Short Notes

A RELIABLE METHOD FOR DISTINGUISHING BETWEEN *BETULA PENDULA* AND *B. PUBESCENS*

The difference in leaf shape between *B. pendula* Roth and *B. pubescens* Ehrh. is usually used to distinguish between these species. The difference normally cited is the shape of the leaf apex (acuminate in *B. pendula* but acute to subacute in *B. pubescens*). Many field botanists recognize the considerable degree of variation within these species (particularly in *B. pubescens*) and the consequent difficulty in identifying some specimens. Accordingly, there was felt to be a need to develop a method of identification which took this variability into account. Consequently, a quantitative method of expressing leaf-shape differences was developed following on the work of Nokes (1979).

Three characters are measured as follows:

1. Leaf tooth factor (LTF). A ruler is placed between the tips of the teeth at the ends of the third and fourth lateral nerves. The number of teeth projecting beyond this line is subtracted from the total number of teeth between the nerves (excluding the teeth at the nerve endings). This character was modified from the leaf tooth factor of Nokes (1979). In Fig. 1, LTF has a value of 3.
2. The distance, in millimetres, from the petiole to the first tooth on the leaf base (DFT), (Fig. 1).
3. Leaf tip width (LTW). The shortest width, in millimetres, of the leaf apex one quarter of the distance between the apex and the leaf base (Fig. 1).

To identify a tree, these three characters are measured on five short-shoot leaves from the lower

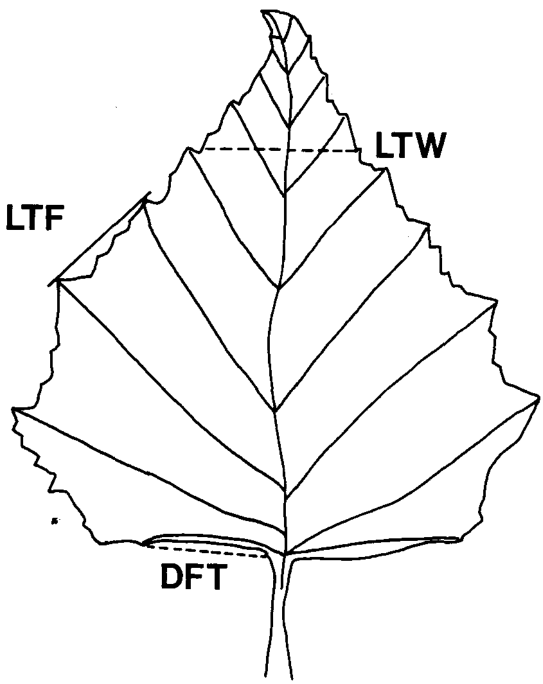

FIGURE 1. Measurement of leaf characters.

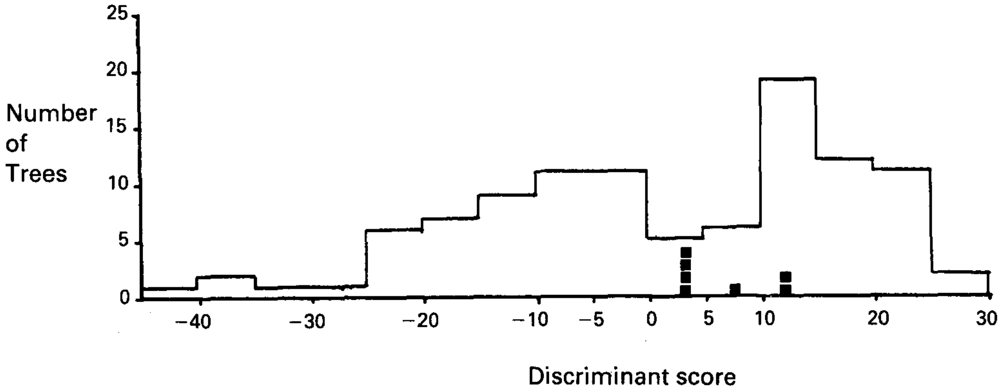

FIGURE 2. Frequency distribution of discriminant scores in the test sample of 104 trees. Plants with discriminant scores less than zero are *B. pubescens* (56 chromosomes) and those with scores greater than zero are *B. pendula* (28 chromosomes) with the exception of those plants marked with a (■) which are misclassified.

crown and averaged. The average for each character is multiplied by a constant and combined in the following discriminant function:

$$(12 \times \text{Average LTF}) + (2 \times \text{Average DFT}) - (2 \times \text{Average LTW}) - 23$$

If the solution is greater than zero, the tree is likely to be *B. pendula*; if it is less than zero, the tree is likely to be *B. pubescens*. This method gives a correct rate of classification of 93% (tested against chromosome number). This was based on a sample of 104 trees which were collected from 14 self-sown populations in England and Scotland. Most of these populations contained both species. Trees which have low values for the solution (between −5 and 5) are less likely to be correctly identified than those with higher numerical values. Of the sample tested, 15% had scores in this range, although only seven trees (7% of the sample) were incorrectly identified. In this sample, only *B. pubescens* trees were misclassified. Fig. 2 shows the distribution of discriminant scores for the test sample.

