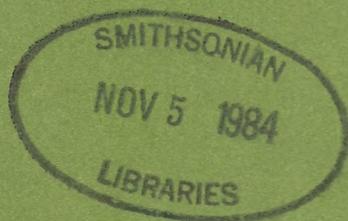


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WATSONIA

**Journal and Proceedings of the Botanical
Society of the British Isles**



Volume 15 Part 1 January 1984
Editors: J. R. Akeroyd, S. M. Eden,
R. J. Gornall, N. K. B. Robson

ISSN: 0043-1532

Botanical Society of the British Isles

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A short history of the introduction and spread of *Elodea* Michx in the British Isles

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ABSTRACT

In the British Isles during the 1970s, there was a sudden and rapid increase of plants having the general characteristics of *Elodea* Michx, but with longer and narrower leaves than had previously been observed. A recent investigation has shown that three species are present, *Elodea canadensis* Michx, *E. ernstiae* St John and *E. nuttallii* (Planch.) St John. The study has also confirmed the identity of *Hydrilla verticillata* (L.f.) Royle in western Ireland. The history of the three *Elodea* species is reviewed. *E. canadensis* was first recorded in 1836 and then rapidly increased, becoming widespread and often reaching pest proportions. Its introduction presented a number of problems to 19th century botanists, particularly regarding its origins and identity. From the 1880s it showed a general decline and, although still widespread throughout the British Isles, it rarely occurs in large numbers. *E. ernstiae* was first seen in 1948, but has not shown any rapid increase or spread, being confined to southern England and one locality in Wales. It has often been confused with *E. nuttallii*. *E. nuttallii* was first recorded in 1966. It has since increased and spread rapidly, particularly in north-western and south-eastern England but is rare in Wales and Ireland and absent from Scotland. It shows a wide range of morphological variation which has caused many problems of identification. *E. nuttallii* has replaced *E. canadensis* at a number of sites where the latter was well-established. It frequently forms large and extensive beds but it has rarely become a pest.

INTRODUCTION

The genus *Elodea* is a member of the family Hydrocharitaceae and comprises 17 species (St John 1962, 1963, 1964, 1965). The genera most closely related are *Egeria* Planch. (once considered to be congeneric with *Elodea*), *Lagarosiphon* Harv. and *Hydrilla* L.C.M. Richard. *Elodea* is native only in the New World and of the 17 species, nine are endemic to North America and eight to South America. There are no native species between northern Mexico and southern Panama or in the West Indies. A few species are adventive in the Old World, particularly Europe and Australasia, the most widespread and well-known of these being *Elodea canadensis* Michx. Following its introduction into a new area, *E. canadensis* frequently attains pest proportions, after which there is a steady decline in its numbers.

After a long period of neglect by British systematists there was renewed interest in the genus during the 1970s. This was due to the sudden and rapid increase in the British Isles of plants which had the characteristic features of the genus, including lowermost leaves in decussate pairs, median and upper leaves in whorls, flowers minute on long thread-like hypanthia and with three bifid stigmas. However, these plants had narrower and often longer leaves than had previously been observed. They were also notable for their wide range of morphological variation, which often appeared to be more or less discontinuous and which suggested the possibility of two or even three new taxa being present. The taxonomic status of *Elodea* was clearly in a state of confusion and, furthermore, the narrow-leaved plants gave every indication of being invasive, with the same potential for colonisation and spread as that shown by *E. canadensis* during the 19th century.

An investigation was therefore carried out which aimed to discover the species present and the most reliable means of their identification, to examine morphological variation and the factors influencing it and to provide information on the ecology and distribution of the taxa. This work has concluded that three species are present: *E. canadensis*, *E. ernstiae* St John and *E. nuttallii* (Planch.) St John. It has also confirmed Scannell & Webb's (1976) identification of *Hydrilla verticillata* (L.f.)

Royle, which is now known from only one locality (Rusheenduff Lough, Renvyle, W. Galway, v.c. H16) and which has in the past been confused with *E. nuttallii*. The results of this investigation will be presented in later papers but, by way of introduction, this paper briefly reviews the history and associated taxonomic problems of the three *Elodea* species in the British Isles.

ELODEA CANADENSIS MICHX

Elodea canadensis is native to North America, being distributed throughout most of the U.S.A. particularly in the northern and eastern states. It is also frequent in south-eastern Canada. The first authenticated station in the British Isles was Waringstown, Co. Down, v.c. H38, where the plant was found in 1836 by a Mr J. New (Moore & More 1866). However, a number of authors have suggested that the plant was seen before this date. Kirk (1851) noted that the lock-keepers on the Market Harborough Canal at Foxton, Leics., v.c. 55, claimed to have had problems with the plant since 1828, whilst Douglas (1880) maintained that Professor D. Oliver believed it to have been first seen in 1817. Furthermore, Lees (1888) wrote "In Aveling's History of Roche Abbey (S.W. Yorks., v.c. 63), there occurs a curious statement 'we noticed it in several places growing with great freedom about half a century ago then it disappeared as mysteriously as it came'. This could hardly have been penned later than 1865 or 1866, which would carry the first observance back to the time of Waterloo". These earlier reports remain questionable without substantive evidence, and New's 1836 locality is still accepted as the first for the British Isles, and indeed for Europe.

The locality usually cited as the first for Great Britain is Duns Castle, Berwicks., v.c. 81. It was discovered there in August 1842 by Dr G. Johnston in a small lake near to the River Whiteadder, a tributary of the Tweed (Marshall 1852). Walker (1912), however, suggested an earlier record from Watford Locks in 1841, and Johnston later indicated that the Duns Castle plants had been introduced from England (Marshall 1852). Therefore it is conceivable that the Duns Castle plants had been taken from Watford Locks, which would suggest that the latter is more likely to be the first British station. Unfortunately there is again no substantive evidence to confirm this, so Duns Castle must remain as the first definite locality.

Johnston observed that *E. canadensis* had disappeared from Duns in 1843 (Douglas 1880) and no further observations were made until the autumn of 1847, when it was seen by Miss M. Kirby in a reservoir next to the canal at Foxton, Leics., v.c. 55. Similar plants were also noted at Leigh Park, S. Hants., v.c. 11, in the same year. There is good evidence to suggest that the arrival of the plant at Foxton was recent, because it appears that the reservoirs had been cleaned and drained two years before its discovery. This contradicted the view of the Foxton lock-keepers that the plant had been present for a number of years. In 1848 *E. canadensis* was known to be present in the Grand Union Canal at Watford Locks, the River Trent at Burton-upon-Trent, Staffs., v.c. 39, and at Chesterfield, Derbys., v.c. 57. By 1849 it had appeared in the River Leen near Nottingham, v.c. 56, and had spread rapidly in the River Trent where a year later it almost blocked the river. In 1850 it reached Rugby, Warks., v.c. 38, where it was observed in the Oxford Canal. Meanwhile the plant had reappeared in Berwicks. and Johnston noted that it had reached the River Whiteadder, where by 1850 "it had colonised almost every part of the river where the water ran sluggishly, almost to choking" (Douglas 1880).

Between 1850 and 1880 *E. canadensis* spread vigorously and some of the most seriously affected areas were the Fen districts of S. Lincs., v.c. 53, and Cambs., v.c. 29. There is good documentary evidence to account for its origin here, given by Marshall (1852). In 1847, specimens were taken from Foxton to the Cambridge Botanic Garden, where they were planted in a tub. In 1848 the curator, W. H. Murray, placed some in a conduit stream running past the garden. From here it spread into the River Cam, via a waste outlet and a small tributary stream, where by 1852 it had become well established, impeding navigation and drainage. It then spread along the Cam and into the River Ouse so that by 1855 it was blocking drains, sluices and most navigable sections of the river. Marshall also gave a vivid description of its effects upon water-borne activities in the Cambridge area: "I am told that the river at the backs of the colleges has been so blocked that extra horses have to be yoked on before barges could be got up to Fosters Mills. Sluice-keepers complain that masses of it get into the pen . . . and the operation of getting boats through is greatly impeded . . . rowers find it interferes with their amusements, and swimmers remark that it clings to them . . . if they are

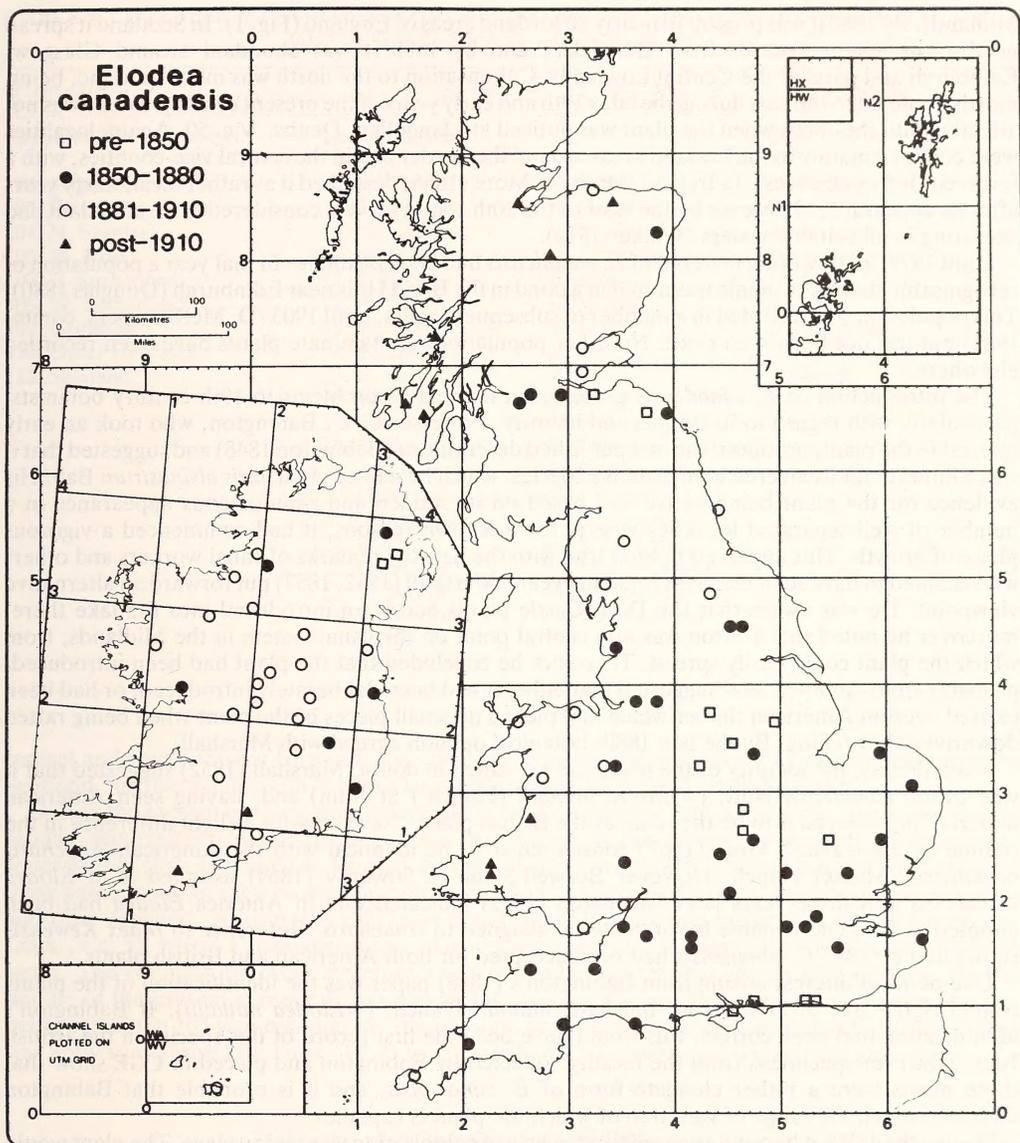


FIGURE 1. Spread of *Elodea canadensis* in the British Isles. Symbols refer to 10 km squares containing the earliest vice-county record in the vice-counties where such records are known. Details of records are held at LANC.

overtaken by a lump of it they are likely to be entangled and dragged by it into deeper water. Lastly drainage is impeded . . . and the average depth of the water in the river below Cambridge has been a foot higher than in ordinary seasons". In 1852, a Mr Rawlinson was sent to the Fens by the Government, to investigate methods of controlling or eliminating the plant. His recommendation, which necessitated dredging the plant, proved ineffective and by 1857 it had colonised ditches and streams throughout S. Lincs. and Cambs.

Meanwhile, the spread continued unabated elsewhere in the British Isles. Marshall (1857) observed that ten years after its appearance at Foxton it was showing no signs of a decline. By 1860 it had reached most of the southern vice-counties of England and was well distributed throughout the

Midlands. By 1880 it was present in nearly all lowland areas of England (Fig. 1). In Scotland it spread northwards and westwards from Berwicks., and by 1880 it was abundant around Glasgow, Edinburgh and parts of the Central Lowlands. Colonisation to the north was more sporadic, being mostly confined to the east during the later 19th and early years of the present century. Wales was not affected until the 1860s when the plant was noticed at Llangollen, Denbs., v.c. 50. Again, localities were confined mainly to the lowland areas around the border and in the central vice-counties, with a few records from the west. In Ireland, Moore & More (1866) described it as rather local, thirty years after its appearance. However by the start of the 20th century it was considered to be abundant and occurring in all suitable waters (Walker 1912).

Until 1879, all flowering material of *E. canadensis* had been pistillate. In that year a population of recognisably staminate plants was noted in a pond in the Braid Hills near Edinburgh (Douglas 1880). This population was recorded in a number of subsequent years, until 1903 (D. McKean pers. comm. 1981) but has not been seen since. No other populations of staminate plants have been recorded elsewhere.

The introduction of *E. canadensis* presented a number of problems to 19th century botanists, particularly with regard to its origins and identity. Professor C. C. Babington, who took an early interest in the plant, produced the first published descriptions (Babington 1848) and suggested that it was a hitherto undiscovered British native species, which he named *Anacharis alsinastrum* Bab. His evidence for the plant being native was based on its sudden and simultaneous appearance in a number of well-separated localities where, for unknown reasons, it had commenced a vigorous phase of growth. This appeared to hold true with the hearsay remarks of canal workers and others who claimed to have seen the plant for many years. Marshall (1852, 1857) put forward an alternative viewpoint. He was aware that the Duns Castle plants had been introduced into the lake there; moreover he noted that Foxton was at a central point on the canal system in the Midlands, from which the plant could easily spread. Therefore he concluded that the plant had been introduced, probably from America, and suggested that either it had been deliberately introduced, or had been carried over on American timber which had picked up small pieces of the plant when being rafted downriver after felling. By the late 1880s botanical opinion agreed with Marshall.

Nevertheless, the identity of the plant still remained in doubt. Marshall (1852) suggested that it was *Udora canadensis* Nutt. (= *Elodea nuttallii* (Planch.) St John) and, having seen American material, he believed it to be the same as the British plant, "save only for a slight difference in the outline of the leaves". Gray (1867) considered it to be identical with the American *Anacharis canadensis* (Michx.) Planch. However Boswell-Syme & Sowerby (1869) assigned it to *Elodea canadensis* and three years later Babington (1872) indicated that in America *Elodea* had been adopted as the generic name for all material assigned to *Anacharis*. Reference to *Index Kewensis* shows that by 1885 *E. canadensis* had been accepted for both American and British plants.

One point of interest arising from Babington's (1848) paper was the identification of the plants from Leigh Park, S. Hants., as *Anacharis nuttallii* Planch. (= *Elodea nuttallii*). If Babington's identification had been correct, this would have been the first record of this species in the British Isles. However specimens from the locality collected by Babington and placed in CGE show that these plants were a rather elongate form of *E. canadensis*, and it is probable that Babington underestimated the range of variation of which the plant is capable.

During the 1880s it became apparent that a cycle of colonisation was taking place. The plant would become established at a locality and over a period of three to four years it would rapidly increase, eventually reaching pest proportions and excluding most, if not all, other macrophytes. Maximum numbers would be maintained for a further three to ten years followed by a gradual decline over a seven to 15 year period. A much smaller, relict population would sometimes remain, or the plant would disappear altogether, possibly returning some years later. This pattern was noted by Siddall (1885) who indicated that "in 1867 the large fishpond in front of Eaton Hall (Cheshire, v.c. 58) was so choked with it as to prevent waterfowl from swimming across" but by 1884 "it was still frequent but far less abundant than formerly". Lees (1888) noted that there was a consensus of opinion that the plant had begun to die out and Murray (1896) suggested that the plant was somewhat less abundant than in recent years. Walker (1912) produced a county-by-county assessment of the status of *E. canadensis* in 1909. This indicated that the plant had declined in the original areas of colonisation, whilst continuing to expand into suitable habitats which had not been previously affected. Therefore the situation between the mid-1880s and the early years of the present century was one of decline in

TABLE 1. LIST OF VICE-COUNTIES IN GREAT BRITAIN AND IRELAND FROM WHICH *ELODEA MICHX* SPECIES HAVE BEEN RECORDED

<i>E. canadensis</i>	<i>E. nuttallii</i>	<i>E. ernstiae</i>
Recorded from all except:	Recorded from:	Recorded from:
74. Wigtowns.	4. N. Devon	30. Beds.
97. Westerness	5. S. Somerset	31. Hunts.
104. N. Ebudes	6. N. Somerset	32. Northants.
105. W. Ross	7. N. Wilts.	33. E. Gloucs.
107. E. Sutherland	11. S. Hants.	35. Mons.
108. W. Sutherland	12. N. Hants.	38. Warks.
109. Caithness	13. W. Sussex	40. Salop
110. Outer Hebrides	14. E. Sussex	42. Brecs.
112. Shetland	15. E. Kent	51. Flints.
	16. W. Kent	53. S. Lincs.
	17. Surrey	56. Notts.
	18. S. Essex	57. Derbys.
	19. N. Essex	58. Cheshire
	20. Herts.	59. S. Lancs.
	21. Middlesex	60. W. Lancs.
	22. Berks.	63. S.W. Yorks.
	23. Oxon	64. Mid-W. Yorks.
	25. E. Suffolk	66. Co. Durham
	28. W. Norfolk	69. Westmorland
	29. Cams.	70. Cumberland
	H21. Co. Dublin	

central and south-eastern England, together with a continued extension of range in north-eastern Scotland, northern and south-western England, central Wales and central Ireland.

During the present century, dramatic increases of the plant became rare events. These rare events usually occurred when the plant became established in the increasing number of man-made water-bodies such as drainage-channels and gravel-pits. Grose (1957) noted that the plant invaded these habitats within a few months of their being filled by water; it then increased for one or two years and then declined. Messenger (1971) saw a similar cycle occurring in the Eye Brook Reservoir, Leics., v.c. 55, where *E. canadensis* spread over a wide area shortly after flooding, but soon receded again. The colonisation cycle therefore appeared to be shorter than in the 19th century. By the middle of the present century *E. canadensis* had reached the maximum extent of its distribution, being present in 103 vice-counties in Great Britain and every vice-county in Ireland (Table 1). This was aptly summarised by Tutin (1952) who described it as widespread but seldom abundant.

ELODEA ERNSTIAE ST JOHN

Elodea ernstiae is native to South America, and is present in southern Uruguay and northern Argentina. The first plants in the British Isles were found in the River Colne, near Harefield, Herts., v.c. 20, in 1948 (BM), and in the Longford river at Stanwell, Middlesex, v.c. 21 (BM), two years later. Grigg (1951) thought that both populations had originated as discarded aquarium material and suggested that they were likely to spread rapidly, starting another *Elodea* 'invasion'. However since 1948, only 19 populations in nine vice-counties have been recorded, 18 of which are in southern England, and one in Wales (Fig. 2, Table 1). Of these only two were still extant at the end of 1982. Therefore the rate of spread of these plants has not warranted the term 'invasion'.

The plant was first assigned, by Grigg, to *E. callitrichoides* (Rich.) Casp., but it was subsequently re-determined as *E. ernstiae* by St John during the 1960s. By the late 1970s there was a lot of confusion between *E. ernstiae* and *E. nuttallii* because of their vegetative similarity. However it is now clear that they are distinct species.

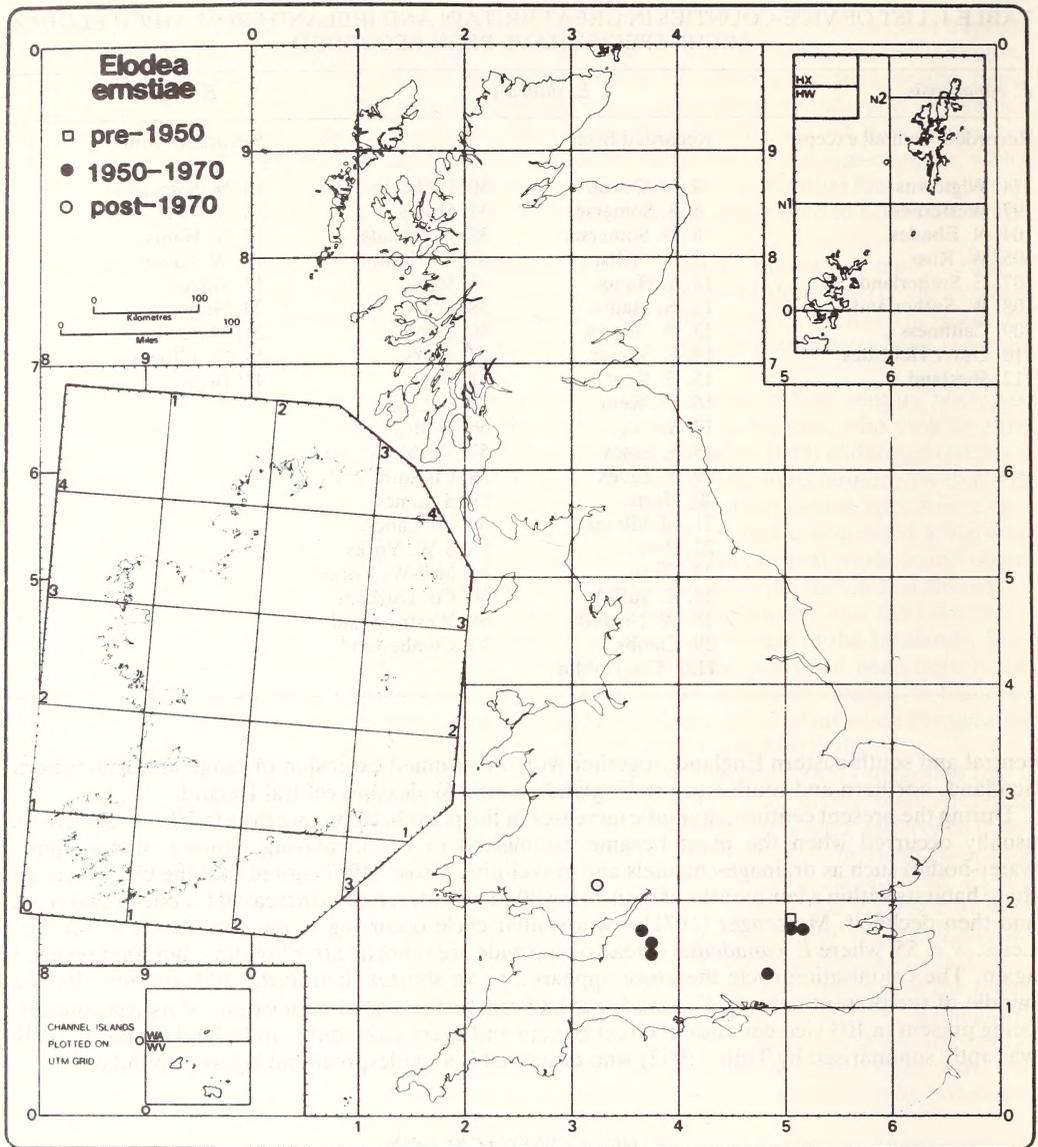


FIGURE 2. Spread of *Elodea ernstiae* in the British Isles. Symbols refer to 10 km squares containing the earliest vice-county record in the vice-counties where such records are known. Details of records are held at LANC.

ELODEA NUTTALLII (PLANCH.) ST JOHN

Elodea nuttallii is native to North America, particularly mid- and north-eastern U.S.A. and Canada, where it has a similar distribution pattern to *E. canadensis*. It is adventive in Europe where it has been known since 1939 (Wolff 1980). The plant was first recorded in the British Isles at Stanton Harcourt near Oxford, v.c. 23, by R. C. Palmer in 1966 (OXF). Three years later, further populations were found at localities in the vicinity of Oxford and, in 1970, the plant was noted in a flooded gravel-pit at Twyford, Berks., v.c. 22. During 1972 and 1973, the Oxford populations were re-discovered and in 1974 further specimens were reported from various localities in Herts., v.c. 20,

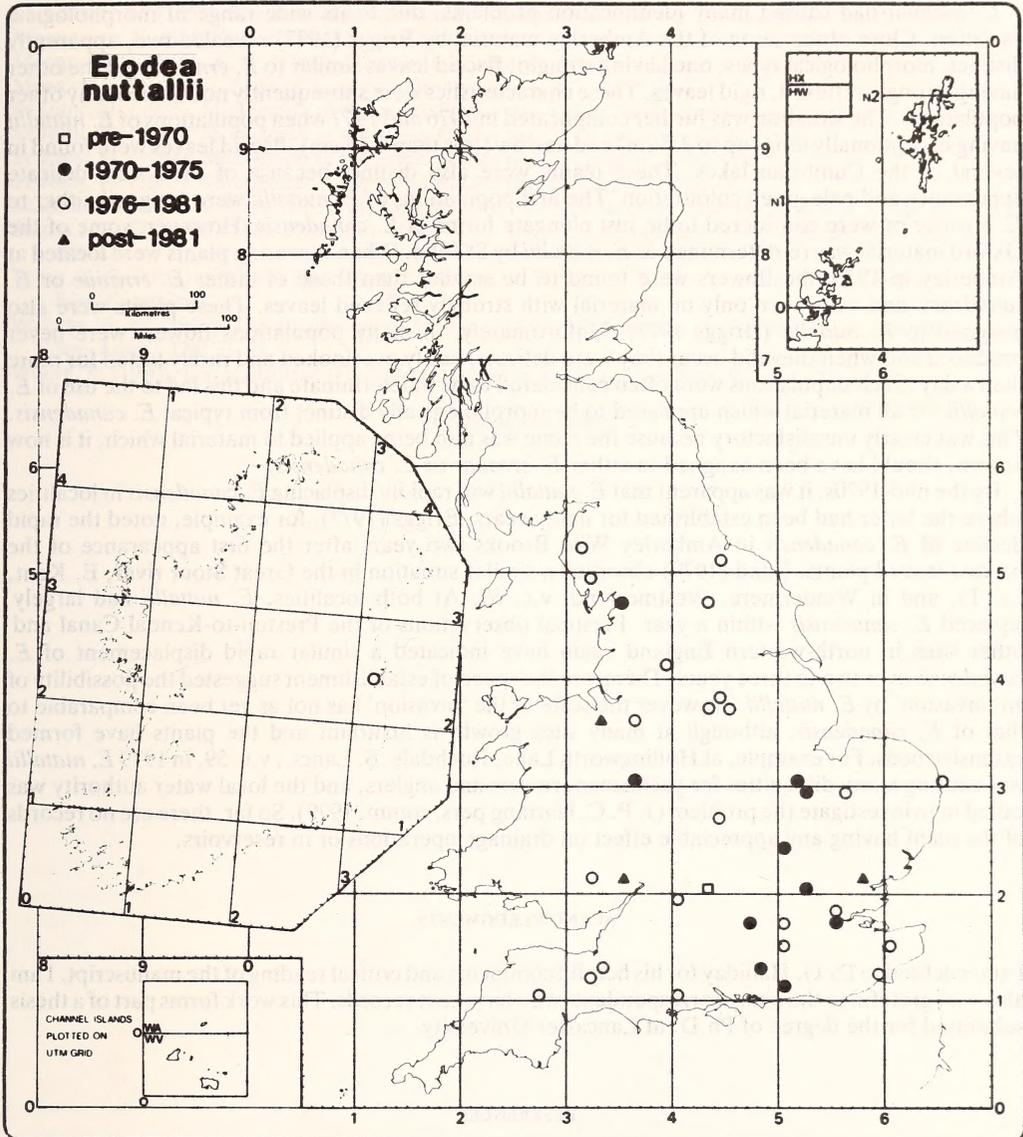


FIGURE 3. Spread of *Elodea nuttallii* in the British Isles. Symbols refer to 10 km squares containing the earliest vice-county record in the vice-counties where such records are known. Details of records are held at LANC.

