Short Notes

CAREX SPICATA HUDS. NEAR LAW, LANARK

Carex spicata Huds. is a sedge common in the south-eastern part of Britain but less so in Cornwall, western Wales and northern England, and rare in Scotland. The *Atlas of the British flora* shows three post-1930 and one pre-1930 records for the plant in Scotland. Of these, the pre-1930 record for 37/2.7, Forfar, v.c. 90, and the records for 25/8.5, Kirkcudbright, v.c. 73, and 37/4.3, Forfar, v.c. 90, cannot be confirmed either by herbarium or literature references. The record for 37/6.4, Forfar, v.c. 90, is still extant. In addition, there is a 1960 record for 37/7.6, Kincardine, v.c. 91, and a more recent find in 26/0.2, Arran, Clyde Is., v.c. 100. There is an unconfirmed record for 28/7.6, Easterness, v.c. 96. There are therefore three recently confirmed stations for the plant in Scotland, one unconfirmed and four others for which there have been records in the past but in which the plant can no longer be found or for which the original record cannot be confirmed.

On the 16th July, 1976, we observed a colony of the plant (confirmed by R. W. David) growing on the roadside verge of the B7011 road west of Law Village at 26/809.518, Lanark, v.c. 77. The location was a damp, open area in an otherwise unbroken stretch of tall herb and grass communities dominated by *Chamaenerion angustifolium*, *Rumex obtusifolius*, *Dactylis glomerata* and *Deschampsia cespitosa*. The extent of the *Carex spicata* was assessed by estimating the number of 1 sq. ft quadrats in which *C. spicata* was the dominant vascular plant. In this way, the population was estimated as covering 16 quadrats with between 12 and 30 fruiting heads per quadrat. A minimum of 200 fruiting heads were present. The largest single area over which *C. spicata* was dominant was 2×3 ft. The species immediately associated with the plant were: *Heracleum sphondylium*, *Dactylis glomerata*, *Vicia cracca*, *Deschampsia cespitosa*, *Arrhenatherum elatius*, *Holcus lanatus*, *Dactylorhiza fuchsii*, *Carex flacca*, *C. nigra*, *C. ovalis*, *Juncus effusus*, *Ranunculus acris*, *Lathyrus pratensis*, *Centaurea nigra*, *Cynosurus cristatus*, *Potentilla anserina*, *Prunella vulgaris*, *Trifolium repens*, *T. pratense*, *Odontites verna*, *Plantago lanceolata*, *Achillea ptarmica* and *Acrocladium cuspidatum*. Other species occurring in the general vicinity, but not directly associated with the plant, were *Cirsium arvense*, *Rumex obtusifolius*, *Chamaenerion angustifolium*, *Phleum pratense*, *Rosa canina* agg. and *Tragopogon pratensis*.

On 9th August a second area, a quarter of a mile north-west of the first, was examined and two isolated tussocks of *C. spicata* were found growing in association with *Juncus articulatus*, *Carex ovalis*, *Achillea ptarmica* and *Salix cinerea* agg. on the edge of a *Juncus/Filipendula* dominated depression. This depression is being infilled with soil and domestic refuse. The area is also grazed by sheep and cattle.

Jermy & Tutin (1968) list the habitats of *C. spicata* as ditch- and pond-sides, wet meadows, hedgebanks and rough grasslands; our colonies appear successful in situations either where ground is in the early stages of plant colonization or in areas kept at subseral stages by either edaphic or anthropogenic factors. At our first station the plant occurs in a section of the road verge which is subjected to disturbance (a small but well-used footpath runs right through the colony) and is directly beneath overhead power cables, suggesting that the ground has been disturbed in the past. At our second station the boggy area is grazed as well as subjected to regular disturbance by tipping. It is interesting to note that all confirmed Scottish records occur on or adjacent to footpaths and, all but our stations near Law, on or near the coast. The wide separation of stations for *C. spicata* could suggest it is an under-recorded species or perhaps that it has been introduced by chance. Its association with footpaths and disturbance would certainly support the latter.

ACKNOWLEDGMENTS

We acknowledge the assistance of the Biological Records Centre, Miss U. K. Duncan, R. W. David and A. McG. Stirling in forwarding information on the status of *C. spicata* in Scotland.

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E. M. & S. M. BIGNAL

CHROMOSOME NUMBERS OF SOME EURASIAN SPECIES OF *CRATAEGUS*

Recent publications by Byatt (1975a, 1976) have shown that hybridization plays an important role in the evolution of *Crataegus* populations. Although Gladkova (1968) has counted the chromosomes of many Eurasian species of the genus, other species, particularly European ones, remain uncounted. Since it is important to know whether hybrids are the progeny of parents with the same or different chromosome numbers, this note contains the results of our investigations of some Eurasian species of *Crataegus*.

For mitotic studies actively growing root-tips were collected and pretreated in a saturated solution of para-dichloro-benzene for 18–24 hours at 4° C. They were then fixed overnight in ethanol/acetic acid (3:1) and stained by the Feulgen method. Meiosis was observed in pollen-mother-cells of young flowers that had been fixed in Carnoy's fluid (ethanol:chloroform:acetic acid, 6:3:1) and stained in aceto-orcein.

The results are given in Table 1. The chromosomes are small, approximately 1·0μm long and metacentric or submetacentric. With the exception of some of the plants from the Forest of Cernay, the species are all either diploid or tetraploid, with a basic number of $x = 17$. *C. wattiana*, a species that grows in the mountains of central Asia, has been included because it is almost certainly conspecific with *C. altaica* Lange, in which case the name *C. wattiana* has priority, as pointed out by Riedl (1969). *C. altaica* was reported by Gladkova (1968) to be tetraploid and our observations confirm this. The plants of *C. laevigata* come from a population studied by Bradshaw (1953, 1971) and Byatt (1975a, 1975c) at Horish Wood, W. Kent. These are the first counts for this species from

TABLE 1. CHROMOSOME NUMBERS OF SOME EURASIAN *CRATAEGUS* SPECIES

	Chromosome No.	Origin
C. heldreichii Boiss.	$2n = 34$	Mt Parnes, Attica, Greece[1]
C. laevigata (Poiret) DC.	$n = 17$ (2 plants)	Horish Wood, Maidstone, W. Kent, v.c. 16[2]
C. nigra Waldst. & Kit.	$2n = 34$	R.B.G. Kew No. 753[3]
C. pentagyna Waldst. & Kit. ex Willd.	$2n = 34$	Forest of Babadag, Dobrogea, Romania[1]
C. wattiana Hemsley & Lace	$2n = 68$	R.B.G. Kew No. 854[3]
Crataegus sp.	$2n = 34$ (2 plants) $2n = 52$ (3 plants)	Forest of Cernay, Haut-Rhin, France[1,3]

[1] Living plants at Westfield College.
[2] Voucher specimens deposited at K.
[3] Living plants at the Royal Botanic Gardens, Kew.

European material of natural origin. The count for *C. pentagyna*, made from plants grown from seed collected in the Forest of Babadag, Romania, agrees with that made by Gladkova (1968) from material collected in the Crimea. Chromosome numbers for *C. nigra* and *C. heldreichii* have not previously been published. The young plant of *C. heldreichii* was collected from a population growing in the classical area for the species, where it appeared to be spatially well isolated from other species of the genus. The plant of *C. nigra* growing at the Royal Botanic Gardens, Kew, is known to have originated from the Botanic Garden at Leningrad.

