaw 1968). In 1976 1,080 holm oak acorns were laid out in a series of experimental mesh enclosures at ten acorns per 10 × 10 cm square at Holkham Dunes N.N.R. (GR 53/890.448) and How Hill (GR 63/372.190). The sides of each enclosure were buried to a depth of 10cm and roofed over. In each set of 18 squares, acorns were put on the surface, in the litter and at 4cm depth. The results are summarized in Table 3. Differences between mesh sizes were not found – the smallest mesh (nominally ½ inch) failed to prevent mammal entry. It is clear that acorn position affected chances of recovery ($F = 47{\cdot}4$, $p < 0{\cdot}001$), burial enhancing acorn survival. It was noted that most surface acorns disappeared within the first three days and in a subsequent experiment at Holkham Dunes and Triumphal Arch (GR53/882.391) losses of 79, 70 and 60% from 500 acorns m^{-2} were recorded in seven days. Furthermore, acorn loss was significantly greater at How Hill than Holkham ($F = 34{\cdot}3$ $p < 0{\cdot}01$).

Acorns vary in size at shedding. Only small acorns (Fig. 6) are produced some years by certain trees. Germination of these was reduced to 20-50% (sample size 50, mean = 35%) in contrast to germination of 75–95% (sample size 264, mean = 84%; 43% plumule and radicle emergence, 41% radicle only) of the usual large acorns (Fig. 6) kept on sand in a greenhouse for 36 days. For *Q. petraea* acorns, Ovington & Murray (1964) recorded 62 to 86% in which germination had initiated in the field. Penistan (1974) gives a usual value of 60% for seedling production from acorns of native oaks sown at $300m^{-2}$ in seed beds.

Regeneration seems more common in the coastal zone: at 22 of 291 sites compared with at 11 of 410 inland sites, though there are more trees, especially big ones, at the coast (4,438 trees; 2530 > 12m high) than inland (2,530 trees; 408 > 12m high). At Holkham Dunes NNR there is extensive regeneration of *Q. ilex* in the shelter belt of Corsican and maritime pines. Seedling growth and survival is particularly successful at this site; C. Johnson (pers. comm. 1976) estimated survival to be more than ten times more successful than regenerating Corsican pine. The extent to which this naturalization can be attributed to

TABLE 3. RESULTS OF ACORN BURIAL EXPERIMENT

	Numbers recovered and percentages lost after 70 days					
	Holkham Dunes		How Hill		Both sites	
Position	No.	%	No.	%	No.	%
on surface	0	100	0	100	0	100
in litter	8	95·6	1	99·4	9	97·5
at 4cm	127	29·4	18	90	145	59·7
Totals	135	75	19	96·5	154	85·7

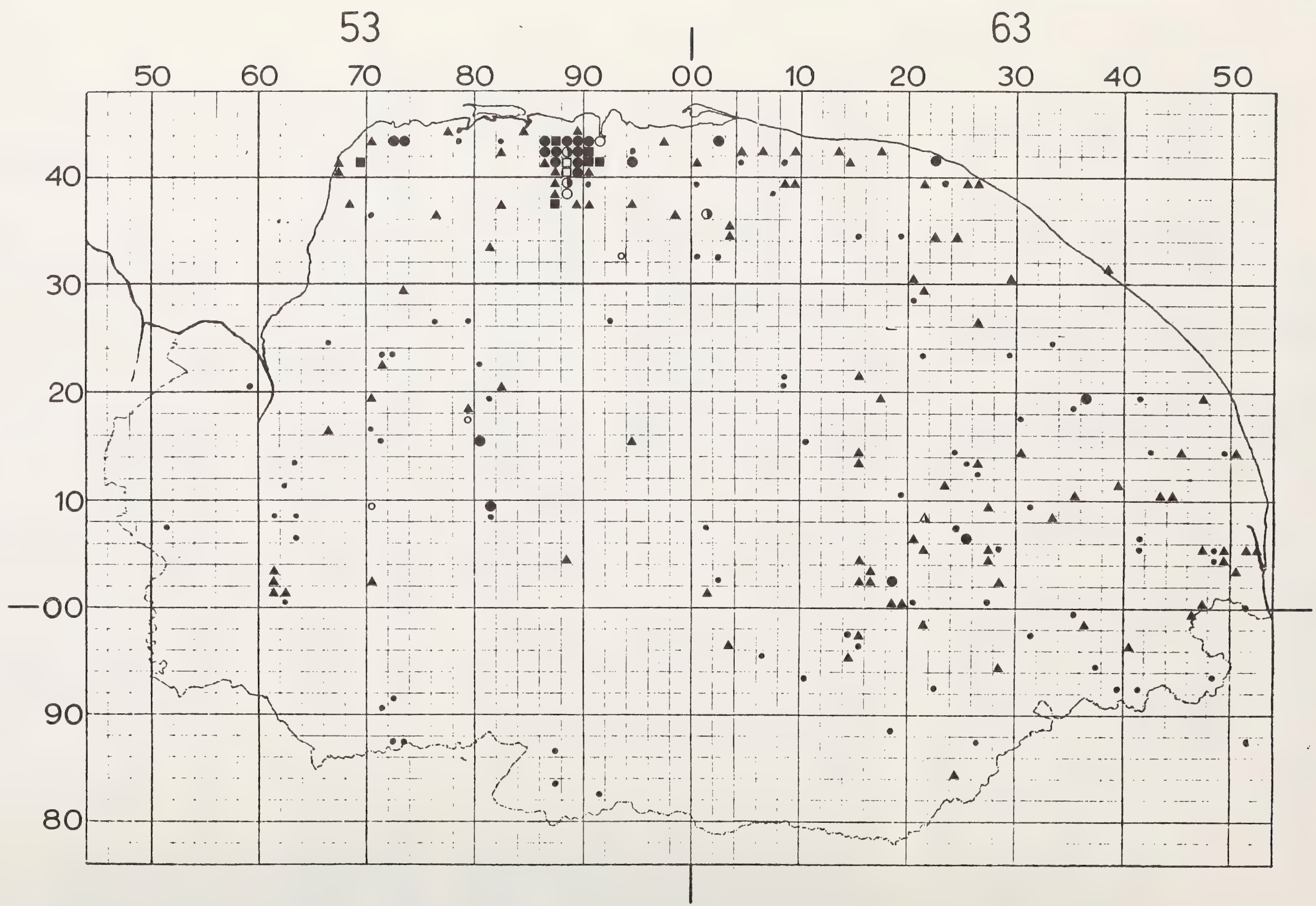

FIGURE 5. Norfolk distribution of taller *Q. ilex* Numbers $Km^{-2} > 12m$ tall (•) 1, (▲) 2–10, (●) 11–100, (■) > 100, (○ & ○)—includes some > 15m tall, (◑)—includes some > 18m tall.

the natural spread of acorns is doubtful as acorns have been planted in this shelter belt from time to time by estate workers (R. Taylor pers. comm. 1979). Another coastal regeneration site is at Overstrand (GR 63/244.411) in unmanaged parkland where numerous saplings grow among old widely spaced pines. An inland site where regeneration from acorns occurs is at Taverham (GR 63/153.143); here a thicket of *Q. ilex* mostly established in the mid-1960s grows at the edge of a beech/oak wood. However, at most regeneration sites there is little chance of the seedlings developing to mature trees because their removal is almost inevitable in most gardens, cemeteries and church yards.

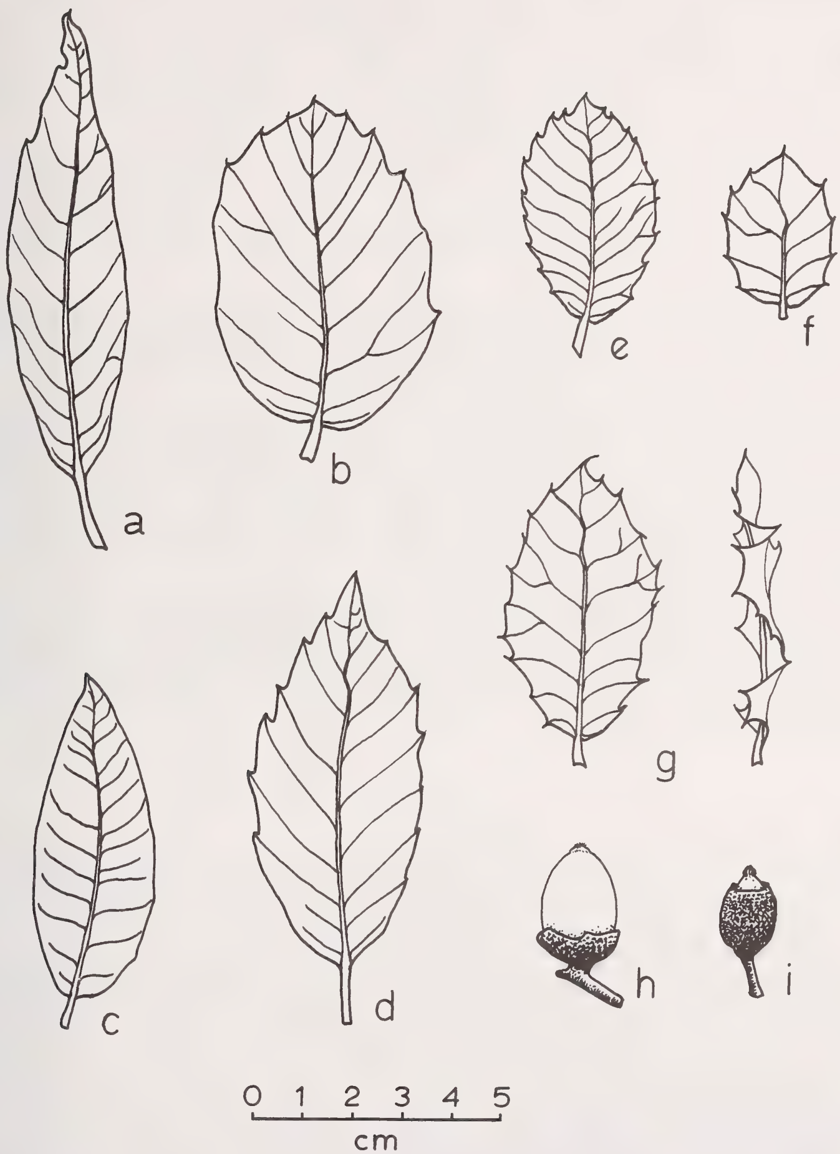

FIGURE 6. (a-g) A selection of *Q. ilex* leaves to illustrate some of the variation in shape, size and spininess; (h & i) mature and immature shed acorns.

VARIABILITY

Many authors (e.g. Jones 1959, Rackham 1974, Shaw 1974, Wigston 1974) have noted the variability of morphological and phenological characters in native oaks. *Q. ilex* shows similar variability, particularly in leaf size, shape, hairiness and marginal spines (Fig. 6). This variability was investigated by measuring 100 leaves randomly taken from near the bottom and top of eighteen mature trees from Wells (GR 53/918.434), Holkham (GR 53/882.390), Bale (GR 63/010.368) and Earlham (GR 63/213.087) (Appendix 2). These trees were chosen to give a range of morphological variation. The coefficient of variation expressed for each sample allows direct comparison of variability in length, width, and their ratio, because the sample mean is the denominator in this statistic. In fully formed leaves the range of mean lengths was 33.0 to 75.6mm and of mean widths 12.2 to 35.6mm – the largest leaf measured 195 × 28mm and the smallest 13 × 13mm. It appears that bottom leaves are usually bigger than top but such size differences within trees are not normally significant ($p > 0{\cdot}05$) (Fig. 7). Considerable differences in leaf lengths and widths between trees are evident (Appendix 2) both within a site (cf. Wells 1 & 6) and between sites (see sites Holkham and Bale).

Leaf shape in *Q. ilex* ranges from lanceolate to nearly orbicular, with a leaf margin which is usually entire but may be dentate or serrate (Fig. 6). The ratio of length to width in this species is a reasonable expression of leaf shape and comparing its values (Appendix 2) reveals that the larger ratio is as likely at the top as the bottom of a tree, unlike larger length or width. Again, within-tree differences are not significant ($p > 0{\cdot}05$) at any site.

The values of sample variation of lengths, widths and their ratios are relatively similar, that for widths being the biggest. Comparing the ratio of maximum to minimum values for mean widths of 2·9 and for mean lengths of 2·29, with that for the mean ratios of 1·66, further indicates that the variation of the linear dimensions exceeds that of their ratio. Leaf shape (length/width ratio) and, to a lesser extent, size, appears to be characteristic for a tree.

Seedlings have shallowly dentate leaves with the teeth apices forming soft spines. All seedlings seen have leaves of this form, even those grown from acorns of trees whose leaves are entire and spineless. Some mature trees have spined leaves. The percentage of such leaves in 100 leaf samples from near the top and bottom of 29 trees from 10 sites was 100% in 1 sample, 99-50% in 7 samples, 49-10% in 11 samples, 9-1% in 9 samples and zero in the remaining 30 samples. It appears to be a fallacy that spined leaves predominate on the lower leaves; in these samples there were more at the top in ten trees and more at the bottom in six trees.

Leaf hairiness and toughness also vary in *Q. ilex*. Newly emerged leaves have a whitish appearance resulting from dense pubescence. This is eventually lost on the upper surface but usually persists on the lower surface. However, some trees are found with no or very few lower surface hairs. We have noticed that the extent of attack by the leaf-mining insect *Phyllonorycter messaniella* (Zeller) appears to be related to these leaf characteristics.

DISCUSSION

Q. ilex has an extensive distribution in Norfolk, growing especially in parks and gardens of country houses, church land and large suburban gardens. The earliest plantings were probably those at Holkham, near the Obelisk, in 1729, at Gillingham Hall (GR 62/413.923) and Ken Wood (GR 53/675.350) at about the same time, and at North Elmham Hall (GR 53/985.218) slightly later. Grigor (1841) or Elwes & Henry (1906–13) (see Appendix 1) recorded measurements of big trees at these sites and the dates of the plantings are inferred from these. Grigor also recorded smaller trees in Norwich, at Bracondale and Thorpe, Wymondham, Aylsham, Yarmouth, Thetford, Hunstanton Hall and Whittington. The distribution of taller (and probably older) trees (Fig. 5) support our view that most subsequent planting was by nineteenth century gentry who in north Norfolk probably obtained their acorns from Holkham; for instance the holm oaks at Sidestrand Hall reputedly originated in this way (P. Paget pers. comm. 1979). This planting obscures any possible natural spread and, although 33 regeneration sites have been found, at none are seedlings or saplings more than 50m from mature trees, except at Holkham Dunes. Here deliberate acorn planting could have been responsible for longer distances between saplings and mature trees.

Native *Quercus* spread very rapidly after re-entry to Britain so that within about 1,000–1,500 years of

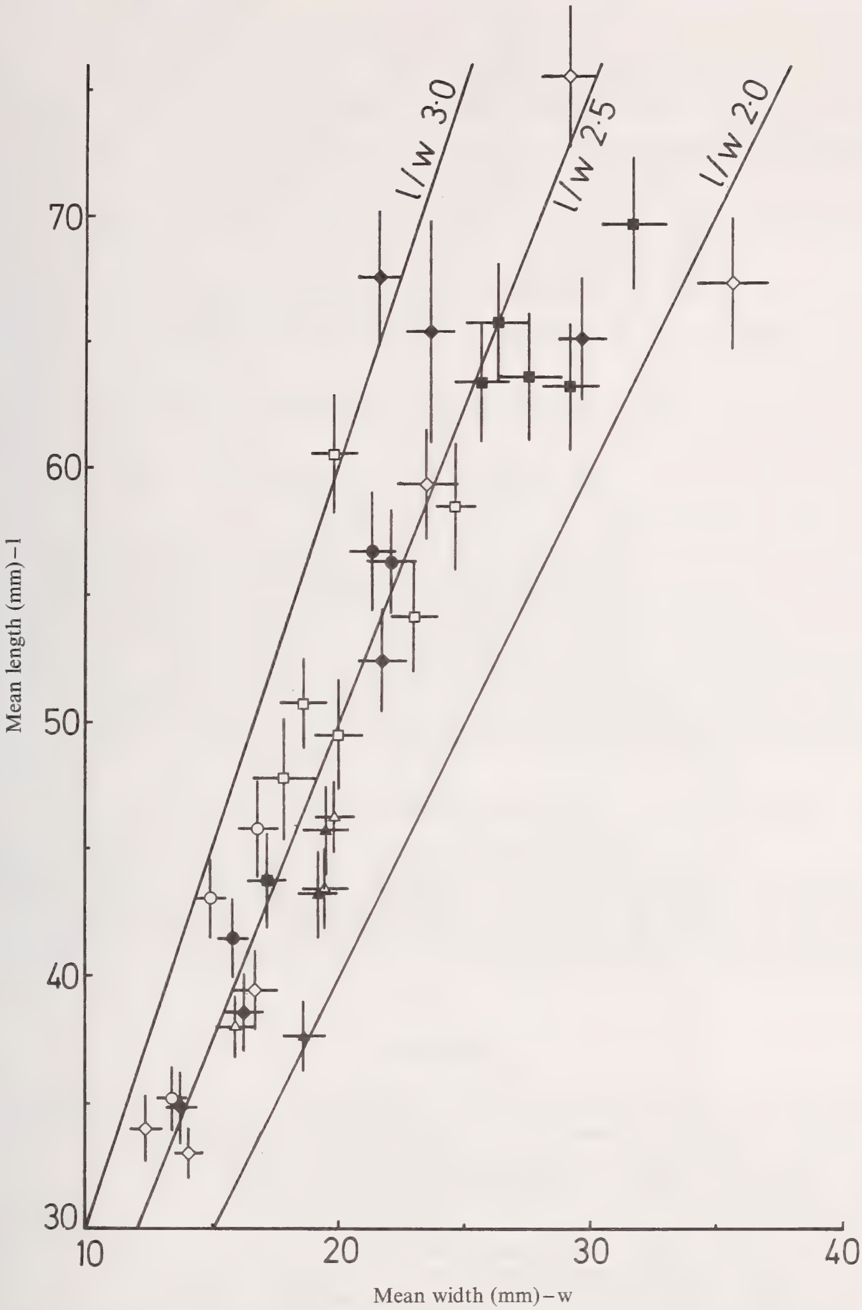

FIGURE 7. Scatter diagram of mean length (l) against mean width (w) of 100 leaves: vertical and horizontal bars ± 95% confidence limits. Wells, (◆) top (◊) bottom of trees; Earlham, (○) top (◉) bottom; Bale, (△) top (▲) bottom; Holkham, (□) top (■) bottom. The straight lines represent values of the ratio of mean lengths/mean widths (l/w) of 2·0, 2·5 and 3·0.

the Preboreal and Boreal it had reached mid-Scotland. Godwin & Deacon (1974) dated oak in Perthshire at 8,354 ± 143 BP. In recent times it has been usual to talk of the failure of native oaks to regenerate from seed in woodland (e.g. Pearsall 1950, Ashby 1959, Tansley 1968). Possibly this is an overstatement, as recorded instances (e.g. Penistan 1974, Rackham 1976, Barkham 1978) are not uncommon and oaks regenerating outside woodland (e.g. Adamson 1931, Mellanby 1968, Pigott 1977) are a common occurrence. If Shaw's view (1974) that insect defoliation of seedlings is a major factor determining their growth and survival is correct, then *Q. ilex*, which is not defoliated in Britain, has an advantage in this respect. Our observation of saplings in Norfolk over five years (1975–1979) suggests that the growth rates of holm oaks are not markedly slower than those of native oaks. Loudon (1838) recorded growth to over 20 feet in 15 years from an acorn in his garden at Bayswater, and Elwes (Elwes & Henry 1906–13) reported growth to 40 feet in 29 years at Windsor. From the girth values of Table 2 the mean annual increment of girth at breast height for 54 *Q. ilex* was 1·46cm, which is equivalent to an annual diameter at breast height increment of 4·7mm and compares with 4·9mm for similarly aged native oaks growing in closely planted stands and 8·8mm in open situations (Jones 1959). Thus the growth rate of *Q. ilex* is somewhat slower, but in other aspects of its performance – acorn production, germination, seedling survival and growth – the species is comparable with native oaks.

After good acorn years many *Q. ilex* seedlings have been seen to develop at a number of inland and coastal sites. For the continued success of these seedlings (i.e. naturalization of the species) freedom from interference by man appears the critical factor. Though regeneration was found to be more frequent at sites in the coastal zone this might not be related to climatic effects. Mature *Q. ilex* are quite resistant to cold. Jones (1959) quotes it enduring −10°C and even −24°C in N. Africa and, although the leaves are scorched by severe frosts (White (1789) recorded this after the severe winters of 1768 and 1784), the tree persists. The severe winter of 1859 similarly affected mature trees in East Anglia though it killed 10–12 year-old saplings (Elwes & Henry 1906–13). Snow lay on many trees in Norfolk in the 1978 winter for over six weeks. At Temple Woods nearly all or all the leaves were killed on about 100 trees yet these trees have survived and produced new leaves. Seedlings may be more susceptible but those at inland sites survived the winters from 1975 to 1978 and seedlings outside in garden pots survived the winter of 1978. The prevalence of *Q. ilex* near the coast appears to be more a result of deliberate planting from early times to form an evergreen shelter than of any climatic influence.

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APPENDIX 1.

EARLY BRITISH RECORDS OF *Q. ILEX*

Estimated date of planting	Site	Source and date of reference
c. 1550	London, City	Clusius 1581 (in Gerarde 1636)
1600–1650	Gloucs., Westbury	Hadfield 1971
	Notts., Wollaton	L.1838
1650–1700	London, Fulham	L.1838
	Middlesex, Harefield	L.1838
	Surrey, Wotton	L.1838
1700–1750	Berks., Cliveden	Thomas 1979
	Berks., Frogmore	Elwes 1904 (in E. & H. 1906–13)
	Devon, Mamhead	Bradley 1739
	Devon, Dawlish	Elwes 1906 (in E. & H. 1906–13)
	Devon, Knightshayes	Mitchell 1963 (in Hadfield 1971)
	Gloucs., Siston	Elwes 1908 (in E. & H. 1906–13)
	Hants., Selbourne	White 1768 (in White 1789)
	Herts., Epping	Elwes 1909 (in E. & H. 1906–13)
	Kent, Godmington	Elwes 1909 (in E. & H. 1906–13)
	Kent, Betteshanger	Elwes 1909 (in E. & H. 1906–13)
	Kent, Cobham	Elwes 1905 (in E. & H. 1906–13)
	Norfolk, Holkham	Estate Records
	Norfolk, Gillingham	Grigor 1841
	Norfolk, Ken Wood	Elwes 1906 (in E. & H. 1906–13)
	Somerset, Hornicote	Elwes 1906 (in E. & H. 1906–13)
	Suffolk, Thelnetham	Grigor 1841
	Surrey, Pains Hill	Whately 1771 (in Hadfield 1967)
	Surrey, Claremont	L.1838
	Sussex, Goodwood	Elwes 1906 (in E. & H. 1906–13)
	Wilts., Wilton	L.1838
	Pembs., Stackpole	L.1838
	Ayrs., Loudon	Gilpin 1776 (ed. Lauder 1834)
	Ayrs., Fullerton	L.1838
	Bute, Mount Stewart	Gilpin 1786 (ed. Lauder 1834)
	East Lothian, Tynningham	Haddington 1732 (ed. Anderson 1953)
	Galloway, Bargally	Walker 1780 (in L.1838)
	Midlothian, Newbattle	L.1838
1750–1800	Cheshire, Tabley	L.1838
	Cornwall, Carclew	L.1838
	Cornwall, Torpoint	Repton c.1800 (in Thomas 1979)
	Devon, Killerton	L.1838
	Devon, Sawbridgeworth	L.1838
	Devon, Exeter	L.1838
	Dorset, Melbury	L.1838
	Hants., Christchurch	Stroud 1965
	Wight, Faringford	Elwes 1906 (in E. & H. 1906–13)
	Lancs., Latham	L.1838
	London, Syon	L.1838
	Middlesex, Stanmore	L.1838
	Norfolk, N. Elmham	Grigor 1841

APPENDIX 1—*continued*

Estimated date of planting	Site	Source and date of reference
	Somerset, Nettlecombe	L.1838
	Suffolk, Bury St. Edmunds	L.1838
	Suffolk, Bungay	L.1838
	Surrey, Farnham	L.1838
	Sussex, Chichester	L.1838
	Westmorland, Holker	L.1838
	Wilts., Wardour	L.1838
	Worcs., Croome	L.1838
	Radnors., Maeslaugh	L.1838
	Kirkcudbrights., St. Mary's Isle	L.1838
	West Lothian, Hopetoun	L.1838

E. & H. = Elwes & Henry (1906–13)
L = Loudon (1838)

APPENDIX 2

SIZE STATISTICS OF *Q. ILEX* LEAVES

Site	Tree number & height	Mean length mm	C%	Mean width mm	C%	Mean $\frac{\text{length}}{\text{width}}$ ratio	C%
Holkham	1T	54·1	20·8	23·0	20·4	2·38	15·8
	1B	63·4	18·0	25·7	21·3	2·47	18·9
	2T	49·5	18·2	20·0	24·0	2·50	16·8
	2B	63·6	20·0	27·5	21·8	2·26	17·0
	3T	60·5	19·0	19·8	24·2	3·09	22.9
	3B	65·8	18·6	26·3	24·3	2·52	21·8
	4T	50·7	17·8	18·6	22·8	2·81	20·3
	4B	69·7	19·6	31·7	22·3	2·17	23·3
	5T	58·5	21·8	24·6	16·7	2·34	18·6
	5B	63·3	19·6	29·2	19·4	2·13	21·4
	6T	47·8	25·0	18·8	31·4	2·56	19·0
	6B	43·8	20·0	17·1	22·7	2·57	18·3
site means		57·5		23·5		2·48	
Wells	1T	34·0	18·0	12·3	18·3	2·82	17·8
	1B	34·8	20·5	13·7	19·3	2·49	17·5
	2T	33·0	16·0	14·0	16·0	2·32	14·8
	2B	38·6	19·6	16·2	20·5	2·33	22·2
	3T	39·5	19·1	16·7	20·7	2·36	20·8
	3B	52·5	19·9	21·7	23·1	2·37	19·8
	4T	67·5	19·4	35·6	20·6	1·92	25·4
	4B	65·2	18·8	29·6	15·2	2·21	20·0
	5T	59·4	17·6	23·5	20·8	2·48	23·1
	5B	65·4	29·4	23·6	21·7	2·77	28·3
	6T	75·6	18·4	29·2	18·5	2·59	22·4
	6B	67·6	19·2	21·6	19·1	3·18	22·4
site means		53·1		21·5		2·49	

APPENDIX 2—*continued*

Site	Tree number & height	Mean length mm	C%	Mean width mm	C%	Mean $\frac{\text{length}}{\text{width}}$ ratio	C%
Earlham	1T	35·2	18·8	13·4	19·8	2·57	19·2
	1B	41·5	19·7	15·8	20·1	2·66	14·3
	2T	43·1	18·1	14·9	19·0	2·90	17.1
	2B	56·7	19·5	21·3	21·0	2·71	14·2
	3T	45·8	20·8	16·8	25·2	2·71	18·6
	3B	56·3	17·8	22·1	23·1	2·57	22·2
site means		48·3		17·4		2·69	
Bale	1T	38·0	15·1	15·9	18·8	2·38	12·6
	1B	37·7	18·2	18·6	22·1	2·09	24·4
	2T	43·4	18·4	19·4	21·9	2·20	20·5
	2B	45·8	20·4	19·4	23·7	2·39	18·3
	3T	46·3	15·4	19·8	16·8	2·35	17·0
	3B	43·3	20·0	19·2	19·4	2·18	20·3
site means		42·2		18·7		2·26	
overall means		52·0	19·3	21·0	21·0	2·48	19·6

Each statistic is based on a sample of 100 leaves
T = near top of tree
B = near bottom of tree
C = coefficient of variation $= \frac{\text{standard deviation}}{\text{mean}}$

Watsonia, **13**, 287–298 (1981).

The history, ecology and status of *Gastridium ventricosum* (Gouan) Schinz & Thell. in the Avon Gorge, Bristol

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ABSTRACT

Gastridium ventricosum (Gouan) Schinz & Thell., a rare annual grass, has been known from the Avon Gorge, Bristol, W. Gloucs., v.c. 34, since 1789. An analysis of the published, manuscript and herbarium records revealed that the grass had been recorded in at least nine distinct localities. Search showed two of these to be extant. The associated vegetation includes other therophytes, and perennials of limestone grassland and open scrub. The historical record and population data from 1978 to 1980 revealed that the grass responds positively to heavy rainfall following hot, dry summers, probably through a seed bank. It is concluded that *G. ventricosum* is native on open south-facing slopes of the Gorge, in rocky grasslands characterized by *Carex humilis*.

INTRODUCTION

Gastridium ventricosum (Gouan) Schinz & Thell. is a member of the Mediterranean element in the British flora (Matthews 1955), and elsewhere occurs in southern Europe, from France and the Iberian Peninsula eastwards to the Balkans, and in north-western Africa and the Azores (Hubbard 1968). Although formerly known in some 28 vice-counties from the Channel Islands northwards to Yorkshire, between 1960 and 1977 it was recorded in only six mainland localities (Perring & Farrell 1977); 17 localities are now known (P. J. O. Trist pers. comm. 1980). It is considered probably native in dry calcareous grassland in southern Britain, mainly near the sea, but a casual, particularly of arable fields, in most inland localities (Hubbard 1968; Perring & Farrell 1977).

The following historical account of *G. ventricosum* in the Avon Gorge is based on a comparison of the published records with the often more explicit notes in manuscripts and associated with herbarium specimens. The grass, once known, is unlikely to be confused with any other British species. Records unsupported by voucher specimens may therefore be accepted.

The nine localities in which the grass has been recorded in the Avon Gorge are described in order of their years of discovery; months and days (where known) are omitted. Whilst the grass has clearly been widespread on the east side of the Gorge (v.c. 34), it has never been recorded on the west side (v.c. 6).

All herbarium specimens cited have been seen by the present author, with the exception of those in **herb. I. M. Roper** (in **LDS**, details from Dr W. A. Sledge). Specimens were found in the herbaria of the following botanists: C. Bucknall (**BRIST**); I. W. Evans (in **BRISTM**); D. Fry (**BRIST**); G. W. Garlick (in **BRIST**); C. M. Lovatt (**herb. C. M. Lovatt**); C. E. Salmon (**K**); H. S. Thompson (**BIRM**) and J. W. White (**BRIST**). In addition, sheets collected by these and other botanists and distributed privately or through the Exchange Clubs were seen in **BIRM, BM, BRISTM, CGE, K** and **herb. A. C. Titchen**.

Although the Avon Gorge has sufficient landmarks (Fig. 1) for a locality to be accurately and unambiguously defined, vague and even incorrect site descriptions have sometimes been used. Records for Bristol (R. C. A. Prior, *c*. 1840, **K**), Clifton (T. B. Flower, 1880, **K**), Clifton Down (C. Alden, 1920, formerly in **herb. H. S. Thompson**), St Vincent's Rocks (G. H. K. Thwaites, *c*. 1840, **herb. H. C. Watson**, in **K**; Thwaites, 1843, **CGE**; J. Ball, 1848, **BRISTM** *ex* **GLR**) and St Vincent Rocks (illustration in Lowe 1858) are too imprecise to be allocated to one of the sites described below. In addition, Roper, in 1916, sent a Bristol gathering to E. W. Hunnybun, the illustrator of the unfinished *Cambridge British Flora* (Hunnybun *in litt. ad.* Thompson 1916).

The geology of the Avon Gorge is described by Vaughan (1906) and an account of the topography and vegetation is given by White (1912b), although since then there has been an increase in secondary

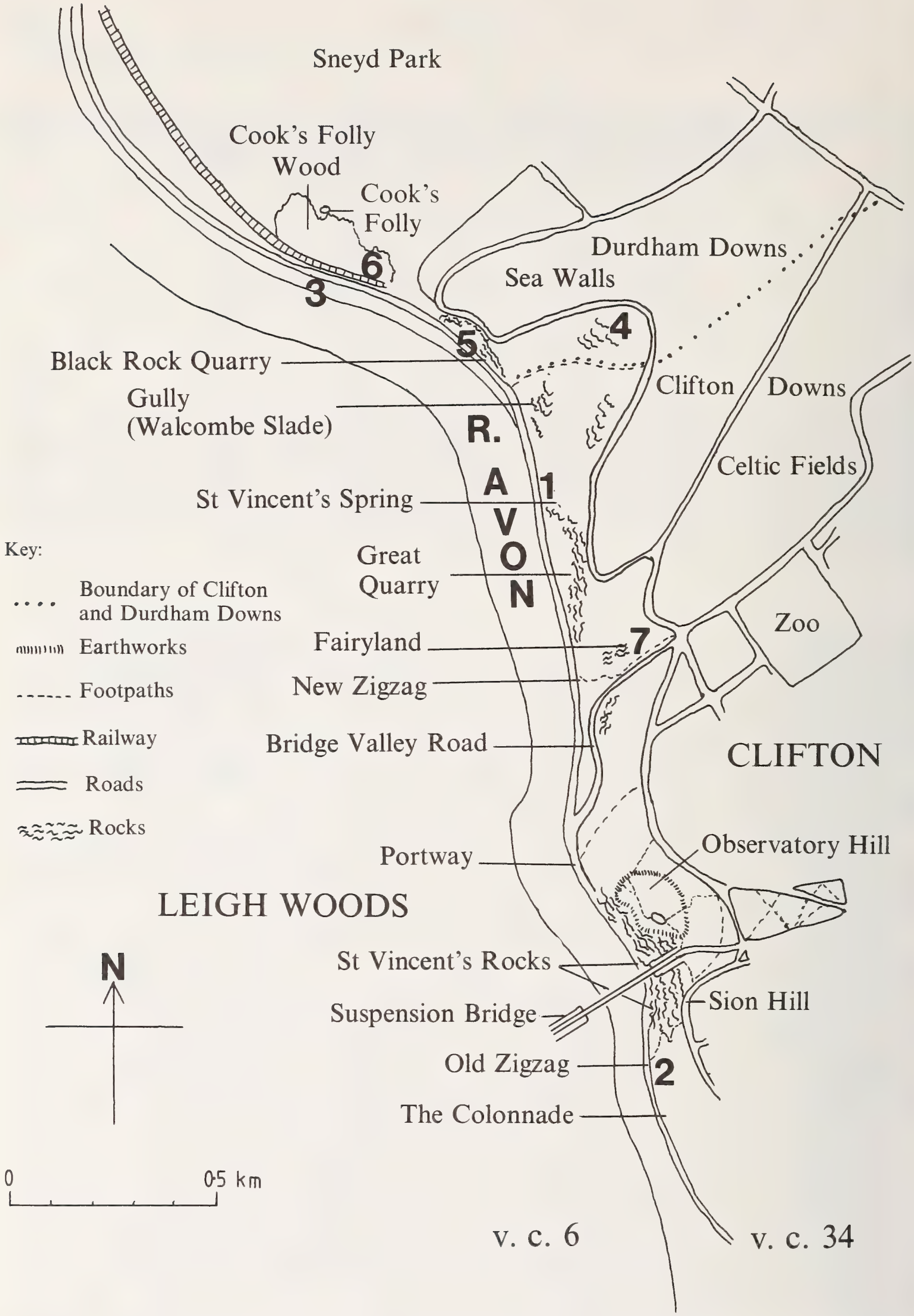

FIGURE 1. Map of the Avon Gorge, showing landmarks mentioned in the text and the seven localities where *G. ventricosum* formerly occurred.

woodland on the Gorge slopes due to the reduction and cessation, in 1925, of sheep grazing, devastation by myxomatosis of the rabbit populations, and the planting and naturalisation of alien trees.

The species nomenclature used follows Dandy (1958, 1969) for vascular plants and Warburg (1963) for mosses. During the period under discussion *G. ventricosum* has been referred to *Milium lendigerum* L. (late 18th to mid 19th century), *G. lendigerum* (L.) Desv. (mid 19th to early 20th century) and *G. australe* Beauv. (early 20th century).

HISTORY AND DISTRIBUTION

1. *The New Hotwell.*

There have been several Hotwell Houses in the Avon Gorge (Waite 1960). The earliest (site 2), just south of St Vincent's Rocks, was built in 1696. A 'New Hotwell' (site 1), built in about 1702 and occupied by quarrymen in 1792 was situated just north of the Great Quarry and is marked by the now dry 'St Vincent's Spring'. In 1822 the original Hotwell, then known as the 'Old Hotwell House', was demolished; the new building was named the 'New Hotwell House'. It was itself demolished in 1867, although a small part (The Colonnade) still remains (Waite 1960). The name given to a botanical locality therefore depended on the date of the record. Unfortunately, further confusion arises because of the repetition of old records and because *G. ventricosum* formerly occurred near both wellhouses.

G. ventricosum was first recorded in the Gorge by T. W. Dyer 'Near the New Hotwell' (Shiercliff 1789). This record was repeated in various Bristol Guides over the next 50 years. Turner & Dillwyn (1805) reported Dyer's locality as 'St Vincent's Rocks near the hot wells'. Most of their Bristol information was from the list in Shiercliff, although Dyer himself contributed a few localities and had also conducted Turner around the Gorge in June 1799, probably too early in the year for the list (Turner & Sowerby 1800) to include *G. ventricosum.*

In his account of *G. ventricosum* in the Bristol area, White (1912b) stated, 'it is most abundant behind the site of the New Well House, long since removed'; here it may be assumed that 'most abundant' was intended in a relative sense. In 1897 White collected specimens from the 'slope above Avon betw. the Gully and Great Quarry' (**herb. J. W. White**) and in 1907 C. E. Salmon, in White's company, gathered specimens on 'Clifton Down, slope above the R. Avon' (**herb. C. E. Salmon**).

2. *Hotwells.*

Evans (1820) reported *G. ventricosum* at the 'Hotwell House' in a list of plants contributed by S. Rootsey. No previous record known to the present author refers with certainty to this locality. The personal record of Swete (1854) for 'St. Vincent's Rocks' probably refers to the same vicinity. White (1886) reported that T. B. Flower 'used to find it behind the New Hotwell House long since removed'. Although White (1912b) described the previous locality in almost identical words, it was the wellhouse near St Vincent's Rocks which was so-called during the period of Flower's botanising in the Gorge (*c.* 1830–1880). In addition White (1887a) cited a specimen in **herb. T. B. Flower**, 'Green slope under St. V. Rocks by the Suspension Bridge, 1852'. White (ibid.) continued 'Bucknall also has found it nr. the old Zigzag and I found it there in 1907'. Specimens from this locality in 1907 are listed as follows: 'opposite Sion Hill' (**herb. J. W. White**); 'On St. Vincent's Rocks above the Suspension Bridge' (J. W. White, **K**); 'St. Vincent's Rocks, just above the Bridge' (**herb. C. E. Salmon**). Bucknall (ann. in White 1887b) noted the grass on 'St. Vincent's Rocks' in 1894 and **herb. C. Bucknall** contains an undated specimen from 'Nr. the Zigzag'. The locality was reported by White (1912b) as the 'slopes south of the Suspension Bridge'.

3. *Bank of Avon.*

G. ventricosum was first recorded at the 'Side of the river below Cook's Folly' by Swete (1854). It was rediscovered on the 'Bank of Avon' by W. E. Green (White 1887a) sometime prior to White's note (ibid) of '4 plants seen on Bank of Avon 1882'. To a report of its occurrence in Black Rock Quarry (see below), White (1884) added, 'it still lingers on . . . within half a mile of the Quarry . . . close search only discloses a sparse annual crop of three or four plants'. The fourth plant from the 'Bank of Avon near Black Rock (towpath), 1882' is in **herb. J. W. White**.

G. ventricosum was next seen there in 1894. White (1912a) noted 'Several by Avon under Sea Wall' and Bucknall collected one plant on the 'Railway bank, near Avon' (**herb. C. Bucknall**) recording the locality as 'Railway embankment' and 'Bank of Avon' (Bucknall ann. in White 1887b). There is no subsequent record for this site about which White (1912b) wrote, 'Twice, at a long interval, I have seen a few plants by the roadside under the Downs'.