Cambs., v.c. 29, Hunts., v.c. 31 and S. Lincs., v.c. 53. The plant was also seen at Amberley Wild Brooks, W. Sussex, v.c. 13, in the same year. By 1975, *E. nuttallii* had been reported from a total of ten vice-counties. This number had increased to 35 by 1978, and by 1982 to 41 with many localities (Fig. 3). The spread appears to have been most vigorous in north-western and south-eastern England, although this may reflect more active recording in these areas. There are a number of areas where populations have remained more or less isolated. This is particularly evident in East Anglia, the Midlands and north-eastern England. By the end of 1982, there appeared to be no decline in the number of stations, but only three of these were in Wales, and none were known in Scotland. There is one population known in Ireland.

E. nuttallii had caused many identification problems, due to its wide range of morphological variation. Close observation of the Amberley material by Briggs (1977) revealed two, apparently distinct, morphological types, one having straight, flaccid leaves similar to *E. ernstiae* and the other having strongly reflexed, rigid leaves. These characteristics were subsequently noticed in many other populations. The situation was further complicated in 1976 and 1977 when populations of *E. nuttallii* having exceptionally long (up to 2.5 cm) and narrow (less than 0.15 cm), flaccid leaves were found in several of the Cumbrian lakes. These plants were also distinct because of their size, delicate appearance and pale green colouration. The first populations of *E. nuttallii* were assigned either to *E. ernstiae* or were considered to be just elongate forms of *E. canadensis*. However, some of the Oxford material was re-determined as *E. nuttallii* by St John. When flowering plants were located at Amberley in 1975, the flowers were found to be smaller than those of either *E. ernstiae* or *E. canadensis* and were seen only on material with strongly-reflexed leaves. These plants were also assigned to *E. nuttallii* (Briggs 1977). Unfortunately, in many populations flowers were never produced and when they did occur they were delicate, easily overlooked and rarely lasted for more than a day. Such populations were often considered to be indeterminate and this led to the use of *E. nuttallii* for all material which appeared to be morphologically distinct from typical *E. canadensis*. This was clearly unsatisfactory because the name was also being applied to material which, it is now known, should have been assigned to either *E. ernstiae* or *E. canadensis*.

By the mid-1970s, it was apparent that *E. nuttallii* was rapidly displacing *E. canadensis* in localities where the latter had been established for many years. Briggs (1977), for example, noted the rapid decline of *E. canadensis* in Amberley Wild Brooks two years after the first appearance of the narrow-leaved plants. Lund (1979) observed a similar situation in the Great Stour river, E. Kent, v.c. 15, and in Windermere, Westmorland, v.c. 69. At both localities, *E. nuttallii* had largely replaced *E. canadensis* within a year. Personal observations of the Preston-to-Kendal Canal and other sites in north-western England again have indicated a similar rapid displacement of *E. canadensis* over two to three years. Therefore the speed of establishment suggested the possibility of an 'invasion' by *E. nuttallii*. However the scale of the 'invasion' has not as yet been comparable to that of *E. canadensis*, although at many sites growth is luxuriant and the plants have formed extensive beds. For example, at Hollingworth Lake, Rochdale, S. Lancs., v.c. 59, in 1979 *E. nuttallii* was causing many difficulties for yachtsmen, rowers and anglers, and the local water authority was called in to investigate the problem (J. P. C. Harding pers. comm. 1979). So far, there are no records of the plant having any appreciable effect on drainage operations or in reservoirs.

ACKNOWLEDGMENTS

I am indebted to Dr G. Halliday for his helpful comments and critical reading of the manuscript. I am also very grateful to the many correspondents who have sent records. This work forms part of a thesis submitted for the degree of Ph.D. at Lancaster University.

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(Accepted May 1983)

Dactylorhiza incarnata (L.) Soó subsp. *cruenta* (O. F. Mueller) P. D. Sell in Scotland

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and

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ABSTRACT

A colony of dactylorchids was discovered by the authors in Scotland in 1982 and specimens were subsequently identified as *Dactylorhiza incarnata* (L.) Soó subsp. *cruenta* (O. F. Mueller) P. D. Sell. This subspecies had not been recorded previously from Britain. The plants were therefore compared with those described from localities in the west of Ireland, formerly the only known area of distribution in the British Isles of *D. incarnata* subsp. *cruenta*. Details of the Scottish habitat are given.

INTRODUCTION

In July 1982 a colony of marsh orchids with heavy spotting on both surfaces of the leaves was found by the authors at a locality in West Ross, v.c. 105. Our initial reaction was that these plants were *Dactylorhiza majalis* (Reichenb.) P. F. Hunt & Summerhayes subsp. *occidentalis* (Pugs.) P. D. Sell, already known from several Scottish localities. However, closer examination showed that they had features in common with *D. incarnata* (L.) Soó subsp. *cruenta* (O. F. Mueller) P. D. Sell. The possibility that they could be this taxon was surprising as this dactylorchid was known in the British Isles only from the west of Ireland.

All previous records for this dactylorchid from Britain were errors, and apparently referred to *D. majalis* subsp. *purpurella* (T. & T. A. Stephenson) D. Moresby Moore & Soó (Heslop-Harrison 1950). Fresh specimens were subsequently sent by the authors to Mr R. H. Roberts who confirmed their identity as *D. incarnata* subsp. *cruenta* (material now in herb. R. H. Roberts).

This dactylorchid is a northern-montane plant, widespread in Scandinavia, and it has been suggested that the Irish plants are relics from late glacial times (Heslop-Harrison 1950). The presence of *D. incarnata* subsp. *cruenta* in northern Scotland is therefore not unexpected.

CHARACTERS

The characters of the Scottish plants match those listed by Heslop-Harrison (1950) and differ only in that they are on average smaller, with fewer leaves, and the flower spike is shorter, with fewer flowers (Table 1). They fall, in fact, outside the range described by Heslop-Harrison for *D. incarnata* subsp. *cruenta* in all of these respects. Additionally, in several plants, the flowers were not small, as described by Heslop-Harrison (1950) and noted, without actual measurements, by one of the authors (D. J. T.) in Co. Clare, v.c. H9. The flower colour of many of the plants was more intense than described by Heslop-Harrison, and the inflorescences of several individuals were not at all dense, as one would expect in a subspecies of *D. incarnata*. In these respects they may also deviate from the Irish plants, although further information is required to ascertain this. However, it should

TABLE 1. COMPARISON OF THE WEST ROSS DACTYLORCHIDS WITH IRISH MATERIAL OF *D. INCARNATA* SUBSP. *CRUENTA*
 Figures in brackets show mean values

Character	West Ross dactylorchids (1)	Irish <i>D. incarnata</i> subsp. <i>cruenta</i> (2)
Height	12-21 (17) cm	19-46 (31.4) cm
Total number of leaves	3-5 (4)	4-6 (5)
Number of non-sheathing leaves	0-1 (1)	—
Maximum length of longest leaf	4-9 (7.5) cm	5-15 (8.4) cm
Maximum width of longest leaf	1.2-1.5 (1.3) cm	0.9-2.1 (1.25) cm
Colour of leaves	Bright green to yellowish green	Yellow-green
Form of leaf-spotting	Numerous large and small violet-brown spots on the upper surface, rather denser towards tip. Several smaller, paler spots on the lower surface	As first column
Colour of upper stem and bracts	Stained pinkish-violet	Deeply stained
Markings on upper stem and bracts	Spotted and flecked (bracts curved into the spike)	As first column
Stem	More slender than subsp. <i>incarnata</i>	As first column
Leaf characteristics	Rather rigid and erect, channelled, slightly recurved, hooded at the tip	As first column
Inflorescence length and density	2.5-5.8 cm. Often markedly less closely packed than in subsp. <i>incarnata</i>	3.0-7.5 cm. Somewhat less closely packed than in subsp. <i>incarnata</i>
Number of flowers in spike	5-15	11-42
Labellum shape, pattern and size	Within the range of <i>D. incarnata</i> , very reflexed, mostly medium sized	As first column, but small sized
Flower colour	Palish lilac-purple to deep violet-magenta	Lilac-purple
Lateral sepals	Mainly held erect, broad, blunt at tips, with spots and rings	Held erect, with dots or short bars.
Shape of spur	Thick at base, conical, curved	As first column
Markings on the ovaries	Purplish-flecked on ridges	As first column

(1) The average characters of eight representative plants examined in the field by D. J. T. and four plants examined by R. H. Roberts.

(2) The average characters of Irish populations tabulated by Heslop-Harrison (1950) and additional characters noted by D. J. T. in a population examined in Co. Clare (v.c. H9).

be mentioned that the colony discovered at the lowest altitude (280 m) differed somewhat from the one at the highest altitude (450 m) and the plants from the latter site deviated the most from the Irish plants described by Heslop-Harrison. They were much smaller and more slender, often with a very short, loosely-packed inflorescence with larger flowers which had a deepish, more intense, colour. These plants closely match coloured illustration number 3 of *D. cruenta* subsp. *cruenta* in Landwehr (1977). The plants from the lowest altitude were larger with longer, more compact flowering spikes and a flower colour which matched that described by Heslop-Harrison, and were therefore much

closer to the Irish plants. These differences are perhaps the result of altitude and exposure and also the slightly differing soil conditions discussed later in this paper, although geographical separation may also be a factor. The Scottish plants agree with plants from a colony of *D. incarnata* subsp. *cruenta* seen by D. J. T. in Co. Clare; some of the characters noted from these plants, but characters which were not specifically mentioned by Heslop-Harrison, have been used in Table 1 as additional factors in the comparison of the Irish and the Scottish populations. All the diagnostic characters given by Heslop-Harrison, namely, leaves spotted on both sides, fleck-markings on the upper stem, bracts and ovaries (the bracts never being flecked in other subspecies of *D. incarnata*), combined with the shape of the flowers, were also present in the Scottish plants. Additional evidence that the Scottish dactylorchids belong to the diploid ($2n=40$) *D. incarnata* group was provided from the microscopic examination of bract-edge cells by R. H. Roberts. These were consistent in size and shape with those of the other subspecies of *D. incarnata*: in the subspecies of *D. majalis* the bract-edge cells are larger and of a distinctly different shape. This effectively distinguishes our plants from subspecies of tetraploid *D. majalis* in north-western Scotland, notably subsp. *occidentalis*, which superficially resembles the higher altitude plants in the West Ross dactylorchid colonies (Tennant & Kenneth 1983).

Soó (1980) stated that *D. incarnata* subsp. *cruenta* has leaves which are not cucullate (i.e. hooded), however the leaves of the West Ross dactylorchids are distinctly hooded at their tips, as one would expect in a subspecies of *D. incarnata*. This has also been reported in Irish material of subsp. *cruenta* (Heslop-Harrison 1950).

HABITAT

The West Ross *D. incarnata* subsp. *cruenta* grew in subalpine flushes at altitudes from 280 m to about 450 m. Four separate colonies were discovered over a very small area; the total number of plants seen

TABLE 2. LIST OF SPECIES ASSOCIATED WITH *DACTYLORHIZA INCARNATA* SUBSP. *CRUENTA* IN WEST ROSS

Flowering Plants and Ferns	<i>Leucorchis alba</i>
<i>Selaginella selaginoides</i>	<i>Platanthera bifolia</i>
<i>Ranunculus acris</i>	<i>Gymnadenia conopsea</i>
<i>Thalictrum alpinum</i>	<i>G. conopsea</i> × <i>Dactylorhiza maculata</i>
<i>Viola riviniana</i>	<i>Dactylorhiza maculata</i>
<i>Polygala serpyllifolia</i>	<i>D. incarnata</i> subsp. <i>cruenta</i> × <i>D. maculata</i>
<i>Hypericum pulchrum</i>	<i>Eriophorum angustifolium</i>
<i>Linum catharticum</i>	<i>E. latifolium</i> (nearby)
<i>Potentilla erecta</i>	<i>Scirpus caespitosus</i>
<i>Drosera anglica</i> (nearby)	<i>Schoenus nigricans</i>
<i>Betula nana</i> (nearby)	<i>Carex</i> c.f. × <i>grahamii</i>
<i>Salix repens</i>	<i>C. hostiana</i>
<i>Calluna vulgaris</i>	<i>C. hostiana</i> × <i>C. lepidocarpa</i>
<i>Erica tetralix</i>	<i>C. lepidocarpa</i>
<i>Gentianella campestris</i>	<i>C. vesicaria</i> (nearby)
<i>Pedicularis sylvatica</i>	<i>C. panicea</i>
<i>Euphrasia</i> sp.	<i>C. echinata</i>
<i>Pinguicula vulgaris</i>	<i>C. pauciflora</i> (nearby)
<i>Plantago lanceolata</i>	<i>C. pulicaris</i>
<i>Galium boreale</i>	<i>C. dioica</i> (nearby)
<i>Succisa pratensis</i>	<i>Molinia caerulea</i>
<i>Antennaria dioica</i>	<i>Anthoxanthum odoratum</i>
<i>Leontodon autumnalis</i>	
<i>Tofieldia pusilla</i>	Bryophytes
<i>Narthecium ossifragum</i>	<i>Hylocomium splendens</i>
<i>Juncus squarrosus</i>	<i>Racomitrium lanuginosum</i>
<i>J. triglumis</i> (nearby)	<i>Hypnum cupressiforme</i>
<i>Hammarbya paludosa</i> (nearby)	<i>Rhytiadelphus</i> sp.

was about forty. The plants at the highest altitude were in full flower on 17th July 1982, whereas those at the lowest altitude were significantly past full flower.

Heslop-Harrison (1950) described the Irish habitat as calcareous marshes with a dominance of *Schoenus nigricans* and a soil pH value of 8. *S. nigricans* was present in quantity and closely associated with the West Ross plants at lower altitudes, but it is unlikely that the pH value was as high as 8. At higher altitudes, *S. nigricans* was present, but not so directly associated with the dactylorchids, and a pH measurement gave a value of 5.5–6.0.

A list of the species which were associated with *D. incarnata* subsp. *cruenta* in West Ross is given in Table 2. These associated plants comprised a rich and interesting flora, although only two of them were mentioned by Heslop-Harrison in his paper, namely *Pinguicula vulgaris* and *Gymnadenia conopsea*, neither of which is especially significant.

Other than *D. maculata* (L.) Soó, no other dactylorchids were noted in the vicinity of *D. incarnata* subsp. *cruenta*; however, a few plants were seen at the lowest altitude site which were totally without spots on the leaves, stems, and bracts. These plants were initially thought to be *D. incarnata* (L.) Soó subsp. *incarnata*, but their inflorescences were identical to those of the subspecies *cruenta* growing with them and they were possibly therefore within the range of that subspecies. A single certain hybrid of *D. incarnata* subsp. *cruenta* with *D. maculata* was found (material in herb. R. H. Roberts), although others were probably present. A *Carex* which was growing near the dactylorchids has been tentatively identified as *C. × grahamii* but it is a somewhat unusual variant and requires further investigation.

In spite of the richness of the habitat, shown by the plants listed above, the sites in question did not appear to be unique to the area and therefore *Dactylorhiza incarnata* subsp. *cruenta* could well have been overlooked elsewhere in north-western Scotland.

ACKNOWLEDGMENT

We should like to thank Mr R. H. Roberts for his detailed examination of specimen plants, the provision of biometric measurements on these, and his confirmation of our initial determination in the field.

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(Accepted May 1983)

The distribution, status and conservation of *Juncus balticus* Willd. in England

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ABSTRACT

In England, *Juncus balticus* is now restricted to a small area of the Merseyside sand-dune system at Birkdale. Here it has spread from a known three sites in 1970 to ten in 1982. This seems to be associated with the availability of new wet-slack habitat and disturbance due to public pressure.

The history of the plant in Lancashire and Merseyside is reviewed and its present habitat is described. New information is presented on the occurrence of two *J. balticus* hybrids, one of which is endemic to these counties. The conservation of these rare plants is discussed.

INTRODUCTION

Baltic Rush, *Juncus balticus* Willd., is a local plant of sand-dune slacks and other damp, sandy places, largely confined in Britain to the coasts of north and north-eastern Scotland and the Hebrides. Its world distribution includes parts of North and South America and the Far East, together with countries bordering the North Sea in Western Europe, the Faroe Islands and Iceland. In England, the species is found only in one small area of sand-dunes at Birkdale, Merseyside. There are also old records for Lancashire and the Furness coast, Cumbria.

Two extremely rare hybrid rushes, *J. balticus* × *J. inflexus* and *J. balticus* × *J. effusus* also occur in the Merseyside and Lancashire dunes, the former being endemic to this area (Stace 1972).

The presence of this small, isolated Baltic Rush population at the southern limit of its range, together with its hybrids, is of considerable scientific interest and also poses special conservation problems. Indeed, Stace (1970) predicted the extinction of *J. balticus* at Birkdale ". . . in the fairly near future". Recent observations, however, show that, far from declining during the past decade, the rush has increased considerably, colonising new sites. The two hybrids are still present, though one no longer occurs in a 'wild' state.

It was therefore considered opportune to investigate the recent change of status of *J. balticus* in its only English locality and to gather up-to-date information on the status of the two hybrids and discuss the conservation of these rare plants in the North-west.

THE DISTRIBUTION OF *J. BALTICUS* IN BRITAIN

Baltic Rush has a northern distribution in Great Britain and does not occur in Ireland. It has been recorded in 61 10-km grid squares in Scotland (46 after 1930) (Perring & Walters 1962). Most of these are coastal sites in the north, north-east as far south as Fife, and in the Hebrides. There is a pre-1930 record for square 34/26 in v.c. 69b (Furness) but Stace (1972) considers that the record is dubious. No herbarium material is available and it has not been possible to establish the circumstances of the discovery.

A second English locality at Ansdell, Lytham-St Annes, Lancashire, v.c. 60, (GR/34333.276) has been more thoroughly documented. The plant was discovered by E. S. Marshall on 10th August 1914 (Marshall 1915). Two specimens were collected at the time and further material was preserved by H. E. Bunker in 1947. Surprisingly, this is referable to var. *pseudo-inundatus* rather than the type variant found elsewhere in Britain (Marshall 1915; Stace 1972). In 1946, the colony was described as "abundant in one damp spot in the dunes" (Whellan 1948) but it was destroyed early in 1965, during

the construction of school tennis courts, and the plant has not appeared since on the Fylde coast (E. F. Greenwood pers. comm.)

Godwin (1975) mentions an outlier of *J. balticus* in Somerset but the most recent Flora of that county (Roe 1981) has no record of the plant. Thus, it would seem that the only existing English colony of *J. balticus*, and the most southerly in Britain, is at Birkdale sand-dunes, S. Lancs., v.c. 59. The history of the plant in this area is described below.

THE HISTORY OF *J. BALTICUS* AT BIRKDALE

R. S. Adamson is credited with the discovery of *J. balticus* at Birkdale on 29th May 1913 in "one series of dune hollows in the fixed dunes." The habitat was "permanently damp but not really swampy" (Adamson 1913). Associated species included *Angallis tenella*, *Blackstonia perfoliata*, *Carex panicea*, *C. serotina*, *Centaurium littorale*, *Equisetum variegatum*, *Juncus articulatus*, *Parnassia palustris*, *Sagina nodosa* and *Scirpus setaceus*. This suggests an open damp-slack community, probably representing a fairly early stage in vegetation succession.

Wheldon (1914) undertook a thorough search in July 1914, concluding that the species was restricted to the small area in which it was originally found. The exact position of this colony is now

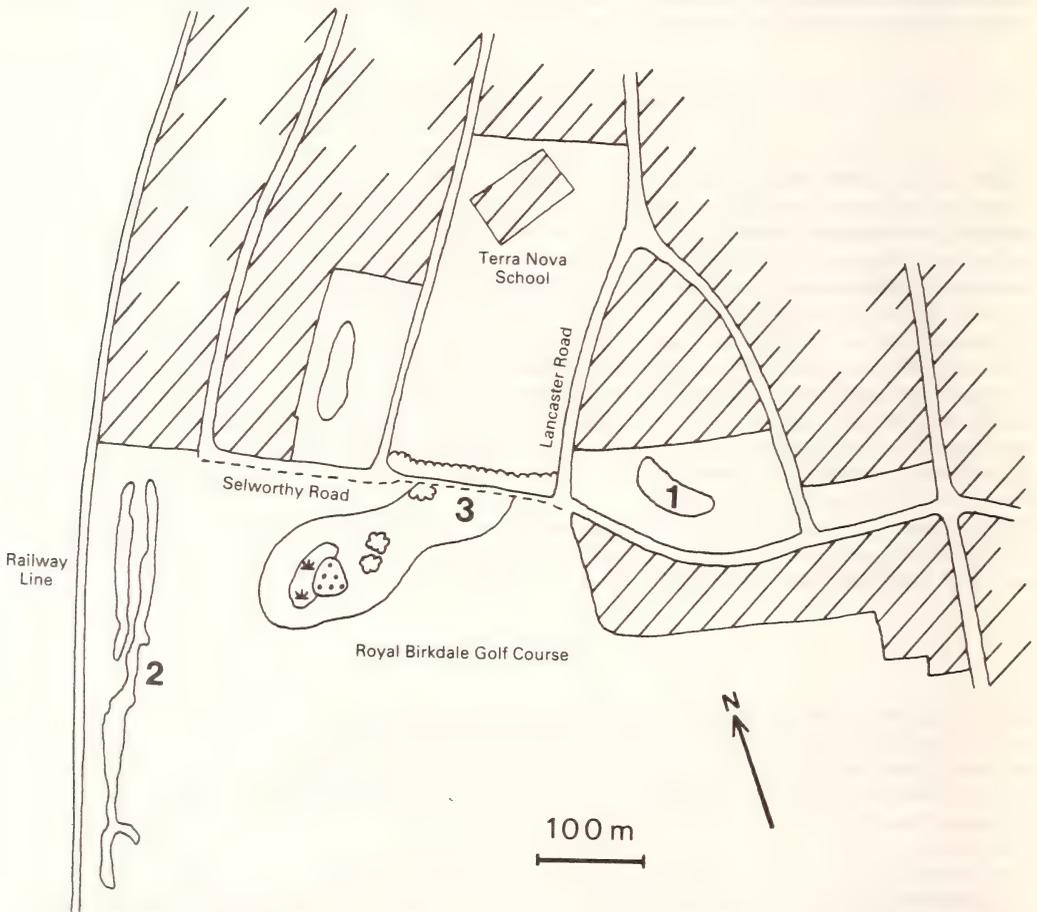


FIGURE 1. Putative locations of the earliest *Juncus balticus* sites in the Selworthy Road area of Birkdale dunes. Outline based on 1945 air photographs. Hatching indicates the extent of built development in 1928. Golf course pond stippled.

1: Adamson's 1913 slack. 2: Travis's "Hillside" site. 3: Holder's 1949 locality.

difficult to determine as the early descriptions are vague and do not include sketch maps. However, clues are available in unpublished manuscripts and letters held in LIV, from Ordnance Survey maps of 1911 and 1928 and air photographs taken in 1945.

F. W. Holder apparently visited Adamson's original site on 19th June 1928, recording in his diary: "There is a large basin in the angle and at the rear of the Terra Nova School in Lancaster Road. Near the bank in this basin Reg (Wagstaffe) showed me the baltic rush. It was frequent there but there were no tufts. In a more distant part we found a large colony in flower . . ."

By 1944, the rush had disappeared from this locality but the slack still existed despite considerable expansion of housing development in the area. Holder's diary entry for 8th July 1944 reads: "On the road back I realised that it is now some years since I last looked at the *Juncus balticus*, so we turned down bumpy Selworthy Roady where the N.E. flank has the large hollow famous to a few Lancs. botanists. We made a thorough search and came to the conclusion that the rush is extinct in its old station. Botanists have not exterminated it; the creeping willow and dried up ground are responsible."

Stereoscopic examination of 1945 air photographs reveals that two ostensibly suitable dune slacks were present just north of Selworthy Road (Fig. 1). The slacks lay east and west, respectively, of the Terra Nova School playing fields, the latter having been a mapped feature since at least 1911. The vegetation tone of these slacks indicates that they were not particularly wet, nor heavily colonised by scrub. J. N. Frankland (pers. comm.) has recently confirmed that *J. balticus* did indeed occur in the eastern slack. He remembers seeing the plant there in 1926 during a visit with F. W. Holder, J. D. Massey, W. G. Travis and R. Wagstaffe. This must surely have been Adamson's (1913) locality.

By 1965, housing development had claimed these slacks but, fortunately, the rush had already appeared in new sites. Thus, W. G. Travis, who first visited Adamson's site in 1913, also records in his manuscript Flora: "A patch in another slack near the Cheshire Lines Railway at Hillside, July 1929." The most likely candidate for this site is a long, narrow wet-slack immediately east of the former railway line. *J. balticus* was also recorded here by V. Gordon in 1961 (Savidge *et al.* 1963), by Stace (1972) and during the present study (site 7, Fig. 2). The use by Travis of the term "Hillside" reflects the more southerly position of this slack, Hillside being a settlement just south of Birkdale.

Holder visited Birkdale dunes again on 22nd June 1949 and discovered another colony. He wrote: "For the next hour or so we examined the marsh flora around the pond on the Birkdale links. Returning to the N.E. side of the pond and while following the barbed wire fence to find a wider gap, we spotted a moderate-sized rush just within the fence. I exclaimed, 'Why it looks like our old friend *J. balticus*'. So we collected two stems of it for examination at the weekend." The identity was later confirmed.