The un-named plants collected from the Forest of Cernay have two different chromosome numbers. Byatt (1976) has described the structure of this population and has shown that three taxa are present inside the wood: *C. laevigata*, *C. curvisepala* Lindman subsp. *lindmanii* (Hrabětová-Uhrová) Byatt (see Byatt 1975b) and *C.* × *macrocarpa* Hegetschw. The young plants studied were growing under mature plants of *C. laevigata* and *C.* × *macrocarpa*. The two plants with $2n = 34$ are probably *C. laevigata* and the three with $2n = 52$ are probably hybrids that arose from crosses between *C. laevigata* and *C. curvisepala* (which was reported by Gladkova (1968) to be tetraploid) and their progeny.

ACKNOWLEDGMENTS

The young plants used in this study were collected on the Westfield College expedition to south-eastern Europe, which was jointly financed by the Royal Society, the University of London Central Research Fund and the Godman Fund (British Museum).

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J. I. BYATT & B. G. MURRAY

MYRIOPHYLLUM AQUATICUM (VELLOSO) VERDC. (*M. BRASILIENSE* CAMB.) IN BRITAIN

During a tour of the Lizard area of W. Cornwall, v.c. 1, on 17th April, 1976, a visit was made to Croft Pascoe Pool on the Goonhilly Downs. My attention was taken by the young, green tufts of a *Myriophyllum* against the blackish mud. A length of rhizome was taken and a few days later transferred to my garden pool at Driffield, S.E. Yorks., v.c. 61.

At that stage the plant was clearly either *M. verticillatum* L. or the S. American *M. aquaticum* (Velloso) Verdc., which appears at present to be better known as *M. brasiliense* Camb., the name used by Cook (1968) in *Flora Europaea*. In addition the latter is known in horticulture as *M. proserpinacoides* Gillies ex Hooker & Arnott and popularly as Parrot's Feathers. *M. verticillatum* seemed unlikely from the distribution map in the *Atlas of the British flora*; moreover *M. aquaticum* is naturalized in south-western France (Cooke 1968).

Only female flowers have been reported on plants of *M. aquaticum* cultivated in Europe or N. America. In early May my specimen flowered, also producing only female flowers. A drawing and subsequently the flowering shoot, when it seemed certain that no male flowers were likely, were sent to Professor C. D. K. Cook, who determined the plant as *M. aquaticum*. He also gave the useful information that this species will flourish indoors in wet soil, which proved to be true with the specimen to hand, whereas *M. verticillatum* will not do so. When once seen, the blueish-green of the aerial leaves, which are completely covered by minute glands (× 15 lens), and the very small (1·5mm), white, apetalous, female flowers are distinctive. Many aquarists stock the plant and this is probably the easiest way to become familiar with it, and no doubt the origin of my find.

Initially it was thought that this was the first record for Great Britain. However, L. J. Margetts (pers. comm. 1976) found it some years ago at Penzance in a stream flowing from a park, and also in a quarry in the Redruth area, both W. Cornwall, v.c. 1. It may well have been found on other occasions and not been reported because it is an alien, reputedly exceptionally frost-tender and not expected to survive.

Since the Goonhilly plant had obviously overwintered, its hardiness in suitable areas in the south-west may allow it to be referred to as naturalized. Both Mr Margetts' finds failed to persist,

but Mrs B. E. M. Garratt informs me (pers. comm. 1976) that the plant has survived for seven years in her garden, which overlooks the valley of the River Fal, W. Cornwall, and it is in the garden pond of my brother, L. Chicken, at Cottingham, S.E. Yorks., v.c. 61, where it survived last winter (1975–76) even though thin ice formed on the pond.

Temperature data for Penzance and for Culdrose near Helston (the nearest recording centre to Croft Pascoe Pool and similar in altitude and distance from the sea) show that the average minimum yearly temperature for the years 1971 to 1975 is −2·6°C at Penzance and −3·2°C at Culdrose. For the previous ten years the figures are −4·2°C and −5·0°C respectively. At Culdrose the average number of days per month with a grass minimum temperature below 0·0°C during the period 1963 to 1972 reaches a maximum in February with 12·5 days, compared with, for example, 2·4 days for May and 0·1 days for August. It may well be that the overwinter survival of *M. aquaticum* depends largely on the depth of water and mud over the rhizome, and it will be interesting to see what happens to this species at Croft Pascoe Pool over the next few years.

ACKNOWLEDGMENTS

My thanks go to the correspondents named and to the Director of the Meteorological Office for weather data.

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E. Chicken

A SECOND STATION FOR *DIAPENSIA LAPPONICA* L.

Diapensia lapponica L. is a plant of the arctic, extending as far south as *c* 60° N. in Norway, to the C. Urals and to New York State. It was first found growing in Britain by C. F. Tebbutt in Westerness, v.c. 97, on 5th July, 1951 (Roger 1952). This site, at *c* 2,500 ft on a hill in the neighbourhood of Glenfinnan, to the west of Fort William, at *c* 56° 40′ N., has remained the only known station for the succeeding 25 years.

The area to the north of this site is very wild and penetrated by only two minor roads before the main road through Glen Shiel, some 20 miles to the north. Several of the mountains exceed 3,000 ft, and provide popular routes for hill-walkers. While walking in the Loch Quoich region of Westerness (GR 18/9.0), some 15 miles north of the original site, on June 1st, 1976, we found a small colony (about ten plants within an area of about 100 m²) of *Diapensia* on an exposed ridge at about 850m. The plants were all small, no more than 10cm across, and were growing in dry broken quartzite with *Alchemilla alpina*, *Antennaria dioica*, *Loiseleuria procumbens* and *Salix herbacea*. The identification has been confirmed from colour slides by Dr F. H. Perring of the Biological Records Centre.

We have not visited the original station, but, from discussions with those who have, it would appear that the two are very similar, the broken quartzite and altitude being common factors. The individual plants are apparently much smaller than those of the first station. Knowledge of this region of Westerness suggests to us that there may be more colonies of *Diapensia* awaiting discovery between Glenfinnan and Glen Shiel.

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A. F. & S. M. Craven

THE DISTRIBUTION OF *CAREX MONTANA* L. IN BRITAIN

The geographical centre of *Carex montana* L. is central Europe, where it is not uncommon locally, especially in sub-alpine regions, preferring open habitats on heaths and in light woodland, generally on calcareous soils. It extends eastwards into Asia at least as far as the Urals, but in the south does not go beyond northern Spain, Corsica, northern Italy and north-western Bulgaria. It is absent from northern Russia, from Scandinavia (except southern Sweden) and from Scotland; and Gliemann's record, made in 1824, for Iceland has been generally rejected by later botanists as an error for *C. pilulifera* L.

In England and Wales, therefore, *C. montana* is at the extreme north-western limit of its range, and this may partly account for its curiously disjunct distribution here. For, though the plant may be extremely abundant, indeed dominant, where it occurs, the areas of occupation are very sharply delimited and one may be separated from the next by as much as 100 miles. Habitats are very varied, from ledges of limestone cliffs to marshy pastures with *Narthecium*, and from dry heaths in full sun to woodlands on heavy clay. The pH, as measured so far, ranges from 4·61 to 7·67, and the altitude from 50 to 2,000 ft. I am led to conjecture that, at least in Britain, the health of *C. montana* is controlled by some soil-factor not yet determined.

The British stations are listed below. The relative abundance of the sedge in each is indicated by the letters A (less than 20 plants), B (20 to 100), C (hundreds) and D (thousands). The numbers are very approximate, for the growth-form of the plant (tufts of leaves from many points on a radiating network of rhizomes, which often dies out in the centre leaving a ring of surviving tufts) makes precise counting difficult. All the estimates given have been made in the field since 1970. In some stations the plant has not been refound, or is extinct, though authentic specimens exist in herbaria; for others the record is unconfirmed. All these are also noted.