Another method has been developed which allows a higher degree of certainty of identification (97%). This requires considerably more calculation and will be dealt with in a later paper.

ACKNOWLEDGMENTS

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M. D. ATKINSON & A. N. CODLING
School of Applied Sciences, The Polytechnic, Wolverhampton, WV1 1LY

MORE ABOUT SEA- AND LAKEBALLS

The publication, earlier this year, of my Presidential Address on 'Seaballs and Lakeballs' (Cannon 1985), in which I attempted to bring together information on naturally occurring plant fibre balls and related phenomena has, as is so often the case, brought to light further information of great interest that I should have liked to incorporate in the original paper. This short note may stimulate further interest in this unusual aspect of field botany.

Dr Elizabeth McClintock, at the Herbarium, University of California, Berkeley, has kindly drawn my attention to three further kinds of fibre balls (McClintock 1977). The first kind results from waste bark fibres from redwood timber extraction and processing on the northern California coast near Fort Bragg. Although some of the bark is itself used commercially, spillages occur into the ocean, where the fibres may become matted and twisted together to form balls which are subsequently cast up on the shore in great numbers. British botanists will probably be less familiar with the bark of the redwood (*Sequoia sempervirens* (Lamb.) Endl.) than with that of the related giant sequoia (*Sequoiadendron giganteum* (Lindley) Buchholz) from the Californian Sierras, which grows much better in our climate than the coastal redwood, and is widely planted in parks and large gardens. However, the general similarity of the very thick fibrous barks will enable readers to appreciate how seaballs from this markedly different source material can occur.

Dr McClintock also describes lakeballs formed from *Ruppia maritima* L. in Little Borax Lake, Lake County, California. Perhaps British botanists should bear in mind the possibility of finding fibre balls from this species, although the habitats of *Ruppia* known to me do not appear to be very conducive to ball formation. The *Ruppia* balls shown in the photograph in her paper look extraordinarily like *Posidonia* balls, but can, apparently, vary in size "from a baseball to a small watermelon". She also refers to a report by H. D. Thoreau as long ago as 1854 of lakeballs in Massachusetts. These were later stated by Ganong (1905) to be composed of fibres from *Eriocaulon* sp. He also refers to a lake in Idaho where species of *Ceratophyllum*, *Chara*, *Nitella*, *Zannichellia* and *Najas* are said to have been implicated in ball formation. Not many English or Welsh botanists have the opportunity to see *Eriocaulon*, but perhaps Scottish and Irish members will note this rather esoteric possibility.

Mr Peter Foss has kindly informed me of the occurrence of the 'mystery' Chater, Walters and Webb seaballs (now known to be composed of *Ammophila* root fibres) in additional Irish localities to that on the Dingle Peninsula where they were originally discovered (Cannon 1985). Perhaps they may yet be found in suitable British localities, where marram occurs abundantly in dunes above an extensive sandy beach which slopes gently into the sea in sheltered conditions? Mr Foss hopes to publish a short paper on the new Irish localities in due course.

On a recent holiday visit to the south of France, my wife and I visited the island of Port-Cros which, as one of the Isles d'Hyères, has been protected as the Parc National de Port-Cros. In addition to the land vegetation, the regulations also provide for an extensive marine reserve stretching out for a considerable distance from the shoreline. The reserve includes, in one of the more sheltered areas, a substantial bed of *Posidonia* and, to our intense amazement, in an otherwise unprepossessing beach cafe, there was offered for sale an excellent publication about the biology of *Posidonia* and its environment (Boudouresque & Meinesz 1982). It provides a complete account of the biology of the species and its ecology, rightly emphasizing the importance of the extensive *Posidonia* meadows as habitats for numerous marine animals, so contributing to the productivity of the Mediterranean and consequently of great relevance to long-term human economic interests. The need for conservation of *Posidonia* beds is rightly emphasized, as they are threatened today in many places, through pollution and the development of marinas and other coastal facilities.

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J. F. M. CANNON

Botany Department, British Museum (Natural History), London, SW7 5BD

DACTYLORHIZA MAJALIS (REICHB.) P. F. HUNT & SUMMERHAYES SUBSP. *CAMBRENSIS* (R. H. ROBERTS) R. H. ROBERTS IN S.E. YORKSHIRE

On 29th June 1963, a population of marsh orchids with narrow leaves, some heavily marked, was found by the author on a marsh by the River Hull, near Wansford, 5 km S.E. of Driffield, GR 54/0.5, S.E. Yorks., v.c. 61. Two, representative, fresh specimens were sent to Kew and the late V. S. Summerhayes suggested that the plants might be *Dactylorhiza traunsteineri* (Saut.) Soó, but that he could not be certain without seeing the population and this he was never able to do.