4. *The Gully.*
Swete (1854) saw *G. ventricosum* in the 'Gully near the Sea Wall', the phrase apparently indicating the location of the Gully rather than the locality of the plant. This was the most northerly extant site known to White (1912b) who in a series of notes (1912a) recorded the grass 'On Durdham Down nr. the top of the Gully (to the S. West) 1894, C. Bucknall. (I saw it there in good quantity J.W.W.) In plenty 1904'. The last statement suggests that the sheets collected by White in 1904 for distribution were in fact from this site, although labelled 'Clifton Downs' (White 1905; sheets in **BM,K**). The boundary of Clifton and Durdham Downs (see Fig. 1) may be traced on the ground, but the names have sometimes been used almost interchangeably.

There is an undated specimen from the 'Gully' in **herb. C. Bucknall** and he recorded the site as 'Durdham Down, 1894' (Bucknall ann. in White 1887b). The grass was also collected on 'Durdham Down, 1897' by D. Fry (**herb. D. Fry**) and at the 'Head of Gully, Durdham Down, 1898' by I. M. Roper (**herb. I. M. Roper**).

The persistence of *G. ventricosum* at this locality after 1912 is confirmed by specimens from 'Rocky turf above the Gully, 1935' (**herb. I. W. Evans**). A duplicate collected by I. W. Evans and labelled 'Top of Gully, 1935' is in **herb. A. C. Titchen**, from where a culm was transferred in 1979 to **herb. C. M. Lovatt**.

5. *Black Rock Quarry.*
According to White (1912b), 'In 1883 and 1884 it came up luxuriantly on dredgings tipped in the Black Rock Quarry but died out soon afterwards'. White (1884) failed to record its abundance in 1883 but White (1887a) noted, '5 or 6 plants' in 1883 but that it was 'plentiful' in 1884. White (ann. in Hooker & Arnott 1860) merely noted its occurrence there in 1883 and 1884. Robust specimens were collected by White in 1883 (**herb. J. W. White**) and by D. Fry in 1884 (**herb. D. Fry**). White's sheet is annotated, 'in great abundance', a remark apparently added subsequently and, like his failure to indicate the precise duration of *G. ventricosum* in the quarry, probably attributable to a lapse of memory. Another annual grass, *Polypogon monspeliensis*, similarly introduced there with dredgings, survived until 1886 (White 1912b).

6. *Railway tunnel, below Sneyd Park.*
White (1912b) recorded that 'for a season or two (1885 to 1887) it occurred plentifully near the mouth of the railway tunnel, Sneyd Park'. However he also noted it at this site 'high up . . . in some plenty, 1884' (White 1887a). The phrase 'high up' probably served to differentiate the site from the riverside one; both sites were included in the description (White 1886): 'scattered over a very small area on the Gloucestershire bank of the Avon'. White (1887a) added that the tunnel site was the 'chief present station'.

7. *Fairyland.*
In 1912, but too late for inclusion in the *Flora of Bristol*, I. M. Roper discovered and collected *G. ventricosum* at 'Fairyland' (**herb. I. M. Roper**). The next day, presumably with Roper's directions, White 'met with a quantity on the rock slope from 'Fairyland' to the Bridge Valley Road' (White ann. in White 1912b) and collected a specimen (**herb. J. W. White**) from the 'Rock-slope above Bridge Valley Road, (Fairyland side)'. This new locality was ambiguously reported by Roper (1913) as a 'rocky slope above Bridge Valley Road', such areas occurring on both sides of the road.

In 1951 G. W. Garlick collected a specimen from 'Fairyland Valley' (**herb. G. W. Garlick**). The finder confirmed (pers. comm. 1979) that this was the Avon Gorge site he had recorded for the *Atlas of the British flora* (Perring & Walters 1962).

In addition, between 1913 and 1922, there are several records, some of which seem precise, that cannot be confidently allocated to one of the numbered localities. All may in fact refer to the 'Fairyland' site. C. I. and N. Y. Sandwith (MS in *Field botanist's diaries* 1913–1918) recorded the grass on 'Clifton Downs' in 1913 and 1916, on 'The Downs, Clifton' in 1914 and on a 'Rocky slope, Clifton Downs' in 1918. H. S. Thompson collected *G. ventricosum* in 1916 at the 'Foot of limestone rocks

TABLE 1. SPECIES ASSOCIATED WITH *G. VENTRICOSUM* IN THE AVON GORGE

Site	'Black Rocks'			'Clifton Down'	
Quadrat number	5	4	1	3	2
Gastridium ventricosum	+	+	+	+	+
Bromus madritensis	+	+	+	+	
Medicago lupulina	+	*	+	+	
Catapodium rigidum	+	+	+		+
Dicot. and grass seedlings	+	+		+	+
Crataegus monogyna		+	*	+	+
Dactylis glomerata		+	+	+	+
Helianthemum chamaecistus		+	+	*	+
Centranthus ruber			+	+	+
Ligustrum vulgare			+	*	+
Poterium sanguisorba			+	+	+
Trichostomum brachydontium			+	+	+
Rubia peregrina			+	+	
Brachypodium sylvaticum	*			+	+
Bromus erectus	+			+	+
Sonchus oleraceus	+			+	+
Rosa canina	*			+	+
Rubus ulmifolius	+				+
Centaurium erythraea	+	+	+		
Hypericum perforatum	+	+	+		
Leucanthemum vulgare	*	*	+		
Odontites verna	+	+	+		
Lotus corniculatus	+		+		
Origanum vulgare	+		+		
Plantago lanceolata	+		+		
Taraxacum laevigatum agg.	+		+		
Acinos arvensis	+	+			
Bromus mollis	+	+			
Clinopodium vulgare	+	+			
Arabis scabra				+	+
Festuca ovina				+	+
Lolium perenne				+	+
Potentilla tabernaemontani				+	+
Trisetum flavescens				+	+
Ulex europaeus				*	*
Viola hirta				+	+

Quadrats 1–4: 1 × 1m. Quadrat 5: 2 × 0·5m.
The quadrats were recorded using % cover. The data are summarized here:
* indicates a ground cover $>10\%$.
+ indicates a ground cover $\leq 10\%$.
Species which occurred in only one quadrat are omitted from the Table. They are listed below following the quadrat number. All had $<5\%$ ground cover.

5: *Arenaria serpyllifolia, Geranium rotundifolium, Hypericum hirsutum, Teucrium scorodonia, Barbula unguiculata, Bryum argenteum.* 4: *Cirsium arvense.* 1: *Foeniculum vulgare, Hieracium strumosum, Linum catharticum, Picris echioides, Pimpinella saxifraga, Scabiosa columbaria.* 3: *Allium carinatum, Carex humilis, Fissidens taxifolius.* 2: *Agrostis stolonifera, Allium oleraceum, Clematis vitalba, Poa annua, Solidago virgaurea, Camptothecium sericeum, Grimmia apocarpa.*

between Clifton and Durdham Downs' (**herb. H. S. Thompson**). A duplicate in **CGE** is labelled, 'Foot of limestone rocks nr. Clifton Downs'. In 1922 he distributed specimens from a 'limestone slope of Durdham Down' (Thompson 1923). Duplicates of this distribution are in **herb. H. S. Thompson**, **CGE** and **K**. Thompson's collecting habits suggest these records may be of a single locality, probably 'Fairyland' in view of his annotation, 'where the *Gastridium* grows' on a sheet of *Sorbus aria* (**herb. H. S. Thompson**, no. 2431) collected on 'Clifton Down. By limestone rocks nr. 'The Fountain', 1922'. Proctor's Fountain is at the top of Bridge Valley Road. In 1922 I. M. Roper collected specimens 'On rocks near Zoo, Durdham Down' (**herb. I. M. Roper**). Such a habitat exists, although strictly on Clifton Down, but Roper's description probably refers to 'Fairyland' rather than an unpublished new locality.

THE TWO EXTANT LOCALITIES

8. *Black Rocks.*
In 1950 I. W. Evans collected the grass on 'Black Rocks' (**herb. I. W. Evans**) and three small distinct colonies occupying $11m^2$ were discovered there in 1978 by the present author (Willis 1980). A voucher specimen is preserved in **herb. C. M. Lovatt**.

9. *Clifton Down.*
Although other records for Clifton Downs are quoted in this paper, there is no evidence of a previous record for the site discovered in 1973 by P. J. M. Nethercott, who reported a 'single plant noted on Clifton Down' (Willis 1974). The discoverer saw three plants there in 1974 (*fide* Biological Records Centre) and reported that 'although the population is tiny, the grass did well in 1977' (Willis 1979). The colony, then occupying $3m^2$, was independently discovered by the present author in 1978.

ECOLOGY

ASSOCIATED SPECIES

Apart from the list of casuals introduced with dredgings (White 1884), no records of the associates of *G. ventricosum* in the Avon Gorge have been traced. In August 1978 the present author recorded five $1m^2$ quadrats in vegetation containing a homogeneous scattering of the grass. The percentage cover of each vascular plant species was recorded and mosses were collected for determination. No liverworts or lichens were present. These data are presented in Table 1.

The species lists reflect the highly calcareous nature of the soil, the sites sharing species of open conditions (e.g. *Catapodium rigidum, Medicago lupulina*), calcareous grassland (e.g. *Helianthemum chamaecistus, Poterium sanguisorba*) and calcareous scrub (e.g. *Ligustrum vulgare, Rosa canina*). Black Rocks has skeletal soils which are freely drained and very dry in summer. This is reflected in the increased proportion of therophytes in the 'Black Rocks' quadrats (e.g. *Bromus mollis, Odontites verna*). The 'Clifton Down' site receives less sunlight and the soil is damper and less strongly alkaline; the species lists have affinities with those of *Carex humilis* sites recorded elsewhere in the Gorge by the present author, but are modified by trampling, resulting in a decrease in cover of *C. humilis* and *Bromus erectus* and the introduction of *Poa annua* and *Lolium perenne*.

De Bolos & Molinier (1958) recorded the species composition of three quadrats containing *G. ventricosum* in Majorca. Eighteen of the species they recorded have been reported in the Avon Gorge, and of these five occur in the present author's quadrats (*Arenaria serpyllifolia, Bromus mollis, Catapodium rigidum, Dactylis glomerata* and *Plantago lanceolata*). Three of the species recorded in Majorca, *Allium sphaerocephalon, Cerastium pumilum* and *Geranium purpureum*, are plants rare or uncommon in Britain but which still occur in Avon Gorge localities where *G. ventricosum* was formerly recorded. Of the ten remaining species, seven are now extinct or rare or are of dubious status in the Gorge; the remaining three are winter annuals not visible in August. In addition, the present author has seen the grass in Malta in close association with *Scilla autumnalis*, a plant formerly abundant above 'Hotwells'.

HABITAT

The present author's quadrats share several features which indicate some of the requirements of *G. ventricosum* in the Avon Gorge (Table 2). The soils are shallow, less than 10cm, and highly calcareous.

TABLE 2. ADDITIONAL DETAILS FROM *G. VENTRICOSUM* QUADRATS IN THE AVON GORGE

Site	'Black Rocks'			'Clifton Down'	
Quadrat number	5	4	1	3	2
Bare rock (%)	—	1	6	12	20
Rock fragments (%)	13	6	15	1	4
Bare soil (%)	10	14	10	13	15
Dead vegetation (%)	3	1	2	1	7
Bryophytes (%)	18	—	8	3	5
Vascular plants (%)	75	80	70	75	60
Aspect (nearest 5°)	145	155	205	155	150
Slope (nearest 5°)	35	40	35	15	20
Ht of vegetation (nearest 5cm)	20	10	20	10	10
Soil depth (nearest 0·5cm)	6·0	9·0	7·0	6·0	7·0
pH	8·3	8·3	8·3	7·8	7·8
Number of species/m²	26	15	26	25	28
Number of plants of *G. ventricosum*	10	50	46	63	50

Soil depth was calculated as the mean of 10 depths recorded by inserting a probe until an obstruction was felt.

The pH of a 1:2·5 aqueous soil suspension was measured in the laboratory for each quadrat.

The vascular plant cover does not exceed 80% and bare soil ranges from 10 to 15%. Both sites have a southerly aspect with appreciable slopes and are unshaded; they are consequently subject to soil desiccation during summer droughts.

Trees and bushes on the slopes of Black Rocks were cleared during the removal of dangerous rocks from above the Portway from 1974 to 1976. This partly accounts for the reappearance of *G. ventricosum* here. There is a rich flora of natives and aliens on Black Rocks including *Arabis scabra, Carex humilis* and *Geranium sanguineum.*

The Avon Gorge is much used by climbers and both sites are occasionally disturbed, although they are somewhat protected from casual interference by their inaccessibility and in one colony by the proximity of *Ulex europaeus.*

NUMBER OF PLANTS AND SEED PRODUCTION

Each August from 1978 to 1980, the present author counted the number of plants and panicles of *G. ventricosum* at the two extant localities (Table 3). From sample counts, it was possible to estimate annual seed production (Table 3), which in any one year exceeded at least 20-fold the number of plants flowering in the following year.

SEED DISPERSAL

G. ventricosum flowers in the Avon Gorge in early July, remaining easily recognisable during seed dispersal (late August to November). This is effected by the abscission of the glumes beneath the swelling which surrounds the dispersal unit, a grain tightly enclosed between a lemma and palea. The panicle may be recognised for several further months by the horn-like remains of the upper glume.

In any given panicle, the lemmas of *G. ventricosum* are awned and ciliate, or unawned and glabrous; the awn is slender and bent at and twisted below the middle (Hubbard 1968). The present author's observations suggest that this dimorphism results in two dispersal strategies. Grains with unawned lemmas may be dispersed by wind, rain, and occasionally by human interference; grains with awned lemmas, besides possible animal dispersal, also possess a self-dispersal mechanism. The awn is hygroscopic and moistening causes rotation. If the tip of the awn becomes fixed, the grain moves, until ultimately driven into a soil depression. This mechanism, also known in *Arrhenatherum elatius, Avena fatua* and *Erodium* spp., may be regarded, like seed hairs, as an adaptation to maximise water uptake and minimise loss by the germinating seedling (Harper 1977).

TABLE 3. POPULATION PARAMETERS OF *G. VENTRICOSUM* IN THE AVON GORGE 1978–1980

Site	'Clifton Down'			'Black Rocks'		
Year	1978	1979	1980	1978	1979	1980
No. of plants	152	49	18	146	1065	4
Average no. of panicles/plant	1·70	1·00	1·39	1·59	1·04	1·25
Average panicle length (cm)	*	1·5	2·5	2·7	*	*
Estimated seed production (1000s)	50	5·5	4·5	47	125	1

The number of both plants and panicles were counted annually at each site with the exception of 'Black Rocks' in 1979. In that case, panicles were counted and the number of plants was estimated from the number of panicles/plant in a sample of 25 plants.

* The average panicle length is based on 10 panicles measured to the nearest mm on 'Black Rocks' in 1978 and on 'Clifton Down' in 1979 and 1980. Each year's average is used to estimate the seed production at both sites for that year, based on a count of 75 seeds/cm from 5 panicles collected on 'Black Rocks' in 1978.

SEED GERMINATION

The panicles collected in August 1978 were stored in normal room conditions. Germination was tested in petri dishes, placing 25 seeds on filter paper moistened with distilled water. In October 1978 the conditions used were a 12 hour day at both 15°C and 20°C; in October 1980 room temperature with either a natural day length, or in the dark. In all cases germination was 100%, simultaneous and complete in 2 days or 3 days for the 15°C test.

In October 1978, 25 seeds were placed on moistened soil in a seed tray out-of-doors. Within two weeks, 13 had germinated and these overwintered as small plants with several tillers: two died due to frost-heaving. No further mortality or germination occurred and 11 plants flowered in late June 1979.

Field observations reveal small numbers of scattered fine-leaved grass seedlings on bare ground by October, a larger number in spring, but relatively few flowering plants by August, suggesting significant seedling mortality, perhaps due to spring droughts, March and April being usually the driest months in the Bristol area.

WEATHER AND POPULATION CYCLES

The increase of the 'Clifton Down' population from 1973 to 1978 may be attributed to the effects of the droughts and high temperatures of 1975 and 1976, which caused a soil moisture deficit and killed or weakened many competitors, leaving much bare soil (*cf.* Martin & Frost 1980). The heavy autumn rains of both years would have benefitted seed germination with some seedling recruitment probably from the newly exposed seed bank. This would result in more flowering plants, a greater seed production and a continued population increase. The subsequent population decline appears to be due to the gradual recovery of the scrub and the increase in ground cover. In two of the 'Black Rocks' colonies the decline, from a total of over 1000 plants in 1979 to only four in 1980, did not begin until after 1979, perhaps due to the dry and open character of the site, delaying the recovery of competitors. The dry autumn of 1978 probably interrupted germination and the predominantly single culmed plants of 1979 were perhaps the result of spring germination (*cf. Alopecurus myosuroides*, Naylor 1972).

Local or microclimatic factors as well as weather conditions must be appropriate for the creation of a marked soil moisture deficit. The grass has mainly been recorded in the Gorge in unshaded and usually rocky habitats on south facing slopes: such sites are particularly prone to desiccation. Lack of rain is the most important weather factor, but long periods of sunshine and high temperatures are also required.

Weather data are available for the Bristol area from 1853 to the present day, with the exception of 1913 and 1914 (Burder 1883; Sturge 1890, 1901, 1912; Clothier 1949, 1950, 1951; Annual reports of the

Long Ashton Research Station for 1948 to 1978). Monthly rainfall has been most consistently recorded. Using these data it may be shown that the recording of *G. ventricosum* is related to the weather of the few years immediately preceding the record and not to the habits of the collectors.

In 1894 the grass was found in three localities, one where it had not been recorded for 30 years, although all the sites had been frequently visited in that period. In 1893 there was a great drought from March to June with only 30% of the usual rainfall and with temperatures reaching 31°C in June. A wet October followed and in March 1894 there was a 20 day drought. In 1896, April to July was dry with only 34% of the usual rain, June and July were warm and followed by the wettest September recorded in Clifton from 1853 to 1911. Spring 1897 was also wet and *G. ventricosum* was refound at site 1 (see Fig. 1) and persisted at site 4. In 1904 it occurred 'in plenty' there, probably due to the wet 1903 and the dry and warm spells of 1901 and 1902. In 1906 there was a hot dry September; in 1907 White and Salmon collected the grass in two sites where it had not been recorded for ten years.

In 1912 a new locality was discovered (site 7) and Roper (1913) stated that 'the damp season appears to have helped this grass to spring up more abundantly than for a long period'. It was, however, the heat and drought of 1911 which allowed 'the damp season' to have such an effect. In July, August and September 1911 temperatures exceeded 32°C, a figure unrecorded at Clifton in the previous 50 years. Rainfall from July to September was only 37% of normal, with only 3% in July. The heaviest December rains since before 1853 then followed.

The grass was recorded in most subsequent years up to 1922, and was distributed in 1922. 1921 was an exceptionally sunny and dry year with 23% of normal rainfall in June and July.

After 1922, White and his 'Botanical Club' seem to have lost interest in the grass: it is likely that it was plentiful in 1923 even though no records have been traced. In the next fifty years it was recorded only three times, in 1935 (site 4), 1950 (site 8) and 1951 (site 7), though this also seems to reflect an actual decline in the grass. These records closely follow the only two years in that period which were unusually sunny and dry (1933 and 1949). July was a dry month in both 1933 and 1934 and in the two years from April 1933, above average rainfall only occurred in April and December 1934 and February 1935. This suggests that Evans's slender specimens of 1935 may have resulted from spring germination. In 1949 temperatures reached 31°C in July, rainfall from June to August was 49% of normal and October was the wettest then on record at Long Ashton. 1947 also had a particularly dry and sunny August.

Although seen in small quantity in 1973 and 1974, a substantial population increase followed the hot and dry summers of 1975 and 1976. In August 1975, temperatures rose to 32°C and rainfall from June to August was 65% of normal. In July 1976 temperatures reached 33°C and the June to August rainfall was only 40% of normal. Both summers were followed by heavy September rains, 177% of normal in 1975 and 211% in 1976.

The records since 1922 suggest that two more or less consecutive hot dry summers are required for *G. ventricosum* to re-appear, or occur in quantity. 1959 was a similar year but although a few records for site 4 in 1960 have been traced, the grass was not recorded in the Gorge between 1951 and 1973.

Insufficient recent data are available to study the relation between weather and seed production. Herbarium specimens cannot be used because of their biased selection. It is suggested that autumn germination, a mild winter, a damp warm spring and a hot June probably increase the seed production.

The evidence suggests that in the Avon Gorge *G. ventricosum* will continue its decline, perhaps, as has already happened in one colony, to zero, until after the next hot dry summer followed by heavy autumn, or perhaps spring rains. It is probable that the same pattern of a reduction in both populations and localities will be observed on the national scale. Indeed, the recent increase in known British localities (mainly recorded in P. J. O. Trist's field survey in 1980) may have been due to the weather conditions of 1975 and 1976.

STATUS

Table 4 lists each of the nine sites at which *G. ventricosum* has been recorded in the Avon Gorge, the number of years between the first and last known records (persistence), whether *Carex humilis* now occurs there, whether the tree canopy is open or closed and the status of *G. ventricosum* there. Map references are only given for those sites where the grass has not been refound by the present author.

C. humilis is considered to be a post-glacial relict species in limestone habitats such as the Avon Gorge, and to have spread on to the chalk in Wiltshire, Hampshire and Dorset following temporary

TABLE 4. SUMMARY OF *G. VENTRICOSUM* LOCALITIES IN THE AVON GORGE 1789–1980

Site no.	Site name	Grid reference	Persistence (years)	*Carex humilis* site	Tree canopy (1980)	Status
1	New Hotwell	562742	119	—	Closed	Native
2	Hotwells	566729	80	+	Closed	Native
3	Bank of Avon	558747	41	—	Open	Colonist
4	Gully	563746	82	+	Open	Native
5	Black Rock Quarry	561746	2	—	Open	Casual
6	Railway tunnel	559747	4	—	Open	Casual
7	Fairyland	564739	40	+	Closed	Native
8	Black Rocks	———	31+	+	Open	Native
9	Clifton Down	———	8+	+	Open	Native

downland agriculture in Neolithic times (Coombe 1955). Its association with other rare species in rocky turf along the edge of Clifton and Durdham Downs suggests to the present author that '*C. humilis* grassland' may be regarded as a 'native' vegetation type. Its extent has diminished over the past hundred years due to the increase of secondary woodland and, more recently, the invasion of *Quercus ilex*.

At sites 2, 4, 7 and 9 '*C. humilis* grassland' has occurred and *G. ventricosum* is considered to have been a native at these sites. The tree canopy is now closed at sites 2 and 7 but small areas of *C. humilis*, more shade tolerant than many of its associates, survive there. Site 9, where the sedge occurs in one quadrat, is a disturbed relic of '*C. humilis* grassland'. Site 4 is open and appears ideal for the grass: canopy closure cannot fully account for the reduction in *G. ventricosum* localities in the Avon Gorge.

C. humilis is not uncommon at site 8 and in one place grows within 1m of *G. ventricosum*. There appears to have been no quarrying in the immediate vicinity and the site must be considered a native one although the plants may have spread there from the unquarried Gully.

Site 1 is now covered with a dense canopy and no *C. humilis* has been found there by the present author; nor are there records for its former occurrence there. The nearest surviving stand of the sedge is in the Gully and has a north-westerly aspect, which is unsuitable for the grass. However, a small area at site 1 contains several species requiring open conditions (e.g. *Arabis hirsuta, Hippocrepis comosa*) which give some indication of its former vegetation. The persistence of *G. ventricosum* there for 119 years suggests that this was a native site. The average persistence at the six native sites is 60 years.

Site 3 is unsuitable for the development of '*C. humilis* grassland'. The site was formerly used as a towpath, but was disturbed during the construction of the Portway (1919 to 1926) and its collapse there in 1928. The alien *Chenopodium urbicum*, first recorded there in 1893, reappeared in 1923 (White 1924), but *G. ventricosum*, last seen there in 1894, did not reappear. The grass could be regarded as a colonist at this site.

At sites 5 and 6 the grass was clearly a casual, persisting for a short time in man-made habitats. At site 5 the grass may have been introduced with limestone ballast for the railway, which was opened in 1877. Other casual occurrences in the Bristol area are given by White (1912b), Sandwith (1933) and Riddelsdell *et al.* (1948).

Webb (1980) suggested eight criteria for assessing native status. No evidence from fossils or genetic diversity is available for the Gorge. A possible means of human introduction does exist, although no record of *G. ventricosum* is known for the 'Celtic Fields' or the Iron Age camp of Observatory Hill from where it might have spread to the Gorge slopes; *C. humilis*, however, was found until recently on the ramparts of Observatory Hill. No information on the extent of naturalisation of the grass outside the Gorge is known to the present author but site 3 may represent an example within the Gorge. Nevertheless, the historical evidence, habitat, geographical distribution and reproductive pattern all suggest the grass to be a native in the Avon Gorge, a conclusion reached by White (1912b) and Druce (1929) who, reporting a Glamorgan record, stated: 'It looks . . . quite as native as in similar situations on limestone slopes at Clifton . . . where I have also seen it'.

CONSERVATION

Jeffers (in Perring & Farrell 1977) stated that for an effective and discriminating policy of species conservation, it is essential to know the extent of the resource and how its ecology will cause it to react to competing plants and to management régimes. This paper is a contribution to that end. The Avon Gorge populations require both protection from damage and conservation management of the habitat by removal of competing scrub. Seeds collected at site 8 in 1978 are in cultivation in the Conservation Section of Bristol University Botanic Gardens for reintroduction if necessary. Experiments to test for a seed bank and its response to exposure are in progress, in view of the report that many arable weed seeds are long-lived and on burial acquire a light requirement for germination, even if previously light insensitive (Wesson & Wareing 1969).

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Lapsana intermedia Bieb. or *Lapsana communis* L. subsp. *intermedia* (Bieb.) Hayek?

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ABSTRACT

A brief survey of variation in the genus *Lapsana* L. in Europe and S. W. Asia is given, together with reasons for accepting only one species and several subspecies. This includes the plants recorded for Britain by Burtt (1950) as *L. intermedia* Bieb. and by Pankhurst (1978) as *L. communis* subsp. *intermedia* (Bieb.) Hayek. A key to all the subspecies of *Lapsana communis* L. is included and the typification of *Lapsana communis* L. and *Lapsana intermedia* Bieb. dealt with.

INTRODUCTION

E. Milne-Redhead (1978) has taken R. J. Pankhurst (1978) to task for not consulting him (the original discoverer of *Lapsana intermedia* Bieb. as a British plant) about its habitat in Bedfordshire (v.c. 30) when recording it in a new locality on the Great Ormes Head in Caernarvonshire (v.c. 49). Milne-Redhead's concluding remarks are 'Why this taxon should be reduced to a subspecies of *L. communis* is beyond my comprehension! Can it be that the computer which Pankhurst demonstrated at this meeting made this decision?' Pankhurst identified the plant from my account in *Flora Europaea* and showed me the specimen for confirmation. He passed no judgement on the rank of the taxon.

TAXONOMY

While preparing the accounts of *Lapsana* for *Flora of Turkey* (Sell 1975) and *Flora Europaea* (Sell 1976) I brought together a very large number of specimens, particularly from the Balkans and S. W. Asia, including some important types. The most obvious character which varied was the size of the ligules, which were much longer in the eastern part of the range of the genus, being up to three times as long as the involucre in some Anatolian and Caucasian specimens. On the whole the plants from S. E. Europe and S. W. Asia had ligules at least twice as long as the involucre while those from the remainder of Europe and N. Africa always had ligules less than twice as long as the involucre.

The variation in the short-liguled plants, which grow over most of Europe and which always seem to be annual, is mainly one of size, varying from 10 cm tall with very few capitula to one growing in my garden at Bassingbourn, Cambridgeshire, v.c. 29, which was 150cm high with 380 capitula. The lateral segments of the leaves, if developed at all, are not as wide as the terminal segments. The stem always has simple eglandular hairs below, but the peduncles and involucres may be glabrous (forma *communis*) or with various amounts of glandular hairs (forma *hirta* (Ten.) Jáv.). The involucre is 5–7 (–8)mm. Plants from N. Africa, although having short ligules, seem to have larger involucres and have been called subsp. *macrocarpa* (Cosson) Arcangeli. Some plants from Mediterranean Europe approach this subspecies in size of involucre.

The large-liguled plants of S. E. Europe and S. W. Asia show much more variation. Apparently annual plants, from scattered localities in Romania, Jugoslavia, Greece and Anatolia, with very short peduncles and usually with short glandular hairs throughout, I have referred to subsp. *adenophora* (Boiss.) Rech. fil. Others from Anatolia, Lebanon (and possibly Greece), with dense crispate glandular hairs in the lower part of the stem, I have referred to subsp. *pisidica* (Boiss. & Heldr.) Rech. fil. Plants from Caucasia and eastern and north-eastern Anatolia, with ovate, undivided leaves and ligules up to three times as long as the dark involucre, I have called subsp. *grandiflora* (Bieb.) P. D. Sell. Plants from the mountains of Anatolia with numerous short stems, glaucous leaves and narrow involucres, I called subsp. *alpina* (Boiss. & Balansa) P. D. Sell. Similar dwarf plants from the mountains of Krym, originally described under the name *L. aipetriensis* Vassilcz. were included in subsp. *alpina*. Whether the plants included in subsp. *alpina* represent a genetically distinct dwarf montane race, possibly of polytopic origin, or secondary growth following grazing, or both, can only be clarified by cultivation experiments.

All the remaining long-liguled plants of S. E. Europe and S. W. Asia I have included in subsp. *intermedia* (Bieb.) Hayek. They appear to be annual, biennial or perennial (although remarks by Burtt (1950) suggest that they would have to be cultivated to make sure). Their stems have simple eglandular hairs towards the base, but are usually glabrous (though sometimes with glandular hairs) above. The basal and lower and middle cauline leaves often have the lateral segments about as wide as the terminal, and the upper leaves are dentate or entire. The peduncles are slender, and mostly more than twice as long as the 7–10mm involucres. The plants from Bedfordshire and Caernarvonshire are referable to this taxon. In 1979 V. Gordon reported *Lapsana communis* subsp. *intermedia* from a roadside at Four Crosses, Cilcain, Flintshire, v.c. 51, GR 33/177.660; a specimen collected from there by R. J. Pankhurst (78/164 in **BM**) is certainly referable to that subspecies. Plants from Anatolia with very long peduncles have been called subsp. *ramosissima* (Boiss.) Rech. fil. Although extreme specimens look very distinct, there are numerous intermediate plants between it and subsp. *intermedia*; as there were no supporting characters I have not recognized it at any rank. I have seen many specimens which on the majority of characters could be referred to subsp. *intermedia*, but which verge towards all the other subspecies except subsp. *pisidica*.

It would seem that subsp. *communis*, subsp. *macrocarpa* and the group of large-flowered plants are geographically separated. As I have never seen mixed gatherings of subsp. *adenophora, pisidica, alpina* and *grandiflora* they probably form populations within, or peripheral to, subsp. *intermedia*, and are therefore most likely to be ecological in origin.

When deciding the rank of a taxon that occurs in a Flora as an introduced plant, consideration should always be given to what happens in the natural area of its distribution. My survey, though extensive, was confined to herbarium sheets. What also needs to be made are observations of the taxa in the field. We need to know if the eastern taxa do in fact grow as populations in distinct habitats, if they are interfertile, if the ligule colour given by Milne-Readhead (1978) for subsp. *intermedia* is of general application, and if plants that verge towards another taxon occur where the two taxa meet. As regards Milne-Redhead's statement that *L. intermedia* is a plant of warmer climes, I would remark that it occurs at over 2,000m in Anatolia. Subsp. *communis* and subsp. *intermedia* are both diploids with $2n = 14$, although $2n = 12$ and $2n = 16$ have also been recorded for subsp. *communis*.

In view of the fact that I could only place many specimens in a taxon on a majority of characters (and not always the same set of characters), it seemed to me to be better to follow the treatment of Hayek (1931) and Re chinger (1943) in regarding them as subspecies of one variable species. They are, however, to my mind rather poorly defined subspecies and I would expect further work to suggest a reduction in rank of some of them rather than elevation to species.

KEY TO THE SUBSPECIES OF *LAPSANA COMMUNIS* L.

1. Ligules less than twice as long as involucre .. .. 2.
   Ligules more than twice as long as involucre .. .. 3.
2. Involucre less than 8mm long .. .. subsp. *communis*
   Involucre more than 8mm long .. .. subsp. *macrocarpa* (Cosson) Arcangeli
3. Stems usually numerous, up to 25(−30)cm, often branched below middle; perennial .. subsp. *alpina* (Boiss. & Balansa) P. D. Sell
   Stems usually solitary, usually more than 30cm, usually branched only above middle; annual, biennial or perennial .. .. 4.
4. Peduncles mostly not more than twice as long as involucre: involucre 6–8mm .. .. subsp. *adenophora* (Boiss.) Rech. fil.
   Peduncles usually longer; involucre 7–10mm .. .. 5.

5. Lower part of the stem with dense crispate glandular hairs .. .. subsp. *pisidica* (Boiss. & Heldr.) Rech. fil.
   Lower part of stem glabrous or with eglandular hairs only .. .. 6.
6. Lower and median cauline leaves usually lyrate-pinnatifid, upper usually narrow and often entire; involucre greenish; ligules 2 to 2·5 times as long as involucre .. .. subsp. *intermedia* (Bieb.) Hayek
   Most leaves broadly ovate and dentate, lower sometimes lyrate-pinnatifid with large ovate-dentate terminal lobe; involucre blackish at least when young; ligules up to 3 times as long as involucre subsp. *grandiflora* (Bieb.) P. D. Sell

NOMENCLATURE

Lapsana communis was described by Linnaeus on page 811 of *Species Plantarum* in 1753. His original diagnosis '*Lapsana calycibus fructus angulatis, pedunculis tenuibus ramosissimus*' was taken verbatim from his *Hortus Cliffortianus* 389 (1738). There are two specimens in the *Hortus Cliffortianus* (**BM**), one of which is labelled '*Soncho affinis Lampsana domestica* CBP [Caspar Bauhin's *Pinax*] 124' is followed by '*Lampsana*' and then '*communis*' in a different ink, and the other just '*Lampsana*' followed by '*communis*' in a different ink. These descriptive names are cited as synonyms by Linnaeus in both *Hortus Cliffortianus* and *Species Plantarum* and both specimens would have been available to him when drawing up the original diagnosis. They are in my opinion the short-liguled taxon which occurs throughout most of Europe. I have selected the first named sheet as the lectotype. The lectotype has the involucres 6–7mm, the ligules about half as long again as the involucre and the whole inflorescence glabrous. The second sheet (paralectotype) has a slightly different (rather abnormal) habit, but does not differ in detail from the lectotype.

I wrote to Leningrad (**LE**) in January 1979 requesting the loan of type material of *L. intermedia* Bieb. and *L. grandiflora* Bieb.–important specimens I had not seen when preparing my accounts of *Lapsana* for *Flora Europaea* and *Flora of Turkey*. I received two sheets labelled *Lapsana intermedia* and a letter to say that no type material of *L. grandiflora* could be found in their herbarium.

Lapsana intermedia was described by Marschall von Bieberstein in *Fl. Taur.-Cauc.*, **3**: 540 (1819), where its diagnosis reads '*L. caulescens ramosa, foliis angulato-dentatis: inferioribus lyrato-pinnatifidis, pedunculis calycibusque glabris, florum radio calyce longiore*' and its locality is given as '*In Tauriae et Caucasi inumbratis, sylvosis vulgari alibi specie frequentior.*' One of the sheets from Leningrad is labelled '*Lapsana intermedia*, Taur.' with an additional printed label which reads Южный берег Крыма. **Стевен Хр.** [Southern coast of the Crimea. Steven Ch.]. The second sheet is labelled '*Lapsana intermedia*, Sudagh' plus the same printed label as the first. Christian Steven (1781–1863) was a friend of F. A. Marschall von Bieberstein (1768–1826) (cf. Kukkonen & Viljamas (1971)) and these specimens would have been available to him when he wrote his *Flora taurica-caucasica*. The first of these sheets contains three inflorescences and a cauline leaf, but no basal parts. It does not in any way disagree with the original description, nor is it contrary to the generally accepted interpretation of the taxon. Therefore, until a better specimen is found, I select it as the lectotype of *L. intermedia* Bieb. The second sheet is not a *Lapsana* at all, but is referable to *Sisymbrium loeselii* L. of the *Cruciferae*.

Citation of nomenclature and specimens are given for all subspecies except *communis* and *macrocarpa* in Sell (1975).

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I am indebted to R. J. Pankhurst for showing me the Welsh specimens of *L. communis* subsp. *intermedia*, to the Keeper of Botany, British Museum (Nat. Hist.) for permission to consult the *Hortus Cliffortianus*, and to the Director of the V. L. Komarov Botanical Institute of the Academy of Sciences of the U.S.S.R. for the loan of type material of *L. intermedia* Bieb.

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Senecio × *albescens* Burbidge & Colgan at Killiney, Co. Dublin: a seventy-eight years old population

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ABSTRACT

A population involving *Senecio bicolor* (Willd.) Tod., *S. jacobaea* L. and the hybrid *S.* × *albescens* Burbidge & Colgan, at Killiney, Co. Dublin, is re-examined after an interval of 78 years. The distributions of *S. bicolor* and of *S.* × *albescens* have not been significantly extended since 1902. In 1902 the hybrids were found to consist of two distinct types, each approaching one of the parent phenotypes, but now they show an almost complete intergradation between both parents and exhibit a high degree of pollen sterility. The importance in the population of such factors as the relative numbers of each parent species, the longevity of both parents and hybrids, the diurnal wind direction leading to selective pollination, the topography of the site, and the habitat restrictions of the two parent species are discussed.

INTRODUCTION

The genus *Senecio* L. is a large cosmopolitan one and in Ireland includes five native and four introduced species (Scannell & Synnott 1972, Webb 1977), as well as several ornamentals. Perhaps the most common native species is *S. jacobaea* L., or Common Ragwort.

S. jacobaea is a stout biennial or perennial plant, 30 to 100cm high, glabrous or slightly woolly. It grows well in disturbed light calcareous soils, but has a wide ecological tolerance and as a result will grow in many situations, e.g. pastures, waste places, sand dunes and even on walls. The plant is widespread in every Irish vice-county and is limited mainly by very acid soil and high altitude.

S. bicolor (Willd.) Tod. subsp. *cineraria* (DC.) Chater is a perennial and grows to a height of 30 to 70cm. The much-branched stems are woody at the base. A dense felt of white hairs covers the leaves, stems, corymb branches and involucre. Unlike *Senecio jacobaea, S. bicolor* is an introduction to Ireland. Until recently, the species was known by the binomial *S. cineraria* DC., but Chater (1974) reduced it to a subspecies of *S. bicolor*. Other synonyms by which the species is commonly known include *Senecio maritimus* Reichb. and *Cineraria maritima* L. Common names are Cineraria (not to be confused with the pot-plant of this name, which is *S. cruentus* DC.), Silver Ragwort and Dusty Miller, all of which refer to the light grey or white appearance of the leaves. The plant is a Mediterranean species and was introduced to Ireland as an ornamental about 1875 by Sir Francis Brady, who sowed seed in his garden at Sorrento Cottage, Killiney, and the adjoining Sorrento Cliffs, Co. Dublin, v.c. H21 (Irish National GR 32 26 25). The species readily acclimatised and established itself on the rocky banks and slopes in the vicinity. Colgan (1904) stated that '*S. cineraria* is limited to a strip of land by the sea for a quarter of a mile from Sorrento Point, Dalkey, west to Vico bathing place, including Dalkey Island, also spreading to adjacent walls, roadsides, railway banks and waste places.' This still remains its only Irish naturalized station (Webb 1977).