W. Cornwall, v.c. 1: 10/5.3, Carbis Bay (B); 10/7.5, Cross Coombe (B).

E. Cornwall, v.c. 2: 10/9.6, Hustyn Wood, W. Curnow, 1878 (Davey 1906), **BM** (not refound despite repeated searches).

S. Devon, v.c. 3: 20/5.6, Bickleigh Common/Roborough Down, **BM, K** (became extinct *c* 1880); 30/1.8, Sidmouth (Harris 1927) (unconfirmed).

N. Devon, v.c. 4 (?): 20/5.8 or 20/5.9 (?), 'foot of Yeast Tor [? = Yes Tor] on dry tufts in peat bog', W. Waterfall, 1876, **K** (not refound).

N. Somerset, v.c. 6: 31/5.5 just extending into 31/4.5, Charterhouse, 3 places (C, C, D). (Outliers are indicated in the literature but have not been recently located.)

Dorset, v.c. 9: 41/0.1, 'moist woodland, Edmondsham' (Linton 1909), **BM, CGE** (not refound).

Wight, v.c. 10: 40/4.9, Park Gate Forest (Druce 1920), **BM, OXF** (not refound).

S. Hants., v.c. 11: 40/2.9, Lymington (B), Sway (A), Wootton Enclosure, J. H. Salter, 1917, **NMW** (not refound); 41/1.1, Deadman Hill (B); 41/2.1, Fritham Plain (B), Ocknell Plain (A), Broom Hill (Townsend 1904) (unconfirmed); 41/3.0, Brockenhurst, 6 places (A, A, A, B, B, B), 'heath near Beaulieu', A. B. Jackson, 1908, **BM** (not refound); 41/3.2, Baddesley (Townsend 1904) (unconfirmed, site now built over).

E. Sussex, v.c. 14: 51/3.2, Chailey, 2 places (A, B). (Well known since 1896, but not seen since 1974); 51/5.1, near Heathfield station, **BM** (though some of the specimens are *C. pilulifera* others are authentic), **NMW, OXF** (became extinct probably *c* 1900); 51/5.3, Broadwater Forest, a single plant on a roadside (the original British station for *Carex montana*, just off the Eridge road, W. Mitten, 1843, **BM, CGE, K, NMW, OXF**, was destroyed in 1969–71).

E. Kent, v.c. 15: 51/9.6, Bysing Wood, Faversham, and 61/1.6, Thornden Wood, Canterbury, both F. J. Hanbury, 1875, **BM** (not refound).

Berks., v.c. 22: 41/8.6, Bracknell, **BM, CGE, K, OXF** (became extinct in 1974). The original finder, J. Higgens, labelled his first sheet (1917, **OXF**), 'Bagshot Heath, Berks', but a second (1918, **BM**) is labelled 'Bracknell', and Druce (1918) takes these stations to be the same.

Bucks., v.c. 24: The finding of a single specimen near Chalfont St Peter (51/0.9) was reported by Armitage (1891). The specimen is in **OXF**, and I have no hesitation in determining it as *C. pilulifera* L.

W. Gloucs., v.c. 34: 31/5.9, Pen Moel, 2 places (A, A), Tidenham Chase, 4 places (A, C, C, C); 32/5.1, Symonds Yat (A).

Mon., v.c. 35: 31/5.9, Wyndcliff, **BM, CGE, NMW, OXF** (reported as extinct *c* 1969). Presumably

the same station as 'limestone wood between Tintern and St Arvans', W. H. Purchas, 1847.
Hereford, v.c. 36: 32/5.1, Great Doward (C).
Worcs., v.c. 37: 32/7.7, Wyre Forest south of Dowles Brook, 2 places (A, C).
Salop, v.c. 40: 32/7.7, Wyre Forest north of Dowles Brook, 4 places (A, A, C, C).
Glam., v.c. 41: 21/8.7, near Newton, Miss E. M. Thomas, 1942, NMW (not refound; possibly but improbably the same station as the next), Ogmore Down and Old Castle Down (D); 21/9.7, Old Castle Down and Ewenny Down (D); 32/0.0, Morlais Castle Hill, Miss E. Vachell, 1932, NMW (not refound).
Brecon, v.c. 42: 22/7.1, Afon Twrch (B); 22/8.1, Penwyllt, 2 places (B, D); 22/8.2, Hydfer valley (C), Bannau Brycheiniog (A); 22/8.5, Abergwesyn (B); 22/9.0, Penderyn, 3 places (A, B, C); 22/9.1, Ystradfelte, 2 places (B, D); 22/9.2, Craig Cerrig Gleisiad (C); 32/0.0, near Cefn-coed, 2 places (C, D); 32/0.1, Dolygaer (B); 32/2.1, Cwm Clydach (C).
Carms., v.c. 44, 22/7.2, Carreg yr Ogof (discovered in 1976 but not visited personally).
Denbigh, v.c. 50: 33/2.4, 'fields, Llangollen', W. Wild, 1880, NMW (not refound).
Derbys., v.c. 57: 43/5.7, Markland Grips, 2 places (B, B).

The brittleness of the woody rhizomes makes *Carex montana* vulnerable to disturbance, and this explains many of the extinctions. On the other hand, I suspect that it is frequently overlooked, if only because in certain seasons it is very shy-flowering and in certain localities regularly so. When present, sometimes as early as the end of March and persisting until late May, the dark purplish-black inflorescences, on long, very thin stalks that become decumbent as the utricles ripen, are distinctive. Non-flowering tufts may also catch the practised eye, for the patches of narrow, more or less erect and more or less straight-sided leaves, in spring a clear, milky green and in later summer with a strong yellowish tinge, stand out from the surrounding herbage. In the last five years one quite new station has been discovered in Cornwall, four in the New Forest, no fewer than ten in Brecon, and one in Carmarthen.

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R. W. DAVID

THE *RUBI* OF SUTHERLAND

The study of the British *Rubi* is at present in such a fluid state that it is very difficult for the authors of local Floras to present an accurate account. Determinations made when the information for the Flora was being collected are sometimes out of date when the book is published. I hope therefore that the author of *John Anthony's Flora of Sutherland* (Kenworthy 1976) will permit the following corrections to the *Rubus* list in that book.

I am said to have named the *Rubi*, but I did not see specimens of all the records, nor did I give a firm determination for all those I did see. I suggested the name *R. purpureicaulis* W. C. R. Wats. (now merged with *R. conjungens* (Bab.) Warren) for the bramble recorded for Skelbo Street, Dornoch, but it was not a confident determination and should not have been published. I named many specimens *R. villicaulis* sensu Rogers, but I told John Anthony that it was not the plant described by Weihe & Nees. The Scottish bramble has since been recognized as *R. septentrionalis* W. C. R. Wats. (Edees 1973). Finally, Weber (1972) has discovered that *R. leptothyrsus* G. Braun is an earlier valid name for *R. danicus* (Focke) Focke.

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E. S. EDEES

A NEW BRAMBLE OF NORTH-WESTERN ENGLAND

While examining *Rubus* sheets at CGE some years ago, I encountered specimens collected by A. Ley, W. H. Mills and others in W. Lancs., v.c. 60, and Westmorland, v.c. 69, which seemed to represent a taxon distinct from *R. egregius* Focke and *R. mercicus* var. *bracteatus* Bagnall (= *R. varvicensis* Edees), to which the specimens had been referred.