In fact, the plants had features which were not correct for *D. traunsteineri*, notably the flowering spikes were not lax and the lowest leaf was not the narrowest. In November 1981, R. H. Roberts identified the taxon from colour transparencies, of both whole plants and close-ups of inflorescences, depicting two typical members of the population. Roberts (pers. comm.) stated that the plants undoubtedly belong to *D. majalis* (Reichb.) P. F. Hunt & Summerhayes subsp. *cambrensis* (R. H. Roberts) R. H. Roberts. In 1961, this subspecies was known only from coastal marshes on Anglesey, v.c. 52, and at Ynyslas in Cards., v.c. 46, but was found a year later in Caerns., v.c. 49, and in 1979 at two localities in Merioneth, v.c. 48.

Associated species at the S.E. Yorks. site were *Equisetum palustre*, *Caltha palustris*, *Ranunculus flammula*, *Cardamine pratensis*, *Lychnis flos-cuculi*, *Parnassia palustris*, *Mentha aquatica*, *Valeriana dioica*, *Succisa pratensis*, *Dactylorhiza fuchsii*, *D. incarnata* subsp. *incarnata*, *D. incarnata* subsp. *pulchella*, *Eleocharis palustris*, *E. uniglumis*, *Carex hostiana*, *C. viridula* subsp. *brachyrhyncha*, *C. panicea*, *C. flacca*, *C. diandra*, *C. disticha* and *C. dioica*.

A biometric study of the S.E. Yorks. population was carried out in 1964 and again in 1983 following the procedure adopted by Roberts (1961a). Table 1 gives sample data for the 1964 and 1983 S.E. Yorks. samples and those given by Roberts (1961b).

My data for the S.E. Yorks. *D. majalis* subsp. *cambrensis* population studied in 1964, including mean measurements for various structures (Table 1), match well those for the two populations first studied by Roberts (1961b) in Wales. Such minor differences as occur between the Yorkshire and Welsh populations may be the result of long isolation.

In 1979, Ettlinger & Roberts (1980) found populations of *D. majalis* subsp. *cambrensis* in two localities in Merioneth. The Merioneth populations, studied by Bateman & Denholm (1983) and on which their description of the taxon was based, differ from the S.E. Yorks. plants and those studied by Roberts (1961b) in a number of respects. Flower colour, shape of labella and labella markings, as depicted in photographs exhibited by Bateman & Denholm (1982) at the B.S.B.I. Exhibition Meeting in 1981, are markedly different from those of S.E. Yorks. plants, and R. H. Roberts (in litt.) confirmed that on the whole the flowers of the Merioneth plants are deep

TABLE 1. COMPARISON OF THE S.E. YORKS. *DACTYLORHIZA MAJALIS* SUBSP. *CAMBRENSIS* POPULATION WITH THOSE IN ANGLESEY AND CARDS.
Figures quoted are means with standard errors; N = sample size.

Character	S.E. Yorks. (1964) N = 30	S.E. Yorks. (1983) N = 10	Cards. N = 85[a]	Anglesey N = 92[b]
Height, mm	259±111	344±193	280±53	273±57
Total no. of leaves	6·2±0·2	6·8±0·3	6·6±0·1	6·8±0·1
No. of non-sheathing leaves	1·5±0·2	1·6±0·2	1·9±0·1	2·0±0·1
Leaf length, mm	129·0±4·7	128·0±7·2	124·0±2·4	123·0±2·6
Leaf width, mm	16·0±0·8	19·0±0·9	17·0±0·4	18·0±0·5
Leaf index (length/width)	8·3±0·3	6·8±0·3	7·3±0·2	6·8±0·2
Labellum length, mm	7·9±0·2	7·5±0·3	8·4±0·1	7·9±0·1
Labellum width, mm	9·5±0·2	9·5±0·4	10·4±0·1	10·6±0·1
Spur length, mm	7·3±0·2	7·0±0·3	7·9±0·1	8·7±0·1
Spur width, mm	2·3±0·1	2·1±0·1	3·3±0·1	3·2±0·1

a) N = 86 for labellum and spur dimensions.
b) N = 118 for labellum and spur dimensions.

magenta and have a diamond-shaped labellum with the labellum pattern concentrated in the central area. The typical flower colour of the S.E. Yorks. plants is identical with that of the original populations studied by Roberts. The leaf index of the Merioneth population sample is 5·3 (Bateman & Denholm 1983), within the range of that for *D. purpurella*, i.e. 3·1–6·1 (Roberts 1961a).

Conditions at the S.E. Yorks. site changed later in the 1960s, believed to be the result of nearby road construction possibly affecting the flow of spring water. *Menyanthes trifoliata*, previously confined to a corner of the marsh remote from the *D. majalis* subsp. *cambrensis* population, spread over the whole area; all *Dactylorhiza* populations were greatly reduced in numbers of plants, and flowering spikes of the *D. majalis* subsp. *cambrensis* colony became scarce and appeared spasmodically.

On 20th June 1982, only five plants of this taxon, only one having leaf markings, were found; these compared well with the 1964 population sample except for average longest leaf length. The data were as follows: average height 262 mm, average leaf number 6·2, average number of non-sheathing leaves 2·2, average longest leaf length 105 mm, maximum width of longest leaf 14 mm, average number of flowers in the spike 31·8.