The hybrid between *S. bicolor* and *S. jacobaea* was first discovered in the area by F. W. Burbidge in 1902. The publication of this new hybrid, as *S.* × *albescens* Burbidge & Colgan, was made in December of that year in two journals (Burbidge & Colgan 1902a, 1902b). The hybrids grew on cliffs, banks, walls, and waste ground in association with the parent species. The authors claimed that two types of hybrids existed, the more common being similar to *S. jacobaea* and the second type approaching *S. bicolor* in appearance.

The purpose of the present investigation was to re-examine a hybrid population, now (1980) at least 78 years old, to see if, as Burbidge & Colgan put it, 'this new race will show itself capable of self perpetuation . . .' A more quantitative description of hybridisation was also obtained.

TABLE 1. CHARACTER STATES AND HYBRID INDEX VALUES FOR *SENECIO JACOBAEA*, *S. BICOLOR* AND THEIR HYBRIDS

	Characters	Taxon, Character state and Hybrid index value		
		Senecio jacobaea	*S.* × *albescens*	*S. bicolor*
1.	Brightness of cauline leaf abaxial surface (percentage reflection)	0·0–27·0 : 0	27·1–55·0 : 1	55·1–100·0 : 2
2.	Angle subtended by lowest inflorescence branch with main axis (in degrees)	0·0–25·0 : 0	25·1–37·0 : 1	37·1–100·0 : 2
3.	Logarithm of number of acute angles per cauline leaf margin	2·00–3·00 : 0	1·87–1·99 : 1	0·00–1·86 : 2
4.	Ray floret corolla length/breadth ratio	4·5–7·0 : 0	4·1–4·4 : 1	2·0–4·0 : 2
5.	Shape of midrib transverse section	As Fig. 3D : 0	As Fig. 3C : 1	As Fig. 3A : 3
			As Fig. 3B : 2	
6.	Inflorescence leafiness	Many leaves : 0	Few leaves : 1	Leafless : 2
7.	Disk floret achene indumentum density	Dense : 0	Moderate : 1	Glabrous : 3
			Sparse : 2	

METHODS

Analyses of the Killiney population employed seven characters which, while dissimilar for the parent species, showed intermediacy in the hybrids. Four of these characters were quantitative, the other three qualitative.

1. *Abaxial leaf surface brightness*. The mature leaf undersurfaces of *S. bicolor* are white or light grey, whereas those of *S. jacobaea* are green. This difference is due to the presence or absence of a thick felt of white hairs. To count, or even estimate, the number of hairs per unit area reasonably accurately would have been difficult for *S. bicolor*. The *Royal Horticultural Society Colour Chart* was used to measure the character. For each colour the chart lists the three Commission Internationale de l'Eclairage coordinates. Of the three, it was found that Y, a measure of the percentage reflection of the sample, was the most useful. The brighter the colour, the greater the percentage reflection was found to be. The abaxial leaf surfaces were matched against the colours in uniform conditions – a bright overhead electric light. As younger leaves have more hairs per unit area than mature leaves they seem brighter, so only mature leaves were used. In all samples, the leaves used were the lowermost healthy stem leaves. In *S. jacobaea* and the hybrids the leaves used were cauline, and not from the rosette, which is withered in mature plants. *S. bicolor* plants do not form rosettes.

2. *Inflorescence density*. In *S. bicolor* the angle subtended by the lowest inflorescence branch with the main axis is greater than that found in *S. jacobaea*, giving the flowering heads of the former a much more open appearance than those of the latter.

3. *Leaf dissection*. The number of acute angles on the leaf margins of *S. jacobaea* is far greater than that of *S. bicolor*, as the leaf margins of the former are considerably more dissected and jagged. Again, the lowermost healthy cauline leaves were used.

4. *Length/breadth ratio of ray floret corolla*. Generally, the ray floret corolla is broader and shorter in *S. bicolor* than in its native congener; therefore *S. jacobaea* has the greater ratio.

5. *Midrib shape*. Transverse sections were taken through the midrib of lower stem leaves, equidistant from the stem and the leaf apex. In *S. jacobaea* the midrib is strongly concave on top (Fig. 3D) while *S. bicolor* has an almost flat-topped midrib (Fig. 3A). This character and the following two proved to be difficult to quantify.

6. *Leafiness of inflorescence*. In *S. jacobaea* the cauline leaves continue right up into the inflorescence, while in *S. bicolor* the leaves stop short of the inflorescence, giving the corymb branches a bare appearance. This also adds to the openness of the inflorescence in *S. bicolor*.

7. *Indumentum of disk floret achenes*. *S. jacobaea* has densely hairy achenes on the disk florets, while the disk achenes of *S. bicolor* are completely glabrous. The number of hairs per unit area or per achene proved to be difficult to count in *S. jacobaea*, so that the hairiness had to be estimated subjectively.

A hybrid index was constructed from these seven characters, with *S. jacobaea* scoring nil and *S. bicolor* 16 (Table 1).

A site was chosen in Killiney, approximately at the centre of the range of *S. bicolor*. Here, both *S. jacobaea* and *S. × albescens* were also found to be most frequent. Four transects were taken within a *c.* 220m wide belt between Vico Road and the sea. All transects were 60cm (2 feet) wide and every *Senecio* plant which was rooted inside the 60cm wide space was collected. All the aerial parts of the plants were taken. The average transect length was approximately 150m.

Sixty-four plants were taken in the four transects. Since only four of these were hybrids, a further 20 hybrids were collected at random in the general transect area. Four extra plants of *S. jacobaea* were also collected, since only eleven plants of this species were collected in the transects. A further four plants of *S. jacobaea* were taken from waste ground in Glasnevin, Dublin, in order to compare them with the Killiney population. This made available a total of 92 plants for scoring, of which only 62 were used in the detailed analysis. *S. bicolor* showed such a high degree of uniformity that 30 of these plants, randomly selected, were not scored. All the unscored plants were thoroughly checked so as not to overlook any irregularities or abnormalities. It is considered that the existing morphological diversity of the population of *S. bicolor* was adequately accounted for in the scored plants. The 62 scored plants are preserved as herbarium specimens in **DBN**.

Fifteen pollen stainability tests (five for each taxon) were carried out. For each test, three disk florets, each from a different capitulum from the same plant, were picked and the pollen shaken on to a clean glass slide, stained in acetocarmine, and examined. Five hundred pollen grains were counted per test.

The ecology of the area was also assessed as it is often significant in hybrid situations.

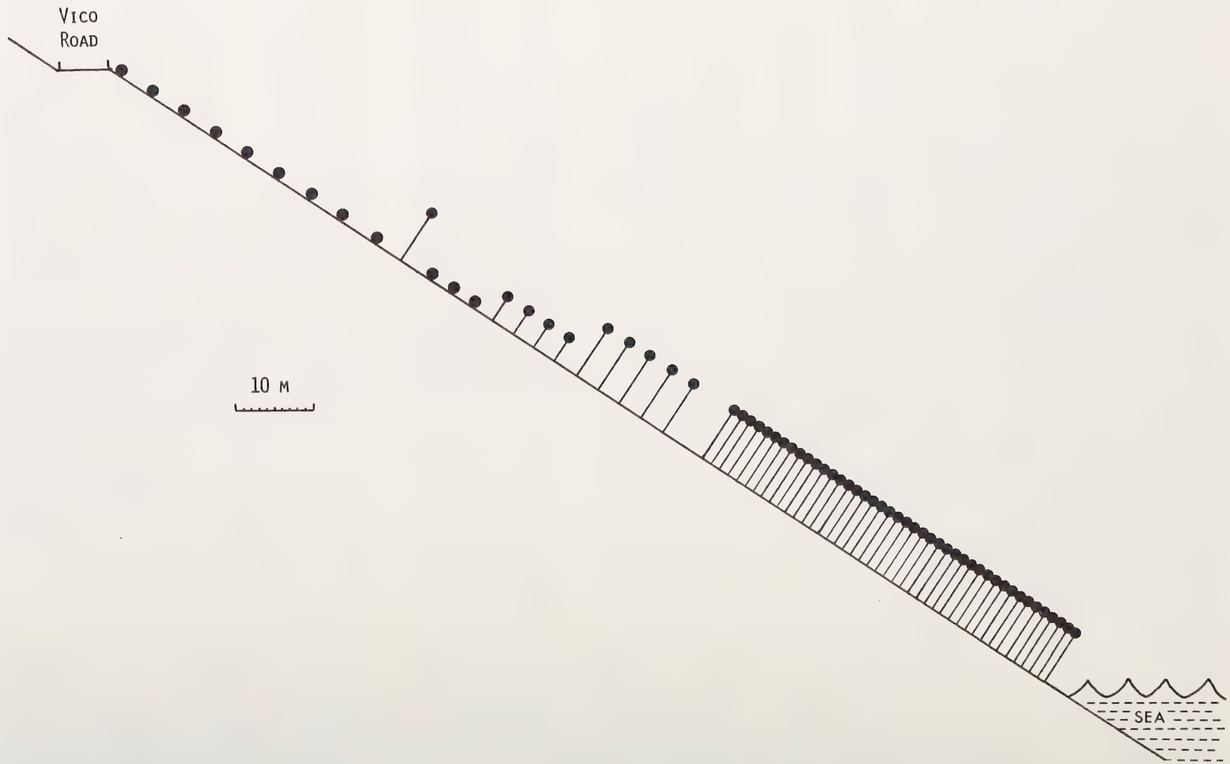

FIGURE 1. Distribution and relative numbers of *Senecio jacobaea*, *S.* × *albescens* and *S. bicolor* in the transect area at Killiney, Co. Dublin (summation of four transects). The long-stemmed circles represent *S. bicolor*, medium-stemmed circles represent *S.* × *albescens* and stemless circles represent *S. jacobaea*.

RESULTS

The substratum in the area is granite, overlayed in parts with limestone. The climate of the area is reasonably mild in winter, with a minimum February temperature of about 3°C and a mean January temperature of 6·5°C. The area has less than 100cm of rain per year. Due to this climate, many southern European garden plants and weeds thrive in the area in addition to *Senecio bicolor*.

According to the distribution of the three *Senecio* taxa, the site can be divided roughly into three equal areas (Fig. 1). In the top third (nearest to Vico Road, 60m alt.), *Rubus* spp. and *Pteridium* predominate; *S. jacobaea* occurs in the more open grassy areas but the other two taxa are absent. All three of the *Senecio* taxa grow in the middle third. In the lowest third (quite rocky and nearest the sea) there is almost a complete cover of *S. bicolor*.

It is perhaps worth noting that *S. bicolor* seems to have replaced and completely excluded *Artemisia maritima* L., which, Colgan (1904) stated, 'was present in considerable quantity on Sorrento Cliffs, Killiney in 1884. It was still there in 1903, but apparently becoming scarce and giving way to the aggressive *Cineraria maritima'*. *Artemisia maritima* was not found in the vicinity in various visits by me between 1973 and 1980.

In the hybrid index histogram (Fig. 2), 24 plants of the hybrid and 19 of each of the two parents are included. In Fig. 2 the frequencies of the hybrid index scores have been converted to their actual percentages found in the transects, i.e. 17·20%, 76·55% and 6·25% respectively for *S. jacobaea, S. bicolor* and the hybrid. Therefore, although based on 62 specimens, the hybrid index represents, by extrapolation, a population of 384 individuals, as the 24 hybrids represent 6·25% of the population. It can be easily seen from the hybrid index that many intermediate phenotypes occur.

Fig. 3 is a scatter diagram showing the relationship between the brightness of the cauline leaf abaxial surface and the logarithm of the number of acute angles per cauline leaf margin. The midrib shape (in transverse section) is also indicated. Although the number of acute angles on the leaf margin was a

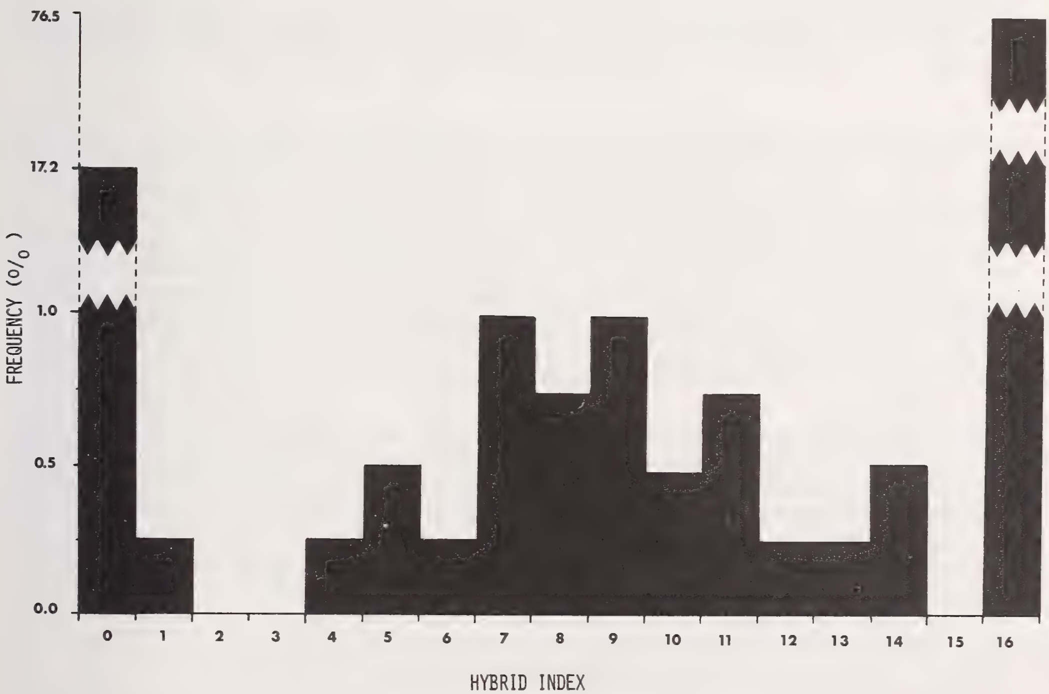

FIGURE 2. Hybrid index for the *Senecio* population. *S. jacobaea* scores 0–1, *S. bicolor* scores 16 and *S. × albescens* scores 4–14.

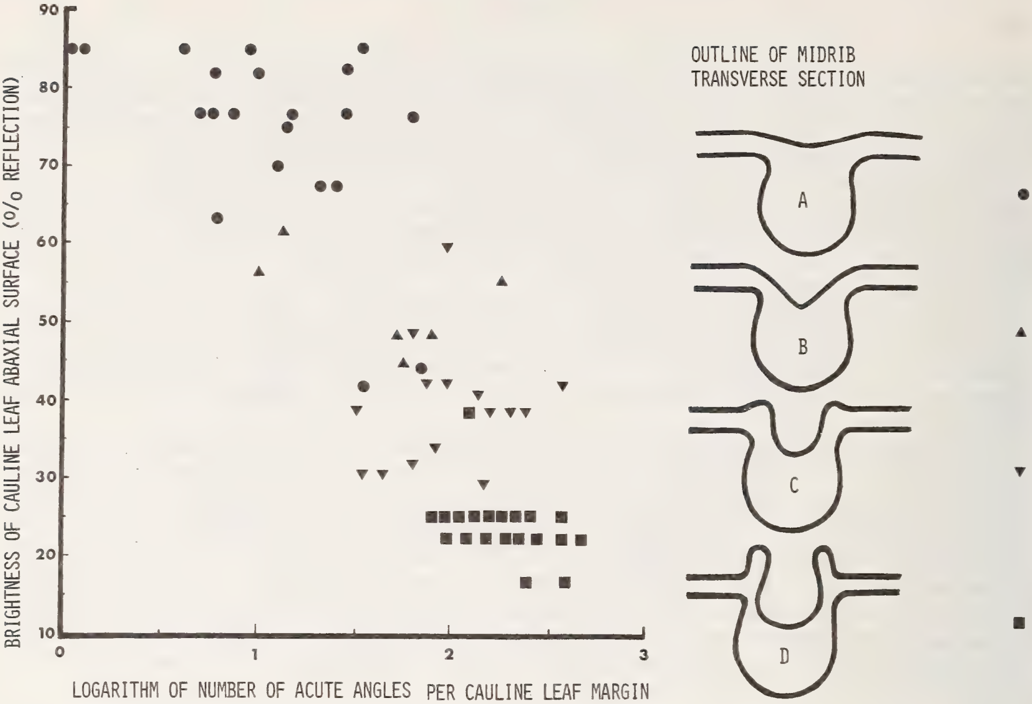

FIGURE 3. Scatter diagram showing the relationship between abaxial leaf surface brightness and logarithm of number of acute angles per leaf margin for *Senecio bicolor* (upper left), *S. jacobaea* (lower right) and their hybrids (intermediate in position). Midrib shape (in transverse section) is also indicated for *S. bicolor* (A), *S. jacobaea* (D) and *S.* × *albescens* (B, C).

good character in that it separated the parent species well, a log transformation of these data served to condense the *S. jacobaea* portion of the diagram, as this species has a wide range of values for this character. Due to this transformation, Fig. 3 gives the false impression that the hybrids approach *S. jacobaea* more closely than *S. bicolor*.

Fig. 4 gives a more realistic impression of the hybrids' general phenetic affinities, i.e. they appear more similar to *S. bicolor*. In this scatter diagram, the relationship between the angle subtended by the lowest inflorescence branch with the main axis and the ray floret corolla length/breadth ratio is shown. The indumentum density of the disk floret achenes is also indicated. It is quite evident from Figs 3 and 4 that the hybrids show a substantial range of intermediacy. It should be emphasized that the ratio of *S. bicolor*, *S. jacobaea* and *S.* × *albescens* shown in Figs 3 and 4 is not the actual population ratio, which is shown in Figs 1 and 2.

Fig. 1 illustrates the relative numbers of each type of plant encountered in the transects, i.e. eleven plants of *S. jacobaea*, four hybrids and 49 *S. bicolor* plants, or approximately 17%, 6% and 77% respectively, being a summation of all records for the four transects. It seems clear that the hybrids are in the middle of the slope and occupy a habitat intermediate between those of the two parents, which tend to grow apart from one another.

The hybrids have highly sterile pollen. Figures obtained for percentage stainable pollen are 99%, 97% and 19·2% for *S. jacobaea, S. bicolor* and *S.* × *albescens* respectively.

DISCUSSION AND CONCLUSIONS

Prolonged observations of hybrid populations are few, so that the present re-examination of the Killiney hybrids after such a long interval is not without interest. The site was visited by me first in

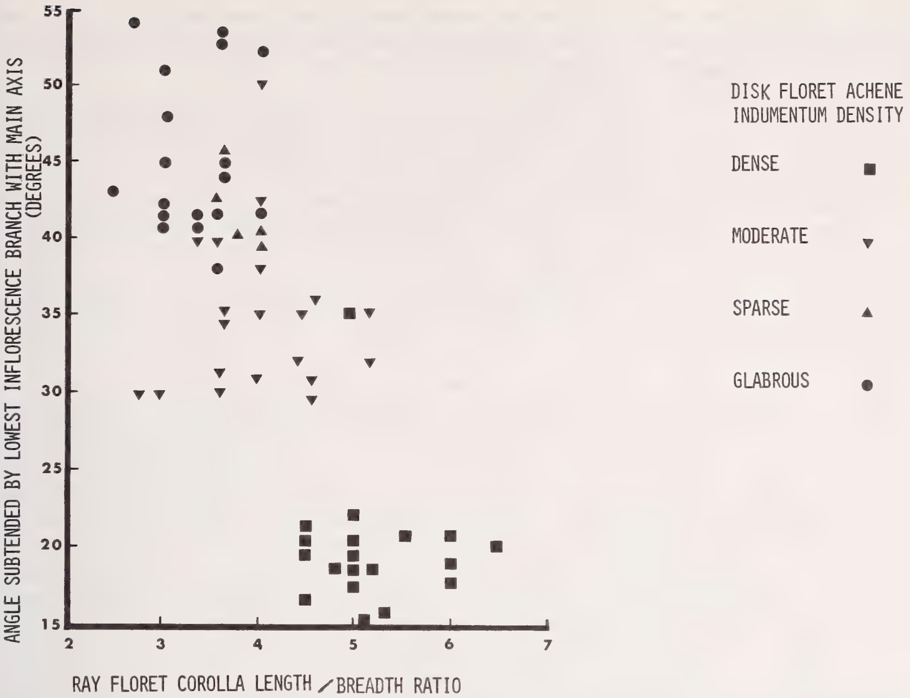

FIGURE 4. Scatter diagram showing the relationship between the angle subtended by the lowest inflorescence branch with the main axis and ray floret corolla length/breadth ratio for *Senecio bicolor* (upper left), *S. jacobaea* (lower right) and their hybrids (intermediate in position). Disk floret achene indumentum density is also indicated for *S. bicolor* (glabrous), *S. jacobaea* (dense) and *S. × albescens* (intermediate).

summer 1973, during which most of the present information was obtained. Intermittent visits up to spring 1980 did not reveal any significant changes in the hybrid situation.

S. bicolor does not seem to have extended its range since 1902. Brunker *et al.* (1961) stated that '*S. cineraria* covers much the same area as recorded by Colgan'. *S. bicolor* is very locally quite aggressive in so far as it has ousted *Artemisia maritima* from the area, but it appears to be confined to rocky slopes and banks quite near the sea shore. In southern England, e.g. Newquay and Torquay, the plant occurs in a similar ecological situation to that at Killiney (Davey 1909). Similarly, *S. × albescens* has not extended its range. In Britain, the hybrid generally follows the distribution pattern of *S. bicolor*, i.e. south-western England and Wales (Benoit *et al.* 1975). This would indicate that the hybrid is not capable of a sufficient degree of self-renewal and must depend for recruitment on regular hybridization between the parent species.

The almost complete inter-gradation of hybrid phenotypes between *S. jacobaea* and *S. bicolor* appears to be a significant change since Colgan's time. Praeger (1951) stated, 'Colgan mentions two forms, one approaching either parent, but no other intermediates have joined them at Killiney'. This apparent change may be due to subsequent backcrossings and segregation of recombinants or possibly inadequate sampling by Burbidge and Colgan. Backcrossing, however, is not sufficient to produce a complete range of intermediates and the hybrid situation does not seem to have managed to attain hybrid swarm status. One plant had a hybrid index value of one (see Fig. 2), very close to typical *S. jacobaea*, from which it differed by the angle subtended by the lowest inflorescence branch with the main axis (35°). The plant was dwarfed and growing on a well-trodden path; it was probably pure *S. jacobaea*, in which environmental rigours had caused the inflorescence to become stunted. The hybrid index indicates that in general the hybrids are skewed towards *S. bicolor*. This is probably due to the fact that there are four and a half times as many *S. bicolor* as *S. jacobaea* plants in the area and, all other things being equal, the chances of a hybrid backcrossing with the former would be correspondingly greater. The fact that *S. bicolor* is perennial, while *S. jacobaea* is biennial or perennial (relatively short-lived), would increase this tendency.

The high pollen sterility of the hybrids is probably one of the main factors in the relatively small number of hybrids present. Nothing is known of the hybrid ovule fertility. Colgan (1904) stated that he planted five seeds from *S.* × *albescens*. Only one retained hybrid characters. The other four approached *S. jacobaea* more or less closely. This suggested to him that the hybrids backcrossed readily with *S. jacobaea* and also that the hybrids were interfertile, but the greater numbers of the parent species rendered backcrosses more likely. The value of this observation is somewhat doubtful as Colgan did not state whether all five achenes (a low number in any case) came from a single hybrid plant or otherwise. It is possible that the five achenes resulted from a single pollination. *S. jacobaea* tends to grow as a biennial herb, as does the hybrid *S.* × *albescens*; this pattern reinforces pollen sterility in restricting the build-up of large numbers of hybrids, because every other year a complete hybrid generation dies.

Burbidge & Colgan (1902a, 1902b) favoured the view that the hybrids resulted from a cross between male *S. bicolor* and female *S. jacobaea*, because the hybrids seemed to grow more closely associated with the latter species. This tendency is still weakly in evidence. Another explanation is offered by the fact that the vast majority of *S. jacobaea* seeds usually fall around that plant, according to Harper & Wood (1957). As both parent species are entomophilous, attracting various species of *Hymenoptera, Diptera* and *Lepidoptera*, among others, perhaps the onshore winds during daylight hours favour pollination in one direction. This would involve *S. bicolor* as the predominant pollen donor, as it tends to grow closer to the seashore, with in general *S. jacobaea* as the female parent. In the event of the reciprocal cross, hybrid seeds set on *S. bicolor* may be blown up the slope by onshore winds or alternatively, out to sea by offshore winds and thus rendered useless. Similarly, seeds of *S. bicolor* may also be transported uphill where they fail to find suitable niches. *S. bicolor* sets a high proportion of good seed at Killiney, as evidenced by the full achenes and frequency of vigorous seedlings.

Both parent species have the chromosome number of $2n = 40$. A physiological similarity between *S. jacobaea* and *S. bicolor*, is indicated by the many parasites which they have in common, e.g. the rust *Coleosporium senecionis* (Pers.) Fr. (Uredinales) (Chittenden 1956). One fairly specific predator of *S. jacobaea* is the larva of the cinnabar moth (*Callimorpha jacobaeae* L.). This familiar caterpillar was observed to be very common on *S. jacobaea* at Killiney, but, despite searching, it was not found on *S. bicolor*. Some caterpillars were observed feeding on the leaves of *S.* × *albescens*, but only on those hybrids with a sparse covering of hair on the leaves, i.e. *S. jacobaea*-like hybrids. On any particular hybrid the number of moth larvae appeared to be much less than on *S. jacobaea*. The most *S. bicolor*-like hybrid on which caterpillars were seen feeding had a hybrid index of 7. In contrast to these observations, C. A. Stace (*in litt.* 1981) states that cinnabar moth larvae readily ate the leaves of cultivated *S. bicolor* in his garden. However, presented with a choice of *S. bicolor, S. jacobaea* and *S.* × *albescens*, it is quite plausible that the caterpillars may exhibit selectivity towards the *S. jacobaea* end of the variation. Bearing in mind that all three *Senecio* taxa have more or less discrete distributions at Killiney, selectivity, either active or passive, may well be shown by the egg-laying female moths. This would lead to a restricted distribution of the resultant larvae.

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The survival of *Alopecurus bulbosus* Gouan in former sea-flooded marshes in East Suffolk

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ABSTRACT

The survival of *Alopecurus bulbosus* in E. Suffolk, v.c. 25, is recorded, following the sea floods of 1953 and subsequent land disturbance. The marsh habitat prior to 1953 is described together with the succeeding land reclamation. The reasons for the re-establishment of *A. bulbosus* are discussed.

INTRODUCTION

Alopecurus bulbosus Gouan is a rare grass included in the British red data books (Perring & Farrell 1977). They report that 'it has been recorded from 25 v.c's in England and Wales as far north as the estuaries of the Humber and the Mersey. It now appears to be extinct in many of its former northern localities, and all post-1960 records have been on or south of the line joining the Thames and the Severn estuaries'. They are of the opinion that 'no cause for the decline is known, but this may be yet another maritime species, with its centre of distribution in the Mediterranean reaching its northern limit in Britain, which has been affected by a change in our climate'.

F. W. Simpson (pers. comm. 1978) reported finds on Breydon Wall in 1962 and Anon. (1963) at Burgh Castle, both in E. Suffolk, v.c. 25, but no population details are given. Perring & Walters (1962) give no post-1930 records for this area. Lowe (1868) records *A. bulbosus* as 'most abundant near Yarmouth' and Hind (1889) records it as 'most abundant in the marshes by the riverside at Belton and Burgh Castle'. Hind also records it for the Breydon and Southtown marshes. All these areas refer to the marshes which lie south of Breydon Water, between Yarmouth and Burgh Castle, and contain the marshes under discussion.

In 1978 I refound *A. bulbosus* on the marshes south of Breydon Water at GR 63/504.073, 498.068 and 473.058. On 6th June, 1978, I had visited the marshes south of Breydon Water in the vain hope of re-finding *A. bulbosus*, in habitats which it was known had undergone almost complete alteration under conditions of maximum disturbance. In spite of these events, I found *A. bulbosus* was not only present, but abundant on Humberstone Farm marshes, Southtown, a direct distance of 3.2km from the sea. On Church Farm, Burgh Castle, about 5·6km from the sea, *A. bulbosus* was rare. *A. bulbosus* thus appeared to have survived through major land reclamation, following the sea floods of 1953.

PHENOLOGY OF *A. BULBOSUS*

In the dormant period of growth, the leaves of *A. bulbosus* are *c*.8–25cm long. There is no significant growth up to mid-April. A warm spell in the last week of April will encourage new leaf shoots and panicles to swell in the sheath. By early May, panicles protrude 1–2cm and most will have attained full length by the second week. *A. bulbosus* flowers about the last week in May, with anthers of 1·0–1·7mm, Culm blade growth is slow and by mid-June has a length of (1·0 –)2·0–3·7(– 4·5)cm and width of 1·0–3·5mm; the ligule is 3–4mm.

The length of the culms of *A. bulbosus* by mid-June is very variable; this variability is related to soil nutrition and the level of salinity. Where it is growing near the upper reaches of tidal water, in association with *Beta vulgaris* subsp. *maritima, Plantago maritima, Puccinellia maritima* and *Spergularia marina*, the culms are often only 8–11cm tall, whereas in less saline habitats the lengths are generally much greater, (21 –)30–39(– 48)cm.

The spring-summer growth period is about 90–100 days. Early in July the leaves start to die back and the spikelets gradually break up and leave a naked rachis. The process is generally complete by the first week in August. Where the habitat is grazed by cattle, their trampling over and through the dying plants rapidly breaks up the stems for dispersal by the wind. Therefore, a late visit will find no trace of the plant, a fact which may be leading to under-recording.

New growth for the following season appears shortly after die-back of leaf and culm. Before the end of August, new leaves are about 6cm long, and by the end of the month 12–17cm in length, increasing to 25cm by mid-September; thereafter growth stops. Below ground the swollen stem-bases are active in growth and new stem-bases develop from the base or above the lowest internode of the old stem-bases. In the mature stage the bases are 1–2cm long and 3–5mm wide, roundish or pear-shaped, and light mauve in colour; this colour may extend up the base of the stem for *c*.3cm over a length of two internodes.

THE HABITAT

HABITAT PRIOR TO THE SEA FLOODS OF 1953

The grass marshes which lay adjacent to the Breydon Water wall were subject to saline water seepage from under and through cracks in the river wall. This found its way under the berm, the flat buffer support behind the wall, into the delph ditch.

The surface of the marshes adjacent to the delph was very uneven, with long furrow-like depressions running across the marsh and leading off to the delph. These low places, of 8–16cm in depth, were at one time the tidal run-off channels from the land to the river course, prior to embankment and enclosure of the marshes. They were therefore subject to an intake of brackish water from the delph, which during the winter months was filled to capacity with water off the marsh. This saline condition was the habitat of *A. bulbosus* up to the time of the 1953 floods, when it was largely confined to depressions. On slightly higher ground, its associates included *A. geniculatus, Bromus hordeaceus* subsp. *hordeaceus, Cynosurus cristatus, Festuca rubra* subsp. *rubra, Holcus lanatus, Lolium perenne* and *Poa trivialis*, but *Alopecurus geniculatus* was the dominant grass.

SEA FLOODS OF 1953

On the night of 31st January–1st February, 1953, the sea floods of the east coast overflowed the coastal and estuarine defence walls by 60cm. Along the Suffolk coast, 8276ha were flooded to a depth of 2·5m. Damage to defence walls was severe and emergency repairs to breaches were carried out to avoid further tidal inflows. It was a month before complete repairs could start. The grassland was killed by asphyxiation and high salinity. The natural drainage of the salt in the soil took 2–3 years before the level of sodium chloride was safe for cultivations.

THE HABITATS OF 1978, FOLLOWING RECLAMATION

A. bulbosus was found in the base and on the sides of depressions, which remained in spite of cultivations and which in winter would be wet or filled with saline water from the delph. A randomly selected station on the Humberstone marshes, 45m from the delph, had 55 panicles in 1m^2 with associates of *A. geniculatus, Carex disticha, Festuca arundinacea, Glaux maritima, Juncus gerardii, Poa trivialis* and *Potentilla anserina*: a very typical association of species found in low degree saline conditions. In a selected 1m^2 station further back in the marsh, 140 panicles of *A. bulbosus* were associated with *Bromus hordeaceus* subsp. *hordeaceus, Cynosurus cristatus, Dactylis glomerata, Festuca rubra* subsp. *rubra, Holcus lanatus, Poa pratensis, P. trivialis, Trifolium campestre, T. pratense* and *Vicia sativa*, the species collectively indicating considerably lower, or absence of, salinity. However, half of these species would not have been included in the 1956 re-seeding and indicated a sward reversion. Outside the quadrat, *Glaux maritima* and *Juncus gerardii* were close but confined to a low depression, indicating salinity at lower levels and accounting for local sward reversion.

On Church Farm, Burgh Castle, *c*.2km to the west, *A. bulbosus* was rare and only found in one isolated station in a depression some 12cm below the average level of the marsh. Some *Juncus gerardii* was present in the depression but the surrounding higher level was largely dominated by *Trifolium repens* and *Lolium perenne*. Some degree of salinity remained in this area but the presence of *Lolium perenne* was not surprising. In field experiments carried out by the Ministry of Agriculture, Fisheries and Food following the 1953 floods, *Lolium perenne* was found to have the highest tolerance to salinity and exceeded that of barley, wheat and sugar beet (M.A.F.F. 1962). The surrounding sward had been heavily grazed and showed less reversion to the pre-flood pasture type; this indicated that the saline seepage into this area of the marshes was very much less and the introduced grass seeds of 1955 had been able to survive.

DISCUSSION AND CONCLUSIONS

In my opinion there are two other reasons which should be considered for the apparent decline of sites of *A. bulbosus* in East Anglia: the increase in coastal land reclamation since the early 1950s, with the loss of suitable saline marsh habitats; and the short annual growth period of *A. bulbosus*, which could account for the grass being under-recorded.

Modern farming techniques on the marshes and the maintenance and improvement of tidal embankments by River Authorities have to be acknowledged as economic necessities. Nevertheless, in the process, plant habitats have been drastically altered and in cases destroyed, and where old grassland is subject to major improvement there is often little hope of survival of interesting grass and herb species. In this context, the re-establishment and frequency of *A. bulbosus* on the Humberstone marshes is of interest. The high salinity and duration of the sea floods reduced all of the marsh swards to a dead mat. The severe affect on all plant species may be judged by the following record (M.A.F.F. 1962). Samples of flood water taken at Reedham Ferry, 6km south west of Burgh Castle and *c.*12km from the sea, four days after the inundation, showed a concentration of 2·68% NaCl, equivalent to 85·6% sea water.

Within the area adjacent to the river wall, hundreds of men trampled over the sodden ground filling sand-bags, while tractors and trailers hauled the bags to the breaches. Following these preliminary repairs, excavators removed the bags and the wall was widened at the base and built up to an increased height of 60cm. The delph was re-cut for spoil for the wall and these operations pushed the traffic futher out into the marsh. Such disturbance continued for many months to the serious deterioration of soil structure. From early 1953 to the spring of 1955 these marshes lay untouched except for an application of gypsum in the autumn of 1953. There was no grazing or cultivations. Halophytic plants were left for their roots to create drainage channels and to absorb saline moisture. By the spring of 1955, the level of sodium chloride was considered safe for cultivation. Fallow operations continued throughout the summer and the rotovator was used in preference to the plough. The land was re-seeded to grass in the spring of 1956 with various strains of *Lolium perenne, Dactylis glomerata, Phleum pratense, Trifolium pratense* and *T. repens* and about 3 cwt/acre of a compound fertilizer.

In spite of the soil disturbance *A. bulbosus* had survived. It is also clear that salinity, a feature of the habitat, is still present and borne out by indicator species and the reversion of the re-seeded sward. A number of species now present would not have been included in the re-seeding.

The species associated with the small colony of *A. bulbosus* on Church Farm, Burgh Castle, in 1978 indicated a difference of habitat when compared with the abundant colonies of *A. bulbosus* and other species on Humberstone marshes. It is concluded that the base of the wall at Burgh Castle is more securely footed against water seepage from the river. In addition, these marshes are *c.*5·6km from the sea at Great Yarmouth and the upstream run of tidal water would undergo considerable dilution by the entry of fresh water from the River Yare and River Waveney to the west of Burgh Castle. It is also concluded that tidal water is still finding its way through and under the river wall in the Humberstone marsh area.

Both *Alopecurus bulbosus* and *Poa bulbosa* have a swollen stem base which survives after seasonal growth dies. Both have a short seasonal growth span. *P. bulbosa* only survives *c.*2 months; its soil habitat is a loose coarse sand or sandy small gravel, in which the swollen stem-bases may be freely moved by wind, small animals and human traffic. By contrast, the soil habitat of *Alopecurus bulbosus* in the area described is an organic silty clay-loam and this heavy texture would not be subject to the same disturbances which affect the movement of the stem-bases of *Poa bulbosa*. It can only be assumed that, in the circumstances under discussion, the stem-bases of *A. bulbosus* remained locked in a soil in which the particles would have become tightly aggregated when wet and set hard when dry.

The consideration of the possible re-invasion of *A. bulbosus* from outside the area is impracticable, as all marshes on either side of the Breydon Water were inundated with sea water and the swards destroyed. The possible re-establishment from seed buried in the soil has not been investigated, but the multiplication of the stem-bases has been studied in the field and in pot cultivation. Field observations showed dense collections of stem-bases in areas of a few square centimetres, and the result of potting 18 stem-bases in March 1980 produced a total of 109 stem-bases in the autumn. These observations would appear to be an indication that this grass mainly reproduces by multiplication of its swollen stem-bases.

When these marshes were reseeded to grass in the spring of 1956, the viable stem-base of *A. bulbosus* still had a period of time to await opportunity of re-establishment. As the autumn leaf growth starts, the new stem-bases begin to develop and the plant then enters a dormant period. It would appear from this record that *A. bulbosus* was flooded by sea water in its autumn growth stage in February 1953 and that the surviving stem-bases had no opportunity to re-start growth until the early autumn of 1956, to completely recover to the flowering stage in May 1957, a period of almost four and a half years.

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Short Notes

CAREX VAGINATA TAUSCH IN SOUTHERN SCOTLAND

Carex vaginata Tausch, an arctic-alpine species, occurs locally in the Scottish Highlands and was thought to have its only other British localities in the Moffat Hills of Dumfriess., v.c. 72, in the Southern Uplands of Scotland. Plants from the latter area were first discovered by J. T. Johnstone in 1880 (Scott-Elliot 1896) and it was not until 1956 that D. A. Ratcliffe refound the sedge; he added a further locality in 1973. In 1978 the author discovered three further localities in southern Scotland outside the Moffat Hills proper. Two of the sites are in the upper Ettrick valley, Selkirks., v.c. 79, 3 miles (4·9km) to the south of the previously known localities and $1\frac{1}{2}$ miles (2·4km) apart. The third locality is in the Tweedsmuir Hills in Peebless., v.c. 78, 6 miles (9·8km) to the north.

The Ettrick plants grow on steep grassy hillsides facing east to north-east and from 1600 to 1850 feet (492–569m) in altitude. The lower levels had been fenced off and recently ditched and planted with conifers. Inflorescences were conspicuous there and measured up to 60cm in height. Outside the fence, where sheep grazing continued, plants were smaller and fewer were fertile.

The Tweedsmuir site is at 2200–2300 feet (677–708m) in altitude with a north-easterly aspect and, being subjected to grazing, the plants tended to be inconspicuous.

In the Moffat Hills (D. A. Ratcliffe *in litt.* 1978) *C. vaginata* occupies two differing types of habitat: a flush bog at 2400 feet (739m), where it is associated with many *Carices*; and a wettish ledge of small broken rocks at 2350 feet (723m). Both habitats were judged to have a moderate base status.

In 1980 soil samples were taken from several of the Ettrick localities for pH determination. The results of these and the associated species are given in Table 1.