Since then I have collected the same plant myself at several places in v.c. 60 and 69 and in Cumberland, v.c. 70, and have recognized gatherings sent to me by D. E. Allen from Man, v.c. 71, as the same. I have also seen and collected both the other *Rubi* mentioned above; the three are distinct taxa. The most obvious features of the northern plant in the field are the dark green foliage and the very floriferous, white-flowered panicles, which are dense at the top and spreading below.

Rubus cumbrensis A. Newton, **sp. nov.**

Turio viridis vel fuscovirescens, subpruinosus obtusangulus superficiebus concavis, aculeis ad angulos dispositis brevibus e basi lata exortis rectis declinatis armatus. Folia 4–5(6–7)-nata digitata olivacea supra subnitida infra griseoviridia pubescentia. Foliolum terminale orbiculare vel obovatum basi truncata breviter cuspidatum dentibus serratis haud profundis.

Inflorescentia longa pyramidata supra subcorymbosa densa, infra ramulis nonnullis subracemosis patentibus vel laxe adscendentibus. Rachis flexuosa pilosa aculeis brevibus rectis declinatis e basi lata exortis praedita. Flores circa 2·5cm diam.; sepala reflexa ovata griseoalba villosa parum aculeolata albomarginata; petala alba vel primo pallide rosea obovata utrinque pubescentia. Stamina stylos flavescentes longe superantia; anthera glabra. Carpella glabra vel sparsim pilosa.

Stem greenish to dull reddish-brown, subpruinose, blunt-angled with furrowed sides and scattered simple hairs; prickles confined to the angles, rather short, mostly straight, slanting from broad bases. Leaves 4–5(6–7)-nate-digitate, olive-green, shining above, somewhat plicate, grey-green felted and pilose below, the terminal roundish to obovate with an entire base, cuspidate, shallowly and regularly compound-serrate with a few recurved teeth, fringed with scattered minute glands, the veins beneath yellowish and prominent.

Panicle long-pyramidal, dense, subcorymbose above with several simple and ternate leaves with leaflets greyish beneath, with many patent or laxly ascending subracemose branches below. Rachis strongly flexuous, angled, hirsute, felted above. Prickles short, straight, declining from broad bases, some small. Flowers *c* 2.5cm diameter; sepals reflexed, ovate, grey-white felted, slightly aculeolate, with white margins; petals white or pink-blushed in bud, distant, broadly obovate or oblong, downy on both sides and erose at the tip. Filaments white, greatly exceeding the yellowish styles; anthers glabrous. Carpels glabrous or with a few hairs.

HOLOTYPUS: Emmetts, Abbotstead, W. Lancs., v.c. 60, 15/8/71, *A. Newton* (CGE)

The chief differences from *R. varvicensis* are: leaves more softly hairy beneath, rounder; panicle narrower in the upper part and more floriferous; rachis lacking glands and acicles; petals white rather than pale pink. It belongs to *Rubus* section *Sylvatici*, and lies between *R. pyramidalis* Kalt. and *R. polyanthemus* Lindeb.

The following specimens in CGE are regarded as representative (paratypes):

W. Lancs., v.c. 60: Lancaster–Clitheroe, 9/1938, *W. H. Mills*, as *R. bracteatus*
Hedge near Inskip, 5/8/1895, E. S. Marshall, as *R. silurum* teste W. M. Rogers

Westmorland, v.c. 69: Windermere, 5/9/1836, *S. Hailstone*, as *R. carpinifolius*
Windermere, 9/1883, *J. G. Baker*, as *R. calvatus*
Ambleside and Coniston, 12/7/1905, *A. Ley*, as *R. mercicus* var. *bracteatus*
Troutbeck, near Ambleside, 5/9/1909, *S. H. Bickham*, as *R. bracteatus*
Coniston to Ambleside, 9/1912, *J. Comber*, as *R. bracteatus*
Roadside north of Elterwater, 28/7/1953, *W. H. Mills*, as *R. egregius*

I have specimens in my own herbarium from the Fylde and the foothills of the Forest of Bowland, v.c. 60; the shores of Ullswater, v.c. 70; and Skelwith Bridge, v.c. 69, where it grows with *R. plicatus*, *R. nemoralis* (*R. selmeri*), *R. furnarius*, *R. errabundus*, *R. infestus* and *R. wirralensis*. It appears to be characteristic of the fringes of upland oakwood and the edges of ancient (now drained) lowland mosses.

A. NEWTON

RUBI COMMON TO THE BRITISH ISLES AND NORTH-WESTERN CONTINENTAL EUROPE

Following visits by A.N. to Germany and Belgium in 1974 and by H.E.W. to Britain in 1976 in each other's company, supplemented by examination of the literature, inspection of herbarium specimens in many European institutions, and much correspondence, we agree that the following *Rubus* species occur both in the British Isles and north-western continental Europe, and that additions to this list are likely to be few:

R. nessensis W. Hall
R. scissus W. C. R. Wats.
R. sulcatus Vest
R. bertramii G. Braun (*R. opacus* auct., non Focke)
R. plicatus Weihe & Nees
R. affinis Weihe & Nees
R. divaricatus P. J. Muell.
R. integribasis P. J. Muell. (*R. holsaticus* Erichs.)
**R. allegheniensis* Porter
**R. pergratus* Blanchard
R. sublustris Lees (*R. warmingii* f. *glaber* Frider. & Gel.)
R. balfourianus Blox. ex Bab. (*R. nemorosus* auct. an Hayne ex Willd.?)
R. gratus Focke
R. sciocharis Sudre
R. adspersus Weihe ex Weber (*R. carpinifolius* auct.)
R. platyacanthus Muell. & Lefèv. (*R. carpinifolius* auct.)
R. nemoralis P. J. Muell. (*R. selmeri* Lindeb.)
**R. laciniatus* Willd.
R. lindleianus Lees
R. egregius Focke
R. macrophyllus Weihe & Nees
R. silvaticus Weihe & Nees
R. pyramidalis Kalt.
R. leptothyrsos G. Braun (*R. danicus* (Focke) Focke)
R. septentrionalis W. C. R. Wats.
R. polyanthemus Lindeb.
R. rhombifolius Weihe ex Boenn. (*R. incurvatus* var. *subcarpinifolius* Rogers & Riddelsd.)
**R. elegantispinosus* (Schumach.) Weber
R. cardiophyllus Muell. & Lefèv.
R. lindebergii P. J. Muell.
**R. procerus* P. J. Muell. (*R. armeniacus* Focke)
R. sprengelii Weihe
R. arrhenii (Lange) Lange
R. vestitus Weihe & Nees
R. mucronulatus Bor. (*R. mucronifer* Sudre)
R. anisacanthos G. Braun (*R. albisequens* Weber)
R. infestus Weihe ex Boenn. (*R. taeniarum* Lindeb.)
R. radula Weihe ex Boenn.
R. rudis Weihe & Nees
R. micans Gren. & Godr. (*R. anglosaxonicus* Gel.)
R. flexuosus Muell. & Lefèv.
R. fuscus Weihe & Nees
R. pallidus Weihe & Nees
R. euryanthemus W. C. R. Wats.
R. scaber Weihe & Nees
R. raduloides (Rogers) Sudre
R. dasyphyllus (Rogers) E. S. Marshall
R. hartmanii Gandog.
R. bellardii Weihe & Nees

* Species further discussed below.

In this context, north-western continental Europe comprises southern Norway, southern Sweden, Denmark, northern Holland and north-western Germany.