In early July, 1983, ten plants were noted, eight with typical leaf markings and all the bracts and upper stem suffused with pigment. The sample data for this population are given in Table 1. Examination of the data, including notes on vegetative, inflorescence and floral features, revealed that this population resembled that studied in 1964 in most respects. The most marked differences were in the average height of the plants, the length of flowering spike (average 54 mm), and a tendency for a slightly wider leaf, although the leaf index of 6·8 is the same as that for the Anglesey colony.

Four of the plants examined in 1983 were in tall vegetation which may have affected height, but this cannot fully account for the greater average height. A possible explanation of these observed changes in the tetraploid *D. majalis* subsp. *cambrensis* population as revealed by the 1983 studies is that there has been past hybridization, most probably with the diploid *D.fuchsii*, and subsequent backcrossing from the F_1 to *D. majalis* subsp. *cambrensis* so that the population has become slightly introgressed. This theory is in line with the findings of Lord & Richards (1977) who demonstrated that triploid dactylorchid hybrids are by no means totally sterile, but may frequently cross among themselves, or backcross to the parents. A photograph of a plant, taken on the S.E. Yorks. site on 29th June 1963, has been examined by R. H. Roberts and tentatively identified as the hybrid *D. fuchsii* × *D. majalis* subsp. *cambrensis*, being similar to plants of this hybrid found in Wales. Also, a plant on the same site with intermediate characters and exceptional vigour, noted in 1982, was thought to be this hybrid and excluded from the population sample. The changed site conditions may have favoured the survival of hybrid derivatives.

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I wish to thank Mr. R. H. Roberts for determining *Dactylorhiza majalis* subsp. *cambrensis* from photographs, for much valuable comment on my observations and for kindly reading the manuscript and making suggestions.

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F. E. Crackles
143 Holmgarth Drive, Bellfield Ave., Hull, HU8 9DX

THE REDISCOVERY OF CAREX MARITIMA GUNN. ON THE FAIRWAYS AT ST ANDREWS LINKS, FIFE

Carex maritima Gunn. is a rare sedge of sandy coasts in north-eastern Britain. During the present century it has been lost from many of its former strongholds, especially in eastern Scotland where, from E. Ross southwards, David (1982) listed the plant as still extant at only two of the 28 sites for which he had old records.

In Fife, v.c. 85, *C. maritima* used to occur at three localities: at Dumbarnie Links, 37/4.0, where it was recorded about a century ago (Howie 1884); at Tentsmuir, 37/4.2, where it was last seen in the late 1960s (M. Benstead pers. comm.) but is now almost certainly extinct; and at St Andrews Links, 37/5.1, where until summer 1984 it had not been recorded since 1911 (specimen in **STA**). *C. maritima* was first found on St Andrews Links by Maughan (specimen in **E**), and was recorded by Howie (1884) as occurring "on the old road that crossed the Swilkin Burn at St Andrews".

In 1984, the sedge was first discovered on 20th June in a damp hollow in the middle of the third fairway of the Jubilee Golf Course. This seemed a most unlikely habitat, yet since then I have crawled across all the St Andrews fairways and – to my utter astonishment – have now found it at 14 sites on the Jubilee Course, 14 on the New Course, six on the Old Course (including three on the eighteenth fairway!), and one on the putting green by the Swilkin Burn.

All the sites are on low-lying fairways that flood intermittently in winter (usually November – April), and despite much searching I failed to find the sedge on any of the uncut roughs. Some of the colonies are very large, with three sites on the Jubilee Course and five on the New Course each holding more than 1,000 plants. Three sites probably have over 100,000 plants each, and it occurs in these at extraordinarily high densities, with sample quadrats producing counts of 500–1,000 plants/m^2.

Apart from *Carex maritima*, the fairway 'slacks' are floristically of little interest, although *Isolepis setacea* occurs sparingly on the Jubilee Course and *Blysmus rufus* is co-dominant with *C. maritima* at two sites on the New Course. The sedge is generally found in damp grassland in which *Agrostis stolonifera*, *Carex flacca*, *Poa pratensis* and *Festuca rubra* are abundant, together with a few other 'wet slack' species such as *Juncus bufonius*, *Sagina procumbens*, *Glyceria declinata*, *Carex ovalis* and *Leontodon autumnalis*.

Perhaps the most surprising aspect of this plant's rediscovery has been to find it flourishing on some of the most intensively managed parts of the golf links. Management of the fairways includes regular cutting to keep the sward to a height of 2–3 cm, aeration of the turf by 'slitting' it in early winter, applications of organic fertilizers in spring, and (in some years) spraying with the broad-leaved weedkiller 2,4-D. This management may in fact favour *C. maritima*, as it keeps the turf fairly open and helps to restrain taller-growing species that might otherwise eliminate it from the sward. Indeed, on the fairways this sedge is probably at a competitive advantage – it can flower and set seed below the height of the cutting blades, is unaffected by 2,4-D, and may be encouraged to spread vegetatively by having its rhizomes repeatedly cut by the tractor-mounted 'slitter' used to aerate the turf. It also seems able to colonize divot holes and turf cuttings quickly, and can establish itself in reseeded areas before the grass sward becomes closed. It is surprising to note that some of the largest colonies (those on the first fairway of the New Course) are in turf that was layed as recently as 1974. The possibility cannot be ruled out that *C. maritima* was already in the turf at the time it was layed; however, I could find no evidence of the sedge in the area from which the turf was taken, and the habitat there does not appear at all suitable.