This locality can be pinpointed fairly accurately because the pond referred to still exists at the northern end of the Royal Birkdale Golf Course, just south of Selworthy Road (Fig. 1). The area north-east of the pond appears on the 1945 air photographs as open, damp-slack vegetation. Now, however, it consists mainly of dense *Hippophae* and *Populus* scrub and the rush no longer occurs here, although it is present nearby in the marsh surrounding the pond.

In 1969/70 Stace (1972) knew of three colonies. His "locality 7" was the site recorded by Travis and by Gordon south of Selworthy Road. About 1 km to the north, his "locality 6" consisted of two colonies west of the former railway line. It is not known who found the first of these but it is thought to date back to at least the late 1930s (V. Gordon pers. comm.). The site was visited by N. A. Robinson (pers. comm.) in 1968. He noted many *J. balticus* plants widely scattered over a thinly vegetated, wind-eroded area in which the water-table was near the surface. This colony was almost completely destroyed in 1968 during the construction of a roundabout for the new coastal road between Ainsdale and Birkdale which follows the route of the old railway line. Robinson searched the area again in 1969, finding a new colony about 50 m south-west of the old one, on the seaward side of the road (Stace 1972).

PRESENT DISTRIBUTION OF *J. BALTICUS* AT BIRKDALE

I visited the Birkdale dunes in 1977, 1978 and 1980, noting the presence of *J. balticus* at several sites in addition to those described by Stace (1972). During the summers of 1981 and 1982, a thorough search was made and the positions of all colonies were mapped. In the latter summer, the area of

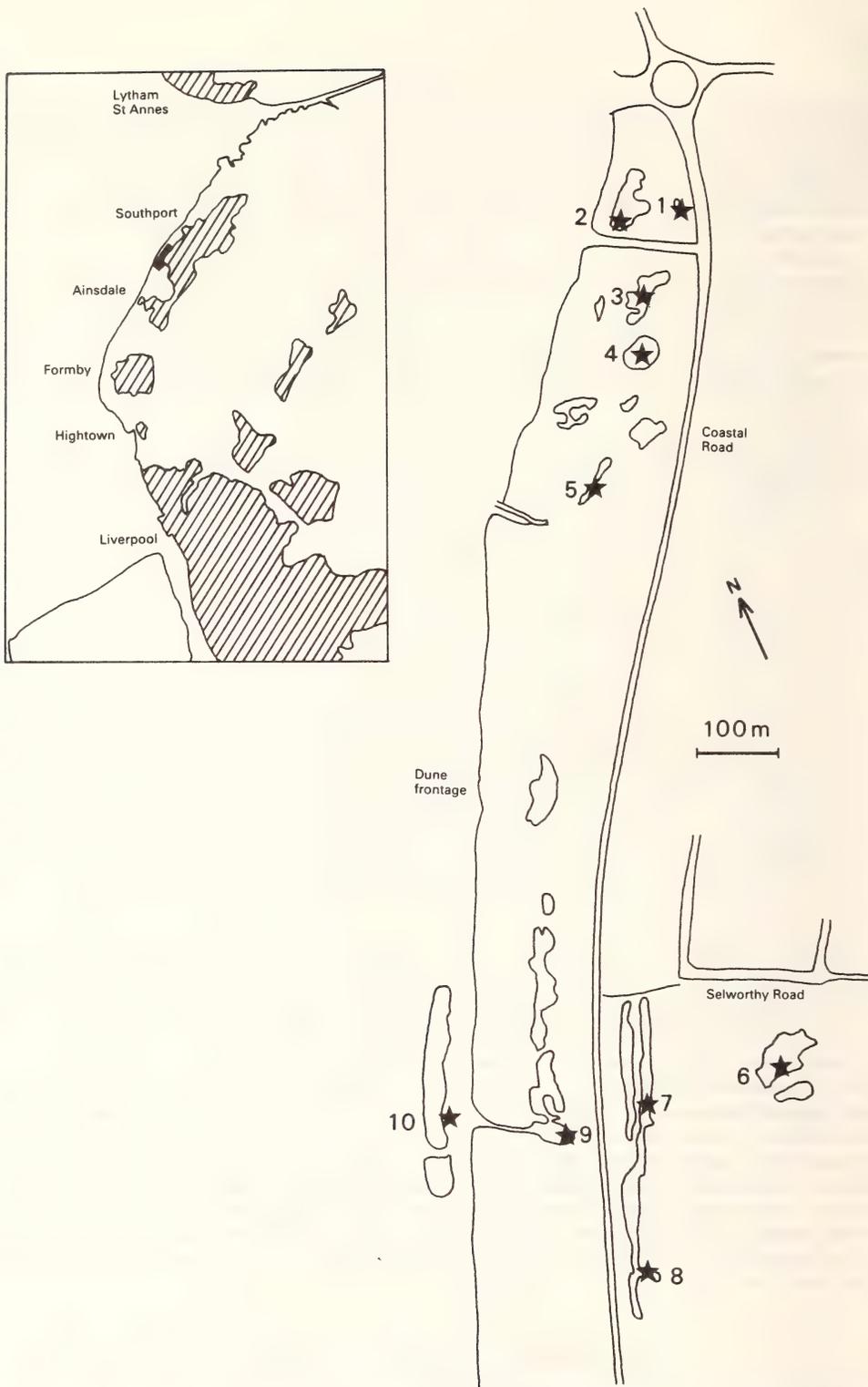


FIGURE 2. Locations of the ten *Juncus balticus* sites recorded in 1982 at Birkdale. Slack outlines and other features based on 1980 1:5,000 scale air photographs. Inset: position of the study area (shaded). Built-up area hatched.

each rush patch was estimated by measuring two diameters, and maximum shoot height was noted for individual patches. In each slack occupied by the rush, a representative sample of vegetation and soil was described using the methods recommended for the National Vegetation Classification (Anon. 1979).

The positions of the ten colonies found are shown in Fig. 2. They form two groups. The northern group (sites 1 to 5) lies to the west of the coastal road. Site 1 contains a remnant of the colony destroyed in 1968 when the road was constructed. About 75 m to the west is a single patch of the rush in a dry slack (site 2). This may also be a survivor of the original colony. The large colony in site 3 is that discovered by N. A. Robinson in 1969. Sites 4 and 5 seem to be post-1970 colonisations, as Stace (pers. comm.) did not find them during his searches of the area in 1969 and 1970.

The southern group (sites 6 to 10) surrounds the long-established colony in Stace's "locality 7" (my site 7). V. Gordon (pers. comm.) notes that, in 1961, sites 7 and 8 were more or less contiguous but the rush has gradually decreased at site 8 since then.

The other colonies, sites 6, 9 and 10, apparently represent a recent expansion in range to the east and west. The *J. balticus* plants in the marsh around the golf course pond (site 6) are perhaps 100–200 m from Holder's 1949 station "within the wires" and the nearest existing colony to that of Adamson (1913).

Rozema (1979) has shown that for several tussock- or patch-forming *Juncus* spp., including *J. balticus*, a relation can be established between a patch's size and its age. Rozema's study area in Holland was relatively homogeneous, the populations were of known age and there was little intra- or inter-specific competition. These conditions do not prevail at Birkdale; nevertheless patch size may give some indication of site antiquity and the rate of colonisation, especially when linked to evidence from air photographs.

Patch measurements at Birkdale are summarised in Table 1. The largest one found (35.5 m²) is in site 7, a locality which probably dates back to 1929. This slack also contains the largest area of the rush (60.7 m²). Site 3 contains the next largest patch (10 m²) and total area (59.7 m²), the colony being already well-established when found in 1969. The single large patch (4 m²) in site 2 may also be of pre-1970 origin. The golf course marsh (site 6) contains two patches, one of which is large (5.1 m²). This colony was not found by Stace and seems to be a recently established patch growing in particularly favourable conditions.

All the other localities support very small patches which seem to have a recent origin, with the exception of sites 1 and 8. Both are old sites where the plant has regressed.

Sites 4 and 10 can be accurately dated from air photographs and personal observations. Site 4 arose from a dune blow-out which was bare of vegetation in 1976. When I visited it in 1977, there was one small patch of *J. balticus*, the slack being very sparsely vegetated. By 1982, there were 32 patches of the rush, the original one covering 2 m², the others being very small.

Site 10 originated behind a recently-formed embryo dune ridge on the foreshore. Plants began to colonise the slack in 1978. One *J. balticus* patch was found in 1980 and this covered an area of 0.3 m² by 1982.

TABLE 1. DISTRIBUTION AND SIZE OF *J. BALTICUS* PATCHES AT BIRKDALE IN 1982

Site no.	No. of patches	Total area (m ²)	Largest patch (m ²)	Estimated time of establishment
1	1	0.8	0.8	late 1930s
2	1	4.0	4.0	pre-1970
3	17	59.7	10.0	pre-1969
4	32	4.9	2.0	1976
5	1	0.3	0.3	post-1970
6	2	5.5	5.1	post-1970
7	13	60.7	35.5	ca. 1929
8	2	0.8	0.7	ca. 1929
9	1	0.7	0.7	post-1970
10	1	0.3	0.3	1978

TABLE 3 (continued)

	1	2	3	4	5	6	7	8	9	10
<i>Dactylorhiza incarnata</i>	1		1		1		1			
<i>Eleocharis quinqueflora</i>				8	9			7	3	
<i>Epipactis palustris</i>								2		
<i>Equisetum arvense</i>	2				2					
<i>E. palustre</i>						1	1	1	1	
<i>E. variegatum</i>								2	1	
<i>Euphrasia nemorosa</i>					1			2		
<i>Festuca rubra</i>	9	9	4		2		7	4		
<i>Galium palustre</i>						3				
<i>Glaux maritima</i>		1								
<i>Holcus lanatus</i>	3				3		5			
<i>Hydrocotyle vulgaris</i>						1			1	
<i>Hypochoeris radicata</i>		1								
<i>Juncus articulatus</i>		1	2	1	2	2	1		1	3
<i>J. balticus</i>	1	3	2	2	2	2	2	1	3	2
<i>J. bufonius</i>				1					4	1
<i>Lathyrus pratensis</i>	4									
<i>Leontodon autumnalis</i>					1		1	1		
<i>L. taraxacoides</i>		1		1	1			1		
<i>Lolium perenne</i>										1
<i>Lotus corniculatus</i>	1	3	4		1		1	2		
<i>Mentha aquatica</i>						2			1	2
<i>Myosotis caespitosa</i>									1	1
<i>Parnassia palustris</i>					1			2		
<i>Pastinaca sativa</i>	1									
<i>Plantago lanceolata</i>	2				1		1	1		
<i>P. major</i>		2			1					
<i>Poa pratensis</i>			1				1			
<i>Polygonum amphibium</i>									1	
<i>Potentilla anserina</i>						1				
<i>Prunella vulgaris</i>								5		
<i>Pulicaria dysenterica</i>								1		
<i>Pyrola rotundifolia</i>								2		
<i>Ranunculus acris</i>	1									
<i>Rhinanthus minor</i>							1		1	
<i>Rubus caesius</i>	1									
<i>Rumex crispus</i>										1
<i>Sagina nodosa</i>									1	
<i>Scirpus maritimus</i>						8			1	1
<i>Senecio jacobaea</i>	1	1								
<i>Taraxacum officinale</i>		1			1					
<i>Trifolium fragiferum</i>			2	1	2				2	
<i>T. pratense</i>			3		2		5	3	1	
<i>T. repens</i>	1	5	5		2					
<i>Triglochin maritima</i>										2
<i>T. palustris</i>						1			1	
<i>Tripleurospermum maritimum</i>										1
<i>Amblystegium serpens</i>					1					
<i>Bryum algovicum</i> var. <i>rutheanum</i>								6		
<i>B. pseudotriquetrum</i>					1					
<i>Calliargon cuspidatum</i>			3		3	9		1		
<i>Campyllum chrysophyllum</i>									2	
<i>C. stellatum</i>								1		
<i>Drepanocladus fuscus</i>						5				
<i>Pellia endiviifolia</i>					4					
<i>Riccardia pinguis</i>								4		
Bare ground			1	4	1			1		5

A small number of associates indicates the proximity of the sea, being characteristic of maritime or sub-maritime habitats. These are *Aster tripolium* (1), *Glaux maritima* (1), *Scirpus maritimus* (3) and *Triglochin maritima* (1).

Examination of phytosociological affinities shows that some samples are characteristic of dune slack communities, while others approach upper salt-marsh vegetation types (J. Rodwell pers. comm.). Samples 1, 3 and 7 are consistent with the *Salix repens-Holcus lanatus* community, an important type in west-coast dune systems. Within this type, samples 1 and 7 fit the driest and most species-poor sub-community, dominated by mixtures of *S. repens*, *H. lanatus*, *Festuca rubra* and *Agrostis stolonifera*. In contrast, sample 3 is from one of the wetter sub-communities of winter-wet and summer-dry slacks, characterised by *Calliargon cuspidatum* and *Trifolium repens*.

Samples 2, 4, 5, 8 and 9 contain little *Salix repens* and seem to be referable to the *Juncetum gerardi* (Adam 1981), a diverse association usually found on the upper levels of sandy salt-marshes in the north and west but also sometimes in dune slacks. The tall *Festuca rubra* sub-community is represented by sample 2, while the others probably belong in the *Carex flacca* sub-community, consisting of species-rich grassland, typically on the tidal limit but with non-tidal affinities. Areas of broken ground on flushed sites often contain *Eleocharis quinqueflora*, as in the Birkdale samples.

Although sample 10 could also belong to the *Juncetum gerardi*, its dominant, *Agrostis stolonifera*, is often the major species of a rather ill-defined vegetation type of freshwater and brackish seepage-lines, puddled inland pastures, etc. This is the *Agrostis stolonifera-Alopecurus geniculatus* inundation community, to which sample 10 probably belongs.

Sample 6 is readily attributed to the *Scirpetum maritimi*, a widely distributed halophytic swamp/fen community dominated by *Scirpus maritimus*, often with an understory of *Agrostis stolonifera*.

TABLE 4. SUMMARY OF INFORMATION ON NATURALLY OCCURRING CLONES OF *JUNCUS BALTICUS* HYBRIDS

Locality & Grid Reference	Habitat	Date found	Approx. area of clone (m ²)	Fate
<i>J. balticus</i> × <i>effusus</i>				
Ainsdale 34/298.126	Wet-slack	1933	800 (1966)	Destroyed by holiday camp development, 1968 Covered by bulldozed sand, 1974
Hightown 34/297.033	Dry-slack	1966	0.02 (1966)	
Hightown 34/296.029	Upper shore	1973	0.5 (1970) 1.0 (1975)	Washed away by high tides, 1980/81
<i>J. balticus</i> × <i>inflexus</i>				
Lytham-St Annes 34/313.300	Wet-slack	1966	50 (1966) 138 (1982)	Extant
Birkdale 34/306.140	Wet-slack	1951	400 (1970) 450 (1982)	Extant
Ainsdale 34/281.099	Wet-slack	1950/52	225-400 (1970) 300 (1982)	Extant

J. BALTICUS HYBRIDS—PRESENT DISTRIBUTION AND STATUS

Stace (1972) described in detail the circumstances surrounding the discovery of the two hybrids *J. balticus* × *J. effusus* and *J. balticus* × *J. inflexus* on the coast between Liverpool and Blackpool. He recognised two sites for the former at Ainsdale and Hightown and three for the latter at St Annes-on-Sea, Birkdale and Ainsdale (Table 4).

Since Stace's study, one new clone of the *effusus* hybrid has been recorded. It was found at Hightown in 1973 by E. F. Greenwood, growing in a brackish marsh community on the upper shore dominated by *Phragmites australis* and *Scirpus maritimus*, together with some *Juncus gerardii* and *Glaux maritima*. The clone was similar morphologically (C. A. Stace pers. comm.) to the clump found by V. Gordon in 1966 in a Hightown dune-slack some 300 m to the north-east. Unfortunately, Gordon's clone was lost in 1974 when contractors working on a new housing estate bulldozed sand over the site (C. A. Stace pers. comm.).

By 1975, Greenwood's clone was flourishing and occupied an area of about 1 m². However, it was judged to be threatened by coastal erosion and, in January 1977, eight rhizome fragments were transplanted to the nearby Altcar Rifle Range by the Lancashire Trust for Nature Conservation. The original clump was washed away by high tides during the 1980/81 winter and I have been unable to find the plant since at Hightown. The only other known patch of the *effusus* hybrid was destroyed in 1968 during the construction of a holiday camp at Ainsdale. This, too, was transplanted but the hybrid now no longer occurs in the 'wild' state.

In contrast, the three clones of the *inflexus* hybrid still exist as vigorous, spreading patches in wet slacks (Table 4). The Birkdale clone was damaged in 1975 when a shallow pond was excavated, in error, in the slack occupied by the rush. About 20% of the patch was destroyed but it has continued to expand, invading the margins of the pond and even the fixed dune slopes around the slack. This plant exhibits spectacular hybrid vigour with shoots commonly 1.8 m high, reaching a maximum of 2 m at Ainsdale. The St Annes clone differs morphologically from the other two (Stace 1972), most shoots being about 1 m tall, with a maximum of 1.35 m (M. Jones pers. comm.).

THE CONSERVATION OF *J. BALTICUS* AND ITS HYBRIDS

Past destruction of parts of the English *J. balticus* population and some hybrid clones is attributable to building development and coastal erosion. In recent years, further losses have been largely prevented by statutory designation of dune habitat as nature reserves and by positive conservation management, such as transplanting from threatened sites.

Of the Birkdale sites for *J. balticus*, numbers 7 and 8 are within the Ainsdale & Birkdale Hills Local Nature Reserve (LNR). Site 6 is on the Royal Birkdale Golf Course but is not threatened by course management operations. The other sites are in the strip of dunes west of the coastal road. This area is not part of the LNR but its status is currently under review.

All the clones of the *inflexus* hybrid are on statutorily protected land, specifically the Lytham-St Annes LNR, the Ainsdale & Birkdale Hills LNR and the Ainsdale Sand Dunes National Nature Reserve (NNR).

Apart from the NNR and the golf course, all the areas mentioned are open to the general public on foot, and trampling, together with the unauthorised riding of horses and motor-cycles, has damaged the vegetation in several slacks occupied by *J. balticus* (Smith 1981). However, as discussed later, this may not be a threat to the plant.

Table 5 presents information on the known transplants of *J. balticus* and its hybrids from threatened sites. Some transplantation attempts in the past were not fully documented. Thus, Stace (1972) mentions a herbarium note by W. G. Travis, dated 28th October 1913, in which it is stated that rhizomes and seeds of *J. balticus* were scattered "... in a large slack nearer to Ainsdale where it is less likely to be disturbed". Nothing is known about the results of this operation.

Attempts to transplant *J. balticus* from Birkdale to the Ainsdale NNR seem to have been unsuccessful, whereas most of the hybrid transplants have taken. Once established, both hybrids appear to compete well with other vegetation and most of the patches have grown steadily (Table 5). The most successful transplant sites seem to be wet-slacks with sparse vegetation. Losses have occurred from the margins of an excavated pond, where a rise in the dune water-table has resulted in

TABLE 5. SUMMARY OF INFORMATION ON *JUNCUS BALTICUS* AND HYBRID TRANSPLANTS

Site of transplant & Grid Reference	Habitat	Origin of material	Date of transplant	Patch area 1982 (m ²)	Fate
<i>J. balticus</i> × <i>effusus</i>					
NNR Large Pond 34/303.112	Aquatic	Ainsdale	1976	—	Died out
NNR Slack 15 34/287.106	Wet-slack	Ainsdale	1968	37	Extant
NNR Slack 15 34/287.107	Dry-slack	Ainsdale	1968	—	Died out
NNR Slack 56 34/291.113	Semi-aquatic	Ainsdale	1978	0.1	Extant
NNR Slack 118 34/286.107	Dry-slack	Ainsdale	1968	21	Extant
Altcar Rifle Range 34/286.050	Wet-slack	Hightown foreshore	1977	3	Extant
<i>J. balticus</i> × <i>inflexus</i>					
NNR Large Pond 34/303.112	Aquatic	Birkdale	1976	2	Extant
NNR Slack 15 34/287.106	Wet-slack	Birkdale	1968	14	Extant
NNR Slack 4 & 5 34/285.105/7	Wet-slack	Birkdale	1967	—	Died out
<i>J. balticus</i>					
NNR Slack 4 & 5 34/285.105/7	Wet-slack	Birkdale	1967	—	Died out
NNR Large Pond 34/303.112	Aquatic	Birkdale	1971	—	Died out

the transplants becoming almost permanently inundated, and from mature wet-slacks where competition may have hindered establishment of transplants.

Living material from the various clones of both hybrids has been cultivated in a number of botanical gardens, including those of the Universities of Leicester, Liverpool, Manchester, Oxford and Sheffield, as well as at Kew. At Leicester, the hybrids grow as well as *Juncus inflexus* and better than *J. effusus* or *J. balticus* (C. A. Stace pers. comm.).

DISCUSSION

The origin of the *Juncus balticus* population at Birkdale, so far from its Scottish localities, can only be a matter for conjecture. Adamson (1913) remarked that the plant appeared to be "perfectly native", there being no reason to suspect a recent introduction. Stace (1972) argued that it was probably a recent immigrant because of the restricted distribution of the colonies and the absence of records before 1913. He suggested sea-borne rhizomes as a means of invasion. The fact that Adamson's colony was about 600 m inland casts doubt on this idea and it is quite possible that the plant was simply overlooked, having long been a member of the dune flora but highly localised.

The history of the rush at Birkdale during the present century suggests that it is a good coloniser of young, sparsely vegetated dune slacks and that it may then persist for several decades before declining as the habitat becomes drier and more heavily vegetated. Thus, Travis's "Hillside" slack could not have existed before 1884 when the Southport and Cheshire Lines Extension Railway was built along the upper foreshore, isolating an area of beach to form the slack. *J. balticus* was recorded there in 1929 and 1961 but, although the plant is still well-established (site 7), it has apparently declined at the southern end of the slack (site 8) compared with its status in the late 1960s.

The most recent colonisations have been mainly in the strip of dunes formed since 1884 to the west of the former railway line. Air photographs show that, with the exception of site 1, the slacks in which the rush now occurs did not exist in 1945. They were excavated by wind erosion, a process that accelerated in the early 1970s when an extremely low dune water-table permitted further wind-scouring of basin sites. Since 1973, the mean water-table has risen by about 80 cm (K. R. Payne pers. comm.), thereby producing suitably wet conditions for *J. balticus* establishment.

J. balticus produces rather sticky seeds which germinate readily (C. A. Stace pers. comm.). It may therefore be no coincidence that the recent expansion of the plant at Birkdale has accompanied a substantial increase in informal public recreation along this stretch of coastline. On summer weekends up to 10,000 cars are parked on the beach between Ainsdale and Southport (Metropolitan Borough of Sefton 1982) and the adjacent dunes and slacks contain a well-developed network of informal footpaths. That pedestrians have played an important role in spreading *J. balticus* is suggested by the fact that patches of the rush in sites 5 and 9 are situated on much-used footpaths, while the distribution of patches in the long-established sites 7 and 8 is closely related to the footpath network in that slack. The new colonies in sites 9 and 10 presumably originated from seeds or rhizome fragments carried across the coastal road from site 7 on a popular route to the beach from Selworthy Road (Fig. 2).

Another important dispersive agency may have been unauthorised and illegal motor-cycle scrambling which has taken place in the dunes since about 1970 (Smith 1981). Site 4 has been particularly affected by this activity in the past five years, during which the number of *J. balticus* patches has increased from one to 32. The rush displays considerable resistance to mechanical damage, surviving in some areas where other vegetation has mostly been destroyed. However, in such sites, the individual plants are suppressed, maximum shoot height being 17–40 cm, compared with 46–100 cm in untrampled localities.

Juncus balticus is still restricted to a small part of an otherwise large dune system. However, its recent increase, ability to colonise and persist in a wide variety of slack types and its apparent resilience to public pressure indicate that it should survive as an interesting and important component of the Merseyside sand-dune flora in the foreseeable future.

ACKNOWLEDGMENTS

I am indebted to the following for helpful advice and information: J. Adamson, J. N. Frankland, Miss V. Gordon, E. F. Greenwood, M. Jones, N. W. Lepp, K. R. Payne, N. A. Robinson, J. Rodwell and the National Vegetation Classification Project, C. A. Stace and Mrs B. Yorke. Grateful thanks are also due to M. Brummage and Merseyside County Council for access to air photographs and archives in the Planning Department and Museum respectively. Liverpool Botanical Society kindly allowed me to refer to W. G. Travis's manuscript Flora of South Lancashire.

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(Accepted March 1983)

The taxonomic status of oaks (*Quercus* spp.) in Breen Wood, Co. Antrim, Northern Ireland

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ABSTRACT

The taxonomic status of oaks (*Quercus* spp.) at a National Nature Reserve, Breen Wood, Co. Antrim, Northern Ireland, was assessed using a combination of eight leaf characters and pollen viability. Four types of tree were recognised: 'pure' *Q. petraea*, F₁ hybrids between *Q. petraea* and *Q. robur*, and two types of backcrossed hybrids—one, morphologically indistinguishable from 'pure' *Q. petraea* but with low pollen viability and the other, morphologically intermediate but with a comparatively high pollen viability. One 'pure' *Q. robur* tree was identified. It is argued that the wide range of backcrossed hybrids present in Breen Wood may be the result of extensive forest clearance in the past, which has promoted introgression.

INTRODUCTION

Variational patterns within and between populations of oaks, *Quercus robur* L. and *Q. petraea* (Matt.) Liebl., have been extensively described (e.g. Carlisle & Brown 1965; Cousens 1963, 1965; Rushton 1978, 1979; Wigston 1974, 1975). The general conclusions derived from these various researches have been that much of the variation can be ascribed to introgressive hybridisation, although authors might disagree on the levels of such hybridisation within populations.

In the course of a preliminary survey of variation in oaks in Northern Ireland (Rushton 1979) it became apparent that a proportion of the trees at Breen Wood, Co. Antrim (GR 34/124.336) were of morphologically intermediate type. This 21 ha woodland is of interest as it is said to represent one of the few remaining stands of natural oakwood in Northern Ireland and has been, in consequence, awarded the status of a National Nature Reserve. Because of the importance of the site, it was decided to resample the woodland more extensively and to use pollen viability studies as an adjunct to leaf morphology in trying to determine the taxonomic status of the trees. Similar studies on oak have already been described by Olsson (1975) and Rushton (1978), and many parallel studies have been carried out in other genera, e.g. *Primula* L. (Woodell 1965), *Agrostis* L. (Bradshaw 1958).

METHODS

During spring 1981, 80 trees from Breen Wood were selected using a random walk. These trees were numbered, marked and mapped so that they could be sampled subsequently for leaf and fruiting material. In May 1981, a sample of catkins was removed from each tree, placed in individual paper envelopes and transported back to the laboratory. The catkins were placed on clean microscope slides and left undisturbed for 12 hours to allow the anthers to dehisce. Before staining, each sample was gently shaken to release any remaining pollen. The pollen was stained with aniline blue in lactophenol and unstained pollen (inviable) estimated for each tree in a count of at least 200 grains.