The Ettrick localities are of considerable interest. *C. vaginata* is at its most southerly known stations

TABLE 1. SITE DESCRIPTION AND ASSOCIATED SPECIES OF *CAREX VAGINATA* COLONIES

Site description	Associates
1600ft (492m), in centre of forestry ride. *Luzula sylvatica* formed conspicuous colonies. pH 4·5.	*Anthoxanthum odoratum, Anemone nemorosa, Carex binervis, Festuca rubra, Luzula multiflora, L. sylvatica, Nardus stricta, Potentilla erecta, Ranunculus acris, Viola riviniana*
1800ft (554m), above the forestry fence. pH 4·0.	*Galium hercynicum, Nardus stricta, Vaccinium myrtillus, Plagiothecium undulatum, Rhytidiadelphus loreus, Sphagnum capillifolium*
As last, *c.* 10m distant. pH 3·8.	*Festuca ovina, Galium hercynicum, Nardus stricta, Potentilla erecta, Vaccinium myrtillus, Dicranum scoparium, Hypnum jutlandicum, Plagiothecium undulatum, Rhytidiadelphus loreus*
1750ft (539m), with plants up to 60cm tall. pH 4·3.	*Anemone nemorosa, Carex panicea, Deschampsia cespitosa, Festuca rubra, Potentilla erecta*
1800ft (554m), above forestry fence, $1\frac{1}{2}$ miles (2·4km) from previous localities. pH 5·6.	*Anemone nemorosa, Anthoxanthum odoratum, Carex pilulifera, C. pulicaris, Luzula sylvatica, Potentilla erecta, Thymus drucei, Viola riviniana, Pseudoscleropodium purum*

in the British Isles and yet is at a comparatively low altitude compared with most of the Scottish localities, which are over 2000 feet (615m). Many of the plants were associated with the usual undistinguished flora of Border hill sheep grazing. Others were present in basic flushed conditions which occur locally on these hills. The base requirements of the sedge have been reported on by several authors. McVean & Ratcliffe (1962) included it in a list of rare highland calcicoles and Porsild (1964) gave the Canadian arctic habitat as 'moist calcareous turfy and rocky places.' Ferreira (1959) considered it to be an indifferent species and Benum's (1958) observations in northern Norway agree. The soil pH and general habitats of the Ettrick plants show that *C. vaginata* will tolerate acid conditions in Scotland. It seems likely that it has been able to persist through the post-glacial climatic optimum in basic flushes which would have had a relatively open canopy, possibly of *Salix*, a habitat in which it is reported to occur in northern Norway (Benum 1958). It has subsequently been able to colonise the neighbouring acid habitats. The Moffat Hills are well known for their montane flora (Ratcliffe 1959) and indeed the upper Ettrick and Tweedsmuir hills have their own more sparse relics. *Galium boreale, Polygonum viviparum, Saussurea alpina, Saxifraga stellaris* and *Thalictrum alpinum* are found in the upper Ettrick hills while the latter have in addition *Alopecurus alpinus, Epilobium alsinifolium, E. anagallidifolium, Myosotis brevifolia, Salix herbacea* and *Sedum villosum*.

It is possible that *C. vaginata* may occur in other areas of southern Scotland or northern England where relict species similar to those mentioned above are found. The apple-green coloration of the inflorescences, with their stouter and stiffer stems, abruptly truncate utricles and more robust darker leaves (which may resemble those of *C. bigelowii* (Lid 1963)), distinguish it from *C. panicea*. Its detection in the purely vegetative state would prove difficult.

ACKNOWLEDGMENTS

I wish to thank Dr D. A. Ratcliffe for checking the manuscript, J. Grant Roger for confirming the identification of the sedge, Mrs M. E. R. Martin for information regarding the earliest record and Drs Pauline Topham and Brian Boag of the Scottish Horticultural Institute for determining the pH of the soil samples.

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R. W. M. Corner

THE DISTRIBUTION OF *CAREX PUNCTATA* GAUD. IN BRITAIN, IRELAND AND ISLE OF MAN

Carex punctata Gaud. is primarily an Atlantic and Mediterranean species, occurring locally on the western coasts of Europe (and in the Azores) northwards via Ireland, Britain, the Channel Islands, and the Frisian Islands to southern Norway, south-western Sweden, and Poland; and in the Mediterranean eastwards to Italy and Tunisia with a few scattered stations in Greece and Turkey. Like its close ally, *C. distans* L., it is also found in some inland stations, as in France, Corsica, Italy, and in and around the eastern Alps and Carpathians, with one record from north-eastern Turkey near the Georgian border. In the British Isles, however, it is wholly coastal, with a curiously disjunct distribution. It is most abundant in south-western Ireland, but appears, almost always in small compact colonies, at intervals up the Irish Sea to the Isle of Man and Kirkcudbrightshire, and along the English Channel at least as far east as Spithead (three East Anglian records are unconfirmed and have been doubted but, in view of the Berwickshire, the Norwegian, and the Swedish stations, cannot be wholly dismissed).

That this sedge is so very local seems to be due partly to its ecological requirements, and partly to its method of reproduction. Though sometimes found with *C. distans* on rocks exposed to the salt spray, it prefers more sheltered conditions and evidently needs an abundant supply of fresh water, for on the raised beaches that it favours it is most likely to occupy a spot where a spring oozes from the cliff above and the vegetation is more species-rich. Where *C. extensa* is seen, *C. punctata* will almost certainly be absent, for the site will be too saline. In dune-associations, another common habitat, *C. punctata* will be in the wetter slacks. Individual plants are short-lived but seed prolifically. so that whole colonies are liable to vanish while new ones spring up nearby.

In the British Isles *C. punctata* has been over-recorded, and in places overlooked, owing to confusion with *C. distans*. The two may resemble each other very closely. *C. punctata* is usually the more erect and rigid plant, and in the west of England has noticeably broad basal leaves (up to 8mm) of bright yellow-green; but in this same area there are colonies of *C. distans* exhibiting what the textbooks quote as the prime characteristic of *C. punctata*, *viz*. a shiny and largely unribbed utricle. One such colony gave rise to the false report of *C. punctata* on the Lizard. In south-western Ireland, where *C. punctata* often behaves as a biennial, the basal rosette of leaves may well have withered by the time the utricles mature, while Hampshire colonies of *C. punctata* are frequently narrow-leaved and *C. distans* has there a yellow-green colouring in place of the more customary dark or bronzy green. Jermy & Tutin (1968) state that in *C. punctata* the inner face of the leaf-sheath is concave at the top, while in *C. distans* it is lingulate. This is generally true, although contradicted by the very poor illustration in Kükenthal (1909); in *C. distans*, moreover, the tissue of this inner face stretches continuously from one edge of the leaf to the other, whereas in *C. punctata* it forms a tube round the stem. But these characters are obvious only in fresh young material; nor are the dots on utricle and, particularly, nut, which give the plant its name, at all easy to observe. Again, *C. punctata* bears frequently, and *C. distans* almost never, at least one bract distinctly overtopping the inflorescence, but this character is by no means constant: in Irish *C. punctata* the long bract is rare.

The only sure distinguishing marks are the shape and position of the utricles, which in *C. punctata* are inserted at something near a right angle to the axis of the spike and are therefore strongly patent when mature. They are smaller than in *C. distans* (3–4mm long as against 3·5–4·5mm) and are suddenly contracted into a very narrow almost prickle-like beak. The more evenly tapered utricles of *C. distans* ascend at a much more acute angle to the axis of the spike. Early in the season (June) the pale-glumed spikes of *C. punctata* stand out almost white against the chequered spikes of *C. distans* with dark-green or brownish glumes, but the distinction becomes less marked as the fruit ripens.

The recorded stations of *C. punctata* are listed below, with grid-references. With the exception of those marked with an asterisk, all have been visited since 1970, and I am particularly grateful to the Royal Irish Academy for a grant from the Praeger Fund which enabled me to consolidate my survey of Counties Kerry and Cork. The present size of each colony of the sedge is indicated by the letters A^1 = 1–10, A^2 = 11–20, B = 21–100, C = over 100 plants. Where the sedge was not refound, the date of, and authority for, the last sighting are given. The authenticity of herbarium specimens quoted is confirmed by me.

W. Cornwall, v.c. 1: 10/4.2, Kemyel Crease (B); (10/6.1, Caerthillian, 1948, **K**, **OXF**, is an error for *C. distans*).

E. Cornwall, v.c. 2: 10/9.3, Camel Cove (A^2); 20/0.4, Polstreath (B); 20/0.5, Charlestown (B); 20/1.5, Lantivet Bay (B); Freshwater (west of Polperro), 1914, **TRU**; 20/4.4, Rame Head, 1878, **BIRM**.

S. Devon, v.c. 3: 20/5.4, Wadham Rocks, Lambside, 1927, **OXF** (all the 'Bigbury Bay' records appear to refer to this one locality and none to 20/6.4); 20/9.6, *Torquay, 1869, **K**.

Dorset, v.c. 9: 30/9.9, between Lytchett and Hamworthy (A^2, 1956; not refound); 40/0.8, Studland, 3 places (A^1, A^2, C); (Brownsea Island, error for *C. distans*); Parkstone (A^2).

S. Hants., v.c. 11: 40/2.9, near Milford, 1928 (Rayner 1929); 40/3.9, Keyhaven (B); Pennington (B); 40/5.9, Gilkicker Point (B); 40/6.9, Hayling (Sinah), 2 places (A^1, B); 40/7.9, Hayling, Sandy Point, 1980 (F. Rose pers. comm.); 41/6.0, Portchester, 1960 (A. W. Westrup field record); 41/7.0, Hayling (Northney), formerly (B) but site destroyed *c*.1970.

E. Suffolk, v.c. 25: 62/4.5, *Aldeburgh, 1929 (Little 1930): 62/4.6, *Dunwich (Scott's Hall), extinct by

1889 (Hind 1889); 62/4.7, *Dunwich, 1879 (Hind 1889). None confirmed, and possibly errors; but see introduction.

Pembs., v.c. 45: 12/7.2, St David's (A^1); 12/8.0, St Ann's Head (A^2); 21/1.9, Caldy Island (A^1); 22/1.0, Waterwinch (B).

Cards., v.c. 46: 22/1.4, Cardigan (A^1).

Merioneth, v.c. 48: 22/5.9, Aberdyfi golf course, 1962, **NMW**; 22/6.9, Penhelyg (A^1); Abertafol (A^2); Gogarth (A^2); 23/5.3, Coleg Harlech, 1974 (A^1, P. M. Benoit *in litt.* 1980); Morfa Harlech, scattered (C); Llanfihangel-y-Traethau, 2 places (A^1, A^1); Portmeirion, 5 places (A^1, B, B, C, C); 23/6.1, Barmouth, 2 places (A^2, B); Barmouth Junction (A^1); Arthog, 1919, **OXF** is probably a distinct station as **OXF** also has a specimen 'Barmouth Junction' by same collector on same day; Farchynys, 1971 (P. M. Benoit *in litt.* 1980); 23/6.3, *Ynys Gifftan, 1971 (O. H. Black & H. Handley field record); Minffordd (A^1).

Caerns., v.c. 49: 23/2.2, Gallt-y-mor, Porth Ysgo (A^1); Trwyn Cilan (B); 23/3.2, Porth Ceiriad, 1980, herb Miss A. P. Conolly; 23/3.3, Llanbedrog, 1958, herb. Miss A. P. Conolly; 23/5.3, Portmadoc, 1978 (P. M. Benoit *in litt.* 1980).

Anglesey, v.c. 52: 23/5.7, *Menai, 1838, **MANCH**.

(Cumberland, v.c. 70: 25/9.1, *Whitehaven, error for *C. distans* (Oliver 1852)).

Man, v.c. 71: 24/2.6, Langness, post-1950 (D. E. Allen field record), no specimen and almost certainly an error for *C. distans*; 24/3.7, Douglas Head (*Backwell's Guide c.*1856), the 'rediscovery' (Allen 1954) probably an error for *C. distans*; Port Jack, 1950 (Allen 1954); 24/4.7, Onchan, 3 places (A^2, A^2, B) and overgrown in a fourth, **K**; 24/4.8, Laxey, 2 places (A^1, A^2); 24/4.9, Port Mooar, 1962 (J. E. Lousley field record), no specimen and probably an error for *C. distans*.

Kirkcudbrights., v.c. 73: 25/8.5, Mote of Mark, 1872, **BM**; Gutcher's Isle, 2 places (A^2, A^2); 25/9.5, Southwick Burn (B).

Wigtowns., v.c. 74: 25/2.5, Garheugh Point (A^2).

Berwicks., v.c. 81: 36/9.6, *Burnmouth, Ayton, 1882, **BEL**.

S. Kerry, v.c. Hl: 00/3.7, Portmagee (Scully 1916); 00/3.9, Ventry (A^1); 00/4.6, Hog's Head (More *et al.* 1898), may be the same as near Loher, 1889, **DBN**; 00/4.7, between Cahersiyeen and River Inny (Scully 1916); 00/4.8, Doulus Head (A^1); 00/4.9, Dingle, 1860, **E**; 00/5.5, Derrynane (B); Abbey Island (Scully 1916); Lamb's Head (C); West Cove (A^1); near Castlecove (A^1); 00/6.6, Glanlough (A^1); Gleesk Pier (B); Sneem, 1925, **BM**; 00/7.5, Croanshagh Bridge (B); shore near Derreen (A^1); 00/7.6, between Tahilla and Parknasilla (A^2); Blackwater Bridge (A^2); Cloonee estuary (A^1); 00/9.6, Kenmare, south of Roughty River, 1901, **BM**, **E**; 00/9.7, Kenmare, River Finnihy, 1890, **OXF**.

N. Kerry, v.c. H2: 01/7.2, between Kerry Head and Ballyheige, 1889, **MANCH**.

W. Cork, v.c. H3: 00/6.4, Dunboy Castle (B); 00/6.5, near Derryvegall (Allin 1883); Ardgroom (B); 00/7.4, Curryglass (B); 00/8.3, Toormore, 2 places (A^1, A^2); 00/8.4, Faha, Adrigole (B); 00/9.3, Schull, 2 places (B, B); *Horse Island, 1948 (Polunin 1950); Ballydehob, 1901, **BM**; 00/9.5, Seal Harbour (B); shore south-east of Glengarriff (A^1); Snave Bridge, 1949, **K**; marsh near Whiddy Island, 1964, **DBN**; 10/0.2, Lough Hyne (A^1); 10/1.2, Toe Head (A^1); 10/2.3, near Myros Wood, Leap (Allin 1883); Glandore, 2 places (A^1, A^1); 10/5.4, Courtmacsherry, 1931, **DBN**; below Kilgobbin Castle (Allin 1883).

Mid Cork, v.c. H4: 10/6.4, Kinsale, 1891 (More et al. 1898); 10/6.5, Oysterhaven inlet (Allin 1883).

E. Cork, v.c. H5: 10/9.6, between Power Head and Ballycotton, 1898 (Phillips 1899).

Co. Waterford, v.c. H6: 20/4.9,* between Drumborough and Bunmahon, 1965, **CGE**, **E**.

Co. Clare, v.c. H9: 12/0.0, Poulsallagh, 1974, **TCD.**

W. Galway, v.c. H16: 02/5.5, Aughrosbeg Lough (C); 02/6.3, Dog's Bay, 1925, **BM**; 02/6.4, *south of Ballyconneely, 1980, **DBN**; 02/6.5, Clifden, 1968, **TCD**; *near Belleek, 1967, **herb. A. O. Chater.**

W. Donegal, v.c. H35: 24/0.3, *Dunfanaghy, 1949, **CGE**, **E**.

Co. Antrim, v.c. H39: 33/3.7, *Belfast, n.d., **BM**.

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R. W. David

CAREX ORNITHOPODA WILLD. EAST OF THE PENNINES

In a Short Note on the British distribution of *Carex ornithopoda* Willd. (David 1980) I recounted the history of the only two records from the eastern side of the Pennines (Borrer's from Mackershaw, near Ripon, and Wheldon's from Hawnby in the North Yorkshire Moors) and concluded that both were probably errors, the first due to a misidentification of *C. digitata* L. as *C. ornithopoda*, the second to a confusion over the provenance of the specimen.

One object of the note was to elicit further information, if this existed; and I was delighted to hear from Miss M. M. Hartley, Keeper of Natural Sciences at the Cliffe Castle Museum in Keighley, that the collection in her charge contained a specimen purporting to be *C. ornithopoda* and to have been collected on 'Mackershaw banks' by F. A. Lees in May 1887. On inspection the plant proved to be very small and immature, but in general habit it matched *C. ornithopoda* and showed two of the special characters of that species: the female spikes all originated more or less from the same point on the axis of the inflorescence, and there was very little red coloration on spike or basal sheath (though this might have been due to fading on drying). On the other hand the utricles were distinctly shorter than the female glumes, a character of the allied *C. digitata*.

I submitted the specimen to A. O. Chater and A. C. Jermy of the British Museum, who both agreed with me that the probability was that that the plant was indeed *C. ornithopoda* rather than *C. digitata*. In order to reach a more positive conclusion I asked Mr Jermy to examine the Keighley specimen, together with authentic specimens of *C. ornithopoda* and *C. digitata*, under the scanning electron microscope, a technique that has proved remarkably successful in separating other species-pairs, e.g. *C. rostrata* from *C. vesicaria*, and *C. montana* from *C. pilulifera*. He reported that *C. ornithopoda* and *C. digitata* do clearly differ in the epidermis of the leaf. In both, rows of bullate fibre cells are separated by lines of rectangular 'brick-cells'. In *C. ornithopoda* the bullate cells are narrowly elongate and the 'brick-cells' carry two or three conspicuous papillae. In *C. digitata* the bullate cells are shorter, plumper, with, at their ends, swollen, claw-like junctions with their neighbours, while the less regular 'brick-cells', with rounded sides, carry for the most part only one papilla (and that indistinct). In all these aspects the Keighley specimen accords with *C. ornithopoda*.

It therefore seems proven that, contrary to my expectation, *C. ornithopoda* does, or did, grow at Mackershaw, though it has been overlooked by every one of the many botanists who have been regularly exploring the area since 1887. Furthermore, its occurrence at Mackershaw would increase the likelihood that the Hawnby record is also correct. It is highly desirable that the sedge should be refound in both localities.

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R. W. David

ASPLENIUM CUNEIFOLIUM VIV. ERRONEOUSLY RECORDED IN THE BRITISH ISLES

Atlas of ferns of the British Isles (Jermy *et al.* 1978) gives a map showing 10km square records for *A. cuneifolium* Viv., a diploid species in the *A. adiantum-nigrum* L. complex. The records were based on those reported by Roberts & Stirling (1974) from serpentine rocks in Scotland and by Scannell (1978) from W. Galway, v.c. H16. These plants have a distinct morphology and the populations were said by the authors to contain diploids. Further records for Kynance, Lizard (W. Cornwall, v.c. 1) were made in 1978 and reported by Page & Bennell (1979) and Murphy & Page (1980). No cytological observations were made on the Kynance plants by the collectors, although some were taken into cultivation for future study. The morphology of the Kynance plants was said to be similar to the Scottish serpentine material.

At the request of R. H. Roberts and A. McG. Stirling, Drs Anne Sleep and Janet Souter of Leeds University investigated cytologically some plants from the Scottish serpentine localities; these, surprisingly, gave tetraploid results (Sleep *et al.* 1980). The sites listed in the 1974 paper were accordingly resampled, and fixed material sent to Leeds; this too, proved to be uniformly tetraploid. Independently, plants showing similar morphology from serpentine localities in Corsica were found also to be tetraploid (Deschatres *et al.* 1978), the authors suggesting that the plants might be autoploids of *A. cuneifolium*. Dr Sleep set up a hybridisation programme to test this hypothesis, in the first instance crossing British material of the previously named *A. cuneifolium* from Bridgend on the Banff/Aberdeenshire border with *A. kobayashii* Tagawa, an unrelated Japanese allotetraploid. The results recently published (Sleep 1980) show the Scottish '*A. cuneifolium*' to display virtually complete failure of chromosome pairing at meiosis, as does *A. adiantum-nigrum* from Kynance Cove when similarly crossed with an unrelated species (Lovis & Vida 1969), thus demonstrating clearly that in both cases the plants involved are unequivocally allotetraploid. Dr. Sleep has now counted material from a large number of serpentine sites; so far, no diploid material has emerged. It is difficult to explain the earlier diploid counts and on present evidence we must conclude that these plants are only serpentine forms of the tetraploid *A. adiantum-nigrum*. Since this species has been shown by Shivas (1969) to contain one genome of *A. cuneifolium*, it is perhaps not surprising that some specimens can develop phenotypically into a morphological form similar to that species. Plants from Page and Bennell's site A at the Lizard have also been counted by Sleep (pers. comm. 1980) and found to be tetraploid, and it is therefore likely that the material collected by Murphy and Page in this well-known serpentine area is also tetraploid.

The Scottish serpentine plants do have a distinct appearance, and in the past several botanists have referred to their apparent similarity to plants of *A. cuneifolium* from central Europe. It is not surprising that an astute field botanist like Allan Stirling should recognize and define them morphologically. Undisputed diploid *A. cuneifolium* is recorded from Austria, Hungary and Switzerland; plants of identical morphology preserved in **BM** are from Al, Bu, Cz, Ge, It, Ju, Po and Rm. Jalas & Suominen (1972) give additional records from Ga, Gr and Hs. Thus, apart from its possible extensions into France and Spain (and it is possible that these records, too, may be of tetraploid serpentine *A. adiantum-nigrum*), this is a central European species and its absence from the British Isles is not surprising. Until a diploid count can be substantiated I suggest *A. cuneifolium* be struck off the British list.

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I am grateful to Anne Sleep and C. N. Page for comments on the above.

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A. C. Jermy

A POSSIBLE ORIGIN OF *CARUM VERTICILLATUM* (L.) KOCH IN NORTH-EASTERN SCOTLAND

Carum verticillatum (L.) Koch was discovered in quantity in an area of wet meadow known as the Shooting Greens on the Aberdeen-Kincardine border by Mrs A. Somerville in 1956. This is still the only known occurrence of this western species in eastern Scotland, and, apart from a Surrey record, the only eastern site in Britain.

A possible explanation for this unusual distribution came to light when I recently visited this area with the local district officer of the Forestry Commission. The Shooting Greens evidently once formed a stance where very large flocks of sheep were rested and foraged on their way over the drove roads to markets in Crieff and Forfar. It therefore seems at least possible that seeds of *Carum*, caught up in the wool of the sheep in their native pastures to the north and west, were brushed off during their few days grazing on the Shooting Greens. Here, by chance, the *Carum* seeds found their ideal habitat – wet hillsides dominated by *Molinia*, with a pronounced soligenous influence typified by an abundance of *Carex hostiana* and *Juncus acutiflorus*.

The main flaw in the sheep transportation theory is that most of the sheep using this particular drove road would have originated from lower Speyside and the Moray Firth, where the *Carum* has not been recorded. We are, however, testing the theory by examining other old sheep stances in north-eastern Scotland for the occurrence of plants outside their normal range.

Carum verticillatum continues to thrive on the Shooting Greens; tens of thousands of plants (at a conservative estimate) occur over an area of *c*. 40 ha. Despite the continuing afforestation of this area the future of the umbellifer seems assured, since the Forestry Commission, who own the ground, have agreed to maintain at least part of the meadows unplanted.

P. Marren

MOISTURE FOR GERMINATION AS A FACTOR AFFECTING THE DISTRIBUTION OF THE SEEDCOAT MORPHS OF *SPERGULA ARVENSIS* L.

In the British Isles the morph of *Spergula arvensis* L. which *lacks* papillae on the seedcoats has a northern and western distribution and it is gradually replaced by the morph *with* papillae with increasing distance south and east (New 1958, 1978). In Europe in general the non-papillate morph has a more northerly distribution than the papillate morph. It has been known for many years that at lower temperatures the non-papillate seeds germinate more readily than the papillate seeds, whereas at higher temperatures the reverse is true (New 1958). This has recently been confirmed by further experiments. Current investigations of the biology of the seed morphs suggest that the difference in temperature requirement for germination is not the only factor affecting the distribution. This finding parallels studies of selective forces affecting the distribution of cyanogenic and non-cyanogenic morphs of

Trifolium repens, for example, where several quite independent forces have been shown to operate (e.g. Foulds & Young 1977, Dritschilo *et al.* 1979).

In the present experiments the effect of water availability on germination was investigated by supplying water at different tensions by the method of Harper & Benton (1966). The tensions were produced by different lengths of hanging columns of water supported by the fine pores (5–10 μm) of sintered glass plates (on which the seeds were placed). As well as testing the effect of water tension, the investigation was designed to test whether soil texture affected germination (soil located on the sintered glass plates). However, there was no significant difference between number germinating on the different soils and so the results from six experiments have been summed in the table. The experiments made comparisons only between the two seed morphs collected from the same locality. This was to ensure that the result was not confused by the possibility that the difference in the distribution of the genes for the seedcoat morphs may be paralleled by a difference in distribution of other genes which might also affect germination. The mean temperature for the experiments was 19°C. At each water tension 110 seeds were put to germinate.

TABLE 1. NUMBER OF SEEDS OF TWO MORPHS OF *SPERGULA ARVENSIS* GERMINATING AT DIFFERENT WATER TENSIONS

	Water tension (cm)		
	0	50	100
papillate seeds	80	86	80
non-papillate seeds	49	22	14

From Table 1 it can be seen that there is a marked reduction ($p<0{\cdot}001$) in germination of non-papillate seeds at higher water tensions, whereas this is not so for papillate seeds. In other words, the non-papillate seeds germinated less readily under drier conditions. This may well be another factor accounting for the lower frequency of the non-papillate morph in the south and east of the British Isles and Europe.

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J. K. New & J. C. Herriott

CHANGES IN THE AQUATIC FLORA OF PULL WYKE BAY AND THE GRASS HOLME AREA OF LAKE WINDERMERE

In July, 1980, surveys were undertaken of the aquatic flora of Pull Wyke Bay (35/365.022) and the Grass Holme area (34/382.926) of Windermere, Westmorland, v.c. 69, in order to make comparisons with previous descriptions. The vegetation of Pull Wyke Bay, one of the most sheltered bays in Windermere, was mapped in 1935 (Macan 1970) by D. Mellon (T. T. Macan pers. comm.) and that of the exposed Grass Holme site by W. H. Pearsall in about 1920 (Pearsall 1920). Our surveys were carried out by snorkel divers recording aquatic macrophyte species along predetermined strategically placed transects. Water depth was recorded at known distances along the transect. The method was designed to produce distributions of the main species, and no extra effort was made by us to find species recorded in 1935 and 1920 but not found in 1980.

The number of species found in Pull Wyke Bay (18) was the same in 1935 and 1980, though the composition on each occasion was different. *Equisetum fluviatile* L., *Potamogeton gramineus* L., *P. natans* L. and *P. obtusifolius* Mert. & Koch were apparently absent from the bay in 1980 and notable absences in 1935 were *Nitella* sp., *Callitriche intermedia* Hoffm. and *Lobelia dortmanna* L. The species common to both surveys were *Carex rostrata* Stokes, *Elodea canadensis* Michx, *Isoetes lacustris* L., *Littorella uniflora* (L.) Aschers., *Myriophyllum alterniflorum* DC., *Nuphar lutea* (L.) Sm., *Phragmites communis* Trin., *Potamogeton alpinus* Balb., *P. berchtoldii* Fieb., *P. perfoliatus* L., *P. praelongus* Wulf., *Ranunculus ?peltatus* Schrank, *Scirpus lacustris* L. and *Sparganium minimum* Wallr. *Elodea nuttallii* (Planch.) St John had colonized Pull Wyke Bay by 1980. The Grass Holme area was less diverse, supporting only six species in 1920 and eight in 1980: *Nitella* sp., *Isoetes lacustris, Littorella uniflora, Phragmites communis, Potamogeton berchtoldii* and *P. praelongus* were common to both surveys, while *Elodea canadensis* and *Myriophyllum alterniflorum* were new to the location.

The total extent and maximum depth (3m) of submerged vegetation for Pull Wyke Bay in 1980 were very similar to those of 1935, though there had been alterations in the relative proportions of species, e.g. a reduction in cover of *Myriophyllum alterniflorum* and an increase in that of *Sparganium minimum*. These changes were of similar magnitude to those described by Macan (1977) for a Lake District tarn, changes attributed to natural causes. The moorings in Pull Wyke Bay have had little or no effect on the submerged stands of plants.

Reductions in the extent of vegetation cover in the order of 50% were recorded for the more exposed area around the island of Grass Holme, notably *Nitella, Potamogeton berchtoldii* and *P. praelongus*, which had virtually disappeared. The stands of *Phragmites communis* around the island were as described in 1920 and the bed of *Littorella uniflora* off the island had increased in extent. The maximum depth of the vegetation for Grass Holme in 1920 was approximately 7m; in 1980 it was 3–4m. The decrease in the extent of vegetation at this site needs to be considered in relation to changes in the ecology of Lake Windermere.

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P. M. WADE, J. E. BERESFORD & D. BLEASE

LYCOPODIELLA INUNDATA (L.) HOLUB AT SMALLHANGER, SOUTH DEVON

Observations of *Lycopodiella inundata* (L.) Holub in man-made habitats have been reported from S. Devon, v.c. 3 (Wigston 1979) and W. Norfolk, v.c. 28 (Petch 1980). In both cases the number of plants observed was small, and in 1979 only one plant was known at the S. Devon site and none was known in W. Norfolk after 1965.

In May, 1980, we investigated a report that a 'clubmoss' grew in abundance at an old working at Smallhanger Down, GR 20/576.595, on the edge of the Lee Moor china clay extraction area on the south-western edge of Dartmoor. The pit consists of four quarry faces from which china clay was extracted until about 1925. Running from the faces are slopes with debris of quartz sand and fine clay. Some of the slopes and pit bottoms are waterlogged, and in one such area large numbers (in excess of

1,000) of shoots of *L. inundata* were seen. We are currently enumerating the details of population numbers and density. One other area of the pit has a few young plants of *L. inundata*, suggesting that the species is spreading at this site.

To date only vegetative sporophyte material has been observed. There appear to be two habitats in the pit where the plant grows:

(a) microtopographical mounds and cliffs (0·5–2m) with freely draining bases. This is a similar habitat to that observed by Wigston (1979) at Fox Tor Mires, S. Devon;

(b) waterlogged deposits of fine china clay waste. Examination of the plants in this habitat revealed bleached horizontal shoots buried underneath recently deposited china clay run-off, with green, upright shoots arising from the most recent growth of the horizontal shoots. From the upright shoots further green, horizontal shoots emanated. It is likely that these will be buried by later run-off, and that further vertical and then horizontal growth will occur. The vegetative spread of the plants in this way tends to produce a circular, expanding pattern of growth akin to a 'fairy ring'. Around the rhizoids of the plants are accumulations of organic debris, upon which *Drosera rotundifolia* grows in close association with *L. inundata*.

The site is gradually being invaded by *Salix atrocinerea*, *S. caprea* and *Rhododendron ponticum*; it will be interesting to see if, as suggested by Petch (1980) for the W. Norfolk site, *L. inundata* is behaving as a 'pioneer' species and will eventually disappear as the succession proceeds.

The main danger to the site at present is its use by motor-cycle scramblers as an unofficial practice area; as a result several patches of *L. inundata* have been damaged.

ACKNOWLEDGMENTS

We should like to thank Mr Roger Davies, who first drew our attention to the site, and English China Clays Lovering Pochin & Co Ltd, for permission and much help in visiting the site.

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D. L. Wigston, D. Pickering & S. Jones

Plant Records

Records for publication must be submitted in the form shown below to the appropriate vice-county Recorder (*List of members* (1979)), and *not* the Editors. The records must normally be of native or naturalized alien plants belonging to one or more of the following categories: 1st or 2nd v.c. record; 1st post-1930 v.c. record; only extant v.c. record, or 2nd such record; a record of an extension of range by more than 100 km. Such records will also be accepted for the major islands in v.c. 102–104 and 110. Only 1st records can be accepted for *Rubus, Hieracium* and hybrids. Records for subdivisions of vice-counties will not be treated separately; they must therefore be records for the vice-county as a whole. Records of *Taraxacum* are now being dealt with separately, by Dr A. J. Richards, and will be published at a later date.

Records are arranged in the order given in the *List of British vascular plants* by J. E. Dandy (1958) and his subsequent revision (*Watsonia*, 7: 157–178 (1969)). With the exception of collectors' initials, herbarium abbreviations are those used in *British herbaria* by D. H. Kent (1958).

The following signs are used:

* before the record: to indicate a new vice-county record.
† before the species number: to indicate that the plant is not a native species of the British Isles.
† before the record: to indicate a species which, though native in some parts of the British Isles, is not so in the locality recorded.
[] enclosing a previously published record: to indicate that the record should be deleted.

3/2. ISOETES ECHINOSPORA Durieu **70**, Cumberland: Derwentwater, GR 35/26.19. R. Stokoe, 1980, **herb. R. S.** 2nd record.

11/1. ADIANTUM CAPILLUS-VENERIS L. †***25**, E. Suffolk: Ipswich, GR 62/16.44. F. W. Simpson, 1977, field record. †***26**, W. Suffolk: Nayland, GR 52/97.34. J. C. Williams, 1980, field record. ***45**, Pembs.: St Brides Bay, GR 12/8.1. Sea cliffs. P. S. Green & K. L. Cram, 1980, field record.

15/1c. ASPLENIUM CUNEIFOLIUM L. [***1**, W. Cornwall: *Watsonia*, **13**: 131 (1980) has been redetermined as probably *A. adiantum-nigrum*. It is now generally agreed that *A. cuneifolium* has not so far been recorded in the British Isles.]

15/5. ASPLENIUM TRICHOMANES L. subsp. TRICHOMANES ***43**, Rads.: Stanner Rocks, GR 32/26.58. Wooded slope. P. M. Benoit, 1980, field record.

16/1. CETERACH OFFICINARUM DC. **25**, E. Suffolk: Oulton Broad, GR 62/52.93. Wall of brick shed. R. S. Briggs, 1977, field record. Only extant record.

21/3. DRYOPTERIS OREADES Fomin. ***43**, Rads.: Elan Valley, GR 22/92.64. R. G. Woods, 1980, **NMW**.

21/4. DRYOPTERIS VILLARII (Bellardi) Woynar **57**, Derbys.: Millers Dale, GR 43/15.72. N. Hards, 1980, field record. 2nd record.

21/6. DRYOPTERIS CARTHUSIANA (Vill.) H. P. Fuchs ***107**, E. Sutherland: N. of Bonar Bridge, GR 28/64.95. M. J. Marshall & M. McC. Webster, 1979, field record.

25/1/int. × vul. POLYPODIUM INTERJECTUM Shivas × P. VULGARE L. ***74**, Wigtowns.: 2 miles N. of Penninghame House, Newton Stewart, GR 25/3.7. A. McG. Stirling, 1979, **GLAM**.

26/1. PILULARIA GLOBULIFERA L. **12**, N. Hants.: Aldershot, GR 41/88.52. Flooded gravel-pit. A. Brewis, 1979, **herb. A.B.** Only extant record. **70**, Cumberland: Derwentwater, GR 35/23.25. R. Stokoe, 1980, **herb. R.S.** 2nd extant record.

29/1a. OPHIOGLOSSUM VULGATUM L. subsp. VULGATUM **76**, Renfrews.: Skiff Wood, GR 26/40.60. A. J. Silverside, 1978, field record. Only extant record.

33/1. Pinus sylvestris L. subsp. scotica (Schott) E. F. Warb. ***107**, E. Sutherland: Balblair Wood, GR 28/81.97. J. K. Butler, 1980, field record.

†40/var. Aconitum variegatum L. ***76**, Renfrews.: Lochwinnoch, GR 26/36.58. Wood. P. Macpherson, 1973, **herb. P.M.**

†41/1. Consolida ambigua (L.) P. W. Ball & Heywood **38**, Warks.: Wishaw, GR 42/15.95. Arable land away from habitation. J. T. Williams, 1972, field record. Only extant record, 1st record since 1817.

46/15. Ranunculus sceleratus L. **42**, Brecs.: Builth, GR 32/04.51. R. G. Woods, 1980, field record. 2nd record.

46/20. Ranunculus circinatus Sibth. ***45**, Pembs.: Castlemartin, GR 11/9.9. Anon, 1880, **TBY**.

46/22a × b. Ranunculus aquatilis L. × R. peltatus Schrank ***38**, Warks.: near Coleshill, GR 42/21.85. Old gravel workings. J. T. Williams, 1974, field record, det. C. D. K. Cook.

50/1. Thalictrum flavum L. †**46**, Cards.: Eglwys-fach, GR 22/68.95. Roadside hedge. W. M. Condry, 1979, field record. 2nd record.

†58/3. Papaver lecoqii Lamotte ***35**, Mons.: Chepstow, GR 31/52.94. Garden weed. T. G. Evans, 1975, **herb. T.G.E.** ***46**, Cards.: Plas Gogerddan, GR 22/63.83. R. G. Ellis, 1980, **NMW**. 1st definite record.

†58/8. Papaver atlanticum (Ball) Coss. ***46**, Cards.: Llanbadarn Fawr, GR 22/59.81. R. G. Ellis, 1979, **NMW**.

59/1. Meconopsis cambrica (L.) Vig. **38**, Warks.: Sutton Park, GR 42/09.98. Foot of railway embankment. H. H. Fowkes, 1972, field record. 1st record since 1891.

65/1. Corydalis solida (L.) Sw. ***45**, Pembs.: Coombes Head, Amroth, GR 22/16.08. Hedgebank. I. M. Vaughan, S. N. & G. H. Tallowin, 1979, field record.

65/3. Corydalis claviculata (L.) DC. **38**, Warks.: Birchley Hayes Wood, near Meriden, GR 42/27.84. Ride in conifer wood. H. H. Fowkes, 1976, field record. 1st record since 1880.

66/3. Fumaria purpurea Pugsl. ***78**, Peebless.: S. of Portmore, GR 36/24.47. Turnip field. D. J. McCosh, 1974, **herb. D.J.McC.**, det. M. G. Daker.

67/4. Brassica nigra (L.) Koch ***12**, N. Hants.: Headley Mill, GR 41/81.35. A. Brewis, 1980, field record.

†72/1. Diplotaxis muralis (L.) DC. ***42**, Brecs.: Glasbury, GR 32/18.39. S. I. Leitch, 1973, **NMW**. ***76**, Renfrews.: Paisley College, GR 26/48.63. Newly sown lawn and flower-beds. A. J. Silverside, 1977, **PSY**.

†76/2. Rapistrum rugosum (L.) All. ***12**, N. Hants.: Aldershot, GR 41/88.52. Covered tip. A. Brewis, 1979, **herb. A.B.**, det. D. McClintock.

†76/3. Rapistrum rugosum (L.) All. subsp. orientale (L.) Arcangeli ***49**, Caerns.: Llandudno, GR 23/77.82. Garden weed. P. M. Benoit, 1980, **NMW**.

†79/den. Lepidium densiflorum Schrader ***77**, Lanarks.: Meadowside Dock area, Glasgow, GR 26/55.66. P. Macpherson & A. McG. Stirling, 1979, **herb. P.M.**, det. E. J. Clement.

†79/vir. Lepidium virginicum L. **38**, Warks.: Lea Marston, GR 42/21.93. M. & J. Williams, 1974, field record. 2nd record.

†80/2. Coronopus didymus (L.) Sm. ***78**, Peebless.: Kings Meadows, Peebles, GR 36/26.39. Waste ground on building site. C. M. Morrison, 1979, **herb. D. J. McCosh**.

†Pachyphragma macrophyllum (Hoffm.) Busch ***40**, Salop: Broncroft Castle grounds, GR 32/54.86. Rough grassland. M. B. Fuller, 1979, **herb. E. J. Clement**, det. E.J.C.

85/1. TEESDALIA NUDICAULIS (L.) R. Br. **50**, Denbs.: Llangernyw, GR 23/85.68. Roadside bank. J. M. Brummitt, 1980, **NMW**. 1st record since 1912.

†92/1. LOBULARIA MARITIMA (L.) Desv. ***45**, Pembs.: Manorbier, GR 21/0.9. Anon., *c*. 1880, **TBY**.