It is remarkable that *C. maritima* has remained undetected at St Andrews for so long. However, it must be admitted that this sedge is easily overlooked, and at St Andrews it is found in places that most field botanists would tend to leave well alone. Certainly its continued occurrence at this site is of considerable interest, not only because of its unusual habitat, but also because it appears to be flourishing here in greater quantity than at any of its other surviving British stations.

It would be most interesting to know whether *C. maritima* is still to be found on other Scottish sand dune systems where the wet slacks are now being managed as golfing fairways.

ACKNOWLEDGMENTS

I wish to thank the staff of the St Andrews Links Trust, and in particular W. Woods, for permission to visit the site and for information about how the fairways are managed. I am grateful to G. H. Ballantyne for details of old records, and P. K. Kinnear and H. J. Noltie for assistance with the field survey. I also thank Mrs D. Longley for her help in preparing this note.

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S. J. LEACH
Nature Conservancy Council, Rathcluan House, Carslogie Road, Cupar, Fife, KY15 4JA

FILAGO PYRAMIDATA L. REFOUND IN WEST SUSSEX

Filago pyramidata, last recorded in W. Sussex, v.c. 13, in 1905, and known from only 14 localities in England since 1960 (Perring & Farrell 1983), was refound by H. W. M. in Halnaker Chalk-pit in 1983 and 1984.

In August 1983, one dry, shrivelled plant was found and at that time misidentified as *F. vulgaris* Lam., and in September of that year a further 15 seedlings were discovered. During July and August 1984, some 250 plants were found; E. C. Wallace and R. C. Stern suggested that these could be *F. pyramidata* L., a suggestion later confirmed by F. Rose and C. Jeffrey (B.S.B.I. Compositae Referee). By early September many hundreds of plants (possibly up to 1000) had been discovered in the chalk-pit. Of these, six were erect and approximately 17·5 cm tall, several were branched and semi-prostrate, and the remaining many hundreds, growing on bare, compacted chalk with the uncommon moss *Seligeria calcarea*, were only 1·25 cm or less, high. In the surrounding patches of very short, rabbit-grazed turf were several species of flowering plant including *Euphrasia nemoralis*, *Gentianella amarella*, *Centaurium erythraea* and *Agrostis stolonifera*, all very dwarfed and only 2·5 cm high or less, and also the moss *Homalothecium lutescens*.

In **BM** there is a specimen of *F. pyramidata* labelled "Halnaker Hill, 8 August 1891" that was collected by H. L. F. Guermonprez. This led us to the Guermonprez collection in the Portsmouth City Museums (**PMH**), in which a herbarium sheet is labelled "Halnaker Hill, Sussex (in chalk-pit)" and also "8 August 1891". H. L. F. Guermonprez specialized in painting the British flora, and among 2000 paintings in the collection at **PMH** is one of *F. pyramidata* painted in 1891 at Halnaker; the sharply five-angled capitula are clearly seen in the painting, just as they are in the growing plants at Halnaker – a key character which cannot be observed in pressed specimens. Guermonprez's working copy of *Flora of Sussex* (Arnold 1907) shows, in pencilled marginal notes, a drawing of the leaf shape (also diagnostic) and refers again to this locality.

Could the warm weather of 1983 possibly have influenced the number of seedlings which appeared in 1984? They may not be in such abundance every year, but their small size, inconspicuous habit and the fact that they flower only late in the season, leads us to suggest that the plants could well have been present but overlooked at this locality since 1891.

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H. W. MATCHAM & M. BRIGGS
21 Temple Bar, Strettingham, Chichester, W. Sussex, PO18 0LB

CHROMOSOME NUMBERS OF IRISH PLANTS, 1.

This paper is the first of a projected series in which I shall provide chromosome counts, using material of known wild origin, of native Irish species. In practice this means that the series will cover virtually the entire Irish flora as very few previous counts of Irish material exist. Expediency dictates that the counts cannot be done following a systematic scheme and therefore several families will be covered by each contribution.

Because of the wide range of material to be surveyed it is not possible to provide more than an outline of the methods used. Generally, for meiotic counts flower buds are fixed, rapidly, in Carnoy's solution (6:1:3, absolute ethanol: glacial acetic acid: chloroform) or Dyer's modification of it (Dyer 1963). Mitotic counts are made from root material, pre-treated by placement in a cold room for 24–48 hours or more, or rarely pre-treated with 0·2% or 0·5% colchicine for either two or four hours. Roots are subsequently fixed, as above, and may then be hydrolyzed in 5N HCl, at room temperature, for up to one hour. Materials are stained using, preferably, the lacto-propionic orcein method of Dyer (1963) or, more rarely, aceto-carmine. Vouchers are deposited in **TCD**.