R. pergratus and *R. allegheniensis* are N. American species grown in Europe and naturalized both in the British Isles and on the Continent. *R. pergratus* (det. H.E.W.) was first recorded in Britain by us in 1976 as a well-established alien in Toft Wood, Cheshire, v.c. 58. A.N. has since seen a sheet of the same species collected by B. A. Miles in 1961 from Epping Forest, S. Essex, v.c. 18 (CGE). It is known from a few places in north-western Germany (Weber 1972). Its affinities are with *R. nessensis* (sect. *Suberecti*) but the strongly grooved, almost thornless stem is a distinctive feature. *R. allegheniensis* is 'rare, but persists' in the London area (Watson 1952) and is established on Lindow Common, Cheshire, v.c. 58; it is occasionally encountered in north-western Germany (Weber 1972). It also belongs to sect. *Suberecti* but, unlike any European example of this section, has frequent short-stalked glands on the panicle.

R. elegantispinosus is native on the Continent, but its history in Britain is as yet obscure. After collecting it in Germany, A.N. has recognized it from a number of British vice-counties, including v.c. 19, 26, 53, 62, 83 and 99; H.E.W. has seen and corroborated some gatherings in **herb. A.N.** Its localities in Britain are, however, similar to those of *R. procerus* (river and railway banks, hedgerows near gardens, etc.); whether it is native in Britain or (as is strongly suspected) of garden origin, is as yet unclear.

R. procerus is a Continental species grown in gardens and naturalized in the British Isles, while *R. laciniatus* is a garden species of unknown origin naturalized in much of Europe.

In A.N.'s view, the above list comprises slightly more than one-half of the total of non-endemic *Rubus* species currently thought to occur in the British Isles; almost 70% of the accepted, named British taxa appear, therefore, to be endemic. The eligibility of a few species (e.g. *R. pygmaeopsis* Focke) has still to be established conclusively. '*R. menkei*' of the British list is found to differ significantly from *R. menkei* Weihe & Nees, and is therefore described below as a new species.

Rubus iceniensis Newton & Weber, **sp. nov.**

R. menkei auct. angl., Sudre et al. ex parte, non Weihe & Nees in Bluff & Fingerhuth, Comp. Fl. Germ., **1**: 679 (1825). *R. tereticaulis* sensu Rogers, Handbook of British Rubi, 91 (1900); Set of British Rubi no. 103; non P. J. Mueller, Flora, ser. 2, **16**: 173 (1858)

Frutex haud omnino *Rubo menkei* Weihe & Nees dissimilis, a quo hoc modo distincte differt: Turio aculeis brevioribus et densioribus. Folia turionis *R. menkei* valde dissimiles; foliolum terminale ellipticum vel late obovatum, vulgo gradatim cuspidatum (non mucronatum) ± aequaliter serratum, dentibus principalibus (contrarie *R. menkei*) non manifeste excurvatis. Inflorescentia angustiora, aculeis brevioribus (ad rachidem 3–(4)mm non 4–>5mm longis). Foliola terminalia foliorum ternatorum basi ± lata elliptica vel late obovata (non sicut in *R. menkei* basi ± anguste cuneata, truncata vel vix emarginata, prope apicem manifeste dilatata saepe angulato-obovata). Ramuli adscendentes, breviores (in *R. menkei* longi, ± patentes, nonnulli reflexi). Pedunculi multis (10–>20) aculeis brevibus (circa 1·5mm longis), ± curvatis (in *R. menkei* rectis, saepe > 2mm longis), glandulis stipitatis brevibus circa 0·2–0·3(−0·7)mm longis (in *R. menkei* 0·8–1·5(−2)mm longis).

In some respects this plant is similar to *R. menkei* Weihe & Nees, but is clearly distinguished by the following characters: Stem with denser and more slender and shorter prickles. Leaf-shape quite different from that of *R. menkei*: terminal leaflet elliptic or broadly obovate, more or less gradually pointed and regularly serrate, lacking the characteristic incised serration of *R. menkei* with its longer and markedly excurved principal teeth (particularly in the upper part) and typical mucronate point. Panicle narrower, with much shorter prickles (on the rachis *c* 3(–4)mm compared with often more than 5mm in *R. menkei*). Terminal leaflets of the ternate leaves more broadly based, elliptic or broadly obovate (on *R. menkei* often more or less cuneate-based, even angled-obovate with the greatest width near the tip, like the leaves of the stem but without excurved teeth). Branches shorter, branched near the base, ascending, not long and patent (or sometimes even reflexed) and divided half-way as in *R. menkei*. The shape of the panicle is quite different in the two species: peduncles with many (10–>20), short and more or less curved prickles only *c* 1·5mm (in *R. menkei* often >2mm) and with very short glands 0·2–0·3(–0·7)mm (in *R. menkei c* 0·8–1·5(–2)mm).

HOLOTYPUS: Set of British Rubi no. 103; Wood on the borders of Sprowston and Rackheath, E. Norfolk, v.c. 27, 27/7/1893, *E. F. Linton*, as *R. tereticaulis* P. J. Muell. (MANCH). Isotypi in BM, CGE, LIV, OXF.

The name commemorates the Iceni, ancient inhabitants of Norfolk, to which county, particularly on the heaths and woods around Norwich, this species appears to be confined.

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A. NEWTON & H. E. WEBER (*University of Osnabrück, W. Germany*)

PEROXIDASE ISOZYMES IN SOME ELMS (*ULMUS* L.) OF EASTERN ENGLAND

Few taxonomically useful characters, other than foliar biometric characters, have been found with which to study the complex European population constituted by sect. *Ulmus* (sect. *Madocarpus* Dum.) of *Ulmus* L. Isozyme variation was, therefore, investigated in a search for independent discriminators. Initial screening of ten enzyme systems revealed surprisingly little variation within the complex, with the exception of peroxidase. Accordingly, peroxidase was used in all subsequent work.

Fresh leaves were collected in five vice-counties (Beds., Cambs., N. Essex, S. Essex, Hunts.) from 19 trees, identified, on the basis of leaf-shape and tree-form, according to the three-species concept (Richens 1968), as *U. glabra* Huds., *U. minor* Mill. sensu lato, *U. glabra* × *U. minor* and *U. procera* Salisb. A list of locations is incorporated in Fig. 1. The leaves were homogenized in cold acetone and the resulting powder stored at −20°C until required. Disc electrophoresis in acrylamide gels was used to separate the isozyme bands and the bands were stained in a catechol + H_2O_2 solution.

The resultant staining patterns are shown in Fig. 1. It is obvious that two bands with Rf values of 28 and 48 relative to a bromophenol blue marker were constant throughout the samples. Several of the trees had additional bands which are of interest. In the *U. glabra* sample (zymogram pattern F), two additional bands were noted, neither of which was present in any of the putative *U. glabra* × *U. minor* hybrids. Two extra bands occurred at Rf 49 and 51 in one tree of *U. minor* (pattern H) and one of *U. glabra* × *U. minor* (pattern I), both in N. Essex. Two *U. minor* specimens exhibited an extra band at Rf 42 (pattern G), sample 18 being the taxon with a unilateral branching habit often given specific rank as *U. plotii* Druce. Although no other qualitative differences in zymograms were noted, quantitative differences occurred which were characteristic and diagnostic of particular populations. Thus pattern C was only found in *U. procera*, pattern D comprised all the representatives of the Boxworth–Godmanchester population of *U. minor* (Richens 1967) plus one specimen of *U. procera*, and pattern E comprised all the representatives of the Grantchester–Sawston population of *U. minor* (Richens 1967) plus a specimen from N. Essex of uncertain affinity.