In mid-summer 1981, leaf samples were collected consisting of five midshoot leaves per tree from a standard canopy position, i.e. at a height of 6 m on the southern aspect (Rushton 1974, 1978). These leaves were assessed for eight characters broadly corresponding to those of Rushton (1978). These were:

1. Lamina shape or obversity.
2. Lobe depth ratio (an estimate of leaf dissection).

3. Petiole ratio (an estimate of relative petiole length).
4. Percentage venation (an estimate of intercalary veining on the leaf).
5. Number of lobe pairs.
6. Basal shape of the lamina.
7. Auricle development.
8. Stellate abaxial pubescence.

Lamina shape, lobe depth ratio and petiole ratio were all assessed by leaf measurement; percentage venation and lobe number were counts; basal shape of lamina, auricle development and stellate abaxial pubescence were assessed on a 0-4 index scale using a set of standard leaves for comparison. This range of characters is more restricted than that used in the earlier study (Rushton 1978).

In September and early October 1981, further visits were made to collect fruiting material. However, due to a very poor mast year, only 22 of the previously sampled trees had produced acorns, which were, for the most part, immature and failed to mature through the autumn. Fruit characters have not therefore been included in this study.

DATA HANDLING

In order to provide a morphological basis for comparison, the morphological data for the 80 Breen Wood trees were combined with type population data of *Q. robur* (25 trees) and *Q. petraea* (22 trees) used in an earlier study (Rushton 1974, 1978) and analysed using a Principal Component Analysis program (PCA) written in PASCAL for the VAX 11/780 computer. The results presented here are derived from a PCA of the appropriate correlation matrix. PCA provides a multidimensional view of the data, but, as indicated in earlier studies (Rushton 1974, 1978), the first Component is often the most useful in that it separates *Q. robur* from *Q. petraea* at the two ends of the axis with intermediate forms distributed between. The earlier studies had shown that, using a PCA, the two reference populations mentioned above separated clearly, with no overlap. In order to avoid bias in the choice of reference populations, the Breen Wood data were also analysed with other reference populations including population mean values for 'pure' populations using the more restricted character set of this present study. Analysis of 'pure' populations alone, either using individual tree results or population means for the restricted character set, resulted in clear, unequivocal separation of the two types - 'pure' *Q. robur* and 'pure' *Q. petraea*. For comparison with the earlier studies, only the analysis of the Breen data together with the previously reported two reference populations will be considered. The results with other reference populations are substantially similar.

RESULTS

Fig. 1 summarises the results of both the morphological and pollen viability study. The first Component of the PCA separated out the two reference populations with *Q. robur* at the right hand end of the Component. The 80 trees from Breen Wood grouped towards the left hand end of the

TABLE 1. VECTOR LOADINGS FOR THE FIRST COMPONENT OF THE PCA

Character	Vector loading
Lamina shape or obversity	-0.31
Lobe depth ratio	-0.59
Petiole ratio	0.69
Percentage venation	0.68
Number of lobe pairs	-0.34
Basal shape of the lamina	-0.63
Auricle development	-0.82
Stellate abaxial pubescence	-0.71

Vectors standardised so that the sum of elements squared equals the latent root. The first Component accounted for 38.4% of the total variance.

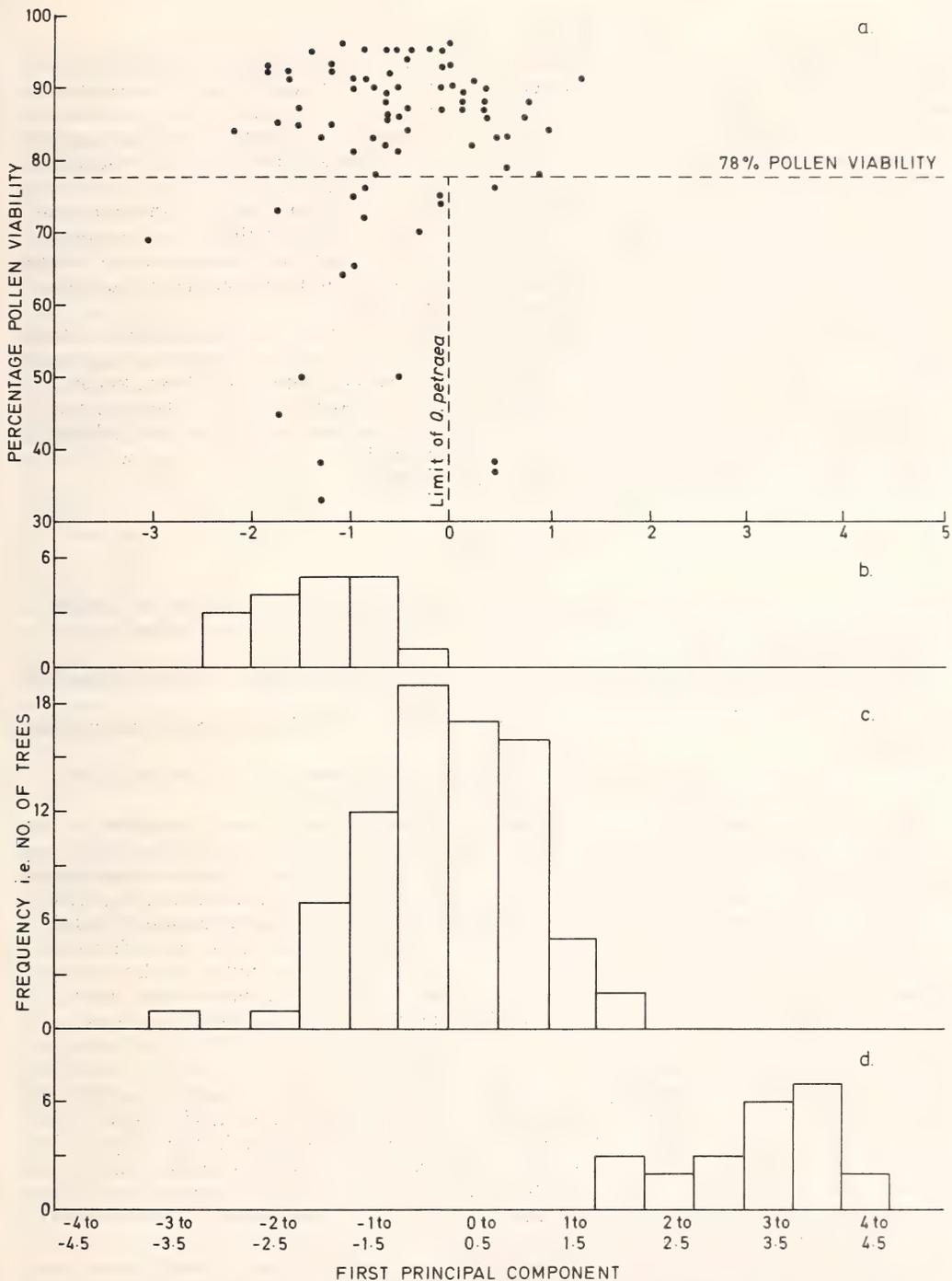


FIGURE 1. PCA of 80 trees from Breen Wood together with a reference 'pure' *Q. robur* population and a reference 'pure' *Q. petraea* population.

a. The first Component of the correlation matrix is plotted against the corresponding percentage pollen viability for each individual tree from Breen Wood.

b,c,d. Frequency distribution of trees along the first Component. b—reference 'pure' *Q. petraea* population; c—Breen Wood population; d—reference 'pure' *Q. robur* population.

Component indicating their *Q. petraea* affinities (Fig. 1a, c). One tree from Breen Wood fell just into the range of the *Q. robur* material. However, a large number of trees (30 out of 80) fell into the intermediate zone between the two reference populations, indicating their intermediate morphology. Examination of the vector loadings for Component 1 (Table 1) indicated that all characters showed significantly high vector loadings although lamina shape and number of lobe pairs were slightly lower than the others. This result is not very dissimilar from that observed in populations considered in earlier reports (Rushton 1978), and is basically similar to the preliminary analysis of Breen Wood oaks (Rushton 1979). On the second Component, the populations retained their integrity but spread along the Component, indicating that this Component was mainly representing within population variation. Thus, on morphological grounds alone these results would indicate that a large proportion of the trees were of hybrid origin.

Consideration of the pollen viability results indicated a much more complex situation. A large number of the Breen Wood trees (48 in all) had pollen viabilities in excess of 85%. Previous results (Rushton 1974, 1978) had shown that among pure trees percentage pollen viabilities as low as 78% might be expected; 62 Breen Wood trees had pollen viabilities above this level. Of the remaining 18 trees, 15 fell within the morphological range of *Q. petraea* and only three in the morphologically intermediate zone. Two of these trees in the intermediate zone had pollen viabilities below 40%. The single *Q. robur* tree had a high value for pollen viability (91%).

DISCUSSION

Examination of Fig. 1a indicates that on the basis of leaf morphology and pollen viability Breen Wood contains four types of tree, broadly divided by the 78% pollen viability line and the limit set for pure *Q. petraea*. These were:

1. Trees with pollen viabilities generally in excess of 85% and within the morphological limits of pure *Q. petraea*.
2. Trees with somewhat lower pollen viabilities (between 80 and 90%) and of intermediate morphology.
3. Trees with pollen viabilities below 78% but morphologically within the limits set by *Q. petraea*.
4. Trees with very low pollen viabilities and morphologically intermediate.

A fifth category would contain the single tree which overlaps the *Q. robur* population on this Component. Trees in the first category on the basis of both leaf morphology and pollen viability can be regarded as 'pure' *Q. petraea*; those in the fourth category, on the basis of both their morphology and very low pollen viability can be regarded as F₁ hybrids. The trees in the second category probably represent various backcross hybrids very similar to those previously studied (Rushton 1974, 1978). The problematical category is the third since no similar trees were observed in the earlier survey (Rushton 1978). However, Olsson (1975) reported some trees with low pollen viability which on morphological grounds would be classed as 'pure'. Indeed, 14% of his *Q. petraea* samples and 8% of his *Q. robur* samples had pollen viabilities below 70%. In the case of Breen Wood, nine trees out of 57 morphologically *Q. petraea* trees had pollen viabilities below 70% (i.e. 15.8%) and, using the 78% pollen viability level argued above, 15 trees or 26.3% would be below this value. On this basis, the Breen Wood results do not differ greatly from those of Olsson (1975). He accepted the low levels of pollen viability in 'pure' trees as part of the natural range of variation expected for a tree species. However, he was able to show that as the samples became more intermediate the percentage of trees with low pollen viabilities increased. Certainly, Breen Wood would not fit this pattern. An alternative suggestion for the status of the trees in category 3 is that they represent backcrossed hybrid individuals which after several generations of backcrossing have completely assimilated the alien genes but have not regained fertility.

The vegetational history of Breen Wood indicates substantial disruption which might have provided opportunities for extensive backcrossing. Cruickshank & Cruickshank (1981) investigated the development of soil profiles at Breen Wood and incorporated into their study aspects of the vegetation history. Using pollen analysis they were able to recognise consistently eight pollen zones:

8. Present oak-birch forest.
7. Birch forest.
6. Forest recovery led by birch in the grass-dominated later stages of the long, major clearance.

5. Major clearance—heath phase.
4. Partial clearance of forest shown in decline in tree pollen.
3. Oak forest.
2. Early clearance—heath phase.
1. Mixed forest.

There were at least two major forest clearances, the first lasting about 200 years from approximately 0 to 200 AD and a further clearance of 865 years duration extending from 510 to 1375 AD.

Introgression in closed, stable populations of long-lived species like *Q. robur* and *Q. petraea* is likely to be relatively slow. If, however, the population is subject to large-scale removal of adult trees, followed by regeneration from seed derived from survivors or trees in the immediate vicinity, then introgression could possibly proceed at a far faster rate. In the case of Breen Wood, the recovery of the forest was relatively fast, suggesting a seed source relatively close, i.e. from survivors of the clearance. It is envisaged that at Breen Wood during both forest clearances, oaks survived in small numbers, these being *Q. petraea*, a small number of *Q. robur* trees and hybrid trees. When the forest re-established itself, these trees provided a pool of both pure and backcrossed acorn progeny. Thus backcrossed individuals could have been present in comparatively large numbers in the re-established forest. Over time these would have continued to backcross to (mainly) *Q. petraea* and ultimately would have become morphologically indistinguishable from pure trees. Their hybrid ancestry is still apparent, however, from their low pollen viability. On the other hand, some trees that were backcrossed hybrids retained a much more morphologically intermediate character but with a substantially restored pollen viability. These trees are represented by those in the second category above.

The taxonomic status of oaks at Breen Wood is important because of the designation of the site as a National Nature Reserve. Grazing was recently restricted in the reserve and *Luzula sylvatica* (Huds.) Gaud. has spread throughout the wood and has now taken over large tracts of land. There is little doubt that the presence of *L. sylvatica* in the wood is restricting oak regeneration. If artificial regeneration is to be undertaken, then careful choice of parent trees is vitally important if the taxonomic balance of the oaks in the wood is to be preserved.

ACKNOWLEDGMENTS

We would like to thank the Department of the Environment (Northern Ireland), Conservation Branch and the Department of Agriculture (Northern Ireland), Forest Service for permission to work at Breen Wood. Mr John Greer (Conservation Branch) gave much useful advice and Miss D. Bainbridge helped with the field work. Mrs S. Tinkler drew the figure.

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(Accepted January 1983)

Short Notes

CAREX ACUTA L. × C. ACUTIFORMIS EHRH. IN S.E. YORKSHIRE

On 2nd June 1955, I collected two shoots of a sedge which I thought was *Carex acuta* L. from the bank of the River Hull, near Hallytreeholme, GR 54/08.49, some eight miles down-river from Drifffield, S.E. Yorks., v.c. 61. Each shoot had the general appearance of *C. acuta* except that the lowest bract was appreciably shorter than the inflorescence; in *C. acuta* the lowest bract characteristically exceeds the inflorescence. Later that year, the specimens were sent to K where E. Nelmes added "or *C. acuta* × *C. acutiformis*" to my tentative diagnosis of *C. acuta*, and retained one specimen.

Early in 1982, I re-examined my specimen (**herb F.E.C.**) and found it to be completely sterile. After a search I found utricles, some with two and some with three stigmas in the same spike, a feature of the hybrid *C. acuta* × *C. acutiformis* mentioned by Jermy (1982). Furthermore, the bottom and next to bottom female spikes are 7.6 cm and 5.3 cm respectively, whereas the maximum length of the female spike in *C. acutiformis* is 5 cm and in *C. acuta* it is 10 cm. The *C. acutiformis* Ehrh. parentage is also indicated by the presence of occasional fibrillae on the split edge of the basal sheath, by the female glume sometimes being drawn out to a point and at least slightly serrulated, sometimes markedly so, and by the utricles being long-beaked.

Identification of *Carex acuta* × *acutiformis* (= *C. × subgracilis* Druce) was confirmed by A. O. Chater, A. C. Jermy and R. W. David in March 1982; A. O. C. commented *in litt.* that some material of the hybrid has shorter, stouter spikes, is more fertile and, like most hybrids, can vary markedly. Remarks concerning the partial fertility of the hybrid, here and elsewhere (Jermy 1967), have not been substantiated experimentally: no germination of fully formed seeds has yet been achieved (Jermy *et al.* 1982).

C. acuta is a species of river-sides and marshy places with a more or less constantly high water level. It is frequent in the upper and middle reaches of the Hull valley and locally abundant by the River Hull, as at Pulfin Bend, GR 54/04.44, about a mile north of Hull Bridge, Beverley.

C. acutiformis often forms large stands by slow-flowing rivers, in ditches and by ponds. It is far more widely distributed and frequent than *C. acuta* in S.E. Yorks, including the River Hull valley where it is locally abundant.

As *C. acuta* and *C. acutiformis* frequently grow together, it is surprising that there are so few records of the hybrid between them. Unfortunately it has not survived by the river near Hallytreeholme, having been lost during bank reconstruction. The hybrid has also been recorded from Berks., v.c. 22, and Oxon., v.c. 23 (Wallace 1975). It also occurs in the Walthamstow Marshes, S. Essex, v.c. 18, (**Wurzel**, 1981, **BM**) and Caerns., v.c. 49, (**herb. A. P. Conolly**, det. A.O.C., A.C.J. and R.W.D.). Records for E. Norfolk, v.c. 27, and France (Wallace 1975) have not been traced to source and require confirmation. It seems possible that *C. × subgracilis* may be under-recorded in the British Isles.

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CAREX PUNCTATA GAUD.: THE EAST ANGLIAN RECORDS

In a previous Short Note (David 1981) I joined some earlier botanists in doubting the reports of this sedge in Suffolk (Hind 1889). Although there are isolated records of *C. punctata* in southern Norway, southern Sweden and Poland, and in BEL an authentic specimen purporting to have been collected near Berwick-on-Tweed, it is primarily a plant of the Atlantic and Mediterranean coasts and has not been seen in the English Channel east of Spithead. Furthermore, confusions between this sedge and its near ally, *C. distans* L., have been very frequent.

Hind's record reads: "Dunwich, on gravelly banks very near the sea: one a little north of the village, the other 2 miles south of it. A sea wall recently built has destroyed the second locality, which was at Scot's Hall". The first site has long since disappeared beneath the sea, so that it is not possible to check the sedge in either of the original localities. When, however, I visited the Hull University herbarium (HLU) in 1982, I noticed a specimen labelled "*C. punctata*, saltmarsh, Dunwich, July 1884, J. D. Gray". On inspection, the comparatively large, evenly tapered utricles, inserted at an angle of 50 to 60 degrees to the axis of the spike, and the fact that the ligule was in no sense tubular, proved this to be *C. distans*. Later Mrs E. M. Hyde drew my attention to the existence of another specimen in the Ipswich City Museum (IPS). There are in fact two there, both collected by Hind himself on 30 June 1881, labelled "Scot's Hall, Suffolk" and "sea-shore, Dunwich", and evidently the vouchers for the records in his *Flora*. Both, on the same criteria as the Hull specimen, are *C. distans*; and one of them had indeed been queried by an earlier visitor, C. E. Salmon, who knew the true plant in Dorset. A duplicate of the Dunwich gathering is in CGE, and is also *C. distans*.

The curator of the Ipswich herbarium, Mrs C. Green, pointed out to me another Suffolk record, which I had overlooked. Mr Ronald Burn (Burn 1933) claimed to have seen *C. punctata* on a Suffolk Naturalists Society Excursion to Blythburgh; but the date of the excursion was 1st June 1933, and I find it very hard to believe that *C. punctata* could, without a great deal of expert discussion, have been certainly identified so early in the season.

There remains the Aldeburgh record, by Miss K. D. Little in 1929 (Little 1930). The specimen was determined by the finder's father, J. E. Little, a very competent botanist with a special interest in *Carex*, but it is not in his herbarium in Cambridge. In view of the fact that, of the six East Anglian records of *C. punctata* so far traced, four have proved to be not that species while a fifth appears extremely doubtful, I think it highly probable that the Littles' record, despite J. E. L.'s expertise, was also an error, and that *C. punctata* has never occurred in Suffolk. I wish, however, that the Littles' specimen could be found.

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DESCHAMPSIA SETACEA (HUDSON) HACKEL NEW TO SOUTH-WESTERN ENGLAND

In September 1982, I discovered *Deschampsia setacea* (Hudson) Hackel, in moderate quantity, in a shallow, heathland pool on Lizard Downs, W. Cornwall, v.c. 1. The identification was confirmed by Dr T. A. Cope. Subsequent searches by myself and my colleagues revealed the grass in nine pools, both natural and artificial in origin, on the Downs and all within the 10 km square SW61. The population size is estimated at 500 plants. Specimens have been deposited at K, CGE and BRIST.

The nearest extant localities for this species are on the Purbeck and New Forest heaths where the plant is widely scattered but in small quantity. A pre-1930 record for *D. setacea* near the

Somerset-Devon border, which was cited by Perring & Walters (1976), originated from Marshall (1908) who stated, "Beer Moors and other hill bogs between E. Anstey and Brushford; an interesting novelty for Somerset". However, Marshall (1909) reported that his record was erroneous and that Arthur Bennett considered the material to be "a variety of *Agrostis tenuis* Sibth. (*vulgaris* With.)". Marshall's material in CGE was identified as *Agrostis canina* L. by P. J. O. Trist in 1982 as was Marshall's specimen in BRIST by me in 1983. Hence the present record of *D. setacea* is new to the Lizard, Cornwall and south-western England.

The rectangular, artificial pools on Lizard Downs are probably the result of cob removal in the past and both these and the natural pools dry out in summer from a winter water depth not exceeding 25 cm. All the pools occur in loess deposits over serpentine (Coombe & Frost 1956a), provided the pool depth does not penetrate the loess-serpentine boundary. Analyses of the loess soil indicated low nutrient status (0.2 ppm P, 2 ppm N—Morgan's reagent extraction). Soil pH gave a range of 4.3 to 5.3, average 5.0 (25 determinations), while pH of pool water ranged from 5.3 to 7.1, average 5.6 (18 samples). Proximity to the sea was indicated by high levels of salts, particularly sodium (up to 59 ppm).

The pools are surrounded by *Agrostis curtisii* (*A. setacea* Curtis, non Vill.) heath (Coombe & Frost 1956b) and the associates of *D. setacea* were investigated by eighteen 1 × 1 m quadrats. The data, showing percentage frequency of associates in the quadrats, are summarized below:

<i>Molinia caerulea</i>	100	<i>Galium palustre</i>	6
<i>Carex panicea</i>	56	<i>Sanguisorba officinalis</i>	6
<i>Hydrocotyle vulgaris</i>	50	<i>Agrostis canina</i>	6
<i>Salix repens</i>	39	<i>Calluna vulgaris</i>	6
<i>Eleocharis multicaulis</i>	28	<i>Genista anglica</i>	6
<i>Ranunculus flammula</i>	28	<i>Potentilla erecta</i>	6
<i>Agrostis stolonifera</i>	17	<i>Plantago maritima</i>	6
<i>Danthonia decumbens</i>	17	<i>Schoenus nigricans</i>	6
<i>Eleogiton fluitans</i>	12	<i>Succisa pratensis</i>	6
<i>Glyceria declinata</i>	12	<i>Ulex gallii</i>	6
<i>Erica tetralix</i>	6	<i>Sphagnum</i> spp.	6

Molinia caerulea was the only constant species. Bare soil was recorded in all quadrats (range 5–70%, average 45%) and the number of species per quadrat ranged from two to ten. *D. setacea* had the lowest percentage cover in quadrats with the least bare soil but the highest number of species, suggesting that in such pools vegetation succession is occurring to the detriment of *D. setacea*. However, the majority of the pools are poorly vegetated and one site is on National Trust land within a reserve operated by the Cornwall Trust for Nature Conservation, thus ensuring the conservation of this uncommon species at the Lizard.

ACKNOWLEDGMENTS

I wish to thank L. J. Margetts and Dr L. C. Frost for their advice and guidance with the manuscript. I am grateful to C. D. Preston for information concerning the Somerset record and Dr T. A. Cope and P. J. O. Trist for determination of specimens. J. M. Lawman and N. Davies are thanked for assistance in the field and Dr M. H. Martin and A. J. Byfield for their advice. Financial support from the Manpower Services Commission, who funded my post with the Bristol University Lizard Project, is also acknowledged.

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SENECIO × *SUBNEBRODENSIS* SIMK., AN EARLIER NAME FOR *SENECIO*
SQUALIDUS L. × *S. VISCOSUS* L.

In 1881, Simkovics described *Senecio* × *subnebrodensis* Simk. as the hybrid between *S. nebrodensis* L. and *S. viscosus* L. from the Bihar Mountains in what is now north-western Romania. However, it is almost certain that Simkovics misapplied the name *S. nebrodensis* to material of *S. squalidus* L. This very frequent misapplication results from a mistake by Linnaeus, who described *S. nebrodensis* as an annual from Sicily, Spain and the Pyrenees. From the Linnaean type, however, it is clear that the name applies to a glandular-viscid perennial endemic to Spain (Alexander 1979). Furthermore, in his description of the hybrid, Simkovics refers to the leaves as “foliis iis *S. Nebrodensis* L. similibus, sed viscosis”, which obviously implies that the material he understood as *S. nebrodensis* was non-viscid, the condition found in *S. squalidus*. As *S. squalidus* is a rather widespread species in south-eastern Europe, Simkovics almost certainly dealt with the hybrid *S. squalidus* × *S. viscosus*. I have not, however, seen any type material.

S. × *subnebrodnensis* Simkovics (1881) has priority over *S.* × *londinensis* Lousley (1946) as the correct name for the hybrid *S. squalidus* × *S. viscosus*. In continental Europe, this name has been in use for a long time (Hegi 1928).

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NOTES ON THE DISTRIBUTION OF *ARTEMISIA MARITIMA* L. IN EASTERN
SCOTLAND

Artemisia maritima L. is found on the coastal fringes and inland saline areas of Europe and from the Black Sea across Central Asia to Lake Baikal (Clapham 1962). Subsp. *maritima* is confined to the coasts of north-western Europe, from western France and the British Isles to Denmark and southern Sweden.

In Britain it is found in some abundance on the south and east coasts between the Humber estuary and the Solent, with scattered records elsewhere. On the west coast its northern limit is, like so many other maritime species, on the north shore of the Solway Firth. On the east coast of Scotland its range extends further northwards to Whinnyfold, N. Aberdeen, v.c. 93. Even so, it is still regarded as a very rare plant in Scotland, with only eight post-1930 10 km square records (Perring & Walters 1976).

In eastern Scotland *A. maritima* is found in several distinct types of habitat: along drift-lines of sand or pebble beaches, on wave-cut platforms amongst boulders or on upstanding ridges of rock, and on (generally south-facing) sea-cliffs and rock stacks, especially where these are washed by storm tides, subject to fresh-water flushing or manuring by sea-birds. However, the largest colonies

occur on small beach-head saltmarshes in East Lothian and Fife. At Barnsmuir, Fife, *A. maritima* is abundant in a grazed *Festuca rubra* turf with *Cochlearia officinalis*, *Agrostis stolonifera*, *Plantago maritima*, *Armeria maritima* and *Juncus gerardii*. This roughly corresponds to the *Artemisietum maritimi* community although it is unusual in that it lacks a number of typically 'southern' associated species such as *Halimione portulacoides*. Although formerly occurring on a beach-head saltmarsh in Angus, it appears that the stands of *A. maritima* on the Firth of Forth marshes are now the northern-most examples of this type of vegetation in the British Isles. Colonies further north, in Kincardine and N. Aberdeen, are confined to sea-cliffs and rock stacks.

All stations for this plant in eastern Scotland which have come to my attention are listed below. Localities in Fife, including all those where it no longer occurs, were visited by me during 1982, following a survey of coastal vegetation by P. Phillipson in 1980–81. Details of extant localities in other vice-counties have been kindly supplied by those listed in the 'Acknowledgments', wherever possible these records have been checked against those in the literature and in local herbaria at STA and DUE. The present status of the plant at each site is denoted by the letters: A = scattered over an area of less than 0.001 ha; B = more than 0.001 ha, but less than 0.01 ha (i.e. up to 10 × 10 m); C = more than 0.01 ha, but less than 0.1 ha; D = more than 0.1 ha; X = probably extinct.