Crambe maritima L.	n = 30[1]	Co. Clare, v.c. H9: Portcowrugh, Inishmore, Aran Islands; sea-shore. 1972, *D. A. Webb.*
Euphorbia portlandica L.	n = 20	Co. Wicklow, v.c. H20: Mizen Head; sand-dunes. 1982, *P. Wyse Jackson.*
Hypericum androsaemum L.	n = 20	Co. Roscommon, v.c. H25: shore of Lough Ree; woodland. 1982, *P. Wyse Jackson.*
Hypericum canadense L.	n = 8[2]	W. Galway, v.c. H16: shore of Lough Mask; wet flush. 1981, *P. Wyse Jackson.*
Hypericum tetrapterum Fries	n = 8	W. Galway, v.c. H16: shore of Lough Mask; wet, peaty flush. 1981, *P. Wyse Jackson.*
Jasione montana L. var. *latifolia* Pugsley	n = 6	Co. Wexford, v.c. H12: Carnsore Point; stone wall. 1982, *J. A. N. Parnell.*
Ranunculus bulbosus L. var. *dunensis* Druce	n = 8	W. Galway, v.c. H16: Roundstone; grassland. 1982, *W. Bradley.*
Samolus valerandi L.	n = 13	Co. Wicklow, v.c. H20: Arklow; damp cliff-base. 1968, *D. A. Webb.*
Spergularia rupicola Lebel ex Le Jolis	n = c.18[3]	Co. Dublin, v.c. H21: Dun Laoghaire; harbour wall. 1969, *D. A. Webb.*
Thymus praecox Opiz subsp. *arcticus* (E. Durand) Jalas	n = 28[4]	Co. Clare, v.c. H9: Poulsallagh; dune grassland. 1979, *P. Wyse Jackson.*

Notes:
[1] The 2n = 30 cytodeme has not yet been detected in Ireland.
[2] Confirms the only previous count of 2n = 16 made on material from the same region by D. M. Moore (Webb & Halliday 1973).
[3] n = 19 was also recorded, but only from two cells; the extra chromosome may be an accessory.
[4] The only cytotype so far recorded in Ireland.

ACKNOWLEDGMENTS

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J. A. N. PARNELL
School of Botany, Trinity College, Dublin 2, Ireland

AN ADDITIONAL CRITERION FOR ASSESSING NATIVE STATUS

Eight criteria which can be used in assessing whether a species is a native member of the British flora have been discussed by Webb (1985). This note outlines a further criterion which has been of use in investigating this problem: the relationship of the species in question to oligophagous insects.

In only a few cases (so far) has entomological evidence been invoked in assessing native status. *Rhynchosinapis wrightii* is the host of two beetles of very restricted distribution. F. R. Elliston Wright used this as evidence for its native status before it was described as a species endemic to Lundy (Wright 1933; Lucas & Synge 1978).

Coombe (1956) showed that the presence of oligophagous insects on *Impatiens noli-tangere* can be used to distinguish sites where the species is probably native (in N. Wales and NW. England) from sites in southern England where it is a garden escape. *I. parviflora*, known to be introduced, is remarkably free from associated insects except where it grows in the vicinity of *I. noli-tangere* at sites where the latter is native.

Entomological evidence must be used with the same caution as Webb's criteria. Introduced species can attract oligophagous insects from related native species, as in the case of *Impatiens parviflora*. Other aliens are associated with insects that were presumably introduced with them. I have found that *Carpobrotus edulis* on the Lizard peninsula, W. Cornwall, frequently bears a scale insect which Mrs Linda Huddleston kindly identified as *Pulvinariella mesembryanthemi* (Vallot). This was originally described from France and only later discovered on native 'mesems' in South Africa. Similarly the weevil *Stenopelmus rufinasus* Gyll. is associated with the introduced fern *Azolla filiculoides* in Britain (Janson 1921; Flint 1979). It may be significant that both *Azolla* and *Carpobrotus* were probably introduced as living plants rather than as seed or spores.

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C. D. PRESTON
Institute of Terrestrial Ecology, Monks Wood Experimental Station, Abbots Ripton, Huntingdon, PE17 2LS.

THE DISTRIBUTION OF *SORBUS LANCASTRIENSIS* E. F. WARBURG

Warburg (1957) published the description of a new species of whitebeam, *Sorbus lancastriensis*, from Humphrey Head, Westmorland, v.c. 69 (now Furness, v.c. 69b) and gave its distribution as "apparently restricted to several places on Carboniferous Limestone round Morecambe Bay in

Lancashire and Westmorland". Between 1982 and 1984 much of the limestone in this area was visited by the authors, and this note details the locations and approximate sizes of all the populations seen of this rare, endemic taxon.