97/3. CARDAMINE IMPATIENS L. ***61**, S.E. Yorks.: $\frac{1}{2}$ mile S. of Londesborough, GR 44/86.44. By chalk Stream. R. Middleton, 1980, **herb. F. E. Crackles**.

†100/3. ARABIS CAUCASICA Schlecht. ***46**, Cards.: Falcondale, GR 22/56.49. Well-naturalized on old walls. A. O. Chater, 1979, **NMW**, det. E. J. Clement.

102/5. RORIPPA AMPHIBIA (L.) Bess. ***76**, Renfrews.: Newlands, Glasgow, GR 26/57.60. P. Macpherson, 1970, **herb. P.M., det. R. D. Meikle.**

†108/4. SISYMBRIUM ORIENTALE L. ***77**, Lanarks.: Cathkin Quarry, GR 26/62.58. B.C.M. & P. Macpherson, 1980, **herb. P.M.**

†108/5. SISYMBRIUM ALTISSIMUM L. ***77**, Lanarks.: Meadowside Dock area, Glasgow, GR 26/55.66. A. McG. Stirling & P. Macpherson, 1973, **herb. P.M.**

†108/vol. SISYMBRIUM VOLGENSE Bieb. ex E. Fourn. ***26**, W. Suffolk: Hadleigh, GR 62/03.41. Disused railway line. M. A. Hyde, 1980, **herb. M.A.H.,** conf. E. J. Clement.

113/5. VIOLA REICHENBACHIANA Jord. ex Bor. **59**, S. Lancs.: 2·5 km N.W. of Whalley, GR 34/71.37. P. Jepson, 1980, field record. 2nd record.

†113/10. VIOLA CORNUTA L. ***93**, N. Aberdeen: Meikle Wartle, GR 38/71.30. Roadside. D. Welch, 1980, **ABD**.

113/11. VIOLA LUTEA Huds. **93**, N. Aberdeen: Wheedlemont Hill, 3 km S.W. of Rhynie, GR 38/47.26. D. Welch, 1980, **ABD**. 2nd record.

†113/wit. VIOLA × WITTROCKIANA Gams **35**, Mons.: Newport, GR 31/30.85. Rubbish tip. T. G. Evans, 1980, **herb. T.G.E.** 2nd record.

115/6 × 5. HYPERICUM MACULATUM Crantz subsp. OBTUSIUSCULUM (Tourlet) Hayek × H. PERFORATUM L. ***69**, Westmorland: Heltondale, GR 35/50.20. Acid roadside bank. G. Halliday, 1979, **LANC**, det. N. K. B. Robson.

118/1. HELIANTHEMUM NUMMULARIUM (L.) Miller †***46**, Cards.: Llanbadarn Fawr, GR 22/59.81. Naturalized on walls. R. G. Ellis, 1979, **NMW**.

122/1. ELATINE HEXANDRA (Lapierre) DC. ***76**, Renfrews.: Loch Libo, GR 26/43.55. A. J. Silverside, 1979, field record.

123/14 × 13. SILENE ALBA (Mill.) E. H. L. Krause × S. DIOICA (L.) Clairv. ***99**, Dunbarton: Dalreoch, Dumbarton, GR 26/38.76. A. McG. Stirling, 1980, **E**.

127/1. DIANTHUS ARMERIA L. **38**, Warks.: Water Orton, GR 42/17.91. Railway sidings. B. Wood. 1980, field record. 1st record since 1871.

†128/1. VACCARIA PYRAMIDATA Medic. ***35**, Mons.: Newport, GR 31/30.85. Rubbish tip. A. Grenfell & A. Titchen, 1980, **herb. A. G.**

131/10. CERASTIUM DIFFUSUM Pers. ***12**, N. Hants.: Bramley Ammunition Depot, GR 41/66.56. F. Rose, 1980, **herb. A. Brewis**. ***40**, Salop: Arley, GR 32/75.80. Railway track. W. Thompson, 1980, field record, det. P. M. Benoit.

†131/bie. CERASTIUM BIEBERSTEINII DC. ***74**, Wigtowns.: 2 miles N. of Stoneykirk, GR 25/09.56. Large roadside colony. A. J. Silverside, 1980, **E.**

136/1. SAGINA APETALA Ard. subsp. ERECTA (Hornem.) F. Hermann **107**, E. Sutherland: Bonar Bridge, GR 28/61.91. M. McC. Webster, 1979, field record. 2nd record.

136/2. Sagina ciliata Fr. ***93**, N. Aberdeen: Slains, GR 48/05.30. Dry rock ledges. D. Welch, 1979, **ABD**.

136/9. Sagina subulata (Sw.) C. Presl ***42**, Brecs.: Mynydd Eppynt, GR 32/0.4. M. Porter, 1973, **NMW**.

136/10. Sagina nodosa (L.) Fenzl ***93**. N. Aberdeen: Strathbeg, GR 48/07.59. Saltmarsh. D. Welch, 1980, **ABD**.

146/1. Herniaria glabra L. †***59**, S. Lancs.: Shore Road, Ainsdale, GR 34/30.12. A. Franks, 1980, field record, det. E. J. Clement. †***76**, Renfrews.: Paisley Cross, GR 26/48.64. Flower-beds. A. J. Silverside, 1979, **PSY**.

147/1. Illecebrum verticillatum L. †***35**, Mons.: Newport Docks, GR 31/31.86. T. G. Evans, J. Curtis & A. Grenfell, 1980, **herb. T.G.E.**

† 149/2. Montia perfoliata (Willd.) Howell **76**, Renfrews.: Paisley College, GR 26/48.63. A. J. Silverside, 1977, field record. 2nd record, 1st post-1930 record.

†153/2. Amaranthus hybridus L. ***35**, Mons.: Newport, GR 31/30.85. Rubbish tip. T. G. Evans, A. Grenfell & C. Titcombe, 1980, **herb. T.G.E.,** conf. E. J. Clement.

†153/3. Amaranthus albus L. **38**, Warks.: Bodymoor Heath, GR 42/20.97. Reseeded gravel pits. H. H. Fowkes, 1976, field record. 1st record since 1872.

156/4 × 3. Atriplex glabriuscula Edmondst. × A. prostrata Boucher ex DC. ***61**, S. E. Yorks.: ½ mile E. of Barmston, GR 54/17.59. E. Chicken, 1978, **herb. E.C.,** det. P. M. Taschereau.

156/lon. × 3. Atriplex longipes Drejer × A. prostrata Boucher ex DC. ***76**, Renfrews.: Erskine, GR 26/46.71. Estuarine saltmarsh. A. J. Silverside, 1978, field record, det. P. M. Taschereau.

156/4 × lon. Atriplex glabriuscula Edmondst. × A. longipes Drejer ***61**, S. E. Yorks.: ½ mile E of Barmston, GR 54/17.59. E. Chicken, 1978, **herb. E.C.,** det. P. M. Taschereau.

†Hibiscus trionum L. ***35**, Mons.: Newport, GR 31/30.85. Rubbish tip. T. G. Evans, B. & E. Burt, 1980, **herb. T.G.E.**

166/1. Linum bienne Mill. **38**, Warks.: Near Wellesbourne, GR 42/27.57. Roadside verge. P. J. Gates, 1974, field record, det. D. J. Ockendon. Coventry, GR 42/33.79. Waste ground, E. G. Webster, 1977, field record. 1st records since 1875.

†Tropaeolum majus L. ***45**, Pembs.: Goodwick Beach, GR 12/95.37. Rocks and shingle. R. G. Ellis, 1980, **NMW**.

168/7. Geranium sanguineum L. ***76**, Renfrews.: Opposite Ganntocks Hotel, S. of Gourock, GR 26/2.7. Grassy bank above shore. A. McG. Stirling, 1979, field record.

169/3b. Erodium cicutarium (L.) L'Hérit. subsp. dunense Andreas ***74**, Wigtowns.: Craignarget, GR 25/25.51. A. J. Silverside, 1980, **GLAM**. 1st definite record.

171/1. Impatiens noli-tangere L. **59**, S. Lancs.: Burgh Wood, Chorley, GR 34/57.15. J. N. Smith, 1980, field record. 2nd extant record.

†171/4. Impatiens glandulifera Royle **73**, Kirkcudbrights.: Corsock House, GR 25/75.75. Woodland. O. M. Stewart, 1974, field record. 2nd record.

† 173/2. Acer platanoides L. ***74**, Wigtowns.: Castle Kennedy Estate, GR 25/11.60 C.S.S.F. Field Meeting, 1977, field record. Glenluce, GR 25/20.57. A. J. Silverside, 1980, field record. 1st and 2nd records.

†181/1. Vitis vinifera L. ***35**, Mons.: Newport Docks, GR 31/30.85. Roadside. T. G. Evans, 1979, field record. Newport, GR 31/30.85. Rubbish tip. T. G. Evans, C. Titcombe & A. Grenfell, 1980, field record. 1st and 2nd records.

†184/alp. LABURNUM ALPINUM (Miller) Berchtold & J. Presl *79, Selkirks.: W. of Ashiesteel, GR 36/42.35. R. W. M. Corner, 1980, **herb. R.W.M.C.**

185/2. GENISTA ANGLICA L. **85**, Fife: Annsmuir, Ladybank, GR 37/30.11. J. A. Macdonald, 1980, field record. 1st post-1930 record.

† 188/str. CYTISUS STRIATUS (Hill) Rothm. ***48**, Merioneth: near Maentwrog, GR 23/63.40. Roadside bank. R. G. Ellis, 1978, **NMW**.

190/6. MEDICAGO ARABICA (L.) Huds. **46**, Cards.: Llanina churchyard, GR 22/40.59. A. O. Chater, 1980, **NMW**. 1st post-1930 record.

†191/2. MELILOTUS OFFICINALIS (L.) Pall. ***76**, Renfrews.: Lonend, Paisley, GR 26/48.63. A. McG. Stirling, 1980, field record.

192/10. TRIFOLIUM STRIATUM L. †***76**, Renfrews.: Paisley, GR 26/48.64. Introduced with turf. A. J. Silverside, 1980, field record.

193/1. ANTHYLLIS VULNERARIA L. subsp. CARPATICA (Pant.) Nyman ***107**, E. Sutherland: Migdale Rock, GR 28/64.90. M. McC. Webster, 1979, **E**.

220/3. ASTRAGALUS GLYCYPHYLLOS L. **61**, S. E. Yorks.: North Cave, GR 44/88.32. F. Wear, 1980, field record. 1st post-1930 record.

201/1. OXYTROPIS HALLERI Bunge **74**, Wigtowns.: Parish of Kirkmaiden, GR 25/1.3. R.E.C. Ferreira, 1979, field record. 1st record since 1890.

206/6. VICIA VILLOSA Roth ***38**, Warks.: Hillfields, Coventry, GR 42/34.79. Demolition site. J. T. Willians, 1974, field record.

206/16. VICIA LATHYROIDES L. **40**, Salop: 1 km N.W. of Rudge, GR 32/80.97. B. R. Fowler, 1978, **herb. I. C. Trueman**. 1st post-1930 record. †**76**, Renfrews.: Paisley College, GR 26/47.63. Garden weed, introduced with sandy topsoil. A. J. Silverside, 1980, field record. 2nd record.

207/2. LATHYRUS APHACA L. ***40**, Salop: Poles Coppice, Pontesbury, GR 33/39.04. Edge of old quarry. K. E. Daniels, 1980, field record.

207/6. LATHYRUS SYLVESTRIS L. ***42**, Brecs.: Tal-y-llyn, GR 32/10.27. W. J. H. Price, 1973, **NMW**.

†207/cly. LATHYRUS CLYMENUM L. ***38**, Warks.: Holbrooks, near Coventry, GR 42/32.82. Suburban garden. J. Robbins, 1979, **K**, det. S. Andrews.

†209/2. SPIRAEA DOUGLASII Hook. **69**, Westmorland: Wyndhammere, Old Town, Kirkby Lonsdale, GR 34/59.85. G. Halliday, 1976, **LANC**. 2nd record.

†209/2 × 1. SPIRAEA DOUGLASII Hook. × S. SALICIFOLIA L. ***46**, Cards.: Llain-fawr, Devil's Bridge, GR 22/71.77. Falcondale, GR 22/57.49. Both A. O. Chater, 1978, **NMW**, det. A. J. Silverside. 1st and 2nd records. ***68**, Cheviot: Linhope, 6km W. of Ingram, GR 36/96.16. Edge of conifer plantation. A. O. Chater, 1979, **BM**, det. A. J. Silverside.

†209/alb. × 1. SPIRAEA ALBA Duroi × S. SALICIFOLIA L. ***46**, Cards.: Rhydcathal, Rhydowen, GR 22/46.47. A. O. Chater & D. G. Jones, 1979, **NMW**, det. A. J. Silverside.

†211/5. RUBUS PARVIFLORUS Nutt. ***57**, Derbys.: near Malthouse Lane, near Wingerworth, GR 43/35.67. M. Robson, 1980, **DBY**, det. A. Newton.

211/11/1. RUBUS NESSENSIS W. Hall ***57**, Derbys.: Repton Shrubs, GR 43/31.23. R. Smith & A. Willmot, 1979, **DBY**, conf. A. Newton.

211/11/27. RUBUS TUBERCULATUS Bab. ***99**, Dunbarton: near Erskine Bridge, Old Kilpatrick, GR 26/46.72. A. Newton, 1980, field record.

211/11/107. RUBUS FAVONII W. C. R. Wats. ***38**, Warks.: Wolford Wood, near Barton-on-the-Heath, GR 42/23.32. B. A. Miles, 1965, field record.

211/11/123. RUBUS CARDIOPHYLLUS Muell. & Lefèv. ***99**, Dunbarton: near Erskine Bridge, Old Kilpatrick, GR 26/46.72. A. McG. Stirling, 1979, **E**, det. A. Newton.

211/11/124. RUBUS DUMNONIENSIS Bab. ***42**, Brecs.: near Penwyllt, GR 22/85.17. M. Porter, 1978, **herb. M.P.,** det. A. Newton.

211/11/165. RUBUS VESTITUS Weihe & Nees ***99**, Dunbarton: near confluence of Dalmuir Burn and R. Clyde, GR 26/47.71. A. Newton, 1980, **E**.

211/11/223. RUBUS FLEXUOSUS Muell. & Lefèv. ***42**, Brecs.: Cwm Giedd, GR 22/78.12. M. Porter, 1978, **herb. M.P.,** det. A. Newton.

211/11/252. RUBUS EURYANTHEMUS W. C. R. Wats. ***57**, Derbys.: Hayfield, GR 43/04.86. R. Smith, 1980, **DBY**, conf. A. Newton.

211/11/301. RUBUS MELANODERIS Focke ***42**, Brecs.: N.E. of Tirabad, GR 22/88.43. M. Porter, 1978, **herb. M.P.,** det. A. Newton.

211/11/315. RUBUS FURVICOLOR Focke ***85**, Fife: 1 mile S.E. of Kilconquhar, GR 37/50.01. G. H. Ballantyne, 1980, **herb. G.H.B.,** conf. A. Newton.

211/11/356. RUBUS DASYPHYLLUS (Rogers) Rogers ***99**, Dunbarton: near Balloch Pier, GR 26/38.82. A. McG. Stirling, 1979, field record. Near confluence of Dalmuir Burn and R. Clyde, GR 26/47.71. A. Newton, 1980, field record. 1st and 2nd records.

211/11/ang. RUBUS ANGLOHIRTUS E. S. Edees ***29**, Cambs.: Warren Hill, near Newmarket, GR 52/66.63. A. L. Bull, 1979, **herb. A.L.B.,** conf. A. Newton.

211/11/gla. RUBUS GLAREOUS Rogers ***42**, Brecs.: Nant Tresglen, GR 22/83.33. M. Porter, 1977, **herb. M.P.,** det. A. Newton.

211/11/ply. RUBUS PLYMENSIS (Focke) Edees & A. Newton ***42**, Brecs.: Aberclydach, GR 32/10.21. M. Porter, 1978, **herb. M.P.,** det. A. Newton.

216/3 × 1. GEUM RIVALE L. × G. URBANUM L. ***52**, Anglesey: Lligwy Wood, GR 23/4.8. C. Aron, 1980, field record, det. W. S. Lacey.

220/3/3. ALCHEMILLA FILICAULIS Buser **93**, N. Aberdeen: Knockespoch, GR 38/55.24. D. Welch, 1980, **ABD**. 2nd record.

†220/3/12. ALCHEMILLA MOLLIS (Buser) Rothm. ***44**, Carms.: Stradey Woods, Llanelli, GR 22/49.01. I. K. Morgan, 1980, field record.

†224/1. ACAENA ANSERINIFOLIA (J. R. & G. Forst.) Druce [***78**, Peebless.: *Watsonia,* **11**: 77 (1976) has been redetermined as *A. inermis.*]

†224/ine. ACAENA INERMIS Hook. f. ***78**, Peebless.: Talla Reservoir, GR 36/10.22. R. C. L. Howitt, 1972, **herb. D. J. McCosh**.

225/1 × 8. ROSA ARVENSIS Huds. × R. CANINA L. ***42**, Brecs.: Aberduhonw, GR 32/05.50. M. Porter, 1979, **herb. M.P.,** det. R. Melville.

225/1 × 12. ROSA ARVENSIS Huds. × R. SHERARDII Davies ***42**, Brecs.: Grwyne Fechan, GR 32/22.25. M. Porter, 1979, **herb. M.P., det. R. Melville.**

225/4 ROSA PIMPINELLIFOLIA L. **38**, Warks.: Lapworth, GR 42/16.71. Hedgerow. M. C. Clark, 1973, field record. 2nd record.

225/4 × 12. ROSA PIMPINELLIFOLIA L. × R. SHERARDII Davies ***42**, Brecs.: Lower Chapel, GR 32/02.35. M. Porter, 1979, **K**, det. R. Melville.

†225/5. ROSA RUGOSA Thunb. ***74**, Wigtowns.: Monreith Bay, GR 25/36.40. Sand dunes. A. J. Silverside & E. H. Jackson, 1977, field record. Ardwell, GR 25/11.45. A. J. Silverside, 1978, field record. 1st and 2nd records.

225/7. ROSA STYLOSA Desv. *42, Brecs.: S. of Builth Wells, GR 32/05.49. M. Porter, 1973, **NMW**, det. I. M. Vaughan.

225/8 × 12. ROSA CANINA L. × R. SHERARDII Davies *52, Anglesey: near Foel, Llangeinwen, GR 23/4.6. R. H. Roberts, 1980, field record.

225/8 × 14. ROSA CANINA L. × R. RUBIGINOSA L. *42, Brecs.: Llansantffraed, GR 32/12.22. M. Porter, 1974, **herb. M.P.**, det. R. Melville.

225/12. ROSA SHERARDII Davies **57**, Derbys.: roadside S.E. of Owler Bar, GR 43/29.77. R. Smith, 1980, **DBY**, det. A. Newton. 2nd record.

225/15 × 12. ROSA MICRANTHA Borrer ex Sm. × R. SHERARDII Davies *42, Brecs.: N. of Llechfaen, GR 32/09.29. M. Porter, 1979, **K**, det. R. Melville. 1st record for British Isles.

225/14. ROSA RUBIGINOSA L. **42**, Brecs.: Llangammarch Wells, GR 22/94.48. M. Porter, 1976, **herb. M.P.** 2nd record.

225/15. ROSA MICRANTHA Borrer ex Sm. **52**, Anglesey: near Carreg Barcud, Llangeinwen, GR 23/4.6. R. H. Roberts, 1980, field record. 2nd record.

225/17. ROSA AGRESTIS Savi *12, N. Hants.: Noar Hill, GR 41/74.31. Warren Farm, GR 41/50.42. Both A. Brewis, 1978, **herb. A.B.**, det. R. Melville. 1st and 2nd records.

†226/7. PRUNUS LAUROCERASUS L. *74, Wigtowns.: 1 km S. of Chapel Rossan, GR 25/10.43. Naturalized at edge of wet birch wood and regenerating freely. A. J. Silverside, 1980, field record. Glenluce, GR 25/20.57. A. J. Silverside, 1980, field record. 1st and 2nd records.

†227/2. COTONEASTER SIMONSII Bak. *70, Cumberland: N. W. of Watermillock, GR 35/42.23. M. G. Coulson, 1977, field record. High Lorton, GR 35/15.26. Field hedge. A. Dudman, 1980, field record. 1st and 2nd records. *74, Wigtowns.: Castle Kennedy, GR 25/10.61. Woodland. A. J. Silverside & E. H. Jackson, 1977, field record. Glenluce, GR 25/20.57. Woodland. A. J. Silverside, 1980, field record. 1st and 2nd records.

232/4/1. SORBUS INTERMEDIA (Ehrh.) Pers. *74, Wigtowns.: Castle Kennedy, GR 25/1.6. O. M. Stewart, 1977, field record.

232/4/5. SORBUS ANGLICA Hedl. *43, Rads.: Craig y Foel, Elan Valley, GR 22/92.64. R. G. Woods, 1980, field record, det. P. D. Sell.

†235/3. SEDUM SPURIUM Bieb. *74, Wigtowns.: Gillespie, GR 25/24.51. Established at top of shingle beach. A. J. Silverside, 1980, field records.

†235/6a. SEDUM ALBUM L. subsp. ALBUM *73, Kirkcudbrights.: West Cluden, GR 25/94.79. O. M. Stewart, 1975, field record. Dundrennan Abbey, GR 25/74.47. J. V. Hall, 1977, field record. 1st and 2nd records. **74**, Wigtowns.:Meikle Galdenoch, GR 15/97.63. Walls of old castle. A. J. Silverside, 1978, field record. 2nd record.

†235/9. SEDUM SEXANGULARE L. *46, Cards.: Bwlchyfadfa, GR 22/43.49. Well-naturalized in graveyard. A. O. Chater, 1980, field record.

†237/hel. CRASSULA HELMSII (T. Kirk) Cockayne *25, E. Suffolk: Felixstowe, GR 62/30.34. Overgrown ornamental pond. E. M. Hyde, 1979, **herb. E.M.H.**, det. E. J. Clement. Barham, GR 62/12.51. Flooded gravel pits. M. A. Hyde, 1980, **herb. M.A.H.**, conf. E. J. Clement.

239/6 × 5. SAXIFRAGA HIRSUTA L. × S. SPATHULARIS Brot. †*61, S.E. Yorks.: Hunmanby, GR 54/09.76. E. Chicken, 1979, **herb. E.C.**, det. D. A. Webb.

†239/7. SAXIFRAGA CYMBALARIA L. **38**, Warks.: Great Alne, GR 42/11.59. J. K. Wheeldon, 1979, field record, det. E. J. Clement. 2nd record.

239/9. SAXIFRAGA GRANULATA L. *107, E. Sutherland: 1 mile N.E. of Golspie, GR 29/83.01. Wooded glen. J. K. Butler, 1978, field record. Golspie golf course, GR 28/82.99. M. J. Marshall, 1979, field record. 1st and 2nd records.

†240/1. Tellima grandiflora (Pursh) Dougl. ex Lindl. **69**, Westmorland: Sockbridge, near Penrith, GR 35/50.26. Waste ground. M. P. G. Tolfree, 1980, field record. 2nd record.

†249/jun. Lythrum junceum Banks & Solander **38**, Warks.: Bedworth, GR 42/35.87. Garden weed. B. Franklin, 1978, **WAR**, det. H. H. Fowkes & E. J. Clement. 2nd record.

250/1. Lythrum portula (L.) D. A. Webb ***74**, Wigtowns.: White Loch, Castle Kennedy, GR 25/10.60. C.S.S.F. Field Meeting, 1977, field record, det. A. J. Silverside.

251/2. Daphne laureola L. **74**, Wigtowns.: Dunskey, GR 25/00.55. Woodland edge. A. J. Silverside, 1980, field record. 2nd record.

†254/6 × 2. Epilobium adenocaulon Hausskn. × E. parviflorum Schreb. *38, Warks.: Emscote, Warwick, GR 42/29.65. J. C. Bowra, 1980, **WAR**, det. T. D. Pennington.

†254/6. Epilobium adenocaulon Hausskn. ***107**, E. Sutherland: Ben a'Bhragaidh, near Golspie, GR 29/81.00. M. J. Marshall, 1979, field record. Bonar Bridge, GR 28/61.91. M. McC. Webster, 1979, field record. 1st and 2nd records.

†254/13. Epilobium brunnescens (Cockayne) Raven & Engelhorn ***12**, N. Hants.: near Longmoor Camp, GR 41/78.30. Damp waste ground. D. H. S. White, 1964, **BM**.

†256/1 × 2. Oenothera biennis L. × O. erythrosepala Borbás ***12**, N. Hants.: Longmoor, GR 41/79.31. Disused railway. A. Brewis, 1980, **herb. A.B.,** det. K. Rostański.

†256/2 × 1. Oenothera erythrosepala Borbás × O. biennis L. ***38**, Warks.: Emscote, Warwick, GR 42/29.65. On waste ground, the site of a demolished power station. J. C. Bowra, 1979, **WAR**, det. K. Rostański.

†256/1 × cam. Oenothera biennis L. × O. cambrica Rostański ***12**, N. Hants.: Woolmer Pond, GR 41/78.32. A. Brewis, 1979, **herb. A.B.,** det. K. Rostański.

†256/cam. × 1. Oenothera cambrica Rostański × O. biennis L. ***38**, Warks.: Emscote, Warwick, GR 42/29.65. J. C. Bowra, 1979, **WAR**, det. K. Rostański.

†256/2 × cam. Oenothera erythrosepala Borbás × O. cambrica Rostański ***12**, N. Hants.: The Slab, Bordon, GR 41/78.35. A. Brewis, 1979, **herb. A.B.,** det. K. Rostański.

†256/cam. × 2. Oenothera cambrica Rostański × O. erythrosepala Borbás ***12**, N. Hants.: outside tank establishment, Hogmoor, GR 41/78.35. A. Brewis, 1979, **herb. A.B.,** det. K. Rostański. ***38**, Warks.: Emscote, Warwick, GR 42/29.65. J. C. Bowra, 1979, **WAR**, det. K. Rostański.

†256/3. Oenothera stricta Ledeb. ***12**, N. Hants.: Farnborough Airfield, GR 41/86.54. A. Mundell, 1980, **herb. A. Brewis**, det. K. Rostański.

†256/per. Oenothera perangusta Gates ***12**, N. Hants.: Aldershot, GR 41/87.51. A. Mundell, 1980, **herb. K. Rostański**.

259/2. Myriophyllum spicatum L. **93**, N. Aberdeen: Loch of Strathbeg, GR 48/06.59. J. Dunbar, 1980, **ABD**. 1st post-1930 record.

262/2. Callitriche platycarpa Kütz. **78**, Peebless.: Williamslee Burn, Leithen Water, GR 36/16.42. D. J. McCosh, 1972, **herb. D.J.McC.,** det. R. W. David. 1st post-1930 record.

262/4. Callitriche hamulata Kütz. ex Koch **78**, Peebless.: R. Tarth at Drochil, GR 36/16.42. D. J. McCosh, 1972, **herb. D.J.McC.,** det. R. W. David. 1st post-1930 record.

†272/ame. Eryngium amethystinum L. ***49**, Caerns.: Llandudno, GR 23/77.81. Sandy ground near a path. E. Phenna, 1980, **herb. E.P.,** det. E. J. Clement. 1st record for British Isles.

285/2 × 3. Apium nodiflorum (L.) Lag. × A. repens (Jacq.) Lag. **29**, Cambs.: Chippenham Fen, GR 52/64.69. S. M. Walters, 1979, in cultivation at University Botanic Garden, Cambridge, conf. T. G. Tutin.

287/1. SISON AMOMUM L. **61**, S.E. Yorks.: 3 miles S. of Patrington, GR 54/32.19. F. E. Crackles, 1980, field record. Only extant record.

291/2. CARUM CARVI L. **70**, Cumberland: Clinthead, Great Corby, GR 35/48.52. Sheep-grazing meadow. M. Smith, 1980, **herb. M.S.** 1st post-1930 record.

297/1. BERULA ERECTA (Huds.) Coville †***99**, Dunbarton: Forth and Clyde Canal, near Maryhill Locks, GR 26/56.69. Known to have been introduced in the canal 3 miles further east in v.c. 77. A. McG. Stirling, 1980, field record.

300/2. OENANTHE PIMPINELLOIDES L. ***25**, E. Suffolk: Ipswich, GR 62/16.42. Rough grassland. E. M. Hyde, 1975, **herb. E.M.H.,** conf. J. E. Lousley. 1st definite record. Brantham, GR 62/11.33. M. A. Hyde, 1979, field record, conf. T. G. Tutin. 2nd record.

306/1. LIGUSTICUM SCOTICUM L. ***76**, Renfrews.: near Wemyss Bay, GR 26/18.70. Anon., 1845, **GL**.

320/14. POLYGONUM MINUS Huds. **76**, Renfrews.: Pilmuir, Newton Mearns, GR 26/51.54. Loch Margin. R. Mackechnie & P. Macpherson, 1975, field record. 1st post-1930 record.

320/16. POLYGONUM DUMETORUM L. ***38**, Warks.: Leek Wootton, near Warwick, GR 42/28.68. Hedgerow by public footpath. J. C. Bowra, 1980, **WAR**, det. R. J. Pankhurst. Billesley, near Stratford, GR 42/14.56. Shrubbery near old farm buildings. J. C. Bowra, 1980, field record. 1st and 2nd records.

†320/20. POLYGONUM SACHALINENSIS F. Schmidt ***40**, Salop: Ironbridge, Benthall Edge Wood, GR 33/67.03. A. P. Conolly & W. Hutton, 1977, **LTR**.

325/1/3. RUMEX TENUIFOLIUS (Wallr.) Löve ***79**, Selkirks.: Over Phawhope, Ettrick, GR 36/18.07. Verge of recent forestry track. R. W. M. Corner, 1977, **herb. R.W.M.C.,** det. D. H. Kent.

325/8 × 12. RUMEX LONGIFOLIUS DC. × R. OBTUSIFOLIUS L. ***79**, Selkirks.: Selkirk sewage works, GR 36/47.30. R. W. M. Corner, 1977, **herb. R.W.M.C.,** det. D. H. Kent.

†325/10. RUMEX PATIENTIA L. ***25**, E. Suffolk: Ipswich, GR 62/1.4. Waste ground. E. M. Hyde, 1980, **herb. E.M.H.,** conf. E. J. Clement.

325/11 × 12. RUMEX CRISPUS L. × R. OBTUSIFOLIUS L. ***79**, Selkirks.: Selkirk sewage works, GR 36/47.30. C.S.S.F. Field Meeting, 1977, **herb. R. W. M. Corner.,** det. D. H. Kent.

325/12 × 14. RUMEX OBTUSIFOLIUS L. × R. SANGUINEUS L. ***99**, Dunbarton: Shore Wood, Aber, Loch Lomond, GR 26/43.88. J. Mitchell & J. M. Cameron, 1980, **E**, conf. A. McG. Stirling. 1st Scottish record.

325/15 × 14. RUMEX CONGLOMERATUS Murr. × R. SANGUINEUS L. ***38**, Warks.: 4 miles S.E. of Nuneaton, GR 42/41.88. Roadside verge. J. T. Williams, 1969, field record.

326/1. PARIETARIA DIFFUSA Mert. & Koch **93**, N. Aberdeen: Tolquhon Castle, GR 38/87.28. D. Welch, 1980, **ABD**. 1st post-1930 record.

329/1. HUMULUS LUPULUS L. ***107**, E. Sutherland: Bonar Bridge, GR 28/61.91. M. McC. Webster, 1979, field record.

336/2. ALNUS INCANA (L.) Moench ***12**, N. Hants.: Farnborough Airfield, GR 41/84.53. Small copse. W. R. B. Hynd, 1980, **herb. A. Brewis**.

343/5. SALIX TRIANDRA L. ***79**, Selkirks.: W. bank of R. Tweed at Yair, GR 36/45.33. B.S.B.I. Field Meeting, 1980, **herb. R. W. M. Corner,** det. R. C. L. Howitt,

343/5 × 9. SALIX TRIANDRA L. × S. VIMINALIS L. ***29**, Cambs.: near Mepal. Ouse Washes, GR 52/43.81. A. C. Leslie, 1980, **herb. A.C.L.,** conf. R. D. Meikle.

343/6 × 9. SALIX PURPUREA L. × S. VIMINALIS L. ***79**, Selkirks.: Clovenford, GR 36/44.36. O. M. Stewart, 1979, **E**, det. R. C. L. Howitt.

†343/8. SALIX ACUTIFOLIA Willd. ***82**, E. Lothian: near Drem, GR 36/51.79. Railway embankment. O. M. Stewart, 1980, **E**, det. R. C. L. Howitt.

343/11 × 9. SALIX CAPREA L. × S. VIMINALIS L. ***80**, Roxburghs.: Galashiels, GR 36/51.35. O. M. Stewart, 1979, **E**, det. R. C. L. Howitt.

343/13 × 16. SALIX AURITA L. × S. REPENS L. ***42**, Brecs.: near Cwmtwrch Uchaf, GR 22/77.11. M. Porter, 1973, **K**, det. R. D. Meikle. ***74**, Wigtowns.: Torrs Warren, GR 25/11.53. A. J. Silverside, 1980, field record.

343/13 × 21. SALIX AURITA L. × S. HERBACEA L. ***99**, Dunbarton: N. side of Doune Hill, Glen Douglas, GR 26/29.98. A. McG. Stirling, 1980, **E**.

343/14. SALIX MYRSINIFOLIA Salisb. ***29**, Cambs.:Fordham Woods, GR 52/63.69. D. R. Donald, 1980, **CGE**, conf. R. D. Meikle. 1st definite record.

343/20. SALIX MYRSINITES L. **99**, Dunbarton: N.W. side of Doune Hill, Glen Douglas, GR 26/29.97. J. Mitchell, 1980, **E**. 2nd record.

343/21. SALIX HERBACEA L. **46**, Cards.: Pumlumon Fawr, GR 22/78.87. R. Meade & I. Smith, 1980, **NMW**. 1st record since 1905.

†351/1. GAULTHERIA SHALLON Pursh ***74**, Wigtowns.: Castle Kennedy, GR 25/11.60. Woodland. C.S.S.F. Field Meeting, 1977, field record.

†352/1. PERNETTYA MUCRONATA (L.f.) Gaudich. ex Spreng. ***74**, Wigtowns.: Castle Kennedy, GR 25/10.61. Woodland margin. A. J. Silverside & E. H. Jackson, 1977, field record.

362/1. MONOTROPA HYPOPITYS L. **38**, Warks.: Moreton Morrell, GR 42/30.55. Conifer plantation. A. W. Brand, 1972, field record. Wilmcote Rough, GR 42/15.57. Under pine trees. J. M. Price, 1974, field record. 1st records since 1848.

†369/1. CYCLAMEN HEDERIFOLIUM Ait. ***46**, Cards.: near Llangybi Common, GR 22/59.55. I. W. Callan, 1977, field record.

370/3. LYSIMACHIA VULGARIS L. **79**, Selkirks.: W. side of R. Tweed, below Ashiesteel Bridge, GR 36/43.35. B.S.B.I. Field Meeting, 1980, field record. 1st localized record.

†370/5. LYSIMACHIA PUNCTATA L. ***74**, Wigtowns.: Newton Stewart, GR 25/41.65. River bank. A. J. Silverside, 1980, field record. Kirkcowan, GR 25/3.6. A. McG. Stirling, 1980, field record. 1st and 2nd records.

371/1 TRIENTALIS EUROPAEA L. **80**, Roxburghs.: E. side of Ninestone Rig, N. of Newcastleton, GR 35/52.97. In ride of young forestry plantation. D. E. Ellis, 1979, field record. 1st record this century.

372/4. ANAGALLIS MINIMA (L.) E. H. L. Krause ***42**, Brecs.: S. of Elan Village, GR 22/9.6. M. Porter, 1974, **NMW**.

375/1. BUDDLEJA DAVIDII Franch. **46**, Cards.: Glandyfi, GR 22/69.96. Railway embankment. A. O. Chater, 1979, field record. 2nd record. ***74**, Wigtowns.: Stranraer, GR 25/05.61. Waste ground. O. M. Stewart, 1979, field record. Old House Point, Cairnryan, GR 25/05.69. A. J. Silverside, 1980, field record. 1st and 2nd records.

†378/2. LIGUSTRUM OVALIFOLIUM Hassk. ***74**, Wigtowns.: Torrs Warren, GR 25/11.53. By pond on military ranges. A. J. Silverside, 1980, field record. Newton Stewart, GR 25/41.65. A. J. Silverside, 1980, field record. 1st and 2nd records.

387/1. NYMPHOIDES PELTATA (S. G. Gmel.) Kuntze **38**, Warks.: Stretton Wharf, GR 42/44.81. Canal. E. G. Webster, 1969, field record. 2nd record.

392/1. SYMPHYTUM OFFICINALE L. **74**, Wigtowns.: Physgill House, GR 25/42.36. Roadside ditch. A. J. Silverside, 1979, **GLAM**. 1st definite record since 1883.

†392/2 × 1. SYMPHYTUM ASPERUM Lepech. × S. OFFICINALE L. *74, Wigtowns.: Gillespie, GR 25/25.51. Coastal stream bank. A. J. Silverside, 1980, **GLAM**. 1st definite record.

†392/2. SYMPHYTUM ASPERUM Lepech. *46, Cards.: Ysbyty Ystwyth, GR 22/73.71. A. O. Chater, 1980, **NMW**.

†399/2. PULMONARIA OFFICINALIS L. *42, Brecs.: Trecastell, GR 22/88.29. R. D. Pryce, 1974, field record.

400/3. MYOSOTIS STOLONIFERA (DC.) Gay ex Leresche & Levier *80, Roxburghs.: E. side of Hazelyside Hill, Newcastleton, GR 35/45.88. R. W. M. Corner, 1980, **herb. R.W.M.C.,** det. A. E. Wade.

400/7. MYOSOTIS SYLVATICA Hoffm. 74, Wigtowns.: Castle Kennedy, GR 25/10.61. Woodland near gardens. A. J. Silverside, 1977, field record. 2nd record, 1st since 1893.

400/8 umb. MYOSOTIS ARVENSIS (L.) Hill subsp. UMBRATA (Rouy) O. Schwartz *76, Renfrews.: Pollock Estate, GR 26/54.61. Woodland. A. J. Silverside, 1979, **herb. A.J.S.**

402/1. MERTENSIA MARITIMA (L.) Gray *50, Denbs.: locality withheld. D. W. Cox, 1979, field record. Extinct in all the other Welsh localities.

†AMSINKIA INTERMEDIA Fischer & C. A. Meyer 80, Roxburghs.: W. of Redden Farm, GR 36/76.36. Field margins. R. W. M. Corner, 1978, **herb. R.W.M.C.,** det. H. J. M. Bowen. 1st record away from wool shoddy areas of Gala Foot.

403/1. ECHIUM VULGARE L. 99, Dunbarton: Dalreoch, Dumbarton, GR 26/38.76. Waste heaps in disused quarry. A. McG. Stirling, 1980, field record. 2nd and only recent record.

†408/1. NICANDRA PHYSALODES (L.) Gaertn. 38, Warks.: Harbury, GR 42/37.59. H. A. Hill, 1973, **WAR**. 2nd record.

†413/3 × 4. SOLANUM NIGRUM L. × S. SARRACHOIDES Sendtn. *26, W. Suffolk: Eriswell, GR 52/72.77. Market garden. A. C. Leslie, 1980, **CGE**.

†LYCOPERSICON ESCULENTUM Mill. *35, Mons.: Newport, GR 31/30.85. Rubbish tip. T. G. Evans, 1973, field record.

†423/2. CYMBALARIA PALLIDA (Ten.) Wettst. *70, Cumberland: Sandwith, GR 25/99.15. Loweswater, GR 35/11.22. Both growing on walls, C. C. Haworth, 1979, **herb. C.C.H.** 1st and 2nd records.

424/3. SCROPHULARIA UMBROSA Dumort. 74, Wigtowns.: Milton, GR 25/21.54. A. J. Silverside, 1980, field record. 2nd record.