Berwicks., v.c. 81: 36/9.6, St Abbs, on two rock stacks—much used by herring gulls—and on drift-line on beach below (McBeath & Warman pers. comm.) (B); 36/8.6, Greenheugh, near St Helen's Church, west-facing on small stack, known here for more than a century, less than ten plants (A); 36/7.7, "not seen recently, possibly saltmarsh/shingle casual" (C.O. Badenoch pers. comm.).

E. Lothian, v.c. 82: 36/7.7, Cat Craig, in saltmarsh (A); The Vaults, in beach-head saltmarsh, also on sandy foreshore nearby (B); 36/6.7, Tynninghame, in estuarine saltmarsh (C); 36/6.8, near Scoughall, on shingle drift-line (A); 36/4.8, Aberlady Bay, extant but status not known. Balfour & Sadler (1871) and Martin (1934) noted records from Gullane, Aberlady and Dunbar but precise localities for these are not known.

Fife, v.c. 85: 36/47.99, Chapel Green, Earlsferry, in rock gully amongst drift litter (B); 36/46.99, Kincaig Point (Wood 1887) (X); 36/49.99, Elie Ness on sandy beach above saltmarsh (A); 37/51.00, Ardross, south-east-facing sandstone cliff at 4 m above sea level, about ten plants (A); 37/52.02, rock stack east of Newark Castle (B); 37/54.02, Pittenweem, behind sea-wall (A); 37/5.0, Anstruther, *Miss Goodsir*, 1839 (Young 1936) (X), but might be the following locality: 37/59.05, Hermit's Well, Barnsmuir, on sandy beach above drift-line (A); 37/60.06, Barnsmuir and The Pans, two colonies in beach-head saltmarsh, *G. Sim*, 1888 (STA) and *W. Young*, 1891 (STA), still extant (B,C); 37/63.09, Fife Ness, low rock outcrop adjoining beach-head saltmarsh (A); 36/66.98, Isle of May, south-facing cliff, *James*, 1947 (STA), Eggeling (1960), still extant (A,B), apparently found elsewhere on island by Sadler (1872); 37/4.2, post-1930 record (Perring & Walters 1976), also record in Young (1936) for Tayport, possibly lost due to reclamation of saltmarsh (X); 37/2.1, Newburgh (Anonymous 1836–45) (X); 37/3.2, Balmerino (Anonymous 1836–45) (X).

Angus, v.c. 90, apparently extinct: 37/6.5, post-1930 record in Perring & Walters (1976), precise locality not known; 37/7.5, Usan, in beach-head saltmarsh, *Crapper*, 1948 (STA) and *Crapper*, 1950 (DUE, herb. J.L. Colville) (X); 37/7.5, north-west of Boddin Point, on sea-cliff, *U.K. Duncan*, 1960 (Ingram & Noltie 1981) (X).

Kincardines., v.c. 91: 37/75.64, St Cyrus, on rock stack (B); 37/9.9, Muchalls (Trail 1923) precise locality not known but probably extinct (X); 38/? 9.0, near Altens, parish of Nigg (Trail 1923) (X); 37/8.8, Garron Point (Dickie 1860), precise locality not known, searched for but presumed extinct (X).

N. Aberdeen, v.c. 93: 48/03.27, Forvie, south-facing site on sea-cliff, 15 m above sea level (B); 48/04.28, Collieston, on sea-cliff, similar position to last (B); 48/08.33, Whinnyfold, on sea-cliff, south-facing site with some flushing, about 20 m above sea level (B).

E. Ross, v.c. 106, extinct: 28/5.4, Redcastle, Beaully Firth, *J. Whyte*, 1955, "all efforts to refind it here have failed" (Duncan 1980) (X); 28/7.5, shore between Ethie and Rosemarkie, *T. Aitken* (Duncan 1980) (X); 28/6.4, Kessock (Lang 1905) (X).

I suspect the reason that Fife appears to be the plant's stronghold is simply that it has been looked for there with the greatest vigour. A thorough search elsewhere would surely reveal other sites; in particular, it is difficult to believe that it will not be refound in Angus.

ACKNOWLEDGMENTS

For details of extant localities I am indebted to C. Badenoch, G. Ballantyne, M. Braithwaite, C. Easton, P. Marren, S. North, P. Phillipson, A. Somerville and N. Stewart. I am grateful to Mrs A. Anderson for her help in preparing this note.

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CHROMOSOME NUMBERS OF BRITISH PLANTS, 7

<i>Apium nodiflorum</i> (L.) Lag. × <i>A. repens</i> (Jacq.) Reichenb.	2n=20	Cambs., v.c. 29: Chippenham Fen, <i>S. M. Walters s.n.</i> (Correction of count in <i>Watsonia</i> , 13 : 170 (1980)).
<i>Festuca juncifolia</i> St Amans	2n=56	E. Sutherland, v.c. 107: fore-dunes at Dornoch. <i>Stace F27</i> .
	2n=56	E. Ross, v.c. 106: disturbed dunes at Nigg Point, Cromarty Firth. <i>Stace F26</i> .
<i>Festuca rubra</i> L. subsp. <i>rubra</i>	2n=42	Caithness, v.c. 109: turf on Wick Golf-course, Wick. <i>Stace F34</i> .
	2n=42	W. Sutherland, v.c. 108: mobile dunes at Betty Hill. <i>Stace F30</i> .
	2n=42	E. Sutherland, v.c. 107: turf at The Mound, S.W. of Golspie. <i>Stace F32</i> .
<i>Glyceria declinata</i> Bréb.	2n=42	W. Sutherland, v.c. 108: low cliff on beach by Coldbackie, near Tongue. <i>Stace F33</i> .
	2n=20	Bucks., v.c. 24: Howe Park Wood, near Milton Keynes. <i>Stace s.n.</i>
<i>Glyceria declinata</i> Bréb. × <i>G. fluitans</i> (L.) R. Br.	2n=30	Bucks., v.c. 24: Howe Park Wood, near Milton Keynes. <i>Stace s.n.</i>
<i>Glyceria fluitans</i> (L.) R. Br.	2n=40	Bucks., v.c. 24: Howe Park Wood, near Milton Keynes. <i>Stace s.n.</i>
<i>Vulpia australis</i> (Nees) Blom	2n=14	W. Kent, v.c. 16: hop garden at Barming. <i>J. E. Lousley W2845. RNG.</i>

Book Reviews

Studies of Irish vegetation. Edited by James White. Pp. 368. Royal Dublin Society, Dublin. 1982. Price IR £25.00 (ISBN 0–86027–0092). Also available, paper-bound, as *J. Life Sci. R. Dubl. Soc.* 3 (1,2). Price IR £10.00.

This volume commemorates a field excursion held in Ireland by the International Society for Vegetation Science from 21st to 31st July 1980. A group of 19 continental (with one American and two British) botanists, accompanied by a number of Irish colleagues, travelled by coach across an extensive portion of the island. During the first two days the party visited sites in Co. Dublin and Co. Wicklow: for the remainder of the excursion it pursued a meandering, more or less circular course through central, western and southern parts of the Republic, halting at frequent intervals to observe a broad spectrum of plant communities. The excursion was a considerable success, with fruitful contacts and lively exchange of ideas, and the participants resolved to produce the present volume, which includes papers related to the excursion programme and also more general statements on Irish vegetation.

Like all such 'symposium' volumes, this book cannot be said to be comprehensive, but nevertheless it provides a most useful introduction and general reference to the vegetation of Ireland. As Professor D. A. Webb states in a characteristically lively 'Introduction' section, it is a "feast of very varied dishes, and I should be surprised if there is any student of vegetation, whatever his principles or prejudices, who cannot find in it several things to his taste". I, myself, have found in it a great deal to devour with relish (despite minor digestive problems induced by the more severe phytosociological passages), on the one hand through scientific curiosity and on the other hand because this book evokes vividly the varied and haunting beauty of the Irish landscape and vegetation.

The scene is set at the beginning of the book in Professor G. F. Mitchell's opening address to the excursion participants on 'The influence of Man on vegetation in Ireland', a précis of salient points raised in his wide-ranging work *The Irish landscape* (1976). It is not always appreciated in Britain that the population of Ireland had risen to eight million by 1840, and that the country was formerly one of the most densely populated regions of Europe. In the 17th century there was massive forest clearance and in the 18th and early 19th centuries the peasantry, living under conditions of extreme poverty, removed nearly every stick of wood from the countryside (except from the demesnes of their landlords) for fuel and extended their lazy-beds of potatoes far beyond the limits of present-day cultivation. The pattern of abandoned potato ridges, even on remote or steep hillsides, is today a tragic reminder of the famine years of the mid-19th century. Pockets of 'natural' vegetation remain, but the general pattern is of ecosystems that have been considerably modified by man.

The opening paper is followed by a scholarly and detailed assessment of the history of Irish vegetation studies, by the editor, who pays tribute not only to the floristic work of R. L. Praeger and D. A. Webb and to the more recent developments of continental phytosociological techniques in the school of Professor J. J. Moore at University College, Dublin, but also to more shadowy figures from the 17th and 18th centuries, such as Gerald Boate, a Cromwellian physician who suggested that the Irish bogs arose as a consequence of the "retchlessness" of the Irish with regard to drainage!

The other two introductory papers are a narrative of the excursion, by G. J. Doyle, and a key to the identification of Irish plant communities, by the editor, this relating to the last paper of the book which is a summary of Irish plant communities. The informal style of Doyle's contribution sets the overall tone of the volume—a nice Irish touch. He includes, for example, an account of an unfortunate confrontation between members of the party and an irate, uncouth Co. Galway farmer armed with a pitchfork! Scientific tomes should contain more of such anecdotes. In this case the incident clearly illustrates the practical problems of field studies and conservation in the face of an unsympathetic public!

The twenty chapters that follow, mostly fairly brief, cover a broad spectrum of Irish vegetation. They include accounts of plant communities of coastal cliffs, saltmarshes and sand-dunes,

grasslands, woodlands, blanket-bog, heavy metal-contaminated soils and ruderal habitats. The last chapter, by White and Doyle, is a 'catalogue raisonné' of communities that have been recognised in Ireland, drawing together all the threads of the preceding papers. This chapter is undoubtedly the most important; it is a checklist on which future work can be based. Not only does it bring together the diffuse material that has been published (or in many cases, sadly, that remains unpublished) on Irish vegetation, but also it emphasises the relationship of the communities with those described from the continent. A major difficulty of such an analysis is that a number of diagnostic species do not occur in Ireland. It is to be hoped that this volume will be read by those who have the authority to conserve Ireland's landscape and vegetation.

The Royal Dublin Society are to be congratulated on the spacious layout of this book (although two columns of print per page may not suit everybody's taste), neat type face, good quality paper and sturdy binding. The cover is not handsome: the blue, rather shiny boards are strong but stark and a dust jacket would have improved the look of the volume. However, the cover looks as if it will serve to protect the book if it is taken into the field—not least for the sake of the key to Irish vegetation—and will doubtless survive the rigours of 'soft' days in the west and sporadic immersions in pools of stout in wayside bars! The illustrations are of high standard, with the exception of the scruffy diagrams of Irish wall structure in the paper on wall vegetation (pp. 81, 86). Some of the figures could have been reduced in size, for instance the dot map of the distribution of *Rhododendron ponticum* in Ireland (p. 210). I should have liked the book to have had a general index.

There are some misprints and minor errors of editing. I noticed "soils in high fertility" and "is restricted rocky slopes" (p. 8); *Sonchus oleraceus* (p. 145); *Oxalis europea* (p. 312); Kelly, D. in a bibliographic context (p. 354, elsewhere as Kelly, D. L.) and a few other small slips. *Rumex crispus* ssp. *trigranulatus* is cited in the index, although it appears in the text (pp. 316–317) as var. *trigranulatus*. The subspecific combination has never, to my knowledge, been published; and it is unfortunate also that var. *littoreus* Hardy is an earlier published name for this variant! Similarly, in the paper by W. Lötschert on 'The heavy metal content of some Irish plants', there is confusion between var. and ssp. with regard to the *humilis* variant of *Silene vulgaris*.

My copy of the book is slightly disfigured by irregular grey lines on some of the pages. There is, furthermore, a curious smear in the sky above Professor Webb's head in a photograph (p. 57) of him taken on the Burren part of the excursion. It almost asks for a comment to fill a bubble. I should like to think that he is saying something favourable about the excursion, about this volume and also about the enthusiasm of his younger colleagues for Irish plant communities.

I recommend this book to both Irish and British field botanists, especially to the latter, to whom Ireland's flora and vegetation may be a mystery or who have restricted themselves to a study of the Burren and Killarney. Our islands on the outer north-western corner of Europe are a small but geographically unified group. Ireland's flora and vegetation are fascinating, and a study of them is indispensable for an understanding of those of Britain.

J. R. AKEROYD

The complete guide to water plants. Helmut Mühlberg. Translated by Ilse Lindsay, revised by Colin D. Roe. Pp. 392, with 109 colour and 112 black & white photographs, and 59 text illustrations. E. P. Publishing Ltd, Wakefield. 1982. Price £6.50 (ISBN 0-7158-0789-7).

This is one of those thorough German books which seeks to cover all aspects of the chosen subject. The bias, however, is horticultural rather than botanical.

Most of the species dealt with are suitable for warm or cold aquarium and garden pond culture. One must hasten to add that the emphasis is on maintaining a collection of aquatic plants for their interest and beauty, not as a background for ornamental, tropical and cold-water fish.

The first 80 pages are devoted to the biology of aquatic plants, covering their distribution and habitat in the wild and their anatomy and physiology. There is also a ten-page section on cultivation. In the space available, the subject is well covered and up-to-date.

By far the greater part of the text is devoted to an account of the genera and species found

throughout the world. These are arranged in taxonomic sequence by family, starting with *Ricciaceae* (liverworts) and *Fontinales* (fountain mosses) and finishing with *Typhaceae* (reedmaces or cat-tails). In between there are 55 other families, each with one to ten genera and numerous species. The species however, are often only briefly dealt with unless they have aquarium appeal. In this respect, the tropical or subtropical genera such as *Aponogeton*, *Cryptocoryne*, *Echinodorus* and *Myriophyllum* get the best coverage. Having said this, I know of no other book which contains such a generally wide coverage of aquatic plants. The "complete" in the title however, is misleading and almost certainly a publisher's ploy. (In such respects the poor author often has no say in the matter, as I know to my own cost!)

A brief look at the plants native to Britain is revealing. Although all the genera are included, many species are not. For example, only six of the water-loving *Ranunculus* are described, eight of *Potamogeton* and two of *Eleocharis*. The two reedmaces (*Typha*) are mentioned by name but only to say that they are unsuitable for cultivation. *Eriocaulon* is included but not the British *E. septangulare*. Unexpectedly, *Lysimachia nummularia* is described but only because it tolerates complete submersion and is used as a short-term aquarium plant.

The 109 colour and 112 black and white photographic illustrations are on the whole good, though often rather yellow in tone. They are useful aids to identification and in some cases provide a pictorial reference otherwise hard to come by.

K. A. BECKETT

Kew Gardens for science and pleasure. Edited by F. Nigel Hepper. Pp. 195, with 2 maps and 125 illustrations in colour, 133 in black and white. Her Majesty's Stationery Office, London. 1982. Price £9.95 (ISBN 0-11-241181-9).

Kew Gardens for science and pleasure is indeed a book for pleasure and information. The first pleasure is from the illustrations, a blend of modern photographs with old prints and old photographs carefully selected from the vast storehouse of beautiful plant illustrations in the Library and from the Archive Department.

One of the most striking photographs is a view of the newly refurbished Temperate House, glistening in the sun with early morning tree shadows across the lawns and taken from the top of the flagstaff. A similar but higher view-point is used for the photograph of the famous Palm House, set in the scene so often identified by incoming air travellers to Heathrow, which is used as the front dust-jacket picture. That the back cover shows the Water Garden at Wakehurst Place is indicative of the extent to which this "Kew in the country" has, with its complementary soil and climate, become closely integrated as part of the Royal Botanic Gardens, although acquired only in 1968.

Possibly, Kew can easily be taken for granted by those visitors who have long known the Gardens, maybe for a lifetime, but who see only part of the extensive research programme initiated in these Gardens—which are "primarily for science". Seven chapters clearly outline selected research in some recent Kew projects in plant anatomy, physiology and cytogenetics. The research is exemplified by studies in *Crocus*, in both the Herbarium and the Jodrell Laboratory; and also by electron microscopy studies (with some photographs) and the biochemical work at the Seed Bank, Wakehurst Place. A chapter on the classification and naming of plants describes the work in the Herbarium, with which perhaps B.S.B.I. members will be most familiar; and we realise the vastness of the scale of operations on reading that more than 5 million preserved plant specimens collected over two centuries from every continent make the Herbarium a reference collection for botanists from all over the world.

The living collections in the Gardens and Greenhouses, described in nine chapters, are also vast in number (more than 50,000 species and varieties) and form a unique representation of the world's flora. Many of the species were collected on expeditions by Kew staff, and some specialised collections (e.g. Orchids and Bromeliads) are particularly comprehensive and valuable for students in training and for botanists and growers. There is an account of some of the past and present horticultural and economic research in the Gardens. Descriptions of individual gardens in both the London and the Sussex Royal Botanic Gardens, with their historical setting, and of the

architecturally notable buildings, as well as the landscaping and many beautiful and exotic plants, highlight the pleasure for the visiting public. There is, too, a chapter on the trees and shrubs at Kew, and one chapter each on the wildlife of the London and the country Gardens. The work of the Threatened Plants Committee, which is linked to I.U.C.N. and makes an important contribution to international plant conservation, is described. Future plans may include greater use of computers for storage of records, more facilities for public education, and expansion of the museum collection of world economic plant products, in keeping with the tradition of research on economic plants at Kew.

Nineteen members of staff are listed as contributors, but there is also a general acknowledgment "to many colleagues for help in preparation of the book" by the editor, F. N. Hepper, Assistant Keeper in the Herbarium. There is a List of Directors since 1841, a selected Bibliography and an Index. Professor E. A. Bell, the present Director, in his Foreword describes Kew as "this most beautiful of Scientific Institutions", and even frequent visitors and regular attenders on Kew Open Days are likely to learn more of the many facets of the work at the Gardens from this interesting book.

M. BRIGGS

Guernsey's earliest Flora. Flora Sarniensis by Joshua Gosselin, 'began in 1788'. With an introduction and commentaries by David McClintock. Pp. 210, with frontispiece portrait, 7 text-figures and end-papers showing all relevant localities. Ray Society Publication no. 155. London. 1982. Price £14.00, including postage (ISBN 0-903874-17-2). Available from Publications (Sales), British Museum (Natural History), Cromwell Road, London, SW7 5BD.

Joshua Gosselin (1739–1813) "seems to have been as naturally gifted and inherently great as he was naturally modest and retiring". A member of a still-prominent Guernsey family, he was a conscientious administrator ('Greffier') for over 30 years, an officer of the militia for nearly 44, and Colonel of his Regiment for twelve at the time of the Napoleonic threats. He was an accomplished antiquarian, conchologist, palaeontologist, mineralogist, water-colour painter and (what concerns us here) a botanist with both a very sharp eye for the unusual and a circle of acquaintances which included Sir Joseph Banks and Sir James E. Smith.

In 1839, the brash and energetic but callow C. C. Babington wrote in his *Primitiae Florae Sarnicae*: "A catalogue of Guernsey plants, drawn up in 1788 by Mr Gosselin, has been recently published by his grandson, in Berry's History of Guernsey, but without any correction or augmentation, and it is very imperfect".

E. D. Marquand, writing from Alderney in his *Flora of Guernsey* (1901), wrote in a more generous vein of Gosselin's "lengthy and valuable" list (1815), which enumerated 528 species, of which 473 were vascular plants; Marquand wrote that "the general accuracy and reliability of his list are placed beyond question". Marquand went on to say: "It is pleasant to be able to pay a well-deserved tribute to the memory of old workers like Joshua Gosselin, and to rescue their names from oblivion". Marquand knew of the existence of "a large portion of Gosselin's own herbarium", but the information contained in "this valuable old collection" was only available at second-hand to Marquand by the "copious notes" of Mr Cecil Andrews.

"Le hasard ne favorise que les esprits préparés" (Louis Pasteur). When David McClintock first went to Guernsey nearly forty years ago, he developed an intense interest in the flora (only impeded by the hospitality of the residents) manifested in his excellent *Wild Flowers of Guernsey* (1974), the delightful *Wild Flowers of the Channel Islands* (1975), with a hundred superb colour photographs by J. D. Bichard, including the only one published of 'my' *Trifolium occidentale* (which I found in the Channel Islands first above the Pea Stacks in 1959), and various other publications, notably on the re-assembly of all the diverse pieces of evidence that Joshua Gosselin was a late-18th-century botanist of the first importance (comparable, say, to John Lightfoot or William Withering), and that his assembled botanical specimens comprise possibly the most important 18th-century herbarium of any locality in the British Isles.

What have come to light in recent years are not only Gosselin's beautifully mounted and preserved specimens, but also a large number of unmounted specimens gathered about 1790, two 'scrap-books'

with a chequered provenance, and two note-books dated 1788, which have all now been happily collated thanks to David McClintock and three faithful members, including Mrs Patience Ryan, of La Société Guernesiaisie, in a superbly mounted herbarium beautifully housed in a very handsome cabinet specially constructed for the purpose in 1976.

The chances which have brought together this remarkable collection could only have been seized by someone with the mental agility, indefatigable energy, verbal felicity and botanical *nous* of David McClintock. In this book, which skilfully and delightfully draws together all the diverse strands of the Gosselin achievement, are listed 605 species, 15 or more of them then new to the British Isles, including a high proportion of the Guernsey specialities; 530 are vascular plants, the remainder cryptogams.

As McClintock rightly states, this is in part a study in historical ecology: drainage and cultivation account for losses over two centuries (e.g. of *Pulicaria vulgaris* and *Myosurus minimus*), while the early 19th century drainage of the great salt-marsh channel, the Braye de Valle, which formerly separated the north-eastern island of Clos du Valle from the rest of Guernsey, eliminated *Limonium vulgare*, represented among Gosselin's specimens. Yet some species have hung on, e.g. two plants of *Halimione portulacoides* at Pulias (the stinking place), reminding us that one can never be certain that a plant is *wholly* extinct. A remarkable number of plants survive where Gosselin recorded them some two centuries ago. Thus his own water-colour (reproduced in Fig. 1) of Câtel Church records the site, then as now, of *Asplenium trichomanes* and *A. ruta-muraria*; remarkably in 1979 there was also *Asplenium marinum* outside the east end of the chancel (just as it grows on the south porch of the parish church of Landewednack at the Lizard). It is difficult to stop writing about this entralling book if one is already 'hooked' on Guernsey; I will just add that the earliest known specimen anywhere of *Trifolium occidentale* is beautifully preserved in Gosselin's herbarium.

Errors are commendably few: Mrs Ryan has forgiven the printers for giving her forename as "Patients", and McClintock makes a slip in saying that *Herniaria ciliolata* was first found in Britain by Hudson; in fact it was found by John Ray at the Lizard in 1667.

One must be deeply grateful to David McClintock and those many members of La Société Guernesiaisie who have worked so hard and so long to publish an account of this great treasure, and who have spent much labour, time, money and love in preserving both the herbarium and its interpretation for posterity.

The price is reasonable for a book of a short print run. Sordid financial considerations apart, however, this is a gem: buy it while you can, and be thankful.

D. E. COOMBE

British Red Data Books: 1. Vascular Plants. 2nd edition. F. H. Perring & L. Farrell. Pp. xxviii + 99, with 3 Figures and 2 Tables. The Royal Society for Nature Conservation with the collaboration of the Nature Conservancy Council and with the financial support of the World Wildlife Fund. 1983. Price £7.00 post paid (ISBN 0-902484-04-4). Available from R.S.N.C., The Green, Nettleham, Lincoln.

The B.S.B.I. embraces catholic tastes; 'rarity' is not everyone's concern—but there can be few British botanists interested in the rarer elements of our flora not already familiar with the first edition of the *British Red Data Book*. This was one of the most important derivatives from the B.S.B.I.'s work on the *Atlas of the British flora* and from subsequent work—co-ordinated from the Biological Records Centre—on those plants which had been recorded since 1930 from 15 or fewer 10 km squares. Now a second edition has been published which retains the same format: introductory chapters, then species' accounts highlighting the present distribution and approximate number of localities; the degree to which these are protected in reserves; the former range and possible reasons for decline; and an index of vulnerability—in British terms the "threat number", and in European terms the IUCN rating.

The second edition has become necessary because of the changes contained within the *Wildlife and Countryside Act 1981*, and the authors see this as the first of a continuing series of revisions relating to the N.C.C.'s quinquennial review of the schedule. However, the second edition also incorporates new information brought to light since the first edition was published—the largest 'leap forward'

being for *Leucojum aestivum* as a result of Lynne Farrell's own fieldwork in Ireland. Much remains to be done though: the new edition suggests work on particular species (e.g. endemic *Euphrasia* spp., *Eleocharis austriaca* and *E. parvula*, *Scrophularia scorodonia*) and on any Red Data Book plants for which population forms have not yet been completed.

This book undoubtedly provides a cornerstone for our attempts to safeguard our rare plants. It is not entirely without fault though. One man's 'possibly native' is another's 'probably introduced'; but are *Cyclamen hederifolium*, *Iris versicolor*, *Crocus purpureus*, *Campanula rapunculus*, *Ajuga genevensis* and others valid inclusions? Also—as the authors readily admit—the “threat number” system needs refining . . . or, if it reflects true threat, then the 1981 legislators should have paid it greater heed! *Fritillaria meleagris*, lost from most of the 115+ 10 km squares in which it has at one time or another been recorded, survives in only 20–30 scattered localities—but has been omitted from the new edition because it has crossed the 15 10 km square rarity ‘threshold’; by comparison, *Erica ciliaris*, extant in 88 1 km squares, is retained because it has a ‘clumped’ distribution and so shows up from only 11 10 km squares. Are we not nearing the stage at which the sum of ‘floating 1 km square’ localities should count for more than the 10 km grid square distribution as the basis for our rare plant list—and not just as now, in the computation of the “threat number”?

There are also one or two inconsistencies: i) in nomenclature—this generally follows *Flora Europaea* but, while *Agropyron donianum* is now excluded, *Trifolium molinerii* and *Allium babingtonii* remain as distinct species; ii) in the policy on subspecies—*Carex muricata* subsp. *muricata* enters for the first time, but the very rare subsp. *cornubiensis* of *Gentianella anglica* is only mentioned *en passant*; and iii) in highlighting in the text just the non-endemic plants on the IUCN European list but not the endemics e.g. *Senecio cambrensis*, *Calamagrostis scotica*, etc. In the species accounts, *Bupleurum falcatum* should be shown as a scheduled species.