Sorbus lancastriensis is often confused with two other species of *Sorbus* which also occur in north-western England, and with which it frequently grows: *S. aria* (L.) Crantz and *S. rupicola* (Syme) Hedlund. There are three reasons for this confusion. Firstly, it is essential to examine the correct leaves. Ideally, the three broadest leaves of a rosette from the short, lateral spurs of branches should be compared, as these are the most constant and typical for each species. Shade leaves, or leaves from the present year's growth, should be avoided as these are highly variable. Secondly, *S. aria* is very variable in leaf shape and size, and two specimens growing together may be superficially quite different, prompting identification of two taxa. Thirdly, the characters used in the key by Warburg (1952) to distinguish *S. lancastriensis* from *S. rupicola* are poor. The fruit and leaf toothing characters are useless, and there is too much overlap in the leaf venation character to allow diagnosis on its own. The more recent key by Game (1981) is much better and includes all the species of *Sorbus* in v.cc. 66–70. The species are distinguished here according to the following key, which is based on material of all three species from north-western England. A combination of characters must be used. *Sorbus lancastriensis* is very close to *S. rupicola* and the relationship between the taxa requires clarification.

1.	Leaves ovate, rhombic to elliptic, rarely obovate, the base truncate to broadly cuneate (angle with central vein 45° or more), rarely cordate, toothed nearly to base, with (10·5)11 or more pairs of veins. Fruit length greater than or equal to width	*S. aria*
1.	Leaves obovate, oblanceolate or oblong, cuneate at base (angle with central vein less than or equal to 42(47)°), ± entire in lowest quarter, with 10(11) or fewer pairs of veins. Fruit width greater than or equal to length	2
2.	Leaves erect, (1·7) 1·8–2·5 times as long as wide, with (5)6–9(10) pairs of veins	*S. rupicola*
2.	Leaves spreading, (1·3)1·4–1·75(1·9) times as long as wide, with (6·5)8–10(11) pairs of veins	*S. lancastriensis*

Sorbus lancastriensis is very characteristic of the open limestone screes, rocks, crags, scars and cliffs within 30 km of Morecambe Bay, usually in small populations. It reaches the northern and southern limits of the local outcropping limestone at Cunswick Scar and Warton Crag respectively. The only locality not on limestone is at Roughholme Point where it occurs on a conglomerate drumlin. It grows from sea-level at Arnside to about 180 m at Cunswick Scar. It prefers open scrub and may persist in developing woodland but does not tolerate shade. It flowers and fruits freely in most localities and regenerates readily in the absence of grazing. The localities are listed below; full lists detailing 6-figure grid references are held by the Biological Records Centre, the vice-county recorders, the Nature Conservancy Council (N.W. Region) and the local Naturalists' Trusts. The names of localities used are those from the Ordnance Survey 1:10,000 series or 1:25,000 'Pathfinder' series.

West Lancashire, v.c. 60 (all 34/4.7):

Eaves Wood. Two sites: Castlebarrow (above Elmslack), around the pepperpot and in the woods below, c. 20 shrubs, the colony extending into Middlebarrow Plain (v.c. 69); and National Trust Nature Trail, c. 15 shrubs mixed with *S. aria*, extending down to Waterslack.

Jenny Brown's Point. A largely inaccessible population on Jack Scout sea-cliffs, mixed with *S. rupicola*, about 30 plants in total.

Scout Wood. Five or six shrubs on the scarp edge in woodland.

Silverdale Cove. Sea-cliffs to north and south of the Cove, c. 50 plants.

Warton Crag. Four sites: Beacon Breast, 10–15 shrubs; above Scar Close, five shrubs; Three Brothers Allotment, one shrub on limestone pavement with three *S. aria* plants; south of Crag Foot, nine plants on rocky outcrop above the road, with *S. rupicola.*

Westmorland, v.c. 69:

Arnside (34/4.7). Generally distributed around Arnside, Arnside Knott and Far Arnside, usually in small populations and frequently with *S. aria*. There are some populations along the Kent Estuary (Arnside–Grubbins Wood) which have some puzzling plants intermediate with *S. rupicola*, and it is not always possible to name an individual specimen. Arnside Knott, at least five shrubs; Copridding Heath, at least three shrubs; Arnside Park, a few trees scattered in woodland; Far Arnside, one plant in hedge by road, and then round the coast on cliffs to Arnside, c. 200 plants, with occasional *S. rupicola*.

Meathop (34/4.7). In the quarry and on sea-cliffs at the mouth of the River Winster, about ten shrubs mixed with *S. aria*.

Middlebarrow Wood (34/4.7). Limestone Pavement at the top of the wood.

Brigsteer (34/4.8). Three places: Burnbarrow Scar, many shrubs along the cliff edge; Crag Millot, about 15 shrubs in pioneer scrub; Windy Howe, one plant on roadside.

Scout Scar (34/4.8). Abundant (probably in excess of 200 plants) along the edge of the cliff with scattered shrubs in the woods and on the scree below.

Whitbarrow Scar (34/4.8). Locally abundant on cliffs from Raven's Lodge clockwise around the scar to Broad Oak, with occasional plants in the wood below. Probably in excess of 1000 plants, the largest population.