†428/1. ERINUS ALPINUS L. *40, Salop: Oakhurst, Oswestry, GR 33/28.31. Naturalized on an old wall. M. Wainwright & E. D. Pugh, 1979, field record.

†430/11. VERONICA REPENS Clarion ex DC. *85, Fife: Gibliston House, GR 37/49.04. Lawn. G. H. Ballantyne, 1980, field record.

†430/14. VERONICA PEREGRINA L. *76, Renfrews.: Newlands, Glasgow, GR 26/57.60. Garden weed. P. Macpherson, 1972, **herb. P.M.,** det. J. E. Lousley. Finlaystone House, GR 26/36.73. A. J. Silverside, 1975, **E**. 1st and 2nd records.

430/sub. VERONICA SUBLOBATA M. Fischer *74, Wigtowns.: Kidsdale, above Port Castle Bay, GR 25/43.36. Woodland bank. A. J. Silverside 1979, **GLAM**. Wigtown, GR 25/43.55. Garden weed. A. J. Silverside, 1980, field record. 1st and 2nd records. *76, Renfrews.: Finlaystone Estate, GR 26/36.73. Woodland path. A. J. Silverside, 1975, field record. 1st definite record.

435/1/1. EUPHRASIA MICRANTHA Reichb. 12, N. Hants.: Longmoor Airstrip, GR 41/80.31. F. Rose, 1979, **herb. A. Brewis**. 1st record since 1875.

†439/2. LATHRAEA CLANDESTINA L. *74, Wigtowns.: White Loch of Myrton, GR 25/35.43. H. A. Lang, 1979, field record.

442/1. UTRICULARIA VULGARIS L. *45, Pembs.: Dowrog, GR 12/76.26. R. Meade, 1979, field record. Waun Llechell, GR 12/78.26. I. R. Smith, 1979, field record. 1st and 2nd records.

445/2. MENTHA PULEGIUM L. 12, N. Hants.: Cove, GR 41/83.55. Sandy lay-by in heathland. A. Wheedon, 1977, **herb. A. Brewis**, det. F. Rose. 1st record since 1904.

†459/1. STACHYS ANNUA (L.) L. *35, Mons.: Newport, GR 31/30.85. Rubbish tip. T. G. Evans, 1980, **herb. T.G.E.**

461/1. LAMIASTRUM GALEOBDOLON (L.) Ehrend. & Polatschek 70, Cumberland: Torpenhow, GR 35/22.39. Streamside bank. R. Bennett, 1980, **herb. R.B.** Only extant record.

462/2. LAMIUM MOLUCCELLIFOLIUM Fr. †*47, Monts.: Coed-y-dinas Farm, Welshpool, GR 33/22.05. Arable field. C. A. Small, 1980, **NMW**.

465/5. GALEOPSIS SPECIOSA Mill. *12, N. Hants.: Winchester Railway Station, GR 41/47.29. D. E. Allen, 1978, field record.

474/1. WAHLENBERGIA HEDERACEA (L.) Reichb. 12, N. Hants.: Tweseldown Water Catchment Area, GR 41/82.50. A. R. Mundell, 1977, field record. 2nd extant record. 66, Co. Durham: Stanhope, GR 35/98.42. J. T. B. Bowman, 1953, **SUN**. 2nd record.

†475/3. CAMPANULA RAPUNCULOIDES L. 73, Kirkcudbrights.: West Cluden, GR 25/93.79. Naturalized on banks of Cluden Water. O. M. Stewart, 1974, field record. 1st post-1930 record.

475/6. CAMPANULA GLOMERATA L. †*43, Rads.: Dolyhir, GR 32/24.58. A. C. Powell, 1980, **NMW**.

475/8. CAMPANULA PATULA L. 12, N. Hants.: Standford, GR 41/81.34. Edge of lawn in forest area. P. Simmonds, 1979, field record, det. F. Rose. 1st record since 1889.

†487/3. SAMBUCUS RACEMOSA L. *107, E. Sutherland: 1 mile N.E. of Golspie, GR 29/83.01. Wooded glen. J. K. Butler, 1978, **E**, det. D. McClintock.

488/3. VIBURNUM OPULUS L. 93, N. Aberdeen: Fetterletter, 4km E. of Fyvie, GR 38/80.38. D. Welch, 1980, **ABD**. 1st post-1930 record.

†506/4 × 7. SENECIO SQUALIDUS L. × S. VISCOSUS L. *57, Derbys.: Markland Grips, GR 43/50.75. Disused railway track. R. Smith, 1980, **DBY**.

†512/1. INULA HELENIUM L. *26, W. Suffolk: Stanstead, GR 52/84.50. K. T. Brown, 1980, field record, conf. E. Milne-Redhead. 1st definite record.

514/2. FILAGO LUTESCENS Jord. 12, N. Hants.: Broomshurst Farm, GR 41/81.56. A. Brewis, 1980, **herb. A.B.** Only extant record.

†516/1. ANAPHALIS MARGARITACEA (L.) Benth. *73, Kirkcudbrights.: Port Ling, GR 25/88.53. Washed away by sea in 1974. O. M. Stewart, 1970, field record. E. of Colvend, GR 25/87.54. Roadside verge. O. M. Stewart, 1980, field record. 1st and 2nd records.

518/2. SOLIDAGO CANADENSIS L. *74, Wigtowns.: Newton Stewart, GR 25/41.65. A. J. Silverside, 1980, field record.

†522/1. CONYZA CANADENSIS (L.) Cronq. 85, Fife: 1 mile S. of Blairhall, near Dunfermline, GR 26/99.88. J. Roper-Lindsay, 1980, field record. 1st post-1930 record.

†522/bon. CONYZA BONARIENSIS (L.) Cronq. *35, Mons.: Newport Docks, GR 31/31.86. A. L. Grenfell & T. G. Evans, 1980, **NMW**, det. E. J. Clement.

532/1. MATRICARIA RECUTITA L. 73, Kirkcudbrights.: W. of Barlay, GR 25/68.77. O. M. Stewart, 1980, field record. 2nd record.

†533/3. CHRYSANTHEMUM MAXIMUM Ramond *69, Westmorland: Mansriggs, Ulverston, GR 34/28.80. Well-established far from houses. J. Adams, 1980, field record.

†535/2. ARTEMISIA VERLOTIORUM Lamotte *25, E. Suffolk: Wherstead, GR 62/16.41. Waste ground by R. Orwell. E. M. Hyde, 1975, **herb. E.M.H.** Ipswich, GR 62/18.45. F. W. Simpson, 1976, field record, det. E. J. Clement. 1st and 2nd records.

535/7. ARTEMISIA MARITIMA L. **73**, Kirkcudbrights.: Ravenshall, GR 25/53.52. O. M. Stewart, 1980, field record. 2nd extant record, rediscovery of 1880 site.

†536/1. ECHINOPS SPHAEROCEPHALUS L. *35, Mons.: Gilwern, GR 32/24.14. Hedgerow. R. Hewitt, 1978, field record.

538/1. ARCTIUM LAPPA L. *42, Brecs.: Llansantfraed, GR 32/11.24. M. Porter, 1972 **NMW** Scethog, GR 32/10.25. R. G. Woods, 1980, field record. 1st and 2nd records.

538/3. ARCTIUM PUBENS Bab. *73, Kirkcudbrights.: Creetown, GR 25/47.58. Waste ground. O. M. Stewart, 1978, **E**, det. F. H. Perring. Kirkdale, GR 35/50.53. Field edge. O. M. Stewart, 1980, field record. 1st and 2nd records.

540/4 × 3. CIRSIUM ARVENSE (L.) Scop. × C. PALUSTRE (L.) Scop. *48, Merioneth: Arthog, GR 23/6.1. P. M. Benoit, 1971, **NMW**.

†544/10. CENTAUREA SOLSTITIALIS L. **38**, Warks.: Exhall, near Coventry, GR 42/34.85. N. B. Edmunds, 1979, field record. 2nd record.

549/2. HYPOCHOERIS GLABRA L. *74, Wigtowns.: N.E. end of Torrs Warren, near Ringdoo Point, GR 25/16.55. Fixed dune. A. McG. Stirling, 1980, **E**.

552/1b. TRAGOPOGON PRATENSIS L. subsp. MINOR (Mill.) Wahlenb. **107**, E. Sutherland: Drumlea Farm, Bonar Bridge, GR 28/60.92. M. McC. Webster, 1979, **E**. 2nd record.

†552/2. TRAGOPOGON PORRIFOLIUS L. **38**, Warks.: Coventry, GR 42/32.83. J. Robbins, 1979, field record. 2nd record.

†557/3. CICERBITA MACROPHYLLA (Willd.) Wallr. *93, N. Aberdeen: Rothienorman, GR 38/72.35. D. Welch, 1980, **ABD**.

558/1/gla. HIERACIUM GLANDULIDENS P. D. Sell & C. West *107, E. Sutherland: Migdale, GR 28/64.90. M. McC. Webster, 1979, **E**, det. P. D. Sell & C. West.

558/2 eur. HIERACIUM PILOSELLA subsp. EURONOTUM Naegeli & Peter *99, Dumbarton: Overtoun Burn, Kilpatrick Hills, GR 26/4.7. A. McG Stirling, 1980, **E.**

562/1 LURONIUM NATANS (L.) Raf. *85, Fife: $\frac{1}{4}$ mile E. of Kinneddar Bridge, Saline, GR 36/02.91. G. H. Ballantyne, 1980, field record.

†570/2. ELODEA ERNSTIAE St John *42, Brecs.: Llangattock, GR 32/20.17. M. Porter & R. G. Woods, 1980, **herb. M.P.,** det. D. A. Simpson. 1st Welsh record.

570/3. ELODEA NUTTALLII (Planch.) St John *59, S. Lancs.: Hollingsworth Lake, GR 34/94.17. J. P. C. Harding. Leeds-Liverpool canal near Netherton, GR 33/36.94. S. H. Taylor. Both 1979, **herb. D. A. Simpson**. 1st two of several records.

576/1. ZOSTERA MARINA L. **74**, Wigtowns.: Baldoon Sands, GR 25/45.52. P. Hopkins, 1979, field record. 2nd record.

557/5. POTAMOGETON LUCENS L. **79**, Selkirks.: Hare Moss Pond, Selkirk, GR 36/46.25. R. Stokoe, 1980, **herb. R.S. & R.W.M. Corner**. Only extant locality.

577/6. POTAMOGETON GRAMINEUS L. **93**, N. Aberdeen: Loch of Strathbeg, GR 48/06.59. B. Gerrie, 1978, **ABD**. 1st post-1930 record.

577/13. POTAMOGETON PUSILLUS L. **93**, N. Aberdeen: Pitfour, GR 38/97.48. B. Gerrie, 1978, **ABD**. 1st post-1930 record.

557/15. POTAMOGETON BERCHTOLDII Fieb. ***93**, N. Aberdeen: Witch Hill, 3 km S. of Fraserburgh, GR 38/98.63. B. Gerrie, 1978, **ABD**.

578/1. GROENLANDIA DENSA (L.) Fourr. **38**, Warks.: Marston Doles, near Priors Marston, GR 42/46.59. Canal arm. D. Jeffray, 1977, field record. 2nd record.

580/1. ZANNICHELLIA PALUSTRIS L. **45**, Pembs.: Milton, GR 22/04.02. Reservoir. S. B. Evans, 1979, **NMW**. 2nd record this century. **93**, N. Aberdeen: Loch of Strathbeg, GR 48/06.59. D. Welch, 1980, **ABD**. 1st post-1930 record.

594/1. FRITILLARIA MELEAGRIS L. †**38**, Warks.: Leamington Spa, GR 42/31.65. River bank. M. J. Perryman, 1979, field record. 1st record since 1879.

†595/1. TULIPA SYLVESTRIS L. **38**, Warks.: Stoney Thorpe Estate, GR 42/40.62. Rough grassland. C. Hawkins, 1975, field record. Moathouse Farm, Shustoke, GR 42/23.90. Naturalized since at least 1927. B. Daulman, 1980, **WAR**. Only extant records.

†598/2. ORNITHOGALUM NUTANS L. **38**, Warks.: Alderminster, GR 42/23.48. Churchyard. J. M. Turner, 1979, field record. 2nd record.

605/5. JUNCUS GERARDII Lois. **93**, N. Aberdeen: Strathbeg, GR 48/07.59. Saltmarsh. D. Welch, 1980, **ABD**. 2nd record.

605/9 × 8. JUNCUS EFFUSUS L. × J. INFLEXUS L. ***70**, Cumberland: Lillyhall, GR 35/00.24. C. C. Haworth, 1980, **herb. C.C.H.,** det. C. A. Stace.

605/12. JUNCUS FILIFORMIS L. ***49**, Caerns.: near Dolgarrog, GR 23/7.6. Lakeside. T. H. Blackstock, 1980, **NMW**.

605/17. JUNCUS SUBNODULOSUS Schrank **57**, Derbys.: by Bradley Brook, GR 43/23.43. D. B. Wheeler, 1980, **DBY**. 2nd extant record.

605/18 × 19. JUNCTUS ACUTIFLORUS Ehrh. ex Hoffm. × J. ARTICULATUS L. ***69**, Westmorland: Gillside, Glenridding, GR 35/37.16. G. Halliday, 1980, **LANC**, det. C. A. Stace.

†605/amb. JUNCUS AMBIGUUS Guss. ***70**, Cumberland: N. side of R. Esk, Muncaster, GR 35/11.96. Saltmarsh. C. C. Haworth, 1979, **herb. C.C.H.,** det. C. A. Stace.

605/fol. JUNCUS FOLIOSUS Desf. ***74**, Wigtowns.: Grennan Plantation, GR 25/12.39. Glenluce, GR 25/1.5. Both A. J. Silverside, 1980, **herb. A.J.S.,** det. T. A. Cope. 1st and 2nd records.

†614/6. NARCISSUS MAJALIS Curt. **74**, Wigtowns.: Boreland, GR 25/35.58. Damp riverside pasture. A. J. Silverside, 1980, field record. 2nd record.

†615/mon. SISYRINCHIUM MONTANUM E. L. Greene subsp. CREBRUM Fernald ***76**, Renfrews.: Williamwood, GR 26/56.58. By railway lines. P. Macpherson, 1976, **herb. P.M.** and **E. J. Clement**, det. E.J.C.

625/4. EPIPACTIS LEPTOCHILA (Godfrey) Godfrey ***40**, Salop: Wenlock Edge, GR 32/58.97. E. A. Ashwell, 1978, field record, det. J. T. H. Knight.

627/1. SPIRANTHES SPIRALIS (L.) Chevall. †**38**, Warks.: Rugby, GR 42/50.75. Garden lawn, Rugby School. J. Baiss, 1976, field record. 1st record since 1873.

628/2. LISTERA CORDATA (L.) R. Br. **74**, Wigtowns.: Torrs Warren, GR 25/11.53. Dune slack. A. J. Silverside, 1980, field record. 1st record since 1890.

630/1. GOODYERA REPENS (L.) R.Br. ***69**, Westmorland: Whinfell Forest, GR 35/57.27. Open pine plantation. D. J. Clarke, 1978, **GLE**. Cliburn Moss, GR 35/57.25. A. Wilson, 1979, field record. 1st and 2nd records.

631/1. HAMMARBYA PALUDOSA (L.) Kuntze **42**, Brecs.: N.W. of Llanwrthwl, GR 22/9.6. M. Porter & R. G. Woods, 1980, field record. 2nd record. **49**, Caerns.: Cors Gyfelog, GR 23/45.48. J. Ratcliffe & T. H. Blackstock, 1980, field record. 2nd record this century.

633/1. CORALLORHIZA TRIFIDA Chatel. ***93**, N. Aberdeen: Loch of Strathbeg, GR 48/0.5. J. Dunbar, 1979, field record. Moss of Kennethmont, GR 38/52.29. D. Welch, 1980, **ABD**. 1st and 2nd records. ***107**, E. Sutherland: Mound Alder Woods, GR 28/76.98. M. J. Marshall, 1979, field record.

637/1. PSEUDORCHIS ALBIDA (L.) Á. & D. Löve **74**, Wigtowns.: Drumnabrennan, 4 miles N.W. of Kirkcowan, GR 25/29.66. H. A. Lang, 1979, field record. 1st record since 1895.

643/2b. × 636/1a. DACTYLORHIZA MACULATA (L.) Soó subsp. ERICETORUM (E. F. Linton) Hunt & Summerh. × GYMNADENIA CONOPSEA (L.) R.Br. subsp. CONOPSEA **74**, Wigtowns.: Drumnabrennan, 4 miles N.W. of Kirkcowan, GR 25/29.66. H. A. Lang, 1979, **E**.

543/5. DACTYLORHIZA PURPURELLA (T. & T. A. Stephenson) Soó ***93**, N. Aberdeen: Moss of Kennethmont, GR 38/53.28. D. Welch, 1980, **ABD**.

643/7. DACTYLORHIZA TRAUNSTEINERI (Sauter) Vermeul. ***66**, Co. Durham: Blackhall Rocks, GR 45/4.3. M. Lowe, 1979, field record, conf. R. H. Roberts. 1st definite record.

645/1. ANACAMPTIS PYRAMIDALIS (L.) Rich. **70**, Cumberland: Maryport, GR 35/0.3. E. H. Shackleton, 1980, field record. 2nd extant record. **85**, Fife: Fife coast, GR 37/—·—· S. Leach, 1980, field record. 1st record for 100 years.

†646/1. ACORUS CALAMUS L. ***45**, Pembs.: Bosherston, GR 11/97.95. Lake. J. M. Baker, 1980, field record.

†648/1. LYSICHITON AMERICANUS Hultén & St John ***74**, Wigtowns.: White Loch of Myrton, GR 25/35.42. Abundantly naturalized in wet woodland. H. A. Lang, 1979, field record, det. A. J. Silverside.

650/4. LEMNA GIBBA L. ***42**, Brecs.: Llangorse Lake, GR 32/12.26. M. Porter, 1973, **NMW**.

†650/minus. LEMNA MINUSCULA Herter ***29**, Cambs.: Sheeps Green, Cambridge, GR 52/44.57. Ditch. E. Landolt, 1977, in *Ber. Geobot. Inst. Rübel (Zurich)*, **46**: 87 (1979). S. M. Walters, 1980, in cultivation at University Botanic Gardens, Cambridge. 1st British record.

655/4. SCIRPUS SYLVATICUS L. ***46**, Cards.: R. Teifi, E. of Cil-y-blaid, GR 22/54.46. Llanfihangel-ar-arth, GR 22/45.40. Both N. T. H. Holmes, 1978, field records. 1st and 2nd records. **61**, S.E. Yorks.: Fulford Ings, GR 44/60.49. E. Bray, 1979, field record. 2nd record.

655/9. SCIRPUS TABERNAEMONTANI C. C. Gmel. **93**, N. Aberdeen: Loch of Strathbeg, GR 48/06.59. J. Dunbar, 1980, **ABD**. 1st post-1930 record.

663/7. CAREX LEPIDOCARPA Tausch. **74**, Wigtowns.: Dowalton Loch, GR 25/4.4. Scottish Wildlife Trust Survey, 1970, field record. 2nd record.

663/11. CAREX EXTENSA Gooden. ***76**, Renfrews.: Cardwell, between Cloch and Inverkip, GR 26/20.74. Saltmarsh turf. A. McG. Stirling, 1979, field record.

663/20. CAREX RIPARIA Curt. ***80**, Roxburghs.: Hoselaw Loch, GR 36/80.31. M. E. Braithwaite, 1980, **herb. R.W.M. Corner**. **93**, N. Aberdeen: Water of Philorth, Fraserburgh, GR 48/02.64. D. Welch, 1980, **ABD**, det. A. C. Jermy. 1st record since 1901, refound at same locality. ***111**, Orkney: Rothiesholm, Stronsay, GR 57/62.24. J. Cadbury, 1979, **E**. 1st definite record.

663/47 × 21. CAREX ACUTA L. × C. ACUTIFORMIS Ehrh. ***49**, Caerns.: Afon Soch, GR 23/28.27. A. P. Conolly, 1979, **herb. A.P.C.,** det. A. O. Chater, A. C. Jermy & R. W. David.

663/33. CAREX LASIOCARPA Ehrh. **46**, Cards.: Tregaron Bog, GR 22/69.64. J. P. Savidge, 1980, field record. 2nd record.

663/46 × 50. Carex elata All. × C. nigra (L.) Reichard *52, Anglesey: Cors y Farl, near Talwrn, GR 23/48.77. Calcareous fen. P. M. Benoit, 1980, **NMW**.

663/47. Carex acuta L. *79, Selkirks.: R. Ettrick, below Ovenscloss, Selkirk, GR 36/47.30. R. W. M. Corner, 1979, **herb. R.W.M.C.**

663/48. Carex aquatilis Wahlenb. **93**, N. Aberdeen: Esslemont, GR 38/93.30. Swamp by R. Ythan. D. Welch, 1979, **ABD**, det. A. C. Jermy. 1st post-1930 record.

663/72 × 54. Carex curta Gooden. × C. paniculata L. *42, Brecs.: Colbren Junction, GR 22/85.10. A. Ley, 1899, **BIRM**, det. A. O. Chater, A. C. Jermy & R. W. David.

663/56. Carex diandra Schrank *67, S. Northumb.: Crag Lough, GR 35/76.68. A. D. Ford & A. J. Richards, 1980, **herb. A.J.R.**

†663/59. Carex vulpinoidea Michx *76, Renfrews.: near Williamwood Station, Glasgow, GR 26/56.58. Waste ground. A. McG. Stirling, 1980, **BM**, **E.** 1st Scottish record.

663/68. Carex muricata L. subsp. muricata **50**, Denbs.: near Minera, GR 33/2.5. Hazel scrub. A. Newton, 1978, **BM**, **CGE**, **NMW**, det. R. W. David. 1st record since 1840, rediscovery at same locality.

669/4. Glyceria maxima (Hartm.) Holmberg **78**, Peebless.: Dawyck Mill, Stobo, GR 36/17.36. Shallow ditch near R. Tweed. D. J. McCosh, 1980, field record. 2nd record.

670/2. Festuca arundinacea Schreb. **107**, E. Sutherland: Bonar Bridge, GR 28/61.91. M. McC. Webster, 1979, field record. 2nd record.

†670/5. Festuca heterophylla Lam. **38**, Warks.: Edgbaston, GR 42/04.84. Garden weed. J. Fremlin, 1975, field record. 2nd record.

670/6d. Festuca rubra L. subsp. megastachys Gaud. *76, Renfrews.: Williamwood, Glasgow, GR 26/56.58. Near railway line. P. Macpherson, 1978, **herb. P.M.**, det. C. E. Hubbard.

†671/2 × 1. Lolium multiflorum Lam. × L. perenne L. *74, Wigtowns.: Stranraer Docks, GR 25/06.60. A. J. Silverside, 1980, **GLAM**.

673/2. Puccinellia distans (L.) Parl. **38**, Warks.: Meriden, GR 42/20.82. Road verge, J. S. Badmin, 1980, **WAR**. 2nd record.

†676/14. Poa palustris L. **73**, Kirkcudbrights.: Tongland, GR 25/69.53. O. M. Stewart, 1980, **E**. 1st post-1930 record. *77, Lanarks.: Queen's Dock, Glasgow, GR 26/57.65. P. Macpherson, 1980, **herb. P.M.**, det. A.McG. Stirling.

†676/15. Poa chaixii Vill. **79**, Selkirks.: side of Upper Loch, Bowhill, GR 36/42.27. C.S.S.F. Field Meeting, 1977, **herb. R.W.M. Corner**. 1st localized record. **80**, Roxburghs.: Perch Pond Wood, Kerswood, Monteviot, GR 36/64.26. C. O. Badenoch, 1974, **herb. R.W.M. Corner**. 1st post-1930 record.

†683/4. Bromus inermis Leyss. **70**, Cumberland: S.W. of Low King Hills, Spadeadam, GR 35/61.72. G. Halliday, 1979, **LANC**, det. P. Smith. 2nd record.

†683/7. Bromus diandrus Roth *82, E. Lothian: Port Seton, GR 36/42.75. O. M. Stewart, 1979, **E**.

†683/20. Bromus unioloides Kunth **38**, Warks.: Leamington Spa, GR 42/31.65. Rough grassland in park. J. C. Bowra, 1978, **WAR**, det. C. E. Hubbard. 2nd record.

685/5 × 3. Agropyron junceiforme (Á & D. Löve) Á & D. Löve × A. repens (L). Beauv. *74, Wigtowns.: Innerwell Port, GR 25/48.49. O. M. Stewart, 1972, **E**, det. C. E. Hubbard.

687/jub. Hordeum jubatum L. *12, N. Hants.: Aldershot, GR 41/88.52. T. Dove, 1979, **herb. A. Brewis**, det. E. J. Clement. *35, Mons.: Brynmawr, GR 32/12.17. Roadside verge. T. G. Evans &

A. Titchen, 1980, **herb. T.G.E.** **38**, Warks.: Mancetter, near Atherstone, GR 42/32.97. M. Daulman, 1974, field record. 2nd record. **70**, Cumberland: Silloth, GR 25/99.30. C. C. Haworth & A. Mitchell, 1980, field record. 2nd of several records.

†690/1. GAUDINIA FRAGILIS (L.) Beauv. ***9**, Dorset: Chickerell, GR 30/64.80. Old, damp pasture. H. J. M. Bowen, 1980, field record.

693/2. HELICTOTRICHON PUBESCENS (Huds.) Pilg. ***93**, N. Aberdeen: Cruden Bay, GR 48/08.35. Sand dunes. D. Welch, 1980, **ABD**.

700/1. CALAMAGROSTIS EPIGEJOS (L.) Roth [***78**, Peebless.: *Watsonia,* **13**: 146 (1980), has been redetermined as *C. canescens.*]

700/2. CALAMAGROSTIS CANESCENS (Weber) Roth ***78**, Peebless.: St Mary's Loch, Cappercleuch, GR 36/24.22. R. C. L. Howitt, 1972, **herb. D.J.McCosh**. 1978, **herb. D.J.McC.,** det. F. E. Crackles. ***80**, Roxburghs.: 1·5km S of Newcastleton, GR 35/47.85. R. W. M. Corner, 1980, **herb. R.W.M.C.,** det. F. E. Crackles.

701/2b. AGROSTIS CANINA L. subsp. MONTANA (Hartm.) Hartm. ***74**, Wigtowns.: Castle Kennedy, GR 25/1.6. A. J. Silverside, 1977, field record.

701/4. AGROSTIS GIGANTEA Roth ***42**, Brecs.: Llandefalle, GR 32/11.35. M. Porter, 1973, **NMW**, det. C. E. Hubbard. ***74**, Wigtowns.: Drummore, GR 25/14.36. A. J. Silverside & E. Wedderburn, 1980, **GLAM**. Glenluce, GR 25/19.57. A. J. Silverside, 1980, field record. 1st and 2nd records.

†701/7. AGROSTIS SCABRA Willd. ***35**, Mons.: Newport Docks, GR 31/31.86. Railway ballast. T. G. Evans, J. Curtis & A. L. Grenfell, 1980, **herb. T.G.E.** ***61**, S.E. Yorks.: West Hull, GR 54/05.29. Disused railway sidings. F. E. Crackles, 1978, **herb. F.E.C.,** det. C. E. Hubbard. ***76**, Renfrews.: Govan Docks, GR 26/57.64. A. J. Silverside & C. Tavendale, 1977, **E**.

†701/8. POLYPOGON VIRIDIS (Gouan) Breistr. ***35**, Mons.: Newport, GR 31/30.85. Rubbish tip. T. G. Evans, 1980, **NMW**, conf. E. J. Clement.

702/1. APERA SPICA-VENTI (L.) Beauv. **38**, Warks.: Brandon Marsh, near Coventry, GR 42/38.76. Waste ground. P. Keats, 1978, field record, det. F. H. Perring. Only extant record.

709/1. MILIUM EFFUSUM L. **74**, Wigtowns.: Glenluce, GR 25/19.57. A. J. Silverside, 1980, field record. 2nd record, 1st since 1896.

711/1. HIEROCHLOE ODORATA (L.) Beauv. ***111**, Orkney: Orkney, GR 57/4.1. E. R. Bullard, 1980, field record.

†713/aqu. PHALARIS AQUATICA L. ***29**, Cambs.: Wood Ditton, GR 52/64.58. Field margin, originally introduced with pheasant food. P. J. O. Trist, 1977, **herb. P.J.O.T.** Linton, GR 52/54.44. A. C. Leslie, 1980, **herb. A.C.L.,** det. E. J. Clement. 1st and 2nd records.

†719/cil. DIGITARIA CILIARIS (Retz.) Koel. ***35**, Mons.: Newport, GR 31/30.85. Rubbish tip. T. G. Evans, C. Titcombe & A. L. Grenfell, 1980, **herb. T.G.E.**

†720/2. SETARIA VERTICILLATA (L.) Beauv. ***35**, Mons.: Newport, GR 31/30.85. Rubbish tip. T. G. Evans, A. L. Grenfell & C. Titcombe, 1980, **herb. T.G.E.** **38**, Warks.: Birmingham, GR 42/07.86. M. J. Pearman, 1973, field record. 2nd record.

†720/3. SETARIA LUTESCENS (Weigel) Hubbard **38**, Warks.: Winterbourne, Birmingham, GR 42/04.83. D. Astley, 1973, field record, det. C. E. Hubbard. 2nd record.

†720/gen. SETARIA GENICULATA (L.) Beauv. ***35**, Mons.: Newport, GR 31/30.85. Rubbish tip. T. G. Evans, A. L. Grenfell & C. Titcombe, 1980, **herb. T.G.E.**

Book Reviews

The Northwest European pollen Flora, II. Edited by W. Punt and G. C. S. Clarke. Pp. vi + 265, with 107 black & white plates. Elsevier Scientific Publishing Company, Amsterdam, Oxford and New York, 1980. Price Dfl. 130·00, US $63·50.

This second volume of the *Northwest European pollen Flora* contains accounts of 13 families, the Saxifragaceae *sensu lato* being treated as five families. Each account has previously been published in volumes 23, 24, 26 or 28 of the *Review of Palaeobotany and Palynology*, and this is the last time that a hard-backed collection of papers will be published. In future, entire editions of the *Review* will be devoted to the *Pollen Flora* when sufficient material has accrued. This method of publication will, one hopes, reduce the cost of the *Flora* and, by gathering them together, make the accounts in the *Review* more useful. However, it is a pity that the bound editions will cease, since the *Flora* is intended primarily to be a much-used laboratory reference book. In this respect the *Flora* resembles Erdtman, Praglowski & Nilsson's *Introduction to a Scandinavian pollen Flora*, except that it aims to cover all species within a wider geographical area and has many more illustrations, including electron micrographs. The quality of the micrographs is generally excellent, although some of the higher magnification scanning electron micrographs of Hydrangeaceae and Saxifragaceae are much too dark to be useful. The editorial policy is to standardize the magnifications of the micrographs; but, as they point out in the Preface, this has not been done in this volume. Thus it is necessary to refer to the captions, which are not always in the same place in each account, to find the magnifications. This might have been avoided by the use of scale lines. Whilst standardizing the size of micrographs increases the consistency of various authors accounts, there are disadvantages. The small pollen grains of some Boraginaceae or Saxifragaceae are reproduced at rather too small a size. Larger grains may be difficult to fit on to plates, and this may account for the unusual sequence of numbering on some plates, notably those of Solanaceae pollen. Each account includes a note on terminology which defines less commonly used or ambiguous terms or, less helpfully, refers to a definition in another work. Ideally reference to representative plates in the *Flora* which illustrate each term should be given, and this has been done for the Boraginaceae. On the whole the *Flora* achieves a very high standard and, as successive parts appear, will undoubtedly become an important reference book both for pollen analysts working in Europe and for plant taxonomists.

S. Blackmore

A guide to the naming of plants. 2nd edition. David McClintock. Pp. iv + 37. Heather Society, Leicester. 1980. Price £2·50.

This is a revised and up-dated edition of a booklet published in 1969, mainly for members of the Heather Society but certainly with a wider potential audience. Its author is a former President of the B.S.B.I., a life-long ardent field botanist with a particular interest in cultivated plants, naturalized aliens, and heathers. The first 15 pages provide a lay-man's guide to the different ranks recognized in botanical classification, to the rudiments of botanical nomenclature, and to the rudiments of cultivar nomenclature. Pages 16 to 24 provide a species-by-species commentary on the Latin names of those heathers (*Erica* and other genera of Ericaceae with a similar habit) which are native of the northern hemisphere and hardy in Britain. Pages 25 to 29 provide a commentary on cultivar names of heathers cultivated in Britain.

The first part will have the widest appeal, and can be well recommended for anybody with an interest in plants but no knowledge of the intricacies of their nomenclature. It can probably be read and digested in under an hour, and will answer simply but clearly most of the questions which the beginner in field botany or horticulture is likely to ask himself about plant names. Definition of the various botanical ranks is something which has taxed the ingenuity of generations of botanists, and, still, widely differing views will be found, but the first few pages of this booklet will give the beginner a reasonable appreciation of the subject, even though the attempted definition of a species could probably apply to anything from variety up to order. Care has been taken to present the basic rulings of the *International Code of Botanical Nomenclature* accurately and up-to-date; if the purist might protest at the failure to distinguish between acceptability, validity and legitimacy of names these are not issues which affect the beginner. The middle section of the booklet contains some interesting historical notes, including reasons for the changing of the name of the Irish Heath from *Erica mediterranea* via *E. hibernica* to *E. erigena*, and of Praeger's Heath from *E.* × *praegeri* to *E.* × *stuartii.*

R. K. BRUMMITT

Excursion Flora of the British Isles, 3rd ed. A. R. Clapham, T. G. Tutin & E. F. Warburg. Pp. xxxiii + 499. Cambridge University Press, Cambridge. 1981. Price £12·50.

The publication of a new edition of a standard work usually receives no more than brief notice in reviewing journals, but the 'CTW' Floras are now so basic to British field botany, and particularly to the work of the B.S.B.I., that serious notice must be taken of new editions as they appear. For the benefit of the few readers who are as yet unfamiliar with the *Excursion Flora*, it should perhaps be stated that it is a smaller and more portable version of the standard British Flora which, while being cheaper and more suitable for beginners, nevertheless retains the style and high quality of the *Flora of the British Isles* on which it is based. Complete coverage of the flora is provided in the keys, but short descriptions are given for the commoner species only. In short, the book is likely to be of value not only to the beginner, but also to the more advanced field botanist who needs to check the identifications of some of the more unusual plants encountered. The new edition is in an entirely new format with a page size of 11·5 × 22·7cm – in other words it would probably fit conveniently into a narrow rucksack pocket and perhaps into the pockets of some anoraks. The former stiff binding has been replaced by a flexible, but probably durable, plastic binding. This might fail an 'acid test' but would certainly pass the 'alcohol test' traditionally recognised as essential for British Floras. At £12·50 the book can be welcomed as at least 'competitive', which is more than reviewers can usually manage to say in these days.

The really important feature of the new edition is that for the first time the immensely significant results of *Flora Europaea*, recently completed by the publication of the fifth volume, have been brought to bear on our native flora. The authors state that, at the time of the publication of the second edition in 1968, they felt it better to retain the stability of recent traditional British usage in nomenclature, etc., rather than to introduce a partial revision in the light of the volumes of *Flora Europaea* then available. In this they were probably right, in that too frequent change confuses all but the most ardent nomenclatural enthusiasts, and a clean sweep is probably preferable to continual dabbling. However, it is clearly time that Britain, which provided the botanical driving force behind *Flora Europaea*, should now lead the way in attuning its national Floras to take full advantage of the broader scale 'Eurobotanical' insights provided by the completion of the larger project. For this reason alone, many serious British field botanists, who would normally reach for the standard CTW, will want to add the new *Excursion Flora* to their libraries. It is impossible within a short review to do more than give some samples of the new information. Those who have wrestled with Cochlearias will be interested in the new treatment provided with the cooperation of Dr J. B. Gill. Having tried to come to terms with *C. atlantica*, one of the new species recognized by the Russian worker Pobedimova, for the *Flora of Mull*, the reviewer would have welcomed this key at that time. Those of us whose botany dates back to the dark ages of B. & H. prior to CTW will feel some sneaking relief at the reunification of *Bromus*, but will take time to come to terms with *Agropyron* in its new guise of *Elymus*, while the 'old' *Elymus*, reappears anagramatically as *Leymus*. In addition to changes resulting directly from *Flora Europaea*, the authors have taken note of continued indigenous progress in the study of our flora; and this is reflected in many places, not least in revised distribution statements taking full advantage of the *Atlas of the British flora* and its *Critical Supplement*, and in some extension and improvement in the coverage of the major critical genera *Rosa, Alchemilla, Hieracium, Taraxacum* and *Festuca*. We have very good reason in this country to be thankful for our specialists, amateur and professional, who are leading a critical but sane and realistic assault on these forbidding complexes. It is a pity that the authors have still declined to bite the *Pilosella* bullet, as this genus seems to be an obvious candidate for recognition. In short, the book can be confidently recommended as a sound diet for beginners and a near essential, for the reasons already specified, for the serious British botanist with taxonomic or ecological inclinations. Of course, there is still much to be done in the study of our native plants, but I believe that in times to come the new *Excursion Flora* will be justly recognized as an important milestone along the road. We can now look forward to the first volume of the projected *Flora of Great Britain and Ireland*, which will provide a critical and definitive review beyond the scope of the CTW works. Although the *Excursion Flora* is certainly portable, it is scarcely a pocket book. Some of us have been talking for a long time about the desirability of a true diary-sized critical *aide memoire* for field botanists whose memories, like that of the reviewer, are no longer crystal clear. Surely there must be a keen and competent botanist out there who might take up this challenge?

J. F. M. CANNON

I fiori delle Alpi. Franco Rasetti. Pp. 316, with 143 colour plates. Accademia Nazionale dei Lincei, Rome. 1980. Price Lire 19,500 (including postage).

Many books are produced which deal with the flora of the Alps, and for such a rich floristic region with outstanding aesthetic appeal and great taxonomic complexity, this is scarcely surprising. We still seem to lack, however, the ideal book on the flora of the Alpine region. Most of those already produced have many things in their favour, but are deficient in other ways. The present volume is no exception; its great strength is a series of really superb colour photos, but they are let down by a systematic text that does them no justice.

This is a substantial library volume and is in no sense a field guide. Although it could obviously be transported by the botanising motorist, only hiking masochists will consider carrying it in their rucksacks. This generous format is no doubt one factor behind the excellent colour illustrations; but to turn first to the text, this, being in Italian, will be of limited access to most readers of this review. However, a little knowledge of botanical terminology, coupled with a degree of persistence, will enable the interested non-Italian-speaking reader to make worthwhile progress. The first section of the text provides a basic introduction to taxonomic terminology, followed by a short chapter on the principles of botanical classification. Next comes a section dealing with the Alpine climate and the major plant communities that are present. There follows a short introduction to Alpine phytogeography, and short accounts of the floras of each of the main regions that constitute the Alpine chain. The second section deals with the systematics, and at the family and genus level brief diagnostic statements are provided, but no keys are provided to facilitate identification. For each species a brief diagnostic description is given, but it is doubtful if this would be sufficient to enable the user to distinguish reliably between closely related species. A short general statement follows on the distribution within the Alps, and sometimes also an indication is given of ecological preferences. In short, the descriptive text takes the form of extended captions for the photos and averages about five lines per species. The nomenclature has a vaguely out-of-date air about it; and this is not surprising as, when one turns to the Bibliography, it is a surprise to see that only the first two volumes of *Flora Europaea* (i.e. up to 1968) are listed. Admittedly, the fifth and final volume only appeared in 1980, but surely full advantage, at least to the level of volumes 3 and 4, could have been taken of the comprehensive review of the European flora that resulted from that outstanding work. For some reason, the author gives only the first part of double authority citations (e.g. *Ligusticum mutellina* (L.)) and does not indicate that secondary authority responsible for the transference of species (etc.) to other genera or ranks. This may be acceptable to zoologists, but it is wholly contrary to long-established botanical practice and the *International Code of Botanical Nomenclature*.