I find this book invaluable and look forward to the series continuing. This edition has drifted from the ‘Red’ (*Cephalanthera rubra*) of the first hard cover to a soft ‘Pink’ (*Dianthus gratianopolitanus*); perhaps the next edition will revert to a stronger shade—with the fruits of a re-discovered *Rubus arcticus* maybe?

D. DONALD

How to draw plants. Keith West. Pp. 152, with frontispiece, 8 colour plates and 82 black & white text illustrations. The Herbert Press, London. 1983. Price £9.95 (ISBN 0-906969-28-X).

In his foreword to this treatise on “the techniques of botanical illustration”, Wilfrid Blunt says: “Would that I myself had had access to such a mine of information when, many years ago now, I too was striving, unaided, to draw and paint flowers!” I quite agree!

This book is beautifully produced by The Herbert Press in association with the British Museum (Natural History). It is set out clearly and concisely, qualities so important for its dual role as a reference and narrative work; and it will be useful for anyone wishing to portray botanical subjects accurately. What a pity, therefore, that the cover does not show a better example of botanical illustration in water-colour!

The historical chapter at the beginning sets the art of botanical illustration in context and reminds us all of the great tradition that we botanical artists hope to live up to. Equipment and materials used are often a matter of personal preference, but how helpful to see the advantages and disadvantages of all those that the artist would be likely to come across, set out before the reader. Keith West, using the wealth of experience he has gained over the years, frequently mentions snags that may be encountered. This is extremely useful and it is a great comfort to know that others come across similar difficulties.

The background information on plant structure found in the chapter entitled ‘Plants in detail’ is valuable, as a full understanding of the construction of plants helps the artist to make an exact representation. The key to botanical illustration is accuracy. Keith West reminds us of this constantly, and he approaches all the techniques that the present-day botanical artist might need to know from this angle. Separate chapters on each of these subjects are found: pencil, ink, scraper board, water-colour, and gouache and acrylics.

There are also chapters on plant handling, and on photography as an aid to illustrating, and a glossary which is unfortunately largely un-illustrated.

I well remember my first feeble efforts in water-colour, on bristol board and with children's paints, and how pleased I was when someone told me the correct materials to use. Now, with the help of this book, no botanical artist setting out on the awe-inspiring task of drawing and painting plants need be held back through lack of information. Armed with an ability to draw, determination and this comprehensive book, no-one need fail!

A. FARRER

Plants of the Balearic Islands. Anthony Bonner, translated from the Catalan by Patricia Mathews. Pp. 150, with 20 colour photographs and 132 line drawings by Hannah Bonner. Editorial Moll, Palma de Mallorca. 1982. Price £4.00 (ISBN 84-273-0423-4).

This attractive little publication states its first purpose as being "to help the beginner to find his way . . . the hiker, the amateur botanist, the nature lover or the ordinary person who wants to know what he is seeing when he strolls through the woods". How far it fulfils this rôle is doubtful; the amateur botanist will certainly find it provoking, both to argument and to exploration, but the ordinary person is less likely to find it useful.

This is not a book to take in the pocket to name what one sees; the heavy emphasis on phytosociology, a regrettable influence in Spanish systematic botany of the last half century, presupposes considerable botanical enthusiasm if not knowledge, and the possession of knowledge makes the text appear a little superficial.

Each chapter deals with a broad habitat, but within chapters the approach is inconsistent; for example those on 'Mountains and walls' and 'The coastal region' use the terminology and conventions of phytosociology, listing species within alliances and associations, whilst that on 'Fields and roadsides' goes through the major plant families one by one. Neither approach leads to easy pathside identifications.

The text contains a number of inaccuracies (for example, *Cneorum* has three species, not two; a third occurs on Cuba), and it is strongly biased towards the Mallorcan flora and ferns, although the title includes all the islands and would seem to include the lower plants. Ibiza and Menorca are really only mentioned in passing, the *étangs* of Ibiza and Formentera and the strikingly different flora of the exposed parts of Menorca are omitted. The English names suffer, as is inevitable in these circumstances, from the appearance of being contrived and of purely local usage, Crown Daisy and Aromatic Inula being notable, and the application of Queen Anne's Lace to *Daucus carota* is totally new to me. It is most unfortunate that the colour photographs are so poorly reproduced; but the 132 line drawings are outstanding in capturing the essence of the plants, adding greatly to the value of the book.

Despite the shortcomings, for the enthusiast with some knowledge this work helps to fill the need for an inexpensive account of Mallorcan Flowering Plants.

L. F. FERGUSON

Aquatic macrophytes in the tarns and lakes of Cumbria. Ralph Stokoe. Pp. 60. Freshwater Biological Association (The Ferry House, Ambleside, Cumbria), Occasional Publication No. 18. 1983. Price not stated (ISSN 0308-6739).

Ralph Stokoe devoted most of his leisure time during the last six years of his life to systematically recording the macrophytes growing in and around the lakes and tarns of his native Cumbria. Following his sudden death early in 1981, Dr Edna Lind undertook the daunting task of sifting through his many notebooks and diaries and of compiling this booklet. It consists simply of two

alphabetical lists: one of species and their abbreviations, the other of the 279 tarns and 15 lakes, under each of which are listed the abbreviated names of the species present.

In view of the effort that must have gone into preparing this booklet it must seem ungenerous to criticise, but any potential user ought reasonably to expect to discover both what macrophytes occur in any particular waterbody and where any particular species occurs. Unfortunately the former depends on knowing the 'correct' name of the tarn, and for many this requires recourse to the 1:25,000 maps. Even then it seems likely that the records for "Church Pool" and "Brickworks Pond" are likely to languish forever in limbo. Where the name can only be guessed at, the grid-reference will serve as a check.

The problem could have been solved quite simply by numbering the tarns and putting the numbers on a map. Only by laboriously looking through the 294 lists can one discover where a particular species occurs; after several searches *Carex riparia* still eludes me. Again, if the tarns had been numbered, the numbers could have been entered in the alphabetical list of species.

The lists are inevitably incomplete: some tarns were visited only during the winter, others, such as those on Walney Island, not at all; neither *Carex acuta* nor *C. aquatilis* are listed for any of the lakes. There are a number of nomenclatural and taxonomic oddities. Why, for example, do we find *Nasturtium microphyllum* but *Rorippa nasturtium-aquaticum*, and both *Epilobium brunnescens* and *E. nerterioides*? What is "*Nymphaea micro*"? *Rorippa amphibia*, unknown in Cumbria, is surely a slip of the pen for *R. palustris*. These are, however, very minor criticisms, and Dr Lind and the Freshwater Biological Association deserve our thanks for this valuable compilation, a fitting tribute to Ralph Stokoe's last years.

G. HALLIDAY

The Ferns of Britain and Ireland. C. N. Page. Pp. xii+447, with 102 figures. Cambridge University Press. 1982. Price: £40.00 (hard cover; ISBN 0-521-23213-9); £15.00 (paper-back; ISBN 0-521-29872-5).

If I were to be marooned on a desert island and could take two books on ferns to remind me of more moist and verdant regions, I would take Edward Newman's *History of British Ferns and allied plants* (1844) and the book under review. They are two of the most readable books on British ferns that have appeared in the 142 years they span.

Chris Page's book contains accounts of the 103 species and hybrids of pteridophytes in the British Isles. For each taxon a detailed description is provided under the headings 'Identification' and 'Variation', with the diagnostic features given separately under 'Preliminary recognition'. The author points out for each species any with which it could be confused, and under 'Technical confirmation' gives details of the cytology of the species, or spore sizes and ornament, if relevant. The 'Field notes' section is the most useful, giving ecological data and distribution in detail. Introductory chapters on altitudinal distribution and environmental factors influencing native pteridophytes contain 14 climatic maps, including one of pleistocene glaciations in the British Isles, all of which the reader will find immensely useful. There is a chart key (basically thumbnail sketches in a dichotomous tabular form), which enables the user to identify his fern quickly, and a 'multi-access' key to the main groups (essentially lists of species with a specific diagnostic character), which in the reviewer's opinion is not particularly useful. In a final chapter there are notes on cultivation and conservation and suggestions for further studies.

One of the most useful features of the book should be the illustrations. Each taxon is illustrated, usually from the smallest juvenile leaf to a mature, fertile one (or several), not from photographs or silhouettes but from xerographic copies made on a Rank-Xerox 9400 prototype machine. It is a novel technique and the originals are superb, but the varying shades of grey have given the printer a very big headache, which has resulted in many of the pages appearing under-inked, e.g. Figs 8 and 74. Many others, however have come out extremely well, e.g. the Polypodies and *Polystichum aculeatum*. I feel sure the technique will be used again, when, I hope, printers will err on the side of over-inking, which will at least produce the familiar silhouette, as in Fig. 76 (*Trichomanes speciosum*).

All in all, Page's observations are detailed and his data factually correct, those describing horsetails (*Equisetum*), his speciality, being particularly good. A grey area still exists around *Dryopteris affinis* (= *D. pseudomas*), which is one of the last taxonomic problems in the British fern flora. *D. affinis* is both diploid (subsp. *affinis*) and triploid (subsp. *borreri* and *stillupensis*). They are all apogamous and hybridise with others in the *filix-mas* group. Even the chromosomes cannot recognise each other at meiosis, so what chance have we? Comparing Chris Page's account with that of C. R. Fraser-Jenkins, who has spent more time on this group than anyone else, it appears that Page's subsp. *affinis* is very close to Fraser-Jenkins' subsp. *stillupensis*, his subsp. *borreri* is really *affinis* and his *robusta* is *borreri*! The reader should not therefore take this account as the 'last word'; more work is obviously needed.

There is also a mass of work still to be done on the distribution and ecology of pteridophytes in Britain and Ireland, especially the latter, and this book will surely stimulate such studies by both professional and amateur alike.

There are some aspects of this book which the reviewer found unhelpful. The arrangement is not systematic, not entirely alphabetical, but a hybrid: alphabetically under four sections—'Primitive ferns', in which Page includes Pillwort, Adder's Tongue and Moonwort; 'Mostly modern, frond-forming ferns'; 'Clubmosses and Quillworts'; and 'Horsetails'. Nomenclaturally Dr Page follows the *Fern Atlas*, except that he rightly uses *Dryopteris dilatata* instead of *D. austriaca* and retains *Thelypteris palustris* for good reasons. It is unfortunate that he also retains *Phyllitis* and *Ceterach* as distinct genera when there is a distinct move in Europe as a whole to include them in *Asplenium*. Wisely he retains *Polypodium australe* until the typification of *P. cambricum* has been clarified. I am more unhappy about the English names that he has introduced. Naming plants at the vernacular level should be taken as seriously as when giving Latin epithets. Why change those which are established e.g. Western Polypody for Intermediate Polypody? There seems little point in naming rare (often extinct) hybrids, e.g. *Asplenium* × *contrei*, the Caernarvonshire Spleenwort, now found in a few places in Central Europe. *Dryopteris* × *ambroseae* was named after Mary née Ambrose and should surely be called, if anything, Ambrose's Buckler Fern and not reflect the lady's later nomenclatural history! There is a degree of carelessness in the large number of printing/author errors or inconsistencies that one would not expect from C.U.P.; a few are serious, e.g. the consistent *Cryptogramma* (pp. 151–153) rather than the correct *Cryptogramma*, and the authorship of *Asplenium onopteris* L. incorrectly given as (Cav.) V. Buch on p. 419. As noted above the illustrations are novel; but I would like to have seen some photographs of habit and habitat, which I feel sure Chris Page has available. More diagrams of sori, which are important for determination, would be useful, as these are not seen clearly on the xeroxes. Each species distribution is shown on a thumbnail dot map, the majority of which are not very informative; single records are arrowed, but some maps appear to lack dots or arrows, e.g. *Dryopteris* × *brathaica*, *D.* × *sarvelae*.

On the whole these are minor points; it is a comprehensive book that has filled a longstanding gap. The high price of the hard-back is unfortunate, but it is well worth the £15 for the soft-back. The publishers have at least made this available from the outset.

A. C. JERMY

An Irish florilegium. Wild and garden plants of Ireland. Water-colour paintings by Wendy Walsh. Introduction by Ruth Ross. Notes on the plates by Charles Nelson. Pp. 224. 48 hand-tipped plates. Thames & Hudson Ltd, London. 1983. Price £60.00 (ISBN 0-500-23363-2).

This is an imposing tome, 14 × 10½ × 1¼ ins, with fine paper, good margins and each plate introduced with a separate, titled page.

The plants included represent essentially the author's personal choice and follow three themes. The first 17 are native plants, the next 21 are Irish cultivars, the last ten are plants found by Irish explorers or botanists. No choice ever pleases everyone, but one does wonder why, to take just two examples, *Iris pseudacorus* and *Geranium sanguineum* were preferred to such native specialities as *Erica erigena* or *Sisyrinchium bermudiana*. Nor are all the cultivars available commercially.

The blurb says that the main attraction of this book must remain the plates, and so indeed it will for

many. Their delicacy and elegance are worthy of quiet contemplation and enjoyment, even though many are depicted 'warts and all'. Most are just of the actual plant, *tout court*, but some have a semblance of accompanying vegetation, usually just decoratively. Few have any sort of details added: *Trichomanes* hasn't even spores. The dancing *Otanthus* is a *tour de force* for so apparently inelegant a plant—I much regret I was prevented from accompanying Miss Walsh when she went to see it for drawing.

The introduction, 25 pages long, by Mrs Ross, a horticultural journalist, sets the historical background, but still contains infelicities. It is however, the text facing the plates by Dr Nelson, the taxonomist at Glasnevin, that most people will read first. This varies greatly in length, and it is regrettable that the shorter ones were not expanded to fill the space, e.g. by saying how to tell *Sorbus hibernica* from *S. aria*, or recording what Mr Beckett wrote about *Davidia* fruits. But what is given often contains new information, much culled from various manuscript sources detailed on the last page. Advice is also given on propagation. There are occasional slips here, e.g. *Trichomanes* survives in Cornwall and *Simethis* went, goodness knows how long ago, from Hants.

Facts being repeated is a minor irritation. But *the* complaint is—no proper index. All we are given is a loose book-marker with the plants in alphabetical order and their plate numbers. But the book has plenty of useful facts, and it is an insult to such worthwhile creative work to leave these buried for lack of the normal, essential, key to them.

This apart, I think the book is worth its, sponsored, price.

D. McCLINTOCK

The vegetative key to wild flowers. Francis Rose. Pp. 48, with numerous text figures. Frederick Warne Ltd, London. 1983. Price £1.95 (ISBN 0-7232-3095-1).

This is a reprint from *The wild flower key* by the same author, already reviewed by A. O. Chater in *Watsonia*, 14: 79 (1982). The jacket states accurately enough that it is the only available identification guide to flowering plants in general when in the vegetative state. There are eight keys, each for a different habitat type, and they are well constructed and illustrated. Those for woodland and chalk grassland did well in field tests, but others, such as those for wasteland and aquatics, omit frequently-occurring species. The booklet should be useful to students on field courses and to field workers making surveys out-of-season, or in heavily grazed areas. The way is still open for someone to publish comprehensive keys to British plants in a non-flowering state. This will require much patient compilation and observation on living plants, since much of the necessary information is not set out in Floras, nor is it visible on herbarium specimens.

R. J. PANKHURST

Wakehurst Place: yesterday, today and tomorrow. Edited by F. Nigel Hepper. Pp. 48, with 4 colour plates, 13 black & white text illustrations and a map. The Kew Guild, Kew. 1983. Obtainable from the bookshops at Wakehurst and Kew, or by post from the Hon. Sec., Kew Guild, Royal Botanic Gardens, Kew, Richmond, Surrey TW9 3AB. Price £1.25, post paid £1.50.

This third edition of the Kew Guild's guide to Wakehurst Place is complementary both to 'Kew's book on Kew' (reviewed above by Mary Briggs) and to *Loder Valley Reserve* (reviewed by Joyce Pope in *Watsonia*, 14: 442 (1983)). It deals with Kew's satellite garden in greater detail than was possible in the former; but the Reserve, although according a chapter to itself (by John Lonsdale), does not receive such full treatment as it does in the latter.

The chapters on the history of house and garden (by Harry Townsend) and the gardens today (by John Simmons and Tony Schilling) make up the core of this booklet, and a fascinating story they relate. The editor (Nigel Hepper) also contributes a chapter on 'Wildlife and conservation', pointing out that part of the Wakehurst Estate is an S.S.S.I. and describing how an active policy is being pursued in order to conserve the diverse habitats in the Estate and their wild organisms.

This booklet is an ideal companion for anyone to take on a visit to Wakehurst, preferably having read it beforehand.

N. K. B. ROBSON

The wild flower finder's calendar. David Lang. Pp. 188. with numerous colour and black & white text illustrations. Ebury Press, London. 1983. Price £8.75 (ISBN 0-85223-250-0).

This unusual book, written by an amateur flower-lover, is for the complete beginner who loves wild flowers but has little idea of how to set about finding and identifying them. It has chapters on the pleasures of finding and refinding plants, on naming and classifying them, and on their study and conservation, including a full list of plants protected under the *Wildlife and Countryside Act*.

Another section explains how to use the book, and recommends basic equipment and other desirable literature such as Field Guides or an Excursion Flora. But although I agree that it is most satisfactory to have "black-and-white illustrations which can be coloured when found". I doubt if Fitch's illustrations to 'Bentham & Hooker', or Butcher's *New Illustrated Flora*, which are recommended, are now obtainable anywhere. But there is good advice on joining Natural History Societies, Naturalists' Trusts and the B.S.B.I. An extremely useful chapter on the basic life cycle and structure of plants, their pollination and seed dispersal is followed by excellent descriptions of environmental factors and habitats. Woodlands, hedgerows, ditches and verges, grassland heaths and moors, mountains, freshwater and seaside communities are all discussed, and some are illustrated with maps or sketches. There is a comprehensive glossary.

Then comes the main part of the book: 220 plants described and illustrated in colour, some with interesting notes about their names and medicinal usages, prefaced by a general survey of those likely to be found in a particular month. English and Latin names are given, and the very pleasantly simple illustrations are mostly truly coloured. The choice of plants is somewhat unexpected: perhaps too many varieties are included, especially of orchids, many of which are too vulnerable to be searched for by beginners, whose feet often seem to be so large and attracted to seedlings!

Next come 18 pages of charts, with plants listed in English alphabetical order, giving habitat, geographical areas and the months during which each plant's major phases of activity occur, i.e. growth visible above ground, in flower, and in seed. This is followed by a Latin/English Index.

Many an enthusiastic beginner may be encouraged by this book towards becoming a competent botanist, but it would have been even more useful had it been pocket-portable!

J. RUSSELL

Anatomy of the dicotyledons, II. Wood structure and conclusion of the general introduction. C. R. Metcalf & L. Chalk. 2nd edition. Pp. xi+297. with 11 pages of black & white plates and many text-figures. Oxford University Press. Oxford. 1983. Price £35.00 (ISBN 0-19-854559-2).

This book completes the two-volume introduction to the second edition of the standard reference work, *Anatomy of the dicotyledons*, the first volume of which was reviewed in *Watsonia*, 13: 354-355 (1981). Chalk died in 1979, but he had prepared most of the material for which he had been responsible, and he is listed as part-author of four of the nine chapters. Seven 'outsiders' contributed two of the chapters and parts of two others. The invaluable lists of families in which certain diagnostic characters occur are continued in this volume, occupying 25 information-packed pages.

The contents of this volume may be considered in three parts. The first four chapters continue the descriptive surveys of the first volume, providing authoritative reviews of wood structure (surely the most important chapter of this volume), anomalous structure, secretory structures and secreted mineral substances. These chapters are valuable guides to the range of dicotyledonous structure and, together with the related chapters in the first volume, will be the standard reference work on

systematic anatomy for many decades. Woody roots are included in the first chapter, but non-woody roots, noted as omitted in my review of Volume 1, are still not covered.

The next two chapters are general review chapters, covering the use of anatomy (especially wood anatomy) in phylogenetic and taxonomic studies, and ecological anatomy and morphology. These two chapters are good in concept, but their aims are impossible to achieve in the short space available. The first part (on a 'General survey' of 'Anatomy, phylogeny and taxonomy') of the former chapter, in particular, is over-discursive and disappointingly thin in data and ideas.

The final three chapters cover chemotaxonomy, the application of statistics and computing in wood anatomy, and a resumé of Takhtajan's classification of dicotyledonous families. To be frank, I cannot see how the inclusion of this material, covering 45 pages, can be justified, nor can I foresee much of a use for it. Of course, it is relevant to systematic anatomy as a scientific discipline, but I consider that the title of the work would have been better served by omission of such supplementary or supporting data and either the expansion of the mainstream chapters or the condensation of the two volumes into one (with a concomitant reduction in price).

Nevertheless, completion of the introduction to *Anatomy of the dicotyledons* represents an exciting stage in this project, and the first of the systematic accounts (starting with Magnoliales) is eagerly awaited.

C. A. STACE

Wild Orchids of Britain & Europe. Paul & Jenne Davies & Anthony Huxley. Pp. xii+256, with 64 colour plates and 46 text figures. Chatto & Windus, The Hogarth Press, London. 1983. Price £9.95 (ISBN 0-7011-2642-6).

It could be argued that with the publication in recent years of an increasing number of well-illustrated books on European orchids, the likelihood of these beautiful plants remaining unrecognised and secure in the wild will decline. Every year, it seems, more people are spending holidays in orchid-rich territory which, a decade or so ago, would only have attracted the knowledgeable naturalist. Witness the increasing popularity of organised 'special interest' holidays! Many formerly little known sites are now visited by hordes of 'enthusiasts', the majority of whom, one hopes, are genuinely interested in wildlife and are conservation-minded and content with taking photographs. However, there are those who regularly visit the Continent with more dubious intentions in mind.

Conversely, one could also argue that a field such as this would still appeal only to those who already have some knowledge of natural history and who simply wish to identify orchids in the field. It is also a fact that the majority of tourists arrive in July and August, long after the spring orchid displays are withered and brown. The opportunity to pick blooms or inadvertently trample plants underfoot is therefore minimal. Whatever the merits or limitations of field guides, this volume on the wild orchids of Europe is the most comprehensive to be published so far in English. This is a welcome addition since the only useful alternatives, by O. & E. Danesch, H. Sundermann and, more recently, Baumann & Künkele, are published in German.

When using a field guide it must be remembered that, firstly, intraspecific variation is often considerable (e.g. in *Dactylorhiza* and *Ophrys*), secondly, that hybrids are not infrequent and, thirdly, that the same species is often known under more than one name although only one of these is the correct one.

The volume is divided into six chapters covering orchid biology, orchid ecology, classification (including a generic key), species descriptions (including specific keys), searching for orchids and finally, photographing them in the wild. A foreword is provided by Anthony Huxley in which the importance of conservation is stressed. A total of 328 colour photographs are inserted between Chapters 3 and 4, and simple black & white line drawings are scattered throughout the text. A comprehensive bibliography is provided at the end. Some habitat photographs and a quick-reference glossary of terms would have been useful additions. A wide area is covered including, despite the title, N. Africa, Cyprus and the Middle East and the Atlantic islands of the Azores and Canaries.

The impression one gains when first leafing through *Wild Orchids of Britain and Europe* is of an informative, well illustrated and attractively produced volume. However, on reading further it soon

becomes apparent that there is "something rotten in the state of Denmark". Before dealing with each chapter in turn I feel that the three major criticisms I have must first be made clear.

There is a general lack of understanding of technical terminology. This becomes clear when reading Chapter 3, in which species, subspecies and varieties are poorly defined. The exclusively zoological term "race" is used throughout to describe a population! The word "conspecific" is also used in the wrong context here. Confusion reigns supreme on p. 174, where it is stated under *Ophrys fuciflora* that "a number of distinct 'forms' of the 'nominated race' have been recorded", a remark which is immediately followed by a list of subspecies! These terms are not interchangeable as is implied here.

The authors should have refrained from airing their own opinions on classification, nomenclature and other areas, many of which are unsound and often misleading. For example, on p. 96 we are led to believe that "*Orchis* and *Dactylorhiza* are obviously closely related because their appearance is so similar". If this were the case, *Colchicum* and *Crocus* would both belong in the *Iridaceae*! On p. 38 we are told that "in recent years, almost in desperation, botanists have agreed to use the earliest name proposed". Again, on p. 99 we read that "if common sense prevails, it seems to us that *D. romana* should be retained on two counts: first, these plants have by far the widest distribution; and secondly, the name is well established". It is obvious from this that the authors are unaware of the *International Code of Botanical Nomenclature* and the rules of priority. Such statements are misguided and mean nothing.

My third major criticism concerns the general lack of guidance over nomenclature and the consistent use of invalid names such as *Microstylis* for *Malaxis* (an error gleaned from *Flora Europaea*). The replacing of well known epithets by earlier, legitimate ones such as *Ophrys holoserica* for *O. fuciflora* may often appear pointless to the layman. For the sake of credibility, new publications should always adopt and standardise correct nomenclature where possible. The authors have unwisely chosen to follow the *Flora Europaea* orchid account, which is far from satisfactory, particularly concerning *Dactylorhiza* and *Ophrys*. I am also surprised to learn on p. 175 that subsp. *chestermanii* has "been listed as a new subspecies of *Ophrys fuciflora*", since I validly published it as *O. holoserica* ssp. *chestermanii* in 1982! The result is that nomenclatural confusion and inaccuracy are perpetuated.

The contents of each chapter may now be discussed individually. Chapter 1 provides a simple explanation of the orchid flower, followed by sections on morphology, pollination and sexual reproduction, seed germination, the seedling, underground organs and flowering span. The section on seed germination is out of date. Our knowledge of this subject has greatly increased since the publication of Summerhayes's *Wild Orchids of Britain* in 1951. *Orchid biology, reviews and perspectives, II*, edited by Arditti (1982), would have provided a useful source of reference here.

Orchid ecology is discussed in Chapter 2, where 21 lowland and highland habitats are dealt with in detail. I would hardly have included garigue under the heading of woodlands, though! The most characteristic orchids are then described for each habitat.

The faults contained in Chapter 3 have been outlined above, and expert guidance should clearly have been sought here. The notes on hybridisation are simple and informative. For once it is pointed out that hybrids are not as frequent as is often supposed, since most insect pollinators are species-specific.

The simplified generic key adapted from *Flora Europaea* is full of errors, some of which should be mentioned. The opening statement "orchids without green leaves" should have been followed by a number 2, which has instead been placed by mistake at the end of the next sentence. The result is that the first part of the key does not make sense. The inflorescences of *Epipactis* and not *Cephalanthera* are one-sided. *Pseudorchis* is not adequately distinguished from *Neotinea*, and its lip never "converges" with the perianth. The sepals of *Steveniella* are never fused, but only adhere to one another; and mention should have been made of its distinctively notched spur. The term "fused" is misapplied to describe adherence. Finally, the "flowers pinkish" used to distinguish *Neottianthe* is misleading, since most of the contrasted genera have similarly coloured flowers.