Yewbarrow (34/4.8) (A. Game). Abundant in open woodland with smaller shrubs on cliff and screes, probably 100–200 plants.

Cunswick Scar (34/4.9). Abundant along the open middle section of the scar, with one plant of *S. aria*.

Furness, v.c. 69b:

Humphrey Head (34/3.7). Abundant along the sea-cliffs and scar on the west side, over 200 shrubs mixed with a much smaller number of *S. rupicola* plants. One shrub also found at Roughholme Point.

Old Park Wood (34/3.7). On cliffs on west side, c.25 plants.

Reake Hill, Leven Estuary (34/3.7). 15–20 small trees on western side of hill.

Roudsea Wood N.N.R. (34/3.8). 1 large shrub in old quarry (N.C.C. and others).

There are also records in Ratcliffe (1977) which need verification or correction. The record for Gait Barrows N.N.R. (v.c. 60) is probably an error for *S. aria*. The record for Hutton Roof Crags and Farleton Knott (v.c. 69) has not been refound. The record of *S. rupicola* for Scout and Cunswick Scars, where the species has been searched for carefully without success, is probably an error for *S. lancastriensis*. There is also a National Trust record for Brigsteer Park (v.c. 69) which has not been refound.

The authors would be pleased to hear of any further localities. Other sites in which the plant should be looked for are about Grange, and the limestone on the west side of the Leven Estuary.

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T. C. G. Rich & M. Baecker
Botany Department, The University, Leicester, LE1 7RH

FURTHER DISCOVERIES OF *HIERACIUM BACKHOUSEI* F. J. HANB.

Hieracium backhousei F. J. Hanb., which is included in section *Alpina*, is one of the rarest British hawkweeds, and is endemic to Scotland. It was discovered by James Backhouse Jnr in 1886 at Dubh Loch, near Braemar, S. Aberdeen, v.c. 92, where a small population still occurs. No definite further localities had been reported until I found a small number of plants in 1976 on Derry Cairngorm, in Glen Derry, S. Aberdeen, which were subsequently confirmed as this species, and later in greater numbers locally in two places in Glen South Esk, Angus, v.c. 90, in 1981. Solitary plants, which also should possibly be referred to this species, were noted by me in Coire Etchachan and near Loch Etchachan in S. Aberdeen, and at the head of Glen Fee, Angus.

All the old records for *H. backhousei*, except for the Dubh Loch records, but including the one from Glen Derry (Linton 1905; Pugsley 1948), appear to refer to *H. memorabile* (Sell & West 1967, 1968).

At Dubh Loch, the population occurs in crevices and in pockets of coarse-grained granite by small waterfalls, very close to the running water. This habitat is matched exactly in both Glen Derry and in Glen South Esk, where the populations occur on slab rock or large boulders of granite, on islands or projections into the stream, again in the vicinity of small waterfalls. In Glen South Esk and at Dubh Loch the species is accompanied by another hawkweed from section *Alpina*, *H. calenduliflorum* Backh. Additionally, *H. hanburyi* Pugsl. and occasionally *H. atraticeps* (Pugsl.) P. D. Sell & C. West and *H. pseudocurvatum* auct. occur nearby. In the localities described, all of these hawkweeds generally occur somewhat further away from the running water than *H. backhousei*. It has also been noted that some of the pockets of rock where *H. backhousei* grows remain temporarily filled with water after heavy rain; and it would seem that the species requires more moisture around the roots than other species in section *Alpina*, as it does not stray onto adjacent ground further away from water, although the surface rock is normally dry as is the case with all species in section *Alpina*. In cultivation, however, it is surprisingly one of the easiest species to grow and it withstands summer drought conditions as well as other species in section *Alpina*.

H. backhousei is distinguished by its large capitulum, often single, from 30 mm to over 50 mm in diameter, or occasionally with two or more heads. The basal leaves are very rigid, coriaceous, drab, non-glossy green, being mainly elliptical and irregularly serrate-dentate with narrow-acute teeth. The lowest cauline leaf is often very similar to the innermost basal leaf, with a few narrow teeth which are frequently spinulose, and has some stellate hairs on the lower surface. The majority of leaf surfaces, except at the margins, have very few or no simple, eglandular hairs present. The involucre is often robust with broadish bracts (1·0–1·6 mm) which are abruptly acute to sub-acute, with only few obvious, very short, glandular hairs. The ligules are a bright, lightish yellow, with several very short simple eglandular hairs at the apices, and very few to several on the backs, and have yellowish styles.

The number of plants in Glen South Esk greatly exceeds the number at Dubh Loch; the former site, in v.c. 90, is therefore now the main station known for the species. It is surprising that *H. backhousei* has not been noted in Angus previously, although it might have been confused with *H. tenuifrons* P. D. Sell & C. West, and could occur in the described habitat elsewhere in the eastern Highlands. Specimens have been placed in **CGE** and in **herb. D.J.T.**

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D. J. TENNANT

Marhead Grange, Arkendale, Knaresborough, North Yorkshire, HG5 0RG