The book concludes with the photographic illustrations, which can only be described as outstandingly good, both in the quality of the colour printing and in the care with which the composition of the pictures has been arranged. The photographs are four to the page and of a size (10·5 × 7cm) which is sufficiently large to do justice to their excellent quality. The many British *afficionados* of the Alpine flora who buy this book can look forward to happy hours of armchair botanising amongst these plates, and will certainly be stimulated to plan further botanical holidays. The book is stated to cost 19,500 Lire (including postage). With the Lire at 2350 to the £1, this represents a near miracle of publishing: if only all botanical books were on this financial basis!

J. F. M. Cannon

The Arctic and Antarctic: their division into geobotanical areas. V. D. Aleksandrova, translated from the Russian by D. Löve. Pp. 247. Cambridge University Press, Cambridge. 1980. Price £15·00.

A great deal of botanical work appears in the Russian literature of which we in the West are ignorant. Many Russian journals and particularly books are hard to obtain and even harder to understand for those of us whose Russian is less than adequate. As a result, it is all to easy to remain unaware of work that is relevant to our own and which often approaches subjects in a way with which we are not familiar. All credit, then, to Cambridge University Press and to the translator, Dr D. Löve, for giving us a simple way of reading the views of Vera Aleksandrova, who has spent many years studying the vegetation of the Arctic region.

Most British ecologists are used to working with a well-known range of vegetation types, of which the major features have been described and documented long ago. Work on polar vegetation has not yet reached that stage, and publications such as this one can, as a result, seem old fashioned in their objectives. This is very much a descriptive book rather than an interpretative one, and the descriptions are at the broadest level. The author sets herself two objectives, first to outline a system for dividing the polar regions (both north and south) into geobotanical areas and second to summarize our knowledge of the vegetation cover in those areas. This is a most worthwhile exercise, and Aleksandrova has produced a scheme which has a good deal to recommend it despite the fact that the data she has had to work with are geographically patchy. Large stretches of the Arctic tundra are still poorly explored from the botanical point of view.

One feature of the vegetation that this book underlines is the diversity of the tundra areas, which are often supposed to be very uniform but which are in reality as varied as many other better-known areas. Another conclusion is that tundra, as a vegetation type, is not present in the southern hemisphere despite various other comparable ecological features.

I found this book an interesting review of polar vegetation as a whole, but it will be particularly useful for its summary of vegetation types in inaccessible parts of the northern U.S.S.R. and for its introduction to the Russian literature. It is an excellent translation and a well-produced volume.

G. C. S. Clarke

Plant taxonomy and biosystematics. Clive A. Stace. Pp. viii + 279, with 58 text-figures and black & white photographs. Edward Arnold, London. 1980. Price £8·95.

This book starts with the now-familiar plea that taxonomy 'matters' and is fundamental to plant science. Many recent taxonomy texts make the same point, yet the cynic wonders with what impact? Readers of *Watsonia* at least will need no conversion, and they will find a great deal of interest in this gallop through the subject. It is a gallop, however, touching on a vast number of topics, some rather superficially; but references to new work are there (including research projects as yet incomplete), and the book makes an excellent supplement or complement to, say, Davis & Heywood's *Principles of angiosperm taxonomy* (1963). University students and other readers will find this book to be a fine source for further reading, with balanced discussions, clear explanations and ample references to the recent taxonomic literature. The ten chapters cover the scope of classification and its historical development, the sources of taxonomic information in morphology and anatomy, and evidence from chemistry, chromosomes, breeding systems, and phytogeography and ecology. Practical aspects follow, including the use of herbaria, keys, the Codes of Nomenclature and other literary aids, with ten pages as a finale on priorities in taxonomic research, monographs, etc. Dr Stace has clearly done his work well, but perhaps we may wonder how much longer up-dating exercises should be undertaken covering virtually the whole of what we (perhaps unwisely) call taxonomy? Perhaps we should think in the future of more detailed texts covering more restricted areas within the broad scope of biosystematics?

Turning to details, Dr Stace's unhappiness with numerical taxonomy is evident, but then many of us have suffered from the early premature claims in that area, and rather few plant systematists will prefer to spend the rest of their days mesmerised before VDU screens instead of looking at real specimens.

Name changes irk the non-specialist, and I for one dread the appearance of any new check list 'compatible with current taxonomic thought and concepts'. I am sorry to find no plea for botanists to follow their zoological colleagues who have ways of keeping their unruly beasts' names under better control, at least in regard to purely nomenclatural causes. One may also query the wisdom of formal nomenclatural recognition for ecotypes, since these develop in response to such a range of independent environmental factors that a taxonomic framework would of necessity be hideously complicated and stifling to the development of an exciting branch of botany. On the other hand, as Dr Stace makes clear, we do need to review our treatment of infraspecific categories in general, and in particular to name inbreeding microspecies where this is feasible.

Finally, I agree strongly that we need more support for critical monographic studies, but here we slide back down a snake to the beginning of the review. The research councils and senior university staff must appreciate that this kind of work really is fundamental to the furtherance of plant science . . . but we have a very long path ahead of us.

D. H. Dalby

Flora of East Ross-shire. Ursula K. Duncan. Pp. xxx + 272, with frontispiece and one map. Botanical Society of Edinburgh. 1980. Price £7·00 including postage and packing.

Dr Ursula Duncan has broken new ground with the publication of this Flora of vice-county 106, East Ross-shire. There has been no previous account of the flora of this area, which is one of considerable diversity and interest. With characteristic modesty, Dr Duncan describes it as only a preliminary Flora and a basis for further exploration. While this may be so, it is precisely as a stimulus to further exploration, to the development of comparisons and to the study of change, that County Floras are so valuable. This Flora will serve all three functions admirably, having been compiled and documented with thoroughness and presented with clarity.

For each species, a brief indication is given of its habitat, followed by a list of the 10km grid-squares in which it has been recorded. In the case of common plants, the first record is given, together with a list of specimens and a descriptive note of additional localities. Full details are entered for all the rarer and under-recorded species. In a brief but interesting Introduction, the topography and range of habitats represented in the vice-county are described, with comments on the corresponding distribution patterns of plants. There is also a short historical account of the various Recorders who have contributed to knowledge of the flora of the area.

The name of the vice-county is perhaps misleading, suggesting chiefly the low-lying, largely agricultural areas to the north and east of Strathpeffer. However, the boundary between the botanical vice-counties of East and West Ross-shire is the Highland watershed, which actually comes within four miles of the western coast of Scotland. Hence the area covered by this Flora includes botanically exciting mountains such as Beinn Dearg in the west, with its outcrops of calcareous schist, as well as the massive Ben Wyvis to the east, poorer in species but of outstanding ecological interest. Consequently, the flora of East Ross-shire is varied and interesting, and not without its quota of famous species, such as *Artemisia norvegica*. Indeed, there also remains the challenge to re-find *Pinguicula alpina*, said to have once been common in a locality in this vice-county, but not seen since the early part of this century.

There are those who express the view that County Floras are not their favourite reading. To them it must be said that to turn the pages of a Flora such as this reveals a wealth of unexpected botanical information, while – far more important – the painstaking compilation lays a secure foundation against which to assess future changes. In these days of accelerated environmental modification this is of inestimable value. Dr Duncan is to be congratulated on her achievement (as, incidentally, are the printers on an exceptionally clear and attractive lay-out).

C. H. GIMINGHAM

The common ground: a place for nature in Britain's future? Richard Mabey. Pp. 280. Hutchinson Publishing Group Ltd (in association with the Nature Conservancy Council), London. 1980. Price £8·95.

The common ground was written at the instigation of the Nature Conservancy Council 'to widen the public debate on nature conservation'. Whilst the Conservancy gave access to records and files and its officers gave freely their time and opinions, the printed views and judgements are the author's own.

There are many quotable phrases in this book, but it would be invidious to use them in trying to summarize its message. What Richard Mabey is stressing on almost every page is the richness of our heritage, and its importance to that quality of life which is so vital if we are to survive this technological era. Throughout Part One of the book, entitled *Perspectives*, are gentle, poignant reminders of threats to this heritage – the thought, for instance, that, through the Forestry Commission's current policy of doubling its acreage of conifer plantation by the year 2025, afforestation could become one of the gravest threats to our natural heritage.

Part Two (*Nature and land-use: past harmonies and present discord*) deals with aspects of the three main-uses of the countryside: Woodlands and forestry, Agriculture, and Recreation. Management techniques throughout history are given in a most readable way; and recent studies, like those of Peterken and Rackham on woodland, are referred to, often in detail. Indeed 147 references are given (as numbered subscripts) throughout the book, giving ample further reading. Under recreation, the subject of commons is discussed, reminding us that the survey and management proposals of the Commons Registration Act have still to be implemented in full. Mabey points out that some commons where no *rights* have been registered are in jeopardy of being *de-registered* (e.g. Cliffe marshes in Kent). If this application of the law is upheld, many other Commons in the same and no doubt other counties may follow suite where lords of the manor 'reclaim' their manorial waste.

Part Three (*Policies and Priorities*) is divided into three chapters. The first is on legislation, and facts and figures are presented succinctly and where required; but the author admits to being 'rather sad' at finding a scarcity of 'compassion for and a delight in the natural world which are what turn people to act in its defence'. Many botanists will share this sadness and point out that no longer are animals the only emotional subjects, as we have recently seen in the first successful conviction for digging up and removing primroses (*Primula vulgaris*) from a Somerset wood. In legal matters the reader will become well aware, if he is not so already through his local Naturalists' Trust, of the strength of the anti-conservation and often hypocritical sporting lobby.

The second chapter (in Part Three) is on the types and functions of Nature Reserves, with examples from all sizes and habitats from those for single species to those with complex mosaics of ecosystems. There is discussion of the need for County Trusts to have clear acquisition programmes. (I believe that 'acquisition' not 'management' programmes are meant on p. 215, where only five Trusts are accredited with having these.) Mabey stresses that land does not *have* to be managed to be a useful reserve. This is true; but he might have stressed the need for clear objectives when deciding on the management needs. Voluntary organisations too often spend money and man-power on the whims of over-energetic, albeit voluntary, wardens! Here again Mabey mentions spiritual attributes and scenic beauty, and expresses the hope that nature conservation bodies will consider these as well as the scientific factors. This reviewer agrees, and indeed many Naturalists' Trusts have the conservation of scenic beauty written into their Charter.

The third chapter of Part Three, and the last in the book, is on *Conservation and the community*. This is the most philosophical and, possibly, the most difficult one to write, but again Richard Mabey has put forward a challenging case for conservation of nature *vis-à-vis* other land-uses, including that of growing more food. Financing the purchase and upkeep of reserves will always be a problem. In the United States, apparently, there are moves to put taxes on bird-foods, nest-boxes and binoculars (and hand-lenses?); and, whilst Mabey comes out clearly against this happening in Britain and makes a plea for public funds to be found, it is clear that we must still rely on voluntary help and finances from each and every one of us.

This is a book that you cannot browse in. Once it is picked up and begun, the reader will want to continue where he left off – if indeed he was able to leave off. It should be read by all members of our Society and many, many more besides.

A. C. Jermy

Living in a wild garden. Roger Banks. Pp. 128, with 31 coloured plates and several black & white illustrations. World's Work Ltd, The Windmill Press, Kingswood, Tadworth, Surrey. 1980. Price £7·95.

Over the last five years or so a fair number of books on the use of wild plants for culinary purposes have appeared on the market. The reason for this sudden upsurge in interest in the products of the 'wild garden' (a contradiction in terms: a garden is nature tamed and can by definition never be wild) are difficult to explain. Perhaps the underlying reason is a longing for the good life which our forebears were supposed to have had, or to get away from food grown with the aid of chemical fertilizers, pesticides, fungicides and other paraphernalia of modern technology. Alas, there is still no need whatsoever for us to scratch around the hedgerows to find fresh material for our diet, since most people who are so inclined can easily grow their own vegetables and fruit in garden or allotment without making use of the modern alchemist's kitchen; and this is certainly a less tedious and time-consuming activity than the hunt for food in the (not necessarily unpolluted) wilderness. This said, one must admit that there are a limited number of herbs, fruits and mushrooms in the wild with which we can occasionally enrich our diet, and it is for this reason that we are grateful for some of the new books which offer advice and guidance.

Let's make it quite clear *Living in a wild garden* does not belong to this category. It is an irritating book and may have given pleasure only to the author when he wrote it. It is a quaint book and makes the sort of present which one buys for Aunty Thelma as a birthday present in want of something better. The book is chatty, but without any literary entertainment value that should go with it. Just sample this: 'It was cousin Mary by divorce when she came to stay at Easter who first got us on to stinging nettles'. Well, if she had got the author on to *Atropa belladonna* she might have saved many innocent purchasers £7·95 last Christmas. The book certainly contains some information, but you cannot easily find it; it is submerged in a sea of inconsequential talk. There are hardly any recipes or hints for the use of wild plants; and the few it does contain can be found only by reading the book from cover to cover, because there is no subject index. Some of the illustrations are attractive, albeit a little insipid, and all are marred by hideous captions inserted streamer-like into the actual plates; it looks like a sixth-form exercise in design. I just wonder how many readers will be able to recognize the Giant Puffball (p. 12), Meadowsweet (p. 26), Lady's Bedstraw (p. 22) or Solomon's Seal (p. 16)? There are a number of botanical mistakes as well; I mention only that the proper name for the Great American Bindweed should be *Calystegia silvatica* and not *C. sylvestris.*

E. Launert

Flora of New Zealand. Volume 3. A. J. Healy and Elizabeth Edgar. Pp. xlii + 220, with 32 colour photographs. Government Printer, Wellington, New Zealand. 1980. Price NZ $18·50.

I found this volume exciting, with a relevance far wider than for New Zealand only. Volumes 1 and 2 of this Flora always suffered from the ostrich-like exclusion of all but native species. This one starts to redress the omission by dealing with all the alien Monocotyledons except, alas, grasses. In all, we are told, there are 335 native species in the relevant genera and 168 aliens, i.e. just half as many, no mean proportion to have ignored hitherto! Moreover, 262 pages allow for an expansive treatment of these

168 aliens, which is the main attraction of this volume. Each is keyed and described, many are illustrated, and many of the treatments with a discussion of status, distribution, characters, etc. The parallels with our own adventive flora are numerous, which is another attraction. Naturally not all their aliens are ours – some, for example, are native British species (including even *Juncus capitatus*); and climate and geography have allowed others to get established which could never do so here. But students of aliens outside New Zealand should find stimulation here – I had not previously thought of boat trailers as potential distributors of waterweeds.

Given its authors, the scholarly nature of this volume can be relied on; but it is readable too. The treatment of some genera is complete, notably Dr Edgar's specialities (*Juncus* and *Luzula*) and *Carex* (90 species in all), for in these, and some other genera, the native species are also included, in less detail. Thus I observed that she gives full specific status to *L. congesta*, learned of the taxonomic value of the caruncle in *Luzula*, and noticed that she frowns on *J. kochii*, after quoting Stace, Benoit and Allen. But in Europe she could never have written that *J. gerardii* 'is unlike any other species'.

There are four pages with 32 colour photographs. These show usefully *Sisyrinchium iridifolium*, the Fire Engine Plant of *Wild flowers of Guernsey*; but they suggest also that *Scilla non-scripta* is its own hybrid, and show up the unsatisfactory treatment of *Narcissus*.

Among the first records of species, it is good to see our old friend E. B. Bangerter's and other members' names appear. Yes, this is an excellent publication, and it is printed on much more suitable paper than are the two earlier volumes.

D. McClintock

Petaloid monocotyledons. Horticultural and botanical research. Edited by C. D. Brickell, D. F. Cutler and Mary Gregory. Linnean Society Symposium Series No. 8. Pp. xii + 222, with 25 black & white plates and 44 text-figures. Academic Press Inc. (London) Ltd, London. 1980. Price £26·80.

The B.S.B.I./Royal Horticultural Society joint conference, held in 1972 and entitled *Plants: wild and cultivated*, was one of the early fruits of the increasing collaboration between botanists and horticulturists that has been apparent in recent years. The present volume, the proceedings of a Linnean Society/R.H.S. joint symposium held in April, 1979, is another. Such joint ventures can be of immense mutual benefit; in this symposium, according to Lord Aberconway, 'the participants on each side had a better understanding, at the end, of the needs, problems and objectives of those of the other'.

The two introductory papers, taken together, give an excellent survey of the monocotyledonous habit, from the viewpoints respectively of botany (morphology and anatomy – Tomlinson) and horticulture (Rees). Indeed, Tomlinson's account is the best concise survey of monocotyledons that I know. The next section, 'Problems in propagation and flowering', is followed by one entitled 'Anatomy and its applications to flowering', which includes papers on the Liliaceae-Melianthoideae, *Galanthus* and *Zephyranthes* (Amaryllidaceae), *Kniphofia* (Liliaceae), the Araceae and the Velloziaceae. The last ('Evolution in Velloziaceae, with special reference to androecial characters', by de Menezes) is a fascinating account of floral evolution in this Afro-American family, showing how the androecium evolves with the development of a corona in a way very comparable with androecial development in the Amaryllidaceae. The section on 'Plant breeding and cytology' is mostly horticultural in emphasis, except for a paper on the cytology of *Crocus* cultivars by Brighton, Scarlett & Mathew; and in the final section, 'Exploitation and conservation', the petaloid monocotyledons of South Africa are considered by Stirton, whilst the endangered monocotyledons of Europe and South West Asia are discussed by Synge. In the latter paper, rarity in the British Isles is contrasted with rarity in Europe as a whole, with interesting results. Thus, of the 15 orchid species in the *British red data book* (Perring & Farrell 1977), only five are on the European list.

This symposium volume, like most of its kind, ranges more widely than the interests of any one reader are likely to do. Conversely, however, most B.S.B.I. members will find much to interest them in its pages.

N. K. B. Robson

Sussex plant atlas – An atlas of the distribution of wild plants in Sussex. P. C. Hall. Pp. 179, with 10 introductory maps and numerous tetrad distribution maps. Borough of Brighton, Booth Museum of Natural History, Brighton. Price £7·95.

This attractively-produced book is the first account of the distribution of vascular plants since Wolley-Dod's *Flora of Sussex* (1937), and fulfils to a great degree the long need for a modern Flora of this most interesting and important English county. Dot-distribution maps (based on the now generally adopted tetrad system) are included of all Sussex species except those that are almost ubiquitous (e.g. *Chenopodium album*) and those that are extremely rare (e.g. *Medicago minima*); in the latter cases the few localities known are listed, with the tetrads in which they occur. It has represented a vast amount of labour by over 200 recorders, nearly all amateurs, who amassed over 277,000 individual records, and by our member Peter Hall, who with his wife Joan assembled the records on to the maps. The whole project was carried out under the supervision of the Sussex Flora Committee set up by the Sussex Trust for Nature Conservation in 1966, and is based almost entirely on post-1950 field data, while the dot-maps themselves refer almost entirely to the duration of the survey (1966–1978) only. The recorders, and Mr and Mrs Hall, are – in general – to be warmly congratulated on the result.

It had been hoped by those botanists with a wide field knowledge of Sussex that there would be an opportunity to see the maps and perhaps also the (necessarily brief) text at manuscript stage, as it was felt that with the use of the tetrad system of recording some records of rarer species not always known to amateur local recorders might not otherwise get on to the maps. It is very unfortunate that, in the event (due presumably to pressure of a timetable for printing), not all those who know the plants of Sussex well did have such an opportunity, because, while the great majority of the species maps are entirely satisfactory, quite a number of those of the less common species are incomplete, and in some cases contain definite errors. In my opinion, this is a great pity, because with a little more consultation these relatively minor (but significant) blemishes, on what is in all other respects an impressive piece of work, could have been largely corrected. I know Peter Hall to be a most able botanist, but from studying some of the maps in this atlas I obtain the impression that his *personal* field knowledge of the distribution of some more local Sussex species was not quite sufficient for him to assess, unaided, the question as to whether the records he had available on the recording cards gave a sufficiently comprehensive picture of the distribution of a number of the less common species. With the commoner species, of course, the absence of records from the odd tetrad here and there is of little significance; for more local species, the editor of a county atlas should surely endeavour to enlist *all* reliable sources of data to achieve the maximum degree of completeness, otherwise its value as a reliable reference work is greatly reduced.

It is not possible within the space of this review to mention all the small errors and omissions that I have detected, so I have selected some of the more important cases, which are discussed below. *Hypericum montanum* is stated (p. 87) to be 'known now only from Stedham (SU82T), RAB' as a native. In fact it has not been seen there, or anywhere else in Sussex as a native species, since before about 1939 (R. A. Boniface, pers. comm). *Lonicera xylosteum* (p. 120) is said to be 'probably an escape at Wilmington Holt' (in E. Sussex), though accepted as native at Amberley in W. Sussex. To those who know the Wilmington Holt population well, there appears to be no difference whatever in the status of the species at Amberley and at Wilmington. In both areas, the species occurs in remote chalk scarp woodlands and scrub.

The Forest Ridge region, especially Ashdown Forest itself, has quite evidently not been comprehensively covered by those who did the tetrad recording there, particularly with regard to several of its wet-heath or bog species, including those listed below. The figure in brackets after each name indicates the number of extra tetrads in which I have records of the recent occurrence of the species concerned; there may well be more: *Hypericum elodes* (6); *Anagallis tenella* (15); *Gentiana pneumonanthe* (9); *Potamogeton polygonifolius* (7); *Narthecium ossifragum* (5); *Scirpus cespitosus* (4); *Sibthorpia europaea* (2); *Hymenophyllum tunbrigense* (3); *Wahlenbergia hederacea* (8).

Over the county as a whole, *Carex laevigata* (15 extra tetrads known), *Carex strigosa* (7) and *Thelypteris limbosperma* (9) are also under-recorded, as is *Chrysosplenium oppositifolium*, known in 20 extra modern tetrads, and surely not totally absent from the scarp-foot spring line and Greensand copses between Washington and Ditchling.

The most extreme case of under-recording in this *Atlas*, however, is that of *Dryopteris aemula* (p. 34). 35 tetrads are shown as having this species; the species in fact has been recorded in the last 20 years in a further 44 by myself and others (including Peter Hall), and the whole of the data have been published (Rose & Géhu, *Bull. Soc. bot. France*, **111,** 90^e Session extr.: 38–70 (1964)). It is a pity that the latter publication falls just outside the period of survey.

The map of *Festuca ovina* (p. 144) clearly includes numerous records for *F. tenuifolia*: I have never seen *F. ovina* sensu stricto on acid soils in Sussex. This map does indicate clearly the sort of problem faced by the editor of a tetrad-mapped Flora when trying to sort out the records made by many different people of varied abilities. *Tilia platyphyllos* (p. 85) is cited as 'planted' at Chanctonbury (11R), but in Hb. Borrer there is a specimen (cited in Wolley-Dod) of this species with the comment 'one ancient tree on the north side of Chanctonbury Hill'. What was clearly this ancient tree was still there in 1953, and I saw also some younger trees of the species. A good case could be made for this population as a relict native one, particularly as its pollen is known from prehistoric deposits in Kent, and as its hybrid with *T. cordata* occurs apparently native in a wooded South Downs coombe east of Harting. There seems to be no reason to regard *Gymnocarpium robertianum* (p. 34) as a 'denizen' at Westburton; the site (on chalk scree in a chalk-scarp ravine) is a remote one, and appears completely natural. *Saxifraga granulata* is given as 'extinct' (p. 65) with the implication that it was perhaps formerly native. The old records (see Wolley-Dod) were all for populations almost certainly introduced; there is little evidence that it was ever a native Sussex plant.

The native distribution of some species is unfortunately obscured by the tetrad recording method; this applies to *Myosotis sylvatica* (p. 106), where the wide scatter of records conceals the distinct native distribution of this species (along the Western Rother, and in old Weald Clay woodland west of Horsham).

The texts accompanying the maps are brief but effective; clearly there was no space for more information, and the editor has done a good job here. I would, however, have liked to see a little more modern information on the ecology and habitats of *some* species, particularly because Wolley-Dod's Flora was weak in this respect. For example, it could have been stated that such plants as *Equisetum telmateia* and the *Chrysosplenium* species are confined to spring-lines and seepage zones, especially where impervious clays underlie pervious sands, or chalk, and can indeed give valuable information on lithological boundaries in the field.

The introductory sections of the *Atlas* are well-presented and valuable. On map 8 (p. 25) of the railways, however, the main Pulborough-Arundel line is shown as closed; fortunately this has not yet happened!

I have been critical of many details in this *Atlas* because such a work should be a reliable reference book and as complete and accurate as it can be made. Apart from the errors and omissions referred to, however, I consider this work to be in general a fine and useful record of the distribution of the great majority of Sussex plants at the present time, which should certainly be in the libraries of all botanists who live in or visit Sussex, or who wish to compare its flora with that of other counties. I understand that the Sussex Flora Society is considering the question of producing map overlays and notes on corrections to the information, and that in due course these may be available for purchase.

F. Rose

Anatomy of the dicotyledons. Second Edition. Volume 1. Systematic anatomy of leaf and stem, with a brief history of the subject. C. R. Metcalfe & L. Chalk. Pp. ix + 276, with 18 black & white plates and 44 text-figures. Oxford University Press, Oxford. 1979. Price £20.

This volume signals the commencement of the second edition of 'Metcalfe and Chalk', 29 years after the First Edition was published. The first two volumes constitute an introductory survey of the systematic anatomy of the dicotyledons, replacing about 50 pages of the first edition. The remaining volumes (number unspecified) will present the anatomical data in systematic order, following the system of Takhtajan. Volume 1 'is devoted mainly to leaves, stems and roots', while Volume II will cover such topics as wood anatomy, ecological anatomy, taxonomy and phylogeny. However, the chapters in the present volume, after a brief discussion of the history and purpose of systematic anatomy and an introduction to external morphology, are concerned only with stems and leaves.

Presumably the chapter on roots was envisaged as part of Volume 1 when the Preface was written, but for some reason it has been held over to Volume II.

The main chapters cover leaf architecture (by L. J. Hickey), trichomes, types of cells and tissues, the leaf, stem nodal anatomy, the petiole (by R. A. Howard), the plant surface (by H. P. Wilkinson), the stem, and phloem (by K. Esau). In fact chapters by anatomists other than Metcalfe and Chalk occupy over half of the whole volume. By far the longest (69 pages), and arguably the most useful and masterly, is that on the plant surface (mainly leaf epidermis) by Dr Hazel Wilkinson. After these chapters comes an extremely valuable series of lists of dicotyledon families in which certain anatomical characteristics are prevalent (updating the similar list in the first edition), the bibliography, indices, and 18 pages of excellent photographs.

One of the problems associated with making such a compilation, and one not fully overcome in this work, is deciding the boundaries of the subject of vegetative systematic anatomy. In this volume there are incursions into reproductive anatomy, external morphology and evolutionary theory, and we are promised discussions of chemotaxonomy, ecological anatomy, and phylogenetic and taxonomic significance in Volume II. While such topics are, of course, vitally important to systematic anatomy, I feel that the space devoted to their superficial survey in the present volume would have been better used for a more thorough treatment of some of the main chapters. In other words, would not *Anatomy of the dicotyledons* best be confined to that topic and its taxonomic interpretation be left for different works?

Such shortcomings and omissions must be considered quibbles of a relatively minor nature; the second edition of this standard work promises to live up to the high reputation of its predecessor and to become an indispensable reference work for both anatomists and taxonomists.

C. A. Stace

Science and colonial expansion: the role of the British Royal Botanic Gardens. Lucile H. Brockway. Pp. xiv + 255. Academic Press, New York and London. 1979. Price £11·80.

'Studies in social discontinuity', the title of the American series to which this book belongs, do not usually find their way on to the desks of botanical reviewers. Nor is it immediately obvious, at least to this reviewer, what constitutes a 'social discontinuity' worthy of study. Leaving aside this initial difficulty, what of the book itself? The author states her aims clearly enough in the Preface: 'this book analyses the political effects of scientific research as exemplified in one field, economic botany, and in one epoch, the nineteenth century, when Great Britain was the leading industrial, commercial and colonial power in the world.' In fact, the main theme of the book is how Kew brought about the effective introduction of new crop plants, especially from the New World to the Old, a theme illustrated by the three case-histories of quinine, rubber and sisal.

It is important to state the limitations in the author's aim. The book would be a grossly inadequate 'history of Kew'. Whether it would be a better book without the 'purple passages' – 'inside the Palm House we are dwarfed by the soaring trunks of the palms, and fascinated by the luscious growth of the many other tropical species' – but with more chronologically-presented factual history of Kew as an institution, is rather difficult to say; and it is at least arguable that 'the story' as here presented is really more readable, and indeed more helpful, than any standard history could be. The Marxist sociological bias, which comes as a shock in the first few pages, and keeps popping up, sometimes rather ludicrously, throughout the book, is indeed a healthy corrective to the sycophantic literature on Kew represented by the few published histories; but, having read the indictment, one longs for some reasonably unbiased account which would place the Hookers, father and son, firmly in their Victorian social and political *milieu* without the strident, anti-colonial tone. After all, as would be true of most great institutions ostensibly devoted to high ideals, Kew and its works are neither wholly good nor wholly evil, but represent a fascinating mixture of motives, aims and achievements.

Two legitimate further criticisms should be aired, the first concerning the title. If the index is to be trusted, nowhere does the author mention the existence of that other prestigious and internationally-famous British Royal Botanic Garden in Edinburgh, whose foundation antedates that of Kew by nearly a century, and whose role and relevance in the whole theme can hardly be negligible. 'Social discontinuity' indeed! This omission of Edinburgh is the more remarkable because the author *does* (p.

90) touch on the unique contribution made by Scottish education to the British (and Colonial) scene in the eighteenth and nineteenth centuries.

The second criticism concerns the central theme, and the way it is handled. One possible analysis would point to two sharply contrasting attitudes which could be present in the same person: on the one hand, a naïve and patriotic desire for the advancement of Britain and her imperial glory, which would see other nations as either potential rivals or subjugated inferiors; and on the other, an idealistic view of the international role of the scientist to disseminate information and spread the light of knowledge ignoring political and social barriers. Here, indeed, is a fascinating theme which the book touches on but hardly begins to develop. Perhaps a definitive 'history of Kew' (which is, incidentally, still lacking) could tell us more about this Victorian struggle of ideas as seen in terms of the economic role of this unique institution.

The volume is handsomely printed and bound, and has rather few minor proof-reading errors; at £11·80 is it by no means exorbitantly priced for a technical work. Most of the scientific plant names are correctly spelt (though *Gossypium* comes out badly misprinted on page 55), and other minor *corrigenda* are few. It is unfortunate that neither the date of birth (1796) nor the date of appointment to the Cambridge Chair of Botany (1825) is given correctly for that remarkable Victorian John Stevens Henslow, who achieves an honourable mention in the book. A final word on the references. Many of these are, understandably, American, and many deal with broad, interdisciplinary issues of a socio-political nature. One British title is, however, surprisingly absent – the eminently readable account by Mea Allen published in 1967 of 'The Hookers of Kew'. Is it possible that no-one told Lucile Brockway to read this? It would have much illuminated her theme and, surely, prevented her from seeing Kew too simplistically as a 'wicked capitalist plot'.

S. M. WALTERS

Obituaries

THOMAS ARTHUR WARREN DAVIS
(1899–1980)

Thomas Warren Davis, B.A., F.L.S. born on 12th April 1899, was the youngest of the five sons of Henry Warren Davis of Trewarren, St Ishmael's, Dyfed. The boy's playground was the lovely little bay of Monkshaven, and it was here that a lifetime of observation and recording in all the disciplines of natural science began and here, after 'the vasty dusk of life abroad', that it ended.

Tommie must have volunteered for service in the first world war as soon as his age permitted, for he was gazetted as Second Lieutenant in the Indian Army on 21st December, 1917, by which time his eldest brother had already given his life in France. Promoted in 1918, he saw active service on the N. W. Frontier in 1919; and later, when demobilized, he returned to take an Oxford degree in Forestry. Thence he passed into the Colonial Service, being attached to the Government of what was then British Guiana in 1925.

When the Oxford University Expedition went out to British Guiana in 1929, he was seconded to work with it together with his Arawak Indian 'Tree Finder' Jonah Boyan, an untutored genius in tropical tree lore. Professor Paul Richards, one of the two botanist members of that Expedition (the other being N. Y. Sandwith), writes that: 'Tommie Warren Davis's experience was invaluable to the expedition . . . he had spent his previous years in Guiana on forest enumeration and surveys, much of it working by himself or with a few native assistants in remote parts of the colony. It was thanks to his practical knowledge that the Expedition's camp at Moroballi Creek was set up quickly and efficiently, and that the Expedition was able to make such good use of the few months that it spent in Guiana. He spent most of his time working in the forest with Sandwith, Jonah and myself, or exploring on his own. He had already acquired an extremely wide and detailed knowledge of the forest and everything in it, especially the trees and the birds, and it was a wonderful education for me [P.R. was then in his second undergraduate year] to be able to work with him. He and Sandwith were complementary to each other, for Sandwith had worked for some years on the tropical American flora at Kew but had not previously had an opportunity of seeing his plants in the field, whilst Tommie knew the trees as they grew in the forest. Tommie Davis worked extremely hard whilst he was with the Oxford Expedition, but his health was far from good and he had several bad bouts of malaria during the three months we were at Moroballi Creek.'

He never routed this recurrent malaria; but despite it Tommie remained working in Guiana until the Second World War, when he returned to the Indian Army and again served on the N. W. Frontier. Later he would speak of the Ghurkas with deep affection, delighting also in the transcendent beauty of Himalayan dawns and the majesty of mature conifer woodlands.

For a time he was attached as Forestry Officer to the British Government in Bonn before returning to build himself a little house on his own land overlooking Milford Haven. In a new phase of his lifelong interests he became B.S.B.I. recorder for v.c. 45 from the inception of the scheme, and also for the West Wales Naturalists' Trust, giving unstinted service to both: serving on Councils and Committees as well as in the field; representing Wales on the Council of the B.S.B.I.; and sitting on the Recorders' Committee for many years and likewise on the Committee for Wales. Shortly before his death he was made an honorary member of the B.S.B.I.

In 1970 appeared his *Plants of Pembrokeshire*, and, had he been granted a few more years, he would have completed a full Flora of the County. He contributed articles and notes to *Watsonia* and other scientific journals such as *Oryx* and *British Birds*; in many a field meeting his ancient service beret was a signal for good leadership. He said once of a friend who had died: 'No one who knew him failed to be fond of him'. How true of himself! Like his namesake St Thomas More, he 'would pin his faith to no man's back' but was in charity with all; though to one accustomed to much solitude, opinionative clamour could be intensely irritant.

His rather tenuous health declined in 1980, but he seemed to be recovering in hospital when the end came suddenly. His body lies by St Ishmael's Church, the scene of his baptism 81 years before and of his constant attendance since. But he is mourned far beyond the confines of Wales.

I. M. VAUGHAN

ROLF NORDHAGEN
(1894–1979)

Dr Rolf Nordhagen, who was an Honorary Member of the Botanical Society of the British Isles, passed away on 8th March, 1979. He was born in Oslo in 1894, and followed an academic career which included 20 years as Professor of Plant Systematics and Phytogeography at Bergens Museum and then a similar period in the corresponding position at the University of Oslo.

Nordhagen was active in several fields and left a profound mark on them. He was one of the pioneers of modern plant sociology, adhering to the Uppsala school, even if he was not in the middle of the turmoil created by the conflict with the Middle European school in that field. Indeed, in 1936 he published the first paper that showed in practice the way in which the two schools could be united – as they later were. In addition to two impressive monographs of Norwegian mountain vegetation (the last in 1943), this paper places him in the first rank of modern plant sociology.

His second main interest was history of vegetation, with special reference to Scandinavia. His doctorate (1921) dealt with classical deposits of calcareous tufa in Central Norway, where he could show that they were in better correspondence with the then disputed Blytt-Sernander theory that Blytt himself knew. His next important paper in this field was written together with Helmut Gams, of Zürich, Switzerland (1923), and demonstrated that the Blytt-Sernander climatic scheme, *mutatis mutandis*, was applicable also to Middle Europe – in contrast to what was then widely believed.

This paper was immediately recognized, so much so that it is now largely forgotten. It was not so with regard to his next major contribution in the field. In an invited series of lectures in 1933 he formalized the hypothesis of Ice Age survival of part of the Scandinavian biota *in situ* – in contrast to the prevailing idea that the area had been completely glaciated and had received all living beings by immigration later. Also in this case, the impact was immediate, but the hypothesis was far from being unanimously accepted. Instead, it is still, 47 years later, a hot discussion theme in northern European Quaternary geology though perhaps not quite so hot as it was earlier. Nordhagen may have overshot the mark; but his formulation of the hypothesis has been extremely fruitful, and there is hardly a paper in the field published later which has not been influenced by it.

Not satisfied by these successes, Nordhagen was also active in other fields of botany. His knowledge of classical botany, especially morphology, was encyclopedic, and he put it to use in studies especially of dispersal ecology, partly elucidating myrmecochorous adaptations, partly on tangential ballistochory. He also wrote a more comprehensive monograph of *Calluna*. Another secondary field of interest dealt with plant lore, especially popular names, where his botanical, pragmatic approach opened the path to interpretations that had hitherto been overlooked.

Nordhagen published (1940) a new Flora of Norway to replace the outdated Blytt-Dahl Flora of 1906; he edited the second Norwegian edition of an illustrated popular 8-volume work on the flora of Scandinavia; he was the Norwegian advisor to *Flora Europaea*; he wrote a number of newspaper articles and other popular communications; and, both in his academic position and outside, he was an enthusiastic lecturer who managed to transfer his enthusiasm to his listeners.

K. FAEGRI

Reports

CONFERENCE REPORT

BIOLOGICAL ASPECTS OF RARE PLANT CONSERVATION

This conference was held in King's College, Cambridge, from July 14th to July 19th, 1980, for the B.S.B.I. in association with the Linnean Society of London. A total of 160 people from all over the world attended all or part of the conference, about 100 being present each day.

A different aspect of the conference theme was discussed each day:

Day 1: the assessment of what is meant by a 'threatened species' – a survey of the techniques for recognizing which species can be regarded as rare;
Day 2: the monitoring of wild populations – a survey of techniques for recording change;
Day 3: autecological studies – case histories of research on rare species, and the lessons for conservation management;
Day 4: introductions and re-introductions – the degree to which these are ethical and practical, with examples of success and failure, and the effects of introduced aliens on managing sites for rare species;
Day 5: the establishment and management of reserves for threatened species – the translation of autecological knowledge into practical reserve management.

Some 47 papers were presented, including 'poster' papers, which were allocated time for discussion. The principal speakers included G. L. Lucas on 'The world problem', E. S. Ayensu on 'The assessment of threatened species in the U.S.A.', J. L. Harper on 'The meaning of rarity', B. H. Green on 'A policy of introductions', N. Myers on 'Conservation needs and opportunities in tropical moist forests', P. S. Ashton on 'Management of tropical forests for the conservation of rare species', A. Medwecka-Kornás on 'Phytosociological and floristic definition of conservation sites', and S. M. Walters on 'Rare species conservation: priorities in the 1980s'. Many other papers of great importance to rare plant conservation were also presented. In addition there was an evening discussion on the conservation problems of 'lower' plants.

During the week of the conference there were excursions to Devil's Dyke, Cambridgeshire, to see the monitoring of rare species, to the University Botanic Garden to see propagation of stocks of rare plants and educational work, and within the City and University of Cambridge. The main excursion on 19th July went to Wicken and Chippenham Fens to see rare plant monitoring and conservation in threatened habitats. At Wicken Fen the Secretary of the National Trust Fen Committee, Dr J. H. Harvey, gave an introductory lecture on fen vegetation, and included an account of studies on the biology of *Peucedanum palustre* (L.) Moench, which is host for the Swallowtail butterfly (now extinct in Cambridgeshire). During the excursion to Chippenham Fen, A. J. Byfield, a B.S.B.I. member, re-discovered a single plant of *Pinguicula vulgaris* L. not seen at this site in recent years and previously thought to be extinct in Cambs., v.c. 29.