Feret & Stairs (1971), in the U.S.A., had examined the peroxidase isozymes in seven imported seed sources of *U. pumila* L. Up to six bands were present in each sample, their positions being highly variable within and between seed sources. To account for these observations, Feret & Stairs suggested genetic determination by nine alleles at one locus, one allele being silent. This picture contrasts strikingly with the present findings in which two bands are constant in position and up to four bands are present; also three populations appear to exhibit little or no internal isozyme variation. These differences may be explained by the fact that *U. pumila* had reproduced sexually while probably all the material examined in the present study, except the *U. glabra* specimen, had probably been propagated vegetatively. As Feret & Stairs' technique was different from ours, it

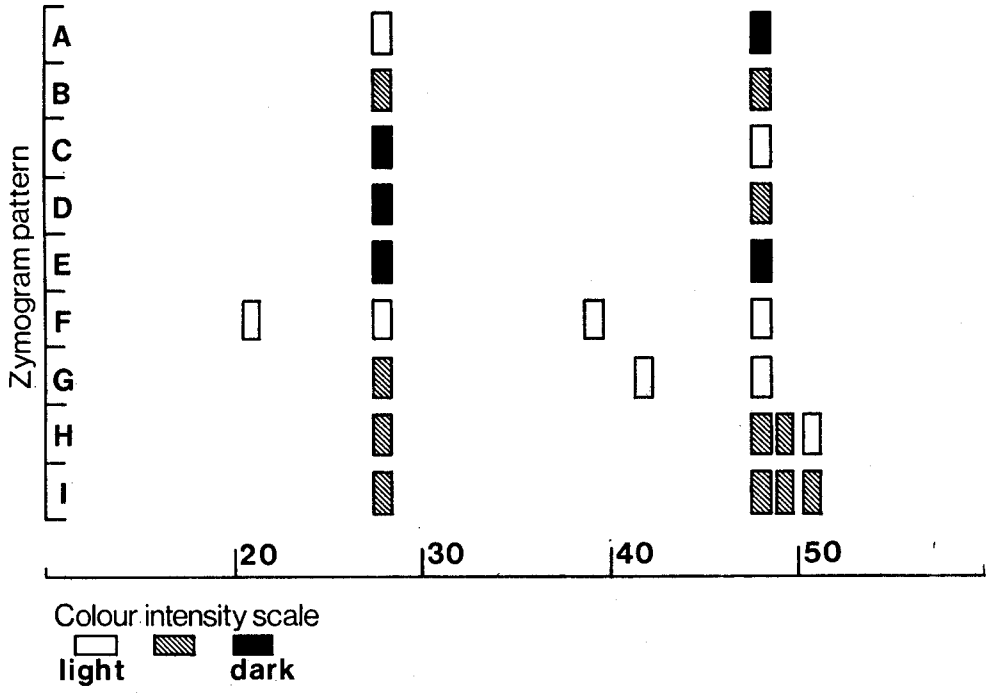

FIGURE 1. Peroxidase zymograms of *Ulmus*. A: (1) *U. minor*, Mundon, S. Essex; (2) *U. glabra* × *U. minor* 'Vegeta', Cambridge, Cambs. B: (3) *U. minor* 'Sarniensis', Cambridge; (4) *U. glabra* × *U. minor* 'Major', Cambridge. C: (5) *U. procera*, Cambridge, ungalled; (6) same tree heavily galled by *Eriophyes ulmicola* Nal.; (7) *U. procera*, Litlington, Cambs. D: (8) *U. minor*, Abbots Ripton, Hunts.; (9) *U. minor*, Lolworth, Cambs.; (10) *U. minor*, Shingay, Cambs.; (11) *U. procera*, Wrestlingworth, Beds. E: (12) *U. minor*, Cambridge; (13) *U. minor*, Barton, Cambs.; (14) *U. minor*, Horseheath, Cambs.; (15) *U. minor*, Goldhanger, N. Essex. F: (16) *U. glabra*, Orwell, Cambs. G: (17) *U. minor*, Wakes Colne, N. Essex; (18) *U. minor*, Cambridge. H: (19) *U. minor*, Salcott, N. Essex. I: (20) *U. glabra* × *U. minor*, Wakes Colne.

is not possible to ascertain whether any of the peroxidase bands that they reported correspond to any found here.

It is disappointing that no peroxidase bands were found in any of the putative interspecific hybrids, as this would have confirmed an *U. glabra* ancestry. The zymograms of hybrids either showed the two constant bands at Rf 28 and 48, or, if extra bands were present, they could be matched with those of supposedly pure *U. minor*. Possibly, *U. minor* carries inhibitors that suppress specific peroxidase isozyme genes from *U. glabra*. Without full genetic analysis, it is not possible to determine the number of genes responsible for the peroxidase complement in the material studied, but it is not improbable that the two bands at Rf 49 and 51 are both controlled by one gene, as they were found together at each of the two occurrences.

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N. J. PEARCE & R. H. RICHENS

CARDUUS PYCNOCEPHALUS L. ON PLYMOUTH HOE, S. DEVON

In 1937 I undertook an investigation, on behalf of the Botanical Section of the Devonshire Association (then engaged on the preparation of a new Flora of Devon), to determine whether *Carduus pycnocephalus* L. still occurred on Plymouth Hoe, S. Devon, v.c. 3. Since that time I have regularly checked the situation and can report that the plant still survives, albeit somewhat precariously. This summer (1976) at least six clumps of the thistle were seen on a natural limestone cliff immediately east of the beach known as Pebbleside at West Hoe. Most of the plants were heavily infested with black-fly but appeared to be producing fruits and it is to be hoped that, despite the phenomenal drought, the plant will reappear next year.

C. pycnocephalus L. was first recorded for Plymouth Hoe by I. W. N. Keys (Keys 1868) and this record was later quoted and confirmed by T. R. A. Briggs (Briggs 1880). Before its destruction by air raids, there was a specimen in the herbarium of the Plymouth Institution at the Athenaeum, Plymouth, collected by Briggs on 2nd June, 1882, and labelled 'Slope under the Hoe, Plymouth'. The original record of Keys occurs under *C. tenuiflorus* Curt. and reads 'Hoe, and under the Citadel, Plymouth, in which situations the variety C. *pycnocephalus* Jacq. also occurs'. In 1937 both plants were seen in some abundance, but *C. tenuiflorus* has now disappeared and *C. pycnocephalus* is restricted to one small area.

At the time of my original investigation I was in communication with J. E. Lousley, who (Lousley 1935) published a short note on the plant, and with A. J. Wilmott, who allowed me to quote (Phillips 1939) his statement (Wilmot *in litt.* 1938) of the characters differentiating the two somewhat similar species. I have tested these characters with reference to Plymouth plants and have found them to be completely diagnostic. Later, I was in touch with J. T. Howell, of the California Academy of Sciences, San Francisco, whose account (Howell 1939) of Californian specimens of the two plants included further points of differentiation which, applied to Plymouth specimens, again proved to be valid. It would seem worthwhile, therefore, to repeat both statements here, to complement the information given in the standard Floras.

Characters based on A. J. Wilmott's original observations on Plymouth specimens and those in the European Herbarium of the British Museum (Natural History) are:

Carduus pycnocephalus L. Plant in general less spiny, with darker green leaves, white-tomentose below, and usually more tomentose phyllaries. Stem only slightly winged above, and some terminal capitula on unwinged, white-tomentose peduncles; capitula solitary or only 2 or 3 in each cluster; marginal veins of the strongly spinose median phyllaries strongly hardened and thickened, making a strongly three-veined, spinose termination. Capitula larger, 22–23mm long, more swollen below and therefore more ovate; florets normally exceeding the longest phyllaries, sometimes greatly so, the reddish-purple corollas more conspicuous as a result.