The colour plates are one of the admirable features of this book, and most are clearly reproduced. Photo 132, of *Orchis papilionacea*, has been printed upside down. It is pleasing to see figures of less well known species and rarities such as *Orchis steveni* and *Platanthera algeriensis*. The inclusion of colour variants is also very useful. Less satisfactory are photos 110 of *Dactylorhiza cilicica*, where a close-up view would have been preferable, and 171 of *Orchis purpurea*, 179 of *O. mascula* and 183 of

O. pallens, all depicting poor specimens. All are correctly identified except that the left-hand plant in 189 of *O. quadripunctata* may be a hybrid.

All genera, species, etc. are described in Chapter 4. The format comprises an introduction to each genus followed, where necessary, by keys to species and lists of interspecific and intergeneric hybrids. The descriptions are informative and written using a minimum of scientific jargon, and notes on subspecies and varieties, flowering time, habitat and distribution are provided. French, German and Italian vernacular names are also provided where applicable. Keys are often poorly constructed and many taxa, e.g. *Ophrys argolica*, fail to key out satisfactorily. On p. 49 it is stated that "taxonomists have suggested that the various genera of slipper orchids should be considered as a tribe apart from the Orchidaceae". The word "tribe" is misused here, since these orchids already form a distinct subfamily.

Chapter 5 entitled 'In search of orchids' is an original and valuable country-by-country guide describing in detail orchid-rich areas such as Monte Gargano in Italy and Phaestos in Crete. Great Britain and the larger or more species-rich countries are subdivided into regions. The notes on France, Spain, Italy and Greece are particularly good. The rudiments of orchid photography are discussed in Chapter 6.

It is a pity that inaccurate nomenclature and terminology should have spoiled what is otherwise a very readable, well illustrated, generally informative and reasonably priced book. Despite its serious flaws it will no doubt remain as the standard English reference on the subject for some time.

J. J. Wood

A dictionary of ecology, evolution and systematics. R. J. Lincoln, G. A. Boxshall & P. F. Clark. Pp. viii+298, with 21 appendices. Cambridge University Press, Cambridge. 1982. Price £25.00 (ISBN 0-521-23957-5).

One's first thought on seeing yet another addition to an already crowded field is that it has to be very good to justify its existence. On the one hand it has to compete with the more general biological dictionaries; on the other with the more specialised taxonomic works. I find many general biological dictionaries unsatisfactory since they attempt to cover too large a field, and are often superficial. Those dealing with a very restricted field may have better coverage, but are of limited value except to the specialist. This new work occupies an intermediate position, dealing with three disciplines which are intimately integrated into what can be called 'evolutionary biology', or as the three authors suggest, "contemporary natural history."

The authors are all members of the Zoology Department of the British Museum (Natural History). They have tackled a formidable task, and since many of the entries are botanical, they have risked the possibility of failing to satisfy botanists in the accuracy of their definitions. One need have no fears on this count. I found the accuracy and comprehensiveness of their writing on botanical matters very impressive; clearly they have put in a lot of effort to ensure that this is so.

It is always tempting, when scanning a dictionary, to look for omissions or errors. No doubt one can find them here if one looks hard enough. Their own guidelines as to what should be included and left out leave some room for omission of items that others may think should have been retained, but I think they have chosen well.

What the potential user of a dictionary really wants to know is whether, in day-to-day use, it will most of the time provide satisfactory definitions of terms in clear unambiguous English. In my opinion this dictionary does just that. Its definitions are brief and clear. It has the added bonus that, as well as defining terms, the authors often go on to explain the meaning in greater detail, reinforcing the definition in a way that few dictionaries achieve.

Cross-referencing is excellent. As well as defining complete terms, they are especially good on prefixes and suffixes. They include many terms of the type that they themselves deplore. Rightly they point out that the literature is overburdened with jargon, especially in ecology. Used intelligently the dictionary should help the beleaguered natural historian to find ways of avoiding such unnecessary jargon. (Used unintelligently it may tempt him or her to compound its use in the literature, a problem which the authors acknowledge in their preface).

There is a useful set of appendices summarising much data that is not easily available except in the specialist literature, such as phytogeographical regions, oceanic surface currents, marine and lacustrine depth zones, etc., as well as more general information such as S.I. Units, Latin abbreviations, and, very useful, proof correction marks.

In sum, this is a useful addition to the library shelf. It is well set out, using small but clear print. I shall refer to it a great deal and strongly recommend it.

S. R. J. WOODELL

Obituary

DOROTHY E. de VESIAN
(1889–1983)

With the death of Miss Dorothy de Vesian on 8th January 1983, at the age of 93, the Society lost one of its oldest members and Gloucestershire one of its leading botanists and a unique personality.

'de V' joined the B.S.B.I. in 1953 and was an active member, attending Field Meetings at home and overseas, and assisting with recording for the *Atlas*. She was Recorder for Vice-counties 33 & 34 (East & West Gloucs.) from 1955 to 1970, and during the same period was Leader of the Botanical Section of the Cotteswold Naturalists' Field Club and Botanical Recorder for the Cheltenham & District Naturalists' Society (later the Gloucestershire Naturalists' Society). She edited the Botanical Reports for the five biennial Reports published by the C.D.N.S. between 1953 and 1962, and was a popular leader of Field Meetings held in the county and further afield. She was a Founder Member of that Society and a Vice-president from 1968.

For many years 'de V' was a Fellow of the Linnean Society and also a keen member of the British Bryological Society.

When I was asked to write this obituary and began to look back over my thirty years' friendship with 'de V', I suddenly realised that, incredibly, I had known her only as a Senior Citizen. She was so energetic and young in outlook that I was never aware of her age until she stopped driving and celebrated her 90th birthday. She was very good company but by nature reserved, and all I knew of her younger days was that she had been Head of Biology at Cheltenham Ladies College before her retirement in 1950. A mutual friend told me she had been a keen horse-woman, which may explain how, on a botanical expedition in India, she was able to ride a mule with evident enjoyment at the age of 84.

Her mother was in her late nineties when she died, and money came late to 'de V'. But she soon put it to good use and travelled widely, visiting friends in South Africa, joining Hellenic Cruises to Greece, and going on botanical holidays around the world. She was a good lecturer and photographer, and her travel talks, illustrated by her own slides, were much enjoyed at a time when the use of colour-slides was a novelty.

For a nonogenarian she was remarkable, and thanks to good neighbours she was able to live in her own house until the day before her death. Although she had outlived most of her generation, she was not the sort to sit at home and complain of loneliness and old age. Instead she would keep up with friends by inviting them to meet her for Sunday lunch at a local hotel, and last December she travelled to Devon as usual to spend Christmas with friends on Dartmoor.

'de V' did not suffer fools gladly; but nevertheless she was always generous in sharing her botanical expertise with others, and I shall always remember with gratitude the help and encouragement she gave me over the years.

S. HOLLAND

Reports

ANNUAL GENERAL MEETING, 7TH MAY, 1983

The Annual General Meeting of the Society was held in the Department of Chemistry, University of Bristol, at 12 noon, with 149 members present. Professor J. P. M. Brenan, retiring President, opened the meeting, taking the Chair.

The adoption of the Minutes of the last Annual General Meeting, as published in *Watsonia*, 14: 299-300 (1983), was proposed by Professor A. J. Willis and unanimously approved by the meeting. Apologies for absence received from members were read, and those present were deeply saddened to hear of the recent deaths (through tragic accidents) of Mrs Sheila Wenham, and Dr A. F. Devonshire, a member of the Society for 25 years, who was to have led one of the groups on the Avon Gorge field meeting on the following day.

REPORT OF COUNCIL

The adoption of the Report for the calendar year 1982, which had been circulated to members, was proposed by Lady Anne Brewis, seconded by Mr T. G. Evans and carried unanimously.

TREASURER'S REPORT AND ACCOUNTS

Proposing the adoption of this Report, which had been circulated to members, the Treasurer emphasised that his forecast deficit had been less than anticipated due to an unexpected legacy and a decrease in printing costs of the Society's journals. The adoption of the Report and Accounts was proposed from the Chair and carried unanimously.

ELECTION OF PRESIDENT

Mr J. F. M. Cannon B.Sc., F.L.S., as nominated by Council, was proposed from the Chair and his election was carried unanimously. The newly elected President took the Chair for the remainder of the meeting. Mr Cannon expressed the thanks of the Society to Professor J. P. M. Brenan. The Society had been fortunate in having for its President for the last two years a botanist with a truly world-wide reputation, and his example of maintaining his interest in our native flora, in spite of international commitment, could well be followed by many of today's younger professional botanists.

ELECTION OF VICE-PRESIDENT

The President welcomed the nomination of Professor D. A. Webb M.A., PhD., F.L.S., as a member from Ireland who was well-known in the Society for his work and writing and taxonomy, botanical geography and local Floras, as well as for his participation in many of the Society's Conferences.

ELECTION OF OFFICERS

The President warmly thanked those officers who had been nominated for re-election for their work for the Society in past years: Mrs M. Briggs M.B.E., F.P.S., F.L.S., Honorary General Secretary; Mr M. Walpole F.C.A., F.L.S., Honorary Treasurer and Miss J. Martin, Honorary Meetings Secretary; these officers were re-elected with acclamation. Four Honorary Editors: Drs S. M. Eden, R. J. Gornall and N. K. B. Robson were nominated for re-election and Dr J. R. Akeroyd for election. Mr J. N. B. Milton had been nominated as Honorary Field Secretary. These nominees

were proposed and elected unanimously. The President expressed the thanks of the Society for considerable work undertaken for the Society by all the officers, and extended a welcome to those newly elected.

Following the election of officers, Mr E. Milne-Redhead asked for the Society's thanks to Mr E. D. Wiggins as Editor of *BSBI News* to be recorded and this appreciation was warmly supported by the meeting. The President also took this opportunity to record thanks to Dr R. K. Brummitt, retiring Secretary to the Publications Committee; to Mrs U. M. S. Preston, retiring Minuting Secretary to Council; and to Mr D. H. Kent, retiring Vice-President who had contributed very greatly to the Society and to its publications for very many years. Thanks to all the above were endorsed by the meeting with applause.

ELECTION OF COUNCIL MEMBERS

Mr P. S. Green F.L.S., Dr C. P. Petch M.D., F.R.C.P. and Mr D. T. Streeter had been nominated and were unanimously elected.

ELECTION OF HONORARY MEMBER

The Honorary Treasurer, as Chairman of Publications Committee, in proposing Dr C. A. Stace, Hon. Editor for 12 years, stated that the endless trouble taken by Dr Stace with the editing and production of *Watsonia* was seen in the current very high standard of our Journal, which enhanced the Society's reputation internationally. His election was carried unanimously.

ELECTION OF HONORARY AUDITORS

The Honorary Treasurer, expressing our gratitude to Messrs Thornton Baker for auditing the Society's accounts, proposed their re-election. This was carried unanimously and the President undertook to send a note of the Society's gratitude.

ANY OTHER BUSINESS

The President thanked Mr A. L. Grenfell for the local organisation for this lively and well attended A.G.M. and, there being no further business, the meeting closed at 12.50.

M. BRIGGS

PAPERS READ AT THE ANNUAL GENERAL MEETING

THE ROLE OF THE BRISTOL UNIVERSITY BOTANIC GARDEN IN THE CONSERVATION OF RARE PLANTS

The best method of safeguarding rare plants is by conservation and management of their habitats. The main service that botanic gardens can play in assisting the conservation of species is by providing a display that will promote an interest in native plants, thereby helping to marshal public opinion in favour of their conservation. Such a display can also assist conservation directly by providing photographers with subjects that can be approached without disturbance of specimens in the wild.

The Botanic Garden at Bristol, by providing a source of plants and seeds of native plants, may reduce the temptation for gardeners to despoil wild population. Plants are supplied to the 900 members of the Friends of the Botanic Garden, and the garden's Seed List (which last year included 150 native species) was despatched in 1982-3 to about 1,500 subscribers and botanic gardens.

A small seed bank, with seed stored at -20°C ., is maintained at the garden, and offers the most practicable way of conserving local genotypes. Without the seed reserve there would be risks of loss when cultivating over many years. These risks would be due to disease, pests, periods of bad weather, loss of labels, and theft. There would also be risks of genetic adulteration through hybridisation, genetic drift and unconscious selection during propagation.

Some 500 British species of vascular plants are being grown at Bristol in 1983. Of about 76 species

of 'threatened' plants with a distribution weighted towards south-western England, 36 species are grown from stocks originating from known localities in the British Isles. Out of a further 44 'non-threatened' south-western species 22 are grown. Some 40 species from these latter two groups are gathered in one area of the garden, with slate labels giving illustrations of flowers, distribution maps and ecological information.

Brief case histories on the cultivation of ten species of south-western plants were presented.

M. C. SMITH

In addition to the above, Dr C. M. Lovatt read a paper entitled *Rare plant conservation in the Avon Gorge* and C. Johnson read a paper entitled *The role of the Avon Wildlife Trust in plant conservation*.

EXCURSIONS HELD IN CONNECTION WITH THE ANNUAL GENERAL MEETING

BRISTOL UNIVERSITY BOTANIC GARDEN. 7TH MAY, 1983

The Society is greatly indebted to the Keeper, Dr M. C. Smith, who conducted a large party around the garden in most unfortunate weather conditions. The garden, although small by some standards, is set in magnificent surroundings and is well-planned, enabling it to fulfil efficiently its primary role of providing the University Botany Department with plant material and research facilities. Its secondary role, that of helping in the conservation of our native flora, is followed in the enlightened manner so eloquently described by Dr Smith earlier in the day. The garden derives much financial support in this work from its thriving League of Friends, whose members benefit reciprocally from a plant and seed distribution service.

AVON GORGE. 8TH MAY, 1983

The flora of the Avon Gorge is so well documented elsewhere that more than a brief summary of this meeting is unnecessary. The early date of the AGM and the lateness of the season combined to thwart partially intentions of examining the endemic *Sorbi* in detail, but study of tree-shape, bark and last season's fallen leaves went some way towards achieving this aim. Members were shown *Sorbus bristoliensis* and *S. wilmottiana*, Avon Gorge endemics, and also *S. anglica*, *S. eminens* and *S. porrigentiformis*, all British endemics of restricted distribution, in addition to some of the the commoner members of the genus.

Other specialities of this botanical 'Mecca' that were seen included *Hornungia petraea*, *Arabis scabra* (*A. stricta*) and abundant *Cerastium pumilum*. *Trinia glauca* was just coming into flower above Black Rock Gully and nearby were *Potentilla tabernaemontani* and *Carex humilis*, the latter already in fruit.

The Society is particularly indebted to Mr A. J. Byfield, Miss I. F. Gravestock, Dr C. M. Lovatt, Mr P. J. M. Nethercott and Mrs M. A. Silcocks, members of Bristol Naturalists' Society, whose expertise enabled some 100 members in four parties to be transported over the sensitive and dangerous habitats of the Gorge (without incident, one should add!). Those attending were saddened to learn of the recent sudden death of Dr A. F. Devonshire who was to have helped in this exacting task.

CHARTERHOUSE, MENDIP AND SAND POINT, SOMERSET. 8TH MAY, 1983

Forty-four members were transferred to Charterhouse by coach and the day's excursion commenced on the outcropping carboniferous limestone of Ubley Warren. Here *Hornungia petraea* and *Cerastium pumilum* were accompanied by a fine display of *Cystopteris fragilis*. Mr R. W. David demonstrated some of the lesser known characteristics of downland sedges and the party were able to compare *Carex caryophyllea* and *C. montana* growing in close proximity. The latter, described by Linnaeus in 1753, remained undiscovered here until the Rev. E. F. Linton recorded it in 1890. The

lead-contaminated soils of the nearby mine excavations, worked from pre-Roman times until c. 150 years ago, do not support a rich flora but are noted for the lead-indicating species *Thlaspi alpestre* and *Minuartia verna*, both of which were much photographed and admired. The presence of *Silene maritima* evoked thoughts of earlier ages when the Mendips were islands in the sea.

After a picnic/pub lunch near the Rock of Ages in beautiful Burrington Combe, the business of the day was resumed at Sand Point (NT), north of Weston-super-Mare, W. Somerset. The landward end of the point, also of carboniferous limestone, was once the site of a traditional tea-garden. Although this establishment has been defunct now for some 30 years, many of the shrubs and herbaceous species at one time planted there still survive, largely on account of the southerly aspect and the proximity of the sea. Some, such as *Syringa vulgaris* and *Spiraea* \times *vanhouttei*, are obvious relics; the Mediterranean *Euphorbia characias* subsp. *wulfenii* seeds itself well and *Genista hispanica* subsp. *occidentalis*, an endemic of the western Pyrenees and northern Spain, is increasing. Both were in full flower. *Hermodactylus tuberosus*, also Mediterranean, in fruit, and a wealth of other interesting species including *Iberis sempervirens*, *Teucrium chamaedrys*, *Zauschneria californica* and *Erigeron karvinskianus* (*E. mucronatus*) were examined.

The walk along the point, in sunny but very windy conditions, yielded much of botanical interest; *Anthriscus caucalis*, *Vicia lathyroides*, *Orchis morio* and *Ranunculus parviflorus*, the latter in fine fettle, deserve mention. In addition to the profusion of spring annuals typical of the south-facing slopes, abundant *Trinia glauca* received special attention. Confined to four main areas of limestone in south-western England, *Trinia* appears to be pollinated solely by ants (C. M. Lovatt pers. comm. 1979) and the large disparity in the numbers of plants of each sex was most evident. Concerted efforts to locate *Cochlearia danica* \times *officinalis*, found here in quantity with both parents in 1982, proved unsuccessful but some reward derived from the sight of sheets of *C. anglica* on the salt-marsh in the bay below.

I am greatly indebted to Mr R. M. Payne for his help and support given at short notice following Mr A. C. Titchen's withdrawal through illness. It might be added that some twenty or more members continued botanising after the return to Bristol, such was the enthusiasm of the party! They were rewarded by the local adventive rarities *Agrostemma githago*, *Linaria supina* and *Carum carvi*.

A. L. GRENFELL

FIELD MEETINGS, 1982

ENGLAND

LOSTWITHIEL, CORNWALL. 11TH-12TH SEPTEMBER

Forty-one members and friends attended this meeting, designed to exhibit some characteristic habitats and plants of East Cornwall. The leaders (L. J. Margetts and R. W. David) were gratified by the size of the attendance, but also dismayed, for some of the sites to be visited were liable to damage by trampling, and the typical Cornish lane, narrow and often sunken, is no place for a cavalcade of cars. Thanks, however, to the willing, patient, and responsible co-operation of all members of the party, these fears proved groundless.

On Day 1, the morning was spent in a marshy valley south of Lostwithiel. This is the home of *Lobelia urens*; it is owned by the National Trust and managed by the Cornwall Naturalists' Trust. Its management raises some problems, and one purpose of the visit was to discuss these with the warden. Other plants noted were *Carex laevigata*, in Cornwall often in wet meadows rather than in woods, *Hypericum undulatum*, and the West Country brambles *Rubus riddelsdellii* and *R. rilstonei*.

The cars (a regular panzer division that luckily seemed to scare off other road users) then proceeded through a maze of lanes to the coast. After a cliff-top lunch, in perfect weather, descents were made into two adjoining coves, one a fine example of a storm-beach, the other containing an extensive raised beach. In the first the party compared *Polygonum maritimum* with *P. oxyspermum* subsp. *raii* and succeeded in raising the known number of the former from eight to over 40. Other characteristic plants of the habitat were *Crambe maritima*, *Crithmum maritimum*, *Euphorbia paralias*, and, on the cliffs, *Asplenium marinum*, *Orobanche hederæ*, and *Rubia peregrina*. Neap

tides prevented easy access to the western end of the beach, but most of the party, including senior and even disabled members, made the fairly severe traverse over rocks to see a wet cliff curtained with *Adiantum capillus-veneris*.

In the second cove the differences between *Carex distans* and *C. punctata* were studied; *Samolus valerandi* and *Scirpus cernuus* were added to the plant-list. The coastal path between the two coves yielded *Lathyrus sylvestris* in quantity, *Lotus angustissimus* and *L. subbiflorus*, *Euphrasia tetraquetra*, and *Potentilla erecta* × *reptans* with both parents. A rock-cleft by the path offered a single tuft of *Asplenium billotii*, and *Polypodium interjectum* was on roadside walls.

For Day 2 the rendezvous was Kit Hill, one of the few surviving heaths overlooking the Tamar valley (Hingston and Viverdon Downs are largely reclaimed). Unfortunately the day was more misty than the previous one, and the spectacular view was curtailed. Notable plants were *Euphrasia anglica*, *E. confusa*, and *E. vigursii*; an *Epilobium ciliatum* hybrid (probably with *E. obscurum*); *Polypodium vulgare* s.s.; *Mentha suaveolens* (approaching *M.* × *villosa*) on the roadside; and six *Rubi*: *R. dentatifolius*, *R. nemoralis*, *R. orbis*, *R. peninsulae*, *R. polyanthemus* and *R. villicauliformis* (see *Watsonia*, 14: 76). After lunch at Luckett, the Cornwall Trust's woodland reserve was perambulated and yielded another *Rubus*, *R. adscitus*, both subspecies of *Hieracium umbellatum*, *Milium effusum*, *Physospermum cornubiense*, and *Euphrasia vigursii* again, the last two in great splendour and quantity. Drizzle set in at 3.30 p.m. and the party began to disperse, a gallant remnant going on to Pensilva to see *Sibthorpia europaea*, a single plant of which was found after an anxious search.

The leaders must particularly thank Keith Spurgin, press-ganged as third leader when numbers became alarming, Denis Harding, honorary warden of the *Lobelia* site, who not only arranged parking both there and at Luckett but acted as demonstrator in both reserves, and Dr D. E. Coombe, who sharpened members' appetites and eyes by producing, on the preliminary evening, a potted plant of *Polygonum maritimum* and who was a mine of information on Cornish history and place-names as well as on Cornish plants. R.W.D. wishes to pay special tribute to Len Margetts, without whose thorough organisation and planning nothing would have been achieved.

R. W. DAVID

LISS, HAMPSHIRE. 16TH OCTOBER

Twenty-eight members took part in this day excursion, on what proved unfortunately to be one of the wettest days of 1982; torrential rain gave way finally to drizzle only in the late afternoon.

Because of the dreadful conditions, the planned programme, which had included a visit to the famous open chalk grassland site of Noar Hill, in v.c. 12, had to be curtailed, and the excursion was confined to more sheltered woodland areas in v.c. 13. *Lycopodium clavatum* (in what may be its best locality now in south-eastern England) was seen with *Gaultheria shallon* and *Pernettya mucronata* along rides in Forestry Commission woodland in Harting Coombe; *Equisetum sylvaticum* was seen in quantity in a recently discovered locality in alder carr nearby, with such ferns as *Oreopteris limbosperma*, *Dryopteris carthusiana*, *D. dilatata* and *Blechnum spicant*. A wooded ravine north of Chithurst provided the most westerly locality for *Dryopteris aemula* in the Sussex Weald.

Those who managed to brave the weather to the end were invited back to tea at Liss at the home of the leader and his wife; this refreshment seemed to be much appreciated!

F. ROSE

WALES

LLEYN PENINSULA, CAERNARVONSHIRE. 18TH JULY

Two base-rich fens and a wet pasture with heathy patches in the vicinity of Edeyrn in the west Lleyn peninsula were visited by some 30 members of Sunday 18th July. The common south of Edeyrn produced a fair quantity of *Genista anglica* in flower and in fruit, and *Oenanthe fistulosa* (both with

less than half-a-dozen sites in Lley). *Carex hostiana*, *C. binervis*, *C. pulicaris* and other sedges were seen, but no trace of the *Botrychium* once recorded from here.

The two fen sites were especially rich both in orchids and in Cyperaceae. Apart from splendid *Epipactis palustris* at both places (a pale-flowered form was much admired), and *Gymnadenia conopsea* at one, the *Dactylorhiza* taxa were all but over. Some possible hybrids of *D. traunsteineri* with Heath Spotted Orchids, and perhaps *D. purpurella*, were discussed. In addition to the commoner sedges, well-grown *Carex lepidocarpa* was in abundance, and we also found *C. lasiocarpa*, *C. dioica*, *C. rostrata*, *C. acutiformis*, *C. diandra* and *C. disticha*, as well as *Cladium mariscus* and *Eriophorum latifolium*. Two species of *Utricularia*, *Crepis paludosa* and *Ranunculus lingua* were amongst taxa seen which have only one or two localities in Lley; and *Parnassia palustris*, which only occurs in fens and flushes towards the northern side of the peninsula.

In and around the farm at Edeyrn were a number of species which in this region are closely associated with old 'habitation' sites and appear to be relics of former 'herbal' usage: *Ballota nigra*, *Verbena officinalis*, *Artemisia absinthium*, *Chelidonium*, *Calamintha ascendens* and *Parietaria*; though perhaps some link with more 'calcareous' or drier soil is implied for some, for here, too, we saw one of the only three stands in west Lley of *Knautia arvensis*, and the locally rare *Malva moschata* and *Reseda luteola*.

A. P. CONOLLY

TENBY, PEMBROKESHIRE. 31ST JULY

Twenty members and friends gathered at Penally railway station to explore the fen between the railway and the dunes. The marsh owed its origins to the growth of dunes north from the Carboniferous limestone of Giltar Head. Long before this growth had finally enclosed the whole of the old Ritec estuary, an ample supply of calcareous water had created a freshwater marsh or fen in the 'armpit' of this extending limb of sand.

The fens and marshes of Pembrokeshire are widespread, but amongst the least known wetlands in southern Britain. Penally Marsh is the only one for which early records of plants exist. Tenby was the main focus for botanical recording in 19th century Pembrokeshire, and it is no coincidence that the first attempt at a Flora by Dr R. W. Falconer, F.R.C.S., listed 388 flowering plants and 14 ferns indigenous to "The Neighbourhood of Tenby" in 1848. On 25th August of the same year Charles Babington, Professor of Botany at Cambridge, had visited Penally Marsh and his opinion was that "the marsh is like the rough parts of the Cambridgeshire fens reproducing Bog Myrtle (*Myrica gale*) etc. Here is Marsh Fern (*Thelypteris palustris*), Greater Tussock Sedge (*Carex paniculata*), Small-fruited Yellow-sedge (*Carex serotina*) and other deep marsh plants".

In Philip Gosse's *Tenby, a seaside holiday*, published in 1856, there is a delightful chapter on 'Bog-botany', describing an expedition to Penally Marsh "well armed with pocket-lens and vasculum". I make no excuse for reproducing at length from this chapter, as it must be the earliest description of the art of *Carex paniculata* walking—an art with which modern connoisseurs of wetland are all too familiar! . . . "The perambulation of our ground was a matter of no small difficulty. It was an area of black soft mire, out of which grew great tussocks of bog-grass—the Panicked Sedge, I believe. These afforded a firm support when the foot was placed fairly on the centre of the tussock; but owing to the spreading of the grass on all sides, overarching the pits and ditches of mire below, it was not easy to know where to set down the foot. Many were the slips, many the plunges, desperate the struggles; and what with the efforts of the gentlemen to help the ladies from tuft to tuft, their own herculean attempts at balance-keeping while they sustained the fair, their occasional tumbles, dragging their protégées into their own humiliation, the ups and downs of all, the screams, the laughs—we became most uproariously merry. Grievously bemired of course we were: boots that had been lavender-coloured looked as if they had been dipped into the blacking bottle, the polishing being omitted; and hose of snowy radiance were encased in sable mud. But we had come out to

botanize, and botanize we would; we were out for a day's pleasure, and we were not to be disconcerted by a little bog-mire . . ."