In spite of the unseasonal cold, wet weather, the conference was a great success. It brought together botanists and conservationists from all over the world, many of whom would otherwise have little contact with each other, and discussions continued at every opportunity. The proceedings culminated at the end of the conference dinner with the presentation of a Linnean Society Medal by Dr Ö. Nilsson, from Uppsala, Sweden, to the chairman of the conference, Dr S. M. Walters.

H. H. Birks

EXHIBITION MEETING, 1980

The Annual Exhibition Meeting was held in the Department of Botany, British Museum (Natural History), London, on Saturday, 22nd November, 1980, from 12.00 to 17.30 hours. The following exhibits were shown.

SOME EARLY MEMBERS OF THE BOTANICAL SOCIETY OF LONDON

The Botanical Society of London existed from 1836 to 1856, and was the body from which the B.S.B.I. originated. Little is known about who belonged to this early society or what it did. To find out more a systematic attempt is being made to identify the 400 or so members of the society, often from very slender clues. Several members have turned out to be people who were well-known in other, non-botanical connections, and the three selected for portrayal (with their photographs) in the exhibit are examples of such famous persons; each has been the subject of attention only to students of English literature, hitherto.

REV. JOHN BRANSBY (1783/4–1857) is generally acknowledged to be the model for the headmaster in Edgar Allan Poe's most accomplished prose work, *William Wilson*, famous for its exploration of the *doppelgänger* theme. Bransby ran Manor House School in Stoke Newington, to which Poe was sent as a boarder in 1817. A member of several other leading societies, Bransby subsequently moved to Norfolk and spent most of the remainder of his life as headmaster of King's Lynn Grammar School.

REV. THOMAS BUTLER (1806–1886) was father of the novelist Samuel Butler, and was used by him as the model for the appalling Theobald Pontifex in that masterpiece of autobiographical fiction, *The way of all flesh*. Introduced to botany by Charles Darwin when the two were fellow undergraduates at Cambridge, he joined the Botanical Society of London in 1840 and remained one of the most faithful contributors to its annual exchange of specimens. Many years later he enrolled in the Botanical Exchange Club, successor to the Botanical Society of London.

GEORGE ELIOT. A 'Miss Evans' of Coventry, elected to membership in October 1850, was almost certainly Mary Anne Evans (1819–1880), the novelist who wrote under this pseudonym. Although her biographers omit any mention of an interest in botany, the circumstantial evidence for my identification is strong. *Inter alia*, she moved from Coventry to live in London in the early years of the Society and at once made a point of attending scientific lectures. The Botanical Society was renowned for the exceptional degree to which women were welcome to take part in its activities, and could thus have been expected to attract her.

Oddly, the one literary figure of that era whose prowess as a field botanist is well known, John Stuart Mill, held aloof from the Society, but his much younger brother, George Grote Mill, was a member.

D. E. ALLEN

OENOTHERA L. AT WARWICK

Oenothera cambrica Rostański was imported into Warks., v.c. 38, with sea sand from South Wales in the early 1950s. *O. biennis* L. and *O. erythrosepala* Borbàs were present in the grounds of a Warwick power station demolished in 1974. The considerable hybridisation occurring between the three species in a comparatively small, relatively undisturbed area of the vice-county was studied in 1979 and 1980. Hybridisation probably dates mainly from 1974 and 1980. From almost 3,700 plants, good representatives of the three species (provisionally *O. biennis* 1,665, *O. erythrosepala* 205, *O. cambrica* 1,237) still greatly exceed some 580 hybrid plants. Specimens were exhibited of each of the six possible simple hybrids to the female parent and two triple hybrids found in 1979, all named by Dr K. Rostański. Also exhibited was a map of the site, showing the distribution of the species and their hybrids in 1979 and 1980.

J. C. BOWRA

LEMNA MINUSCULA HERTER, AN AMERICAN DUCKWEED, AS A MEMBER OF THE BRITISH FLORA

Professor Landolt of Zurich published in 1979 (*Ber. Geobot. Inst. E.T.H. Rübel (Zurich)*, **46**: 86–89) the first record for Britain of *Lemna minuscula* Herter (*L. valdiviana* Philippi). This new American invader may be widespread in southern England, since it is already known from Cambs., v.c. 29, E. Suffolk, v.c. 25, Surrey, v.c. 17, and W. Sussex, v.c. 13. In its *locus classicus* in Cambridge, where Landolt collected it in 1977, it was growing (3rd October, 1980) in abundance with *L. minor*. Such mixed populations could be overlooked, the plants of *L. minuscula* resembling poorly-growing *L. minor*.

It seems possible, with practice, to identify populations of *L. minuscula* in the field, pure or mixed with *L. minor* and *L. gibba*. However the best character for individual plants is the number of veins, and to see this character clearly staining is needed. *L. minor* has three veins, *L. minuscula* has one only – the midrib.

M. Briggs, A. C. Leslie & S. M. Walters

PLEASE, WHAT IS THIS?

This exhibit consisted of a photograph taken in 1979 of an unknown umbellifer, found growing on a riverside in Scotland by J. Agnaroff. It illustrated the inadequacy of a photograph compared with a pressed specimen as material for identification.

R. M. Burton

WILDFLOWERS OF NORTH AMERICA – A NEW SERIES OF WALLCHARTS

As a result of the success of the *Plant ecology wallcharts*, the British Museum (Natural History) has embarked on a joint project with the Missouri Botanical Garden to produce a comparable series of wallcharts illustrating major North American plant habitats.

The first four charts, which cover the *Low desert*, the *Rocky mountains*, the *Southern pinelands* and *Spring woodland wildflowers*, are now available for purchase from the Museum. A further four habitat titles are in preparation and a special chart dealing with garden herbs in the U.S.A. will shortly be published.

The art work is by Keith West.

J. F. M. Cannon

PRESSED FLOWERS FROM BRITAIN

A selection of pressed flowers and plants were displayed as decorative pictures. Some were arranged in groups reflecting form or hue, and some were single specimens. The plants were collected mainly from private gardens or obtained from members of local garden societies. Also exhibited were two volumes of specimens of pressed flowers.

C. Chua

SOME LLEYN RECORDS FROM 1980

Some of the current season's finds of rarer species from W. Lleyn, Caerns., v.c. 49, were exhibited, including first records of *Hordeum jubatum* (a North American alien – earliest English record from Kent in 1892 and Welsh from Cardiff in 1924), *Avena strigosa, Barbarea verna, Chenopodium polyspermum* and *Epilobium roseum* – all with few or no recent records in North Wales and all considered to be introduced. There were new localities for the casuals *Heracleum mantegazzianum* and

Datura stramonium. Among native species, *Linum bienne* was re-found where Woodhead & Tweed had collected it in 1956 (**UCNW**), and new localities were found for *Zannichellia palustris, Eriophorum gracile* and *Viola lactea*. The hybrid *Myosotis caespitosa* × *M. scorpioides*, although already known from a nearby locality, was found within W. Lleyn for the first time. Maps of dated occurrences of the hybrid in Wales and other parts of the British Isles were shown.

A. P. CONOLLY

CAREX ERICETORUM POLL. IN BRITAIN

For a full account of this exhibit see David, R. W., *Watsonia,* **13**: 225–226 (1981).

CAREX PUNCTATA GAUD. IN BRITAIN, IRELAND AND THE ISLE OF MAN

For a full account of this exhibit see Short Notes, pp. 318–321.

THREATENED PLANTS OF MALAYSIA

In September – October 1976 I was awarded a Winston Churchill Travelling Fellowship to make sketches of threatened plants of Malaysia. In July 1979 I made another visit to Malaysia, sponsored by Lady McNeice, Trustee of the Loke Foundation, Singapore. 76 paintings from the 1976 visit and 48 from the 1979 visit were exhibited; these paintings will eventually go into the collection of paintings at the Royal Botanic Gardens, Kew. It is hoped that they will be used to further conservation of plants in Malaysia. A wallchart of Malaysian plants has been prepared and a calendar was published by Shell Malaysia in 1979, using twelve of the 76 paintings made in 1976. A World Wildlife Fund (Malaysia) Brochure is being planned.

B. EVERARD

LEUCOJUM AESTIVUM L. IN IRELAND

Many records of *Leucojum aestivum* L. were made from Ireland early in the 20th Century. During 1979 and 1980 surveys of localities were undertaken with the help of a Praeger Fund grant. Most of the previously known localities still exist and a new site was discovered near Coleraine, Londonderry, v.c. H40. 27 localities are now known; there is some evidence that the species has been introduced at five of these.

L. FARRELL

STEREOPHOTOGRAPHS OF BRITISH ORCHIDS

Close-up three-dimensional pictures of twelve British orchids were exhibited, making it possible to see the structures of the flowers in more detail than can usually be seen in the field, especially for the smaller species such as *Herminium monorchis* and *Hammarbya paludosa*. All photographs were taken of untouched plants in their natural habitats at a distance of 12–13cm, at a stop of F28, using an electronic flash and much patience to eliminate movement due to wind. The lens spacing was 12mm for these close-up photographs, to give a magnifying effect without exaggeration of apparent depth.

J. H. FREMLIN

THE AVON GORGE APPEAL

A brochure for the Avon Gorge Appeal, which is organized by the University of Bristol, was displayed, together with a coloured poster, prepared by Dr M. C. Smith, of leaf prints of the twelve taxa of *Sorbus* L. found in the Avon Gorge. The original line drawing of *Duchesnea indica* (Andrews) Focke, published in *B.S.B.I. News,* **25**, and later coloured by the artist, I. F. Gravestock, and framed, was sold in aid of the appeal. Further details of the appeal are published in *B.S.B.I. News,* **26**.

I. F. Gravestock & L. C. Frost

AN AVON GORGE MISCELLANY

The exhibit included short biographical notes on several deceased Bristol botanists. The notes were derived mainly from manuscript sources and photographs of several of the botanists were shown, together with some of their herbarium specimens. Photographs of the first known collections from Avon Gorge of *Cerastium pumilum* Curtis (*c.* 1840), *Allium sphaerocephalon* L. (1847), *Sorbus bristoliensis* Wilmott (1853) and *Carex depauperata* Curtis ex With. (1888) were shown.

Part of the display concerned H. S. Thomson (1870–1940). Some of his Avon Gorge photographs were exhibited, and a photograph of his room (*c.* 1920), showing his herbarium cabinets, vasculum and plant press. A painting of *Caltha palustris* L., which hung on his wall, survives and was displayed. As Secretary of the Watson Botanical Exchange Club in 1934, he seems to have been responsible for its closure; a photocopy of his manuscript draft of the notice of closure was shown.

Herbarium specimens of *Cirsium erisithales* (Jacq.) Scop. and *Rubus fuscicaulis* H. S. Edees, both from Leigh Woods, Bristol, v.c. 6, were also exhibited.

C. M. Lovatt

PEN AND INK DRAWINGS ANALYSING THE STRUCTURE OF FLOWERS

The exhibit displayed the complete set of original drawings showing in detail the floral structure of the plants representing each of the families in *100 families of flowering plants*, by M. Hickey & C. J. King, published by Cambridge University Press. The authors have adopted Stebbins' system of family arrangement which agrees with the second edition of *The identification of flowering plants*, by P. H. Davis and J. Cullen. Dr S. M. Walters, Director of the University Botanic Garden, Cambridge, acted as advisor to the now completed project.

M. Hickey & C. J. King

SOME DISTINCT VARIANTS FROM THE *LIMONIUM BINERVOSUM* (G.E.SM.) C. E. SALMON GROUP IN THE BRITISH ISLES

The present classification of the *Limonium binervosum* (G.E.Sm.) C. E. Salmon group is unsatisfactory. There are up to about thirty undescribed variants and the taxonomic limits of the microspecies which have so far been named are ill-defined. For example, material from Ireland has been incorrectly ascribed to *L. transwallianum* (Pugsley) Pugsley and to *L. paradoxum* Pugsley, in spite of these taxa being very distinct. Difficulty with identifying *L. recurvum* C. E. Salmon in the field has given rise to doubts about its status. Nevertheless there are distinct morphological and chromosomal variants within the group, so that it is possible, with sufficient information, to say whether one or more variants are present in a locality. For example, over a 25km stretch of the coastline of Pembs., v.c. 45, six variants can be distinguished. Of seven colonies, five have a single variant, and two have two variants present. The taxonomic status of these variants has yet to be determined.

M. J. Ingrouille

DIPHASIASTRUM ISSLERI (ROUY) HOLUB IN BRITAIN

The *Atlas of ferns of the British Isles* (Jermy *et al.* 1978) shows the distribution in Britain of a taxon that has had a controversial history in British botany. Argument began with the publication by G. C. Druce in 1882 (*J. Bot., Lond.,* **20**: 321) of a figure of a plant collected by Rev. H. P. Reader from Gloucestershire as *Lycopodium complanatum* L. – a new plant to Britain. Boswell Syme later published the drawing in *English botany* as *L. alpinum* var. *decipiens*. This drawing was exhibited, together with specimens from the Continent known as *Diphasiastrum issleri* (Rouy) Holub, supposedly a hybrid between *D. complanatum* (L.) Rothm. and *D. alpinum* (L.) Rothm. Examples of the parents were shown, with their ranges within Europe. The exhibit showed that the specimens known as *L. complanatum* in Britain are identical with those from the Continent known as *D. issleri*.

D. complanatum has not been verified as occurring in Britain, and most records have proved to be *D. issleri*, which, although of hybrid origin, produces some fertile spores which can spread the taxon beyond the range of the parents. The nearest plants to Britain are on the Jutland heaths, Denmark.

A. C. Jermy

EXPERIMENTAL TAXONOMY OF TAXA OF *SENECIO* L. RELATED TO *S. SQUALIDUS* L. FROM THE MEDITERRANEAN REGION

The exhibit described a study concentrating mainly on infraspecific variability in *Senecio leucanthemifolius* Poiret. To date it has been found that 38 listed taxa are synonyms, and its affinities to related annual and perennial species have been investigated. Included among the annuals to be considered is *S. rodriguezii* Walk. ex Rodr., a small Balearic endemic with lilac ligules and purple disk-flowers. Also of special interest are *S. gallicus* Chaix and *S. coronopifolius* Desf., treated as being synonymous in *Flora Europaea*, and *S. glaucus* L., not mentioned in that work. These species, with their infraspecific taxa, seem to inhabit comparable habitats in different parts of the Mediterranean, tending to be mutually exclusive.

J. Kadereit

TWENTY QUESTIONS

A number of unidentified herbarium specimens were exhibited, and members were asked to give assistance with identification. The response at the meeting was considerable, and it is intended to mount similar exhibits in future years. Members desiring informal help with problems of identification are invited to send specimens to the exhibitor.

The following are some of the taxa identified during the meeting: *Sasa palmata*, *Rodgersia aesculifolia*, *Olearia macrodonta*, *Scleranthus perennis*, *Silene nutans*, *Carthamus tinctorius*, *Bromus unioloides*, *Chenopodium hybridum* and *Calceolaria* cf. *mexicana*.

67 opinions were expressed at the meeting on the 21 (or 22?) taxa displayed, giving 39 different names! 5 names were given for one specimen! No specimen was unnamed.

S. L. M. Karley

SEED OF WILD FLOWERS AND WEEDS

Vast quantities of wild flower seed is imported each year into Britain from the Continent, where it is largely collected from the wild. The species concerned may be common, uncommon or even protected in this country and the races are sometimes visibly different from those that occur in Britain. The seed may eventually find its way into the British countryside as wild flower 'mixes', or by distribution by the public; it may thereby pose a threat to our flora. There is an urgent need in Britain for wild flower seed of British origin, for use in conservation, reclamation, education, and research and development. Emorsgate Seeds was recently established to fill this need and it is cultivating common British wild flowers and weeds for seed production. Samples of seed of a range of species was exhibited and a list of 69 species whose seed is currently available was issued.

D. MACINTYRE

OPHIOGLOSSUM L. IN BRITAIN

The three species of *Ophioglossum* L. currently recognized in Britain were illustrated. *O. azoricum* C. Presl can easily be confused with small specimens of *O. vulgatum* L., and in the past either has not been recognized as a separate entity or has been regarded as a subspecies of *O. vulgatum* (subsp. *ambiguum* (Cosson & Germ.) E. F. Warburg, subsp. *polyphyllum* auct. non A. Braun). Herbarium specimens of each species were displayed to show overall morphological differences. Venation diagrams and scanning electron micrographs of spore ornamentation illustrated the clear differences between the species, and also the intermediate nature of *O. azoricum*. This supports the suggestion from various cytologists that *O. azoricum* is of hybrid origin from *O. lusitanicum* L. and *O. vulgatum*. European distributions of the three species were given, drawing particular attention to the range of *O. azoricum*.

A. M. PAUL

NEW DESIGNS FOR RECORDING CARDS

The Biological Records Centre at Monks Wood has recently redesigned the record cards. The new cards are all A5 size. The designs of the new *Individual Record Cards* (which incorporate the previously separate *Population Form*) and *One Species Cards* were shown. A new card, the *Delete Card*, which will be used when records need deleting or amending, was also exhibited. Comments on the species listed on the regional *Field Cards* were invited before the new size cards are printed.

C. D. PRESTON

A WILD FLOWER KEY TO THE BRITISH ISLES AND NORTH-WEST EUROPE

Proofs of text plates of this book, to be published in May 1981, by Frederick Warne and Co. Ltd., were exhibited. The book will be a guide to the flowering plants of the British Isles and the lowland areas of north-western Europe, from the Loire Valley in the south, east to cover all north-western Germany, and north to cover the Low Countries and Denmark. For the British Isles, all native plants and long-established introductions are included, except for the more critical groups such as *Rubus fruticosus* agg., *Alchemilla vulgaris* agg., *Taraxacum* and *Hieracium*, and for the grasses, sedges and rushes. The book will also contain a series of dichotomous keys, including a general key taking the user to the family, keys to the genera of all the larger families, and keys to the species of all the larger genera.

A special feature of the book will be a series of keys to plants not in flower, based upon vegetative characters, classified by the major types of habitat.

F. ROSE

THE GUERNSEY BAILIWICK, 1980

Specimens were exhibited of some of the most important finds from the three largest islands of the Guernsey Bailiwick in 1980:

GUERNSEY: *Brassica juncea* (*ex* bird seed, where it has doubtless occurred before unnoticed; it is new to the Bailiwick, with only one Jersey record), *Lepidium sativum* (presumably a relic of (mustard) and cress, the first definite record since 1891), *Sedum confusum* (first record for Britain of this Mexican species; *S. praealtum*, the usual member of this group to be seen, was also exhibited for comparison), *Anagallis foemina* (second confirmed record for the Bailiwick; the first in 1890 was discovered after *Wild flowers of Guernsey* was published), *Echium plantagineum* (first record since 1894 of a species known in Jersey for 300 years, and here, perhaps, of garden origin), *Schkuhria pinnata* (*ex* bird seed, new to the Channel Islands), *Senecio* × *albescens* (new to the Bailiwick, only a single record for Jersey), *Trisetum flavescens* (only previous record by Dr Hubbard in 1953 was in a different locality, where it has never been refound), *Bromus carinatus* (new to Guernsey).

ALDERNEY: *Eruca sativa* (*ex* bird seed, new to the Channel Islands), *Torilis japonica* (first record since 1907), *Pyrus pyraster* (new to the Bailiwick, source unknown), *Mentha spicata* (first record since 1900).

SARK: *Veronica hederifolia* subsp. *lucorum* (first confirmed record), *Zostera marina* (first satisfactory record).

P. RYAN

EARLY IRISH NATURE POETRY

In *Early Irish poetry* (1969), Patrick Byrne wrote, concerning rhyme: 'but it is in Ireland that it seems to have been developed to its fullest extent both in Latin and in the vernacular'. Kuno Meyer, a German scholar of Celtic literature, wrote in *Selections from ancient Irish poetry* (1911): (the poems) 'occupy a unique position in the literature of the world. To seek out and watch and love nature, in its tiniest phenomena as in its grandest, was given to no people so early and so fully as to the Celt. Many hundreds of Gaelic and Welsh poems testify to this fact'.

Extracts of early Irish nature poetry were exhibited.

M. J. P. SCANNELL

A COMPUTER IN THE HERBARIUM

The exhibit showed the work of a team of cataloguers in the Natural History Department, Birmingham Museum, transcribing some 21,000 records of the herbarium of British vascular plants into a mini-computer for storing, indexing, retrieval and printing of catalogues.

All written information on every specimen sheet is recorded word for word in the appropriate sections of a record form, from which the entry is typed into the computer. Supplementary information, such as vice-county, grid-reference and a habitat code, is also added. Several unique catalogues can be assembled to serve different requirements.

The exhibit showed pages from the main catalogue and from geographical, ecological and historical summary catalogues in which each record occupies either one or two lines.

B. A. SEDDON

ELODEA MICHX IN GREAT BRITAIN

The identification of *Elodea* species naturalized in Britain has caused much confusion in recent years with the appearance of plants having longer, narrower leaves than observed previously. The exhibit illustrated research undertaken at Lancaster University that has, hopefully, clarified this situation. There have been a number of problems encountered in the study of this genus and one of the most important has been the degree of morphological variation shown by the plants. This has led to much confusion, and accepted criteria, such as leaf length, have been rejected for identification purposes.

The areas of research which have proved most rewarding include leaf and flower morphology, leaf and stem anatomy, cytology and phytochemistry. The results suggest the existence of three taxa in Britain, which correspond with the species *Elodea canadensis* Michx, *E. nuttallii* (Planchon) St John, and *E. ernstiae* St John. It has also become clear that *Elodea* and *Hydrilla* L. C. M. Richard are two distinct genera and *Hydrilla verticillata* (L. fil.) Royle should not be a synonym of *E. nuttallii.*

The present study is continuing with an investigation into the ecology of the three taxa of *Elodea* occurring in Britain.

D. Simpson

SERPENTINE FORMS OF *ASPLENIUM ADIANTUM-NIGRUM* L.

Specimens of *Asplenium* from serpentine rocks of Scotland and Cornwall, previously identified as *A. cuneifolium* Viv., have recently been shown to be allotetraploid and identical with *A. adiantum-nigrum* L. (see Short Notes, pp. 322–323). *A cuneifolium* is a distinct species, a diploid, which appears to be confined to serpentine rocks in central and eastern Europe; it is also one of the parents of the tetraploid *A. adiantum-nigrum*. It is, therefore, not surprising that specimens of *A. adiantum-nigrum* growing on serpentine rock can develop into a morphological form exhibiting some of the characters of *A. cuneifolium*. The Scottish serpentine material of *A. adiantum-nigrum* is remarkably homogeneous. Specimens from the Lizard, Cornwall, are, however, very variable, and intergrade imperceptibly with more typical forms of *A. adiantum-nigrum*.

Specimens were exhibited of *A. cuneifolium* from different European localities to compare with serpentine material of *A. adiantum-nigrum* from Scotland and Cornwall, and of *A. adiantum-nigrum* from a variety of localities and habitats to illustrate the range of variation seen in this species in Britain.

A. Sleep

THE *FLORA OF UIG (LEWIS)*

The *Flora of Uig (Lewis)*, edited by Miss S. Campbell, was published in 1945 by T. Buncle & Co., publishers, of Arbroath. The firm went bankrupt several years ago and in 1978 it was discovered that their stock was included in a sale at an Edinburgh auction room. The stock of the *Flora*, which numbered 248 copies, was withdrawn from the sale and is now being sold through the B.S.B.I. Committee for Scotland at £2·50 per copy, on behalf of Miss Campbell. Copies of the *Flora* were available for purchase at the meeting.

R. A. H. Smith

A NEW HYBRID *SYMPHYTUM*

A plant noticed by W.T.S. growing in the garden of D.McC. at Platt, W. Kent, v.c. 16, on 18th May 1980, between colonies of *Symphytum ibiricum* Steven (*S. grandiflorum* Hort., non DC.) and *S. tuberosum* appears to be a hybrid between those two species. This hybrid is new to science.

W. T. Stearn & D. McClintock

A PRELIMINARY INVESTIGATION OF *CALAMAGROSTIS* ADANSON IN SCOTLAND

Specimens of *Calamagrostis* Adanson from Scotland and of *C. purpurea* (Trin.) Trin. from northern Europe were exhibited, with diagrams showing that material collected from Rescobie Loch, Angus, compares well with specimens of *C. purpurea*. New records from Kirkcudbrights., v.c. 73, and E. Lothian v.c. 82, were also exhibited, together with some flower paintings.

O. M. STEWART

GASTRIDIUM VENTRICOSUM (GOUAN) SCHINZ & THELL. AND *FESTUCA LONGIFOLIA* THUILL. (*F. CAESIA* SM.)

The exhibit comprised two herbarium sheets from **K** of each species, in both cases showing the ungrazed plant and the effect on growth by frequent grazing and scratching by rabbits.

A survey of *Gastridium ventricosum* in England and Wales, at the request of the Nature Conservancy Council with the support of the World Wildlife Fund, was carried out in 1980. Sites in N. Somerset, v.c. 6, Dorset, v.c. 9, S. Hants., v.c. 11, W. Gloucs., v.c. 34 and Glam., v.c. 41, were surveyed. Members who have knowledge of recently recorded sites were invited to exchange information.

P. J. O. TRIST

A VICTORIAN FLORA OF PAINTINGS OF BRITISH PLANTS

Exhibited was a collection of about 1,000 water-colour paintings, executed between 1831 and 1884 by Caroline Rebecca May, eldest daughter of the Rev. Thomas May, Rector of Breamore and Hale (Hants.). In 1850 she went to live with her brother, the Rev. Henry May, at South Petherwyn in Cornwall. Apart from the high artistic quality of the paintings, and the eye for botanical detail, the most interesting attribute is the fact that all are dated and the location noted. Miss May's main areas of research were Hampshire and Cornwall, but a substantial number of flowers and grasses come from Guernsey and the other Channel Islands.

The collection is in the possession of the Rev. John Tyler, 1 Borough Post, North Curry, Taunton, Somerset, to whom application may be made to see the collection for research.

J. T. TYLER

THE AQUATIC SPECIES OF *RANUNCULUS* L. AND THEIR IDENTIFICATION

A tape-slide programme was shown introducing the aquatic species of *Ranunculus* L. found in Britain. *Ranunculus* subgenus *Batrachium* poses problems of identification; the programme illustrated the characteristics of the species of this subgenus, highlighting similarities and differences. The programme was designed for the non-specialist to stimulate interest in these species and to develop confidence in approaching their identification.

P. M. WADE

THE AQUATIC FLORA OF PULL WYKE BAY, WINDERMERE, 1935 AND 1980

For details of this exhibit see Short Notes, pp. 324–325.

P. M. WADE

HENSLOW'S VASCULUM

Exhibited was a fine old vasculum which belonged to John Stevens Henslow, who was Professor of Botany in the University of Cambridge from 1825 to his death in 1861. It was rescued from oblivion in a garden shed by Major John Henslow, great-grandson of the Professor, who has now very kindly presented the vasculum to the Cambridge University Botanic Garden. The gift was very timely, because 1981 is to be celebrated as the 150th anniversary of the present garden, the site of which was purchased in 1831 by the University at the instigation of Professor Henslow.

David Allen in *B.S.B.I. News,* **12** (1976), records that a vasculum belonging to the elder Hooker is extant. It seems probable that Henslow's vasculum is of similar age – rather more than 150 years.

S. M. Walters

LYCOPODIELLA INUNDATA (L.) HOLUB AT SMALLHANGER, SOUTH DEVON

The exhibit showed herbarium specimens of *Lycopodiella inundata* (L.) Holub collected from an old china clay working at Smallhanger Down, on the south-western edge of Dartmoor. The species is very abundant at this site. Also exhibited was a detailed ecological map of the site, species lists and maps of permanent quadrats established to monitor the population. Further details of the site are given in Short Notes, pp. 325–326.

D. L. Wigston, D. Pickering & S. Jones

HOW TO DRAW PLANTS

Two botanical artists, whose drawings have appeared in *B.S.B.I. News*, exhibited detailed instructions on how they draw plants in pen and ink.

Hilary Broad described how to draw from a fresh specimen and Rosemary Wise gave an account of drawing from herbarium specimens. A list was given of the drawing materials used. Original and published examples of their work were displayed.

R. Wise & H. Broad

The following also exhibited:
M. Briggs, Dr & Mrs F. H. Perring. The botanical attractions of Majorca.
E. J. Clement. Some alien plants.
H. Clokie & P. I. Edwards. Johann Jacob Dillenius (1684–1747) – manuscripts and drawings.
L. Farrell, N. T. H. Holmes & C. Newbold. Endangered fine-leaved Potamogetons.
A. N. Gibby. Postage stamps of botanical interest.
M. A. Hyde. *Amsinckia* Lehm. in eastern England.
St Christopher's School, Burnham-on-Sea. Operation orchid.
A. J. Silverside. Naturalized lupins and their hybrids.
E. C. Wallace. Photographs from the B.S.B.I. archives.
E. C. Wallace & M. Briggs. Is *Teucrium chamaedrys* L. native in Britain?

In the lecture hall the following members gave short talks illustrated by colour-slides:
N. T. H. Holmes. Rivers and river plants.
C. Saunders. Saving the flowers of the Somerset Levels.
P. Taylor. The flora of the Isles of Scilly.
J. Wilson. Orchid variations.
J. L. Mason. Bird's-eye view.
P. M. Wade & D. Blease. Aquatic plants in the lakes of the Lake District and Snowdonia.

BOTANICAL SOCIETY OF THE BRITISH ISLES, COMMITTEE FOR SCOTLAND, THE BOTANICAL SOCIETY OF EDINBURGH AND THE NATURAL HISTORY SOCIETY OF GLASGOW, EXHIBITION MEETING, 1980

An Exhibition Meeting was held at the Glasgow College of Technology, on Saturday, 1st November, 1980, at 12.00 hours. The following exhibits were shown:

J. Bevan. Professor Balfour's teaching herbarium.
J. Clark. A bird-seed alien.
R. W. M. Corner. Some new records for Selkirks., v.c. 79, and Roxburghs., v.c. 80.
R. W. M. Corner. Some plants common to Scotland and the northern coast of Greenland.
J. H. Dickson. Crassulaceae from Teneriffe.
G. Halliday. Progress in recording the flora of Cumbria.
J. Lyth. Seashore plants from Arran.
P. Macpherson. Guernsey stowaways two years on.
Mr & Mrs Martin. Some Dumfriesshire plants.
C. W. Murray. A botanist in Skye (new edition).
P. Newell. Pollen analysis from Torrs Warren, Wigtownshire.
D. Robinson. Pollen analysis from Macline Moor, Isle of Arran.
A. J. Silverside. Naturalized lupins and their hybrids.
D. Simpson. *Elodea* in Britain.
A. Slack. A second station for *Arenaria norvegica* Gunnerus in Main Argyll, v.c. 98.
R. A. H. Smith. Flora of Uig.
O. M. Stewart. Flower paintings.
O. M. Stewart. Records for Kirkcudbrightshire, v.c. 73.
O. M. Stewart. *Calamagrostis* Adanson in Scotland.
A. McG. Stirling. Some recent Dunbartonshire records.
A. McG. Striling. Hybrids of *Crataegus* L.
A. McG. Stirling. *Carex vulpinoidea* Michx in the Glasgow area.

B.S.B.I. Publications

Symposium Volumes

The following volumes arose from the very successful series of conferences sponsored by the Society. They contain authoritative papers on many aspects of British botany containing information which is not available elsewhere (all prices include packing and postage).

1. BRITISH FLOWERING PLANTS AND MODERN SYSTEMATIC METHODS
   Ed. A. J. Wilmott, 1948. 104 pages, 18 plates. Wrappers. £2.20
2. THE STUDY OF THE DISTRIBUTION OF BRITISH PLANTS
   Ed. J. E. Lousley, 1951. 128 pages, illustrations and maps. £2.20
4. SPECIES STUDIES IN THE BRITISH FLORA
   Ed. J. E. Lousley, 1955. 189 pages, 2 plates and 23 text figs. £2.80
5. PROGRESS IN THE STUDY OF THE BRITISH FLORA
   Ed. J. E. Lousley, 1957. 128 pages, 4 plates and 9 text figs. £2.60
6. A DARWIN CENTENARY
   Ed. P. J. Wanstall, 1961. 140 pages, 7 plates and 11 text figs. £2.60
7. LOCAL FLORAS
   Ed. P. J. Wanstall, 1963. 120 pages and 12 text figs. £2.60
8. THE CONSERVATION OF THE BRITISH FLORA
   Ed. E. Milne-Redhead, 1963. 90 pages. £2.40
10. FLORA OF A CHANGING BRITAIN (Reprint, 1973)
    Ed. F. H. Perring, 1970. 158 pages, 21 text figs. Paperback. £2.50
12. TAXONOMY, PHYTOGEOGRAPHY AND EVOLUTION (Reprint)
    Ed. D. H. Valentine, 1972. 431 pages and numerous text figs. £14.50
13. PLANTS WILD AND CULTIVATED
    Ed. P. S. Green, 1973. 232 pages, 8 plates and 24 text figs. £3.00
14. THE OAK: ITS HISTORY AND NATURAL HISTORY
    Eds. M. G. Morris and F. H. Perring, 1974. 376 pages, illustrations. £7.50
15. EUROPEAN FLORISTIC AND TAXONOMIC STUDIES
    Ed. S. M. Walters, with the assistance of C. J. King, 1975. £3.90
16. THE POLLINATION OF FLOWERS BY INSECTS
    Ed. A. J. Richards, 1978. 213 pages and 31 plates. £13.50

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2. UMBELLIFERS OF THE BRITISH ISLES
   T. G. Tutin, 1980. 197 pages, 73 line drawings. Paperback. £5.00
3. DOCKS AND KNOTWEEDS OF THE BRITISH ISLES (Polygonaceae)
   J. E. Lousley and D. H. Kent, 1981. *c.* 200 pages, 80 line drawings. Paperback. £5.50

Other B.S.B.I. Publications

ENGLISH NAMES OF WILD FLOWERS (Reprint with corrections, 1981)
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ATLAS OF THE BRITISH FLORA (2nd Edition)
Eds. F. H. Perring and S. M. Walters, 1976. 423 pages, 1700 maps. Maps revised of 300 rarer species. Complete with full set of overlays. £32.00
CRITICAL SUPPLEMENT TO THE ATLAS OF THE BRITISH FLORA (Reprint)
Ed. F. H. Perring, 1968. 159 pages, 500 maps. £18.00
OVERLAYS. Set of 12 on same scale as *Atlas* and *Critical Supplement*. £1.50
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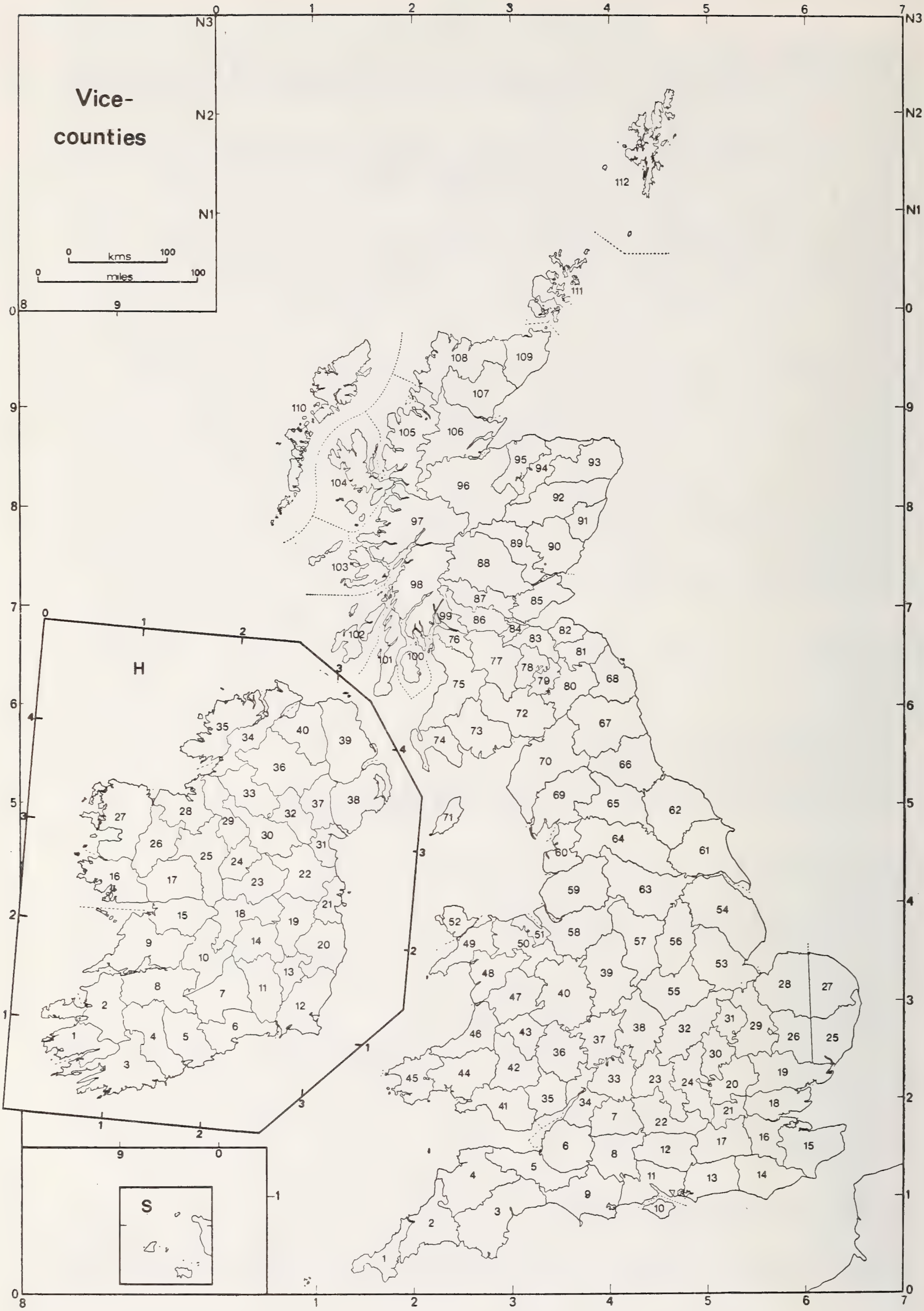

INSTRUCTIONS TO CONTRIBUTORS

Papers and Short Notes concerning the systematics and distribution of British and European vascular plants as well as topics of a more general character are invited.

Manuscripts must be submitted in duplicate, typewritten on one side of the paper only, with wide margins and double-spaced throughout. They should follow recent issues of *Watsonia* in all matters of format, including abstracts, headings, tables, keys, figures, references and appendices. Note particularly use of capitals and italics. *Only underline where italics are required.*

Tables, appendices and captions to figures should be typed on separate sheets and attached at the end of the manuscript. Names of periodicals in the references should be abbreviated as in the *World list of scientific periodicals*, and herbaria as in Kent's *British herbaria*. Line drawings should be in Indian ink, preferably on good quality white card, but blue-lined graph paper or tracing paper is acceptable. They should be drawn at least twice the final size and they will normally occupy the full width of the page. Lettering should be done in Lettraset or by high-quality stencilling, though graph axes and other more extensive labelling are best done in pencil and left to the printer. Photographs can be accepted only in exceptional cases.

Contributors are strongly advised to consult the editors before submission in any cases of doubt. Manuscripts will be scrutinized by the editors and a referee and a decision communicated as soon as possible. Authors receive a galley proof for checking, but only errors of typography or fact may be corrected. 25 offprints are given free to authors of papers and Short Notes. Further copies may be purchased in multiples of 25 at the current price.

The Society takes no responsibility for the views expressed by authors of articles.

Papers and Short Notes should be sent to Dr C. A. Stace, Botanical Laboratories, Adrian Building, The University of Leicester, LE1 7RH. Books for review should be sent to Dr N. K. B. Robson, Dept. of Botany, British Museum (Natural History), Cromwell Road, London, SW7 5BD. Plant records should be sent to the appropriate vice-county recorders. Reports of field meetings should be sent to Dr S. M. Eden, 80 Temple Road, Cowley, Oxford, OX4 2EZ.

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Contents

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