Carduus tenuiflorus Curt. Plant in general more closely spiny, with lighter green leaves, usually only somewhat tomentose below, and usually less tomentose phyllaries. Stem strongly winged above right up to the capitula; capitula clustered together in groups of 5 to 7 or more; marginal veins of the strongly spinose median phyllaries not strongly hardened and thickened, not making a strongly three-veined, spinose termination. Capitula smaller, 15–17mm long, less swollen below and therefore more or less cylindrical; florets normally shorter than the longest phyllaries, the light pink-mauve corollas less conspicuous as a result.

Additional points of differentiation from Howell (1939) are:

Carduus pycnocephalus L. Involucral bracts not membranous-margined, the tips of the outer and middle bracts more rigid, the margins and backs bearing tiny, rough, appressed trichomes especially on the prominent mid-vein. Achenes light tan or buff, usually with about 20 veins; pappus 1·5–2·0cm.

Carduus tenuiflorus Curt. Involucral bracts more or less membranous-margined, the tips of the outer and middle bracts glabrous and smooth except on the sub-ciliate margins. Achenes grey-brown, usually with 10–15 veins; pappus 1·0–1·5cm.

C. tenuiflorus, common on the southern coast of England, is regarded as a native species. *C. pycnocephalus*, however, is a native of the Mediterranean area, and is also naturalized in California together with *C. tenuiflorus*. Its status upon the Hoe at Plymouth is presumably that of an alien, perhaps originally introduced by shipping, which has established itself and survived. It is surprising, in view of the fact that *C. pycnocephalus* has been naturalized at Plymouth for over a hundred

years, that *Flora Europaea* (Franco 1976) does not include Britain in the list of countries given for that species. Identification poses no special problem to anyone familiar with the two species, but in case of difficulty the presence or absence of the minute trichomes on the spinose tips of the involucral bracts provides a completely diagnostic character easily observable with a × 10 lens.

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E. N. M. PHILLIPS

VIOLA RUPESTRIS SCHMIDT AND *JUNCUS ALPINUS* VILL. IN MID-W. YORKSHIRE

During 1976 substantial colonies of *Viola rupestris* Schmidt and *Juncus alpinus* Vill. (*J. alpino-articulatus* Chaix) were found in the limestone areas of Craven in Mid-W. Yorks., v.c. 64. Both species are particularly associated with Upper Teesdale, and their presence in Craven provides further parallels between the flora of the two areas. The *Juncus*, which occurs in two colonies in Craven, is unknown elsewhere in England except in Teesdale (although widespread in Scotland), whilst the *Viola*, which is frequent over the limestone plateaux on the south-eastern slopes of Ingleborough, seems to be more abundant there than in any of its three previously-known British stations.

The previous history of *Viola rupestris* has been detailed by Valentine & Harvey (1961). First discovered in Britain by James Backhouse in 1862 on the sugar limestone outcrops on Widdybank Fell, Upper Teesdale, Durham, v.c. 66, it remained unknown elsewhere until 1960, when the above-mentioned authors, following clues from herbarium specimens, found it near Arnside and on Long Fell above Brough, both in Westmorland, v.c. 69. The authors state that although these three sites differ in altitude—450 ft to 1,950 ft—and in aspect and associated species, each has a combination of a shallow, well-drained, richly alkaline soil, and a sunny open position, and conclude that: 'These discoveries encourage the idea that *Viola rupestris* may be found in other places too. The limestones of north and west England, especially the Craven district of Yorkshire, would seem to possess many possible localities . . .'

Viola rupestris was first found in Craven, Mid-W. Yorks., v.c. 64, on 25th May 1976. Several dozen plants were found growing along one of the tracks crossing the high limestone plateau between Clapham and Selside in Ribblesdale, at an altitude of 1,260 ft. Most plants grew in open bare soil at the edges of the track, with some sprouting from bare cracks in the bed-rock where this was exposed in the ruts. It was found that the colony extended along 150m of track, and in one place also on to two low hummocks of bare limestone clitter (gravel) adjacent to the track.

Associated plants on the track were *Arenaria norvegica* subsp. *anglica*, *Bellis perennis*, *Carex caryophyllea*, *C. flacca*, *Erophila verna*, *Festuca ovina*, *Minuartia verna*, *Plantago lanceolata*, *Ranunculus repens*, *Sesleria albicans*, *Taraxacum* sp. and *Thymus drucei*. There were fewer associates on the clitter areas: *Carex caryophyllea*, *C. flacca*, *C. panicea*, *Campanula rotundifolia*, *Festuca ovina*, *Sesleria albicans* and *Thymus drucei*. *Viola riviniana* var. *minor* grew in adjacent *Festuca* turf.

Many of the plants were in flower, and specimens submitted to Professor D. H. Valentine were confirmed as *V. rupestris*. The existence of plants on the less artificial clitter areas suggested that the plant might occur elsewhere, and on 12th June 1976 a further colony was found on a very similar area of exposed clitter on Moughton Fell at 1,200 ft, about 2·6km south-east of the first

site. The soil here seemed derived from more peaty deposits and new associates were *Antennaria dioica, Empetrum nigrum, Polygala serpyllifolia, Potentilla erecta* and *Vaccinium myrtillus*. Specimens from this site also were confirmed by Professor Valentine.

Continued exploration during the following months showed that the plant was widespread over much of the exposed limestone tracts from Sulber in the north, down the western flank of Crummockdale to Norber; in several colonies across the head of the dale; and thence on to Moughton Fell itself, where colonies were found almost wherever suitable habitat occurs, as far as the south-eastern corner at Foredale. Away from this plateau, two colonies were found on Smearsett Scar above Feizor, about 2 km south of its nearest station at Foredale. The range, as so far defined, covers an area 6 km long and 3·5 km wide, plants occurring in at least ten 1 km squares and three 10 km squares. If the glabrescent plants discussed below are included, nearly 20 colonies are now known, their populations varying from a dozen or so plants to many hundreds. All lie above 1,000 ft, and in one site reach 1,400 ft. The habitats are all very similar to those already described, open clitter hillocks and gentle slopes of fine screes comprising the most frequent sites.

Besides the usual hairy variant of *Viola rupestris*, another variant occurs widely in scattered colonies over the same range. Although agreeing with the typical plant in most respects (viz. leaf shape and size, corolla shape and colour, habit and habitat), the indumentum of short, backward-pointing hairs on the capsules, petioles, stems and peduncles, so characteristic of English *V. rupestris*, is in these plants reduced to a variable extent, and in a few cases lacking. The status of such plants is not yet clear. They are not the sterile hybrid *V. riviniana* × *V. rupestris*, since abundant ripe capsules and seed are produced.

Juncus alpinus was first found in Craven on 22nd July 1976 on a marsh near Malham Tarn, Mid-W. Yorks., v.c. 64, at an altitude of 1,250 ft. Mature specimens collected on 26th August 1976 were confirmed by Dr C. A. Stace. The habitat here is remarkably similar to some well-known 'flush' areas in Upper Teesdale, and contains many species in common. Seepage of lime-rich water on gentle gravelly slopes has produced zones of bare limey mud and gravel, interspersed with low hummocks carrying a rich variety of plants, including small populations of *Bartsia alpina, Carex capillaris* and *Polygala amarella*.

Juncus alpinus grows, as in Upper Teesdale, in the very open community on the bare patches between the hummocks, in a stretch at least 200 m across the flank of the marsh. The only associates are *Carex lepidocarpa, C. hostiana, Molinia caerulea* and *Juncus articulatus* (as very small and scattered plants). Where the substrate becomes less firm, as on the lower fringes of the flushed zone where peaty mud replaces the gravel, *J. alpinus* is replaced by robust plants of *J. articulatus*.