Although over 120 years had elapsed since the visits by Babington, Gosse and their contemporaries, most of the c. 30 wetland species they recorded were re-found by our 20th century party. *Carex disticha*, first recorded in 1853, was admired for its dominant stands on the mown areas of the marsh, and was perhaps indicative of its estuarine origins. *Lysimachia vulgaris* and *Rumex hydrolapathum*, both recorded in 1848, were still abundant along the ditches and tall fen. In an area of more acid peat kept open by grazing horses, *Thelypteris palustris*, *Osmunda regalis* and a few bushes of *Myrica gale* were re-found. The latter had evidently declined since Gosse's time as he described the most fragrant Sweet-gale or Bog Myrtle as "growing in great profusion" and mentioned that "here in Wales they offer it as a token of kindly feeling to strangers". Although not in full flower, *Cyperus longus* was closely examined and photographed by the party. H. W. Pugsley had first found it at Penally in 1923. It has one other extant location in Pembrokeshire, at Orielton, where it may have been introduced to the lake. *Cyperus longus* was one of the first plants to be collected in Pembrokeshire. A specimen was taken from Whitesands Bay, St. Davids, in July 1773, but numerous searches have failed to re-find it despite precise locational details on the British Museum specimen label.

In the wettest areas, amongst the species-rich *Phragmites* and *Molinia* stands of the fen, were Gosse's large *Carex paniculata* tussocks. Growing alongside were the smaller tussocks of *Carex elata*. This was not amongst the six sedges recorded in Victorian times, but was discovered by the leader early in 1982 and is only the second record for the vice-county. A few flowering plants of *Baldellia ranunculoides* were found. It was the first record for the marsh since Babington's day. Two of his notable species that have yet to be re-discovered are *Cladium mariscus* and *Carex serotina*. It seemed likely that the first-named is now extinct, whilst the latter may just have been overlooked.

During lunch, the appearance of riflemen was followed by gunfire on the Ministry of Defence Small Arms Range. The marsh forms an integral part of this Range, and there is no doubt that the survival of this species-rich fen in such a popular tourist area as Tenby owes all to the presence of the military.

After refreshments, the party avoided the small arms fire and set off for the limestone sea-cliff of Giltar Head. A detour en route took in the site of *Gentianella uliginosa*, where much debate and reference to 'Clapham, Tutin & Warburg' preceded the identification of *G. uliginosa*, owing to the confusion caused by the presence of apparent intermediates with *Gentianella amarella*. The Dune Gentian is now confined in Pembrokeshire to the one disused sand pit, whereas it was more widespread when discovered by H. W. Pugsley in September 1923, "in a damp sandy pasture around Tenby" as a first record in Britain. Relict clumps of *Juncus acutus* were seen, and *Thalictrum minus* subsp. *minus* was spotted growing in the main dunes and on the wind-blown sand that tops Giltar Head itself. Both had been seen here by John Lightfoot in 1773.

Once on the sea-cliff, there were splendid views across to Caldey and St. Margaret's Islands, and time was spent discussing the *Limonium binervosum* group. Again with the help of 'Clapham, Tutin & Warburg', another of Pugsley's finds—his endemic *Limonium transwallianum*—was examined. There was, predictably, mixed enthusiasm for the prospect of yet more splitting of this group following Martin Ingrouille's work at Leicester University. The dry, south-facing and exposed maritime turf yielded two surprises. One was a plant of *Salvia horminoides* not previously recorded from the headland; the other was the re-discovery of *Asparagus officinalis* subsp. *prostratus*. This was last seen here by the late Tommie Warren Davis in July 1973 and, after repeated searches in subsequent years, it was assumed to be extinct. Mr and Mrs M. Kitchen found two clumps: one was growing on the extremely exposed margin of the cliff slope, whilst the second flowering stand was set back from the edge in a lush growth of *Festuca rubra* and *Ammophila arenaria* over sand. This second locality seemed to be the site of the 1973 record. The *Asparagus* had been seen by Babington between Giltar Head and Lystep Haven in August 1848, and R. W. Falconer refers to it as plentiful near Giltar Head in his work of the same year. Its re-location was a most appropriate end to the day's botanising in the footsteps of our more illustrious forebears.

Thanks are due to Major P. E. Pillar (Retd) of the Penally Training Camp, for permitting access to the marsh and adjacent areas.

TAL-Y-LLYN LAKE, MERIONETH. 14TH AUGUST

A sizable party of members and friends assembled at Tal-y-llyn Lake (Llyn Mwyngil) 4½ miles south of Dolgellau, to explore the flora of the lake and adjacent marshland. The water level was fairly low and the weather fine, bright and cool.

Tal-y-llyn Lake, an oblong measuring about a mile by about a quarter of a mile and orientated south-west and north-east, lies below the steep southern slopes of Cader Idris and although at an altitude of only 270 ft it is rather upland in nature. It receives all the waters from the south-eastern quarter of Cader Idris, draining from acid mudstones and acid intrusive volcanics, and is moderately oligotrophic with a peaty and gravelly shore.

All the species recorded from the site, except *Potamogeton natans*, were seen. The most notable were *Callitriche hamulata*, *Carex rostrata*, *C. vesicaria*, *Elatine hexandra* (in great quantity), *Isoetes lacustris* (with sporangia), *Littorella uniflora* (flowering), *Menyanthes trifoliata*, *Myriophyllum alterniflorum*, *Nuphar* × *spenneriana*, *Nymphaea alba*, *Peplis portula*, *Phalaris arundinacea*, *Phragmites australis* (uncommon in the inland parts of north-western Wales), *Potamogeton alpinus*, *P. berchtoldii*, *P. perfoliatus*, *P. polygonifolius*, *Subularia aquatica* (in quantity), *Vaccinium oxycoccus* and *Wahlenbergia hederacea*.

The *Nuphar* was discovered here by the Rev. Augustin Ley on the 9th August 1886 and recorded as "*N. pumilum*". But the plant in fact has characters intermediate between those of *N. pumila* and *N. lutea*, the fruits are normally malformed, asymmetrical and contain only up to eight developed seeds. Two other hybrids new to Tal-y-llyn were discovered during the meeting, *Cirsium arvense* × *C. palustre* and *Senecio aquaticus* × *S. jacobaea*. Although no new species were added to the list for this well-botanised site, it was possible to do useful local recording because the lake runs into four 1 km and two 10 km nations grid squares.

After the meeting some members made a dash before the onset of rain to Tywyn to see *Limosella australis* in one of its few extant stations in the British Isles.

P. M. BENOIT

WYE VALLEY WOODS, GWENT AND HEREFORDSHIRE. 18TH SEPTEMBER

This meeting was primarily to study the species of *Sorbus* of the area. Two main problems were apparent: firstly the plasticity of the leaf form of *Sorbus aria* (L.) Crantz and *S. porrigentiformis* E. F. Warb., and secondly the distribution of species, with more species occurring on the south-facing rocks of the Seven Sisters and Lord's Wood, Herefordshire, than on the north-facing slopes of Lady Park Wood, Gwent. We were very fortunate to have Mr P. J. M. Nethercott with us, who could give us a considered opinion on problem trees.

The 'Welsh' meeting started in England. When examining leaves of *Sorbi*, only those on mature branches on 'spurs' away from ends of branches should be looked at, but as we were in a nature reserve it was stressed that specimen leaves should be sought for underneath the trees. In Herefordshire, *S. aria* displayed a bewildering variety of leaf forms. Some trees had small oval leaves, while others had large suborbicular leaves; some leaves had shallow lobes, while others had none. The fruit tended to be slightly longer than broad. *S. porrigentiformis* tended to differ from the type in the Avon Gorge, but Mr Nethercott pointed out the outward-pointing teeth, which on the sides of the leaves formed an angle of 90° with the leaf axis, and the dark crimson, subglobose fruit. *S. rupicola* (Syme) Hedl., in its exposed cliff-edge position, was wind damaged. A few typical leaves, long, narrow, obovate with long cuneate bases were found, but it bore no fruit. *S. eminens* E. F. Warb. had large obovate-orbicular leaves and bore large fruits (c. 20 mm) that made it fairly distinctive. The leaves of *S. torminalis* (L.) Crantz had turned a beautiful red and contrasted vividly with the green of the shaded trees on the Welsh side. *S. aucuparia* L., with its pinnately arranged leaflets, tended to have fruits only where it grew on path edges and had a fair share of the sunlight. *S. × thuringiaca* (Ilse) Fritsch needed no conservation measures to protect it, as it grew out from the top edge of a tufa-clad cliff. It had a peculiar leaf, with a basal pair of free leaflets and then paired lobes decreasing in size. Lower down in the valley it is more common to find pairs of free leaflets at the base of the leaves. Nearby were two trees of *S. × vagensis* which showed a similarity of leaf shape with one of their parents, *S. torminalis*, both having deeply divided leaves with pointed lobes, but whereas the hybrid had a

greenish-white tomentosum on the underside of the leaf, the parent was glabrous. Other plants observed were *Solidago virgaurea*, *Serratula tinctoria*, *Geranium sanguineum*, *Hippocrepis comosa*, *Rhamnus catharticus*, *Tilia cordata*, *Carex humilis*, *C. montana*, *Scabiosa columbaria* and, by the River Wye, *Mentha* × *smithiana*.

After lunch, the river was crossed and Gwent entered. *Elodea nuttallii* was retrieved from the river. Along the riverside path were growing *Tilia platyphyllos*, *Dipsacus pilosus* and *Atropa bella-donna*. It was necessary to climb to the top of the cliff to see the many *Sorbus torminalis*. Under these trees were growing two uncommon grasses for Gwent: *Festuca altissima* and *Hordelymus europaeus*. Fungi were much in evidence and among those seen were *Amanita phalloides*, *A. citrina*, *Hydnum repandum*, *Oudemansiella radicata*, *O. mucida*, *Lepiota procera* and many species of *Lactarius*. *Sorbus eminens* (only Gwent example?) and *S. × vaginensis* were seen, the latter was determined positively only after comparison with the other herbarium examples.

T. G. EVANS

SCOTLAND

KINDROGAN, EAST PERTSHIRE. 20TH–24TH MAY

Leaving the 'blown' Dandelions of an early season in the English lowlands, Taraxacologists ventured north to the Scottish glens in the hope of prolonging the short season, seeing some of the Scottish specialities, having a chance to exchange opinions and specimens and to learn. Politically, the meeting was equally divided, six English harmonising with six Scots. Interests were diverse, linked only by the genus *Taraxacum*, for while nearly everybody collected many specimens and the changing of drying paper in professional-looking presses went on far into the small hours, some also painted them very beautifully (Olga Stewart), some etched their leaf-outlines (Adrian Rundle), some looked them up on a portable computer terminal (Richard Pankhurst), and copious annotations were made by many. John Richards of Newcastle University led the party in identification, most ably abetted by Chris Haworth, the other *Taraxacum* referee, and both will agree that the presence of the other led to an unusually high rate of successful identification in this maddening group of plants.

Before the visit, East Perth was one of the least known vice-counties for *Taraxacum*, with only 13 species recorded. We failed to find two of these while adding another 42 species to the list. We were also able to add 25 species to the list for Mid Perth. Altogether, 62 species of *Taraxacum* were seen, just over 30% of the total for the British Isles, but with a higher proportion of apparently native and endemic species than would be the case in more lowland areas. One new species was discovered in the neighbourhood of Kindrogan, and has been provisionally named after the beautiful Glen Ardlie (or should it be Strath), in which it resides. The Taraxacological and other interests of the excursion were much aided by the Warden of Kindrogan Field Centre, Brian Brookes, who was an active member of the party and took us to many of his favourite local spots, which he quite rightly suspected might be rich for dandelions. Thus we were able to notice incidentally many other worthy plants, of which *Schoenus ferrugineus*, *Betula* × *intermedia*, *Melampyrum sylvaticum* and *Pseudorchis albida* aroused as much interest as any.

The new sectional classification in *Taraxacum* was used throughout the course. Although the sections *Erythrosperma*, *Obliqua* and *Palustria* remain as conceived in the *Taraxacum flora of the British Isles* (Watsonia 9, suppl. 1972), *Spectabilia* and *Vulgaria* have been subdivided. *Spectabilia* sensu stricto now only includes the few pentaploid relatives of *T. spectabile* with adpressed bracts and large oblong achenes. The sections *Crocea* (high mountain plants) and *Naevosa* of Christiansen are now recognised, and the relatives of *T. nordstedtii* and *T. adamii*, with *T. praestans* and species previously considered to be *Vulgaria*, such as *T. raunkiaerii* and *T. haematicum*, are now placed in a new section. These usually have erect, pruinose bracts and unspotted leaves with bright purple midribs. The relatives of *T. hamatum*, previously placed in section *Vulgaria*, are also treated as a section, named *Hamata* H. Øllgaard. We were able to see several representatives of all these sections except *Obliqua* (northern coasts) and *Palustria* (southern fens).

The first day around Kindrogan yielded 36 species, including three which are as yet undescribed. One of these, formerly mistakenly called *T. crispifolium*, was discovered near Brian Brookes' new

cottage. The main road through Enochdhu was rather disappointing, but *T. retroflexum* and *T. incisum* occurred as sparsely distributed introductions.

Weedy, non-native species were far more evident on the Saturday morning, which was spent exploring the riverbank in Blairgowrie. Here the Scandinavian rarities *T. altissimum* and *T. angustiquameum* each occurred as single plants, while *T. uncosum*, *T. undulatiflorum*, *T. hemipolyodon* and *T. rhamphodes* were recorded for the only time, again as single individuals. Although introduced in the Highlands, *T. hemipolyodon* must be considered as native elsewhere, for it does not occur outside the British Isles. Further along the river, wooded banks revealed two local native species, *T. laetifrons* and *T. argutum*.

In the afternoon, a fen near Blairgowrie added *T. spectabile* and the much rarer Highland speciality *T. eximum* to the list (the latter proved to be quite widespread in mesic fens in the area) with *T. adamii* and *T. nordstedtii*. Totally unexpected however was *T. palustrisquameum*, previously thought to be restricted to fens in Norfolk, although with old records in Cambridgeshire and Lancashire. Other areas nearby added the rare introduction *T. praeadians*, and several stations were discovered for *T. polyhamatum*, which appears to be native in the Highlands, but not elsewhere. *T. pseudolarssonii*, the commonest *Naevo* species in northern England which also occurs plentifully into southern Scotland, was another unexpected discovery. It is unusual in that the leaf spots fade with age.

On the Sunday, we ventured into Mid Perth to examine limestone sites around Aberfeldy and Schiehallion. An undescribed *Naevo* species, known from northern England and Wales, proved to be widespread in this area, and an interesting and apparently undescribed *Hamata* species was also detected. The *Erythroperma* species were disappointing, but one colony of *T. laetiforme* was found only just coming into flower. One plant of the rare *T. excellens* was found beside a woodland path, apparently introduced. The best find of the day was made on the way home near a transplant of *Schoenus ferrugineus*. Here a fine colony of the endemic and little known *T. scoticum* was found on a gravel track.

On the final morning we proceeded with frequent stops towards the railway station at Pitlochry. One species was added to the list for East Perth, the very rare northern species *T. melanthoides* (this as described in the *Taraxacum* Flora from southern meadows, can be equated with *T. scotiniforme*).

So ended an enjoyable and useful four days, and thanks to Brian Brookes as well as to all the participants should be placed on record.

A. J. RICHARDS

PITRODDIE DEN, SIDLAW HILLS, PERTSHIRE. 13TH JUNE

A total of 21 members and friends of the B.S.B.I. and Perthshire Society of Natural Science attended the above joint excursion. The main aim was to explore a little known area of the Sidlaw Hills in the hope of finding new plant records and confirming some old ones.

Pitroddie Den comprises mainly south-facing slopes above a river valley together with a rock face and spoil from a long-disused quarry. It is extensively colonised by scrub, except from the uppermost grazed section. This may explain the failure to re-find some old records, but nevertheless we were pleased to re-find both *Astragalus glycyphyllos* and *Lactuca virosa*. South-facing calcareous substrate supported such local rarities as *Agrimonia eupatoria*, *Carduus acanthoides*, *Primula veris*, *Reseda luteola*, *Sherardia arvensis* and *Viola hirta*. Apart from the plants, enjoyment of the visit was increased by the many butterflies which were on the wing.

We are grateful to Mrs M. A. Steele, Nether Durdie, for access permission, and in particular for the splendid gate which was especially erected to permit us access to the upper Den.

R. A. H. SMITH

GLEN FESHIE, CAIRNGORMS. 26TH-27TH JUNE

The joint meeting between the B.S.B.I. and the Alpine Section of the B.S.E. had 25 participants, for this two-day meet in Glen Feshie.

The group met at Achlean on the Saturday and proceeded to Coire Garbhlach, recording *Listera cordata* and *Genista anglica* amongst the dense sward of *Calluna*, which carpets much of the valley floor. On the banks of the Allt Garbhlach, *Equisetum pratensis* was scattered through the short turf and amongst open stony habitats, along with such widespread alpine species as *Alopecurus alpinus*, *Carex dioica*, *Epilobium alsinifolium*, *E. anagallidifolium*, *Juncus triglumis*, *Phleum alpinum*, *Salix myrsinites*, *Saxifraga hypnoides*, *S. oppositifolia*, *S. stellaris* and *Trollius europaeus*. The chief area of interest was the north facing cliffs above 2,000 ft; here, the large, free-flowering clumps of *Cardaminopsis petraea* were outstanding and the quantity of *Carex atrata* noteworthy. *Athyrium alpestre*, *Dryas octopetala*, *Cerastium alpinum*, *Coeloglossum viride*, *Cryptogramma crispa*, *Draba norvegica*, *Galium sternerii*, *Polystichum lonchitis*, *Saussurea alpina*, *Saxifraga nivalis*, *Silene acaulis*, *S. dioica* and *Veronica alpina* were amongst the interesting plants recorded.

On the Sunday the group divided into several small parties. The most energetic travelled up past Glen Feshie Lodge, then proceeded to explore under recorded areas in the upper reaches of the Feshie, recording *Betula nana*, *Drosera anglica*, *Dactylorhiza maculata* subsp. *ericetorum*, *Salix lapponum*, *S. phyllicifolia*, and *Tofieldia pusilla*. A second party searched some south-facing cliffs near Creag na Gaibhre in the upper Feshie; fine stands of *Vicia sylvatica* were in full flower in the screes amongst the old *Pinus sylvestris* and *Sparganium angustifolium* was in pools near the river. On the cliffs, *Galium boreale*, *Anthyllis vulneraria*, *Arabis hirsuta*, *Asplenium viride*, *Botrychium lunaria*, *Briza media*, *Gymnadenia conopsea*, *Helictotrichon pratensis*, *Melica nutans*, *Orchis mascula*, *Rubus saxatilis* and *Saxifraga aizoides* were noted. Nearby, the recently discovered colony of *Ophioglossum vulgatum* was investigated and some 1,000 plants counted. A third party visited interesting sites in the Spey Valley, where they found the well established *Cicuta virosa* and the recently discovered *Carex chordorrhiza*.

I would like to take this opportunity to thank the land owner for his encouragement of this very successful field meeting.

R. J. D. McBEATH

FORTH & CLYDE CANAL, GLASGOW. 29TH AUGUST

Around 15 people attended this joint meeting with the Glasgow Natural History Society. The morning was spent visiting known sites on the western fringes of the city, while the object of the afternoon was to explore an unrecorded 1 km square east of the city at Cadder.

The day began at Bowling, where the western extremity of the Canal reaches the River Clyde. *Lemna gibba* was seen in its usual abundance as was a large colony of *Potamogeton lucens*. *P. pusillus* was an unexpected addition to this well-surveyed section, though sadly a tiny colony of *Lysimachia thyrsiflora* seemed to have finally succumbed to vigorous marginal clearance. The complex of scrub and old railway adjoining the canal contains well-established colonies of *Anaphalis margaritacea* and *Solidago rugosa*, while *Aster* × *salignus* was a new discovery. The old railway supported a large hybrid swarm of *Euphrasia arctica* × *nemorosa* and a rare toadstool, *Leptonia atomarginata*, was plentiful.

Further into the city at Knightswood, the canal speciality *Potamogeton* × *bennettii* was seen in quantity and the canal banks had abundant material for a diversion into *Solidago* taxonomy, forms of *S. gigantea* and *S. canadensis* sensu stricto being present. The nearby section at Clydebank has recently been shallowed and landscaped, destroying a formerly rich flora, but it was heartening to see *P.* × *bennettii* as the main recolonist.

At Cadder, an advance party kindly hauled out *P. trichoides* while the rest of us were still having lunch, but, apart from *P.* × *bennettii* again, no more notable aquatics were found. However the canal bank produced two surprising discoveries, *Rubus drejeri* (subsequently confirmed by A. Newton) and a single, large plant of *Nepeta cataria*.

There was too little time to appreciate the full richness of the canal flora but enough was seen to emphasise the considerable botanical importance of the Forth & Clyde Canal. It is distressing that its flora continues to be destroyed while conservation bodies show little effective interest.

A. J. SILVERSIDE

GRANGEMOUTH, STIRLINGSHIRE. 4TH SEPTEMBER

A party of 15 attended this joint meeting with the Glasgow Natural History Society. The object of the meeting was to explore the extensive areas of waste ground about the docks and beside the mouth of the River Carron. A century ago Grangemouth was a fairly prolific source of plant casuals and adventive aliens, but with the gradual decline in both volume of traffic and the use of stone ballast the variety of species has greatly diminished. Much of interest still remains to be found, however.

Before lunch the areas near the entrance of the docks were explored together with the muddy bank of the Carron, where estuarine conditions prevailed. On fairly dry, open, waste ground the most interesting species found included *Sisymbrium altissimum*, *Reseda luteola*, *R. lutea*, *Silene vulgaris*, *Sagina apetala*, *Erodium cicutarium*, *Pastinaca sativa*, *Convolvulus arvensis*, *Chaenorhinum minus*, *Senecio squalidus*, *S. viscosus*, and their hybrid *S. × londonensis*, *Carduus acanthoides*, *Poa compressa*, *Bromus sterilis*, *Avena fatua* and *Agrostis scabra*. A damp brackish depression produced a few plants of *Chenopodium rubrum*. The river bank yielded a selection of halophytes including *Spergularia salina*, *Atriplex littoralis*, *Salicornia* species (one of which was *S. dolichostachya*), *Aster tripolium* and *Puccinellia distans*. A prominent feature of the docks area was the abundance of the bramble *Rubus elegantispinosus*, a species recently detected in Britain and suspected of being a horticultural introduction. Other brambles seen in the area included *R. latifolius*, *R. nemoralis* and *R. leptothyrsus*.

In the afternoon we turned our attention to a large area of grassy, waste ground, stretching towards the oil refineries. This was colonised in places by *Salix* scrub, and an interesting feature was the considerable tracts dominated by *Calamagrostis epigeios*. This extremely invasive grass had obviously increased greatly since our previous field meeting held here in 1969. In another place a small area was dominated by *Carex hirta*, while nearby was an extensive patch of *Carex acutiformis*. Casual introductions were scarcer here, but *Thlaspi arvensis*, *Linaria repens* and *Melilotus officinalis* were noted, also a sedge of the *C. muricata* group, which was subsequently determined as *C. spicata* by R. W. David. Towards the oil refineries some damper hollows provided variety with *Ranunculus sceleratus*, *Typha latifolia*, *Scirpus tabernaemontani*, *Carex otrubae* and *Phragmites australis*.

A. MCG. STIRLING

FRANCE

FONTAINEBLEAU, SEINE-ET-MARNE. 6TH-13TH JUNE

Twenty members attended this meeting in what is almost certainly the richest lowland forest of France; some 1200 vascular plant species have been recorded over the years in the Forêt de Fontainebleau, and more than half of this number was observed during the week's excursion, which was held in beautiful sunny weather.

In view of the very great interest and variety of habitats in the forest, it is not possible to give a proper account of the flora in this brief report, but it is hoped to do this more adequately at a later date.

The forest of Fontainebleau comprises a low plateau of Oligocene rocks in the south-eastern part of the Paris basin. By far the greater part of it is composed of Fontainebleau sandstones, producing a dissected plateau of sarsen-like boulders, sometimes forming ridges or inselbergs, elsewhere forming broad more level areas with karstic hydrological features. There are no streams; water percolates through the porous strata and emerges at spring lines round the edges, feeding the Seine or its tributaries; there are however boggy areas and even small lakes sitting on an impervious 'iron-pan' layer on parts of the plateau. While the acid sandy parts of the forest are very interesting, undoubtedly the richest floras occur on the thin limestones which occur either below the massive sandstone (Calcaine de Brie) or, as relic outliers, on top of the sandstone (Calcaine d'Etampes). These limestone areas display extraordinarily rich calcicole vegetation, including many rare British species of 'continental' distribution, such as *Pulsatilla vulgaris*, *Hypochaeris maculata*, *Veronica spicata*, *Silene oites*, *Scleranthus perennis* and many Orchidaceae, and also a very large number of European species that do not reach the British Isles, and are in some cases nearly or quite at their northern or western limits here; these include such species as *Peucedanum onoselinum*, *Seseli*

montanum, *Vincetoxicum hirundinaria*, *Teucrium montanum*, *Ranunculus gramineus*, *Helianthemum umbellatum*, *Amelanchier rotundifolia*, *Asperula tinctoria*, *Anthericum ramosum*, *A. liliago* and *Dianthus carthusianorum*. Perhaps most pleasure, however, was given to members by seeing very rare British plants in great abundance, such as *Ophrys fuciflora*, *Himantoglossum hircinum*, *Orchis militaris* and *Cephalanthera rubra*, and by the numerous *Orobanchae* spp., including the typical, white-flowered *Orobancha alba* on *Thymus*. The plant that gave the leader most pleasure was *Carex depauperata*, in fine condition and in some quantity, because this species is now reduced in the British Isles to a very few plants on a Somerset hedgebank.

The opportunity was taken, on both outward and return journeys to Fontainebleau, to sample the rich flora of the Normandy chalk slopes, where *Astragalus monspessulanus* (at its extreme northern limit) and many Orchidaceae were seen in plenty.

F. ROSE

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.

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Watsonia

January 1984 Volume fifteen Part one

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Published by the Botanical Society of the British Isles

UK ISSN 0043-1532

Filmset by
WILMASET, BIRKENHEAD, MERSEYSIDE
Printed in Great Britain by
EATON PRESS LIMITED, WESTFIELD ROAD, WALLASEY, MERSEYSIDE