Another colony of *Juncus alpinus* was discovered on 4th September 1976, during a *Viola rupestris* search, near Austwick, about 14 km west-north-west of the Malham site. The Great Scar Limestone here lies unconformably on an impermeable bed of Silurian slate. At many points, the groundwaters of the limestone emerge as springs at the junction with the slate at around 1,000 ft.

A particular series of springs converges on a convex slope of slate to give a mosaic of rivulets and open gravelly areas, continuously irrigated by lime-rich water—even at the height of the 1976 drought. *Juncus alpinus* grows wherever the plant community is really open, scattered plants of *Molinia caerulea, Carex lepidocarpa, C. hostiana* and *J. articulatus*, as at Malham, being its only associates. Hummocks are not developed in this situation, swards of *Carex* tufts (in which the rush does not occur) occupying the stream edges. Other plants noted in the flush are *Saxifraga aizoides* and *Lycopodium selago*. The population is of the same order of size as the Malham colony—perhaps some hundreds of plants—but many plants, at least in the 1976 season, were much taller. One stem measured was over 36 cm.

Other suitable areas, both around Ingleborough and elsewhere in Craven, have been examined for *Juncus alpinus*, so far without success. It may be significant that *Schoenus nigricans*, which is very often present in flushes of this type in Craven, seems not to occur in the series containing *J. alpinus*.

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F. J. ROBERTS

CYTOLOGICAL STUDIES IN *PLANTAGO CORONOPUS* L.

Investigations of chromosome numbers in *Plantago coronopus* L. by Böcher *et al.* (1953, 1955) have generally shown a diploid number of $2n = 10$. Four strains, however, proved to be trisomic and were found to be restricted to the extreme western and mostly coastal regions of Europe, from Jersey to Portugal. Chromosome counts determined by Böcher *et al.* (1955) from six Irish sites (two in W. Donegal, v.c. H35, two in W. Cork, v.c. H3, one in N.E. Galway, v.c. H17, and one in Dublin, v.c. H21) were all $2n = 10$.

During an investigation by me of morphological variation in *P. coronopus* subsp. *coronopus* along the northern coast of Antrim, v.c. H39, chromosome counts were also determined. The sites sampled are given in Table 1. At each site, a small number of plants were removed, potted in John Innes No. 2 potting compost and left for six months under greenhouse conditions to establish themselves. Subsequently, somatic chromosome counts were made on root-tip squashes from these plants. The root-tips were pretreated for three hours with 0·002M 8-hydroxyquinoline, fixed in acetic-alcohol (1:3), hydrolysed in 1N HCl and stained using the Feulgen method. Meiosis was also observed in pollen-mother-cells.

TABLE 1. CHROMOSOME NUMBERS RECORDED IN EIGHT POPULATIONS OF *P. CORONOPUS* IN ANTRIM, V.C. H39

Irish GR	Locality	No. of plants	Total no. of cells	$2n$	Abnormalities
24/890.407	Whiterocks, disused quarry	6	23	10	None
24/947.448	Giant's Causeway, Grand Causeway	9	28	10	One plant trisomic $(2n+1)$
24/952.452	Giant's Causeway, cliff path	6	34	10	None
34/038.454	Ballintoy, harbour	8	31	10	One plant trisomic $(2n+1)$
34/037.455	Ballintoy, exposed rocks	10	37	10	None
34/039.454	Ballintoy, limestone area	8	30	10	None
34/036.450	Ballintoy, arch	8	24	10	None
34/198.421	Murlough Bay, exposed rocks	7	32	10	None

TABLE 2. PERCENTAGE OCCURRENCE OF METAPHASE I CHROMOSOMAL ARRANGEMENTS IN POLLEN-MOTHER-CELLS OF TWO TRISOMIC PLANTS AND NORMAL DIPLOIDS OF *P. CORONOPUS*

Arrangement	Plant 1 (Grand Causeway)	Plant 2 (Ballintoy, harbour)	Normal diploids
5II	—	—	100
4II+1III+1I	90·6	84·7	—
4II+3I	7·8	14·3	—
4II+1IIII	1·6	1·0	—
No. of cells examined	64	105	83

The results are presented in Tables 1 and 2. In all, 60 plants proved to be diploid, $2n = 10$, but two plants, one from the Grand Causeway population and one from the Ballintoy harbour population, proved to be aneuploid. Karyotype analysis of these plants indicated that the shortest chromosome of the complement, with a submedian centromere, was tripled. Further, these showed no degree of heterochromatinization, and it was concluded that these two plants were trisomics. As far as could be ascertained, they were in no way morphologically distinct from the rest of their respective populations.

The presence of the trisomics in Northern Ireland extends the geographical range reported by Böcher *et al.* (1955) for trisomics of *P. coronopus*. Details of chromosome numbers for the *P.*

coronopus group given by Chater & Cartier (1976) are misleading, since *P. serraria* is recorded as $2n = 10+0-3B$, $20+2B$ and *P. coronopus* as $2n = 10+0-1B$. The extra chromosomes in *P. serraria* are, according to Böcher *et al.* (1955), true accessory chromosomes, being smaller than chromosomes of the normal somatic complement and showing strong heterochromatinization. Those of *P. coronopus*, on the other hand, as shown by the present study and that of Böcher *et al.* (1955), are due to multiplication of one of the somatic chromosomes.

Observations of meiosis showed that it proceeded normally in the small number of diploids studied. Metaphase I chromosomal arrangements at meiosis in the trisomics produced three patterns: 5 bivalents and 1 univalent, 4 bivalents and 3 univalents, and 4 bivalents and 1 trivalent. The percentage occurrence of these three types is given in Table 2; the most frequently observed arrangement was 5 bivalents and 1 univalent. The observation of trivalent formation at metaphase I appears to be the first record in *P. coronopus* of such an arrangement, although Böcher *et al.* (1955) did observe trivalent formation at a very low frequency at diplotene and diakinesis.

The trisomics appear to originate from non-disjunction of the two short chromosomes (Böcher *et al.* 1955), although no direct observation of this was made by the present author in the normal diploids in which meiosis was studied. Other chromosomal aberrations, e.g. tetraploids (Gorenflot 1960) or hexaploids (Böcher *et al.* 1955), have not been found in the Irish material examined. However, the presence of trisomics serves to emphasize the chromosomal variability of this species.

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PYROLA MINOR L. IN PEMBREY FOREST, CARMARTHENSHIRE

Pyrola minor L. was first seen in Pembrey Forest (GR 22/385.023) in early May, 1970. It was then in leaf only and was not distinguished from *Pyrola rotundifolia* L. subsp. *maritima* (Kenyon) E. F. Warb., which had been known on the adjacent dunes since 1964 (Kay *et al.* 1974). This large patch of *P. minor*, which was then new to Carms., v.c. 44, made an almost pure stand, covering about 8×10 yards with very sparse plants of *Ammophila arenaria*, *Carex arenaria*, *C. flacca*, *Euphorbia portlandica*, *Oenothera* sp., *Prunella vulgaris* and *Rubus caesius* on an afforested dune under a 75% canopy of *Pinus nigra* subsp. *laricio*. In subsequent years the stand increased and measured about 12×12 yards by 1974, when flowering specimens were sent to Dr Q. O. N. Kay, who confirmed it as *Pyrola minor*.

In August 1974 two smaller stands were found about 30 yards from the first; these were under rather lighter canopy and in less well-drained conditions, one in fact in a wet dune hollow. Here there was more competition from other plants, the associates being *Carex flacca*, *Fragaria vesca*, *Hippophae rhamnoides*, *Lotus corniculatus*, *Rubus fruticosus*, *Salix repens* and *Viola riviniana*.

In June 1975, four further stands were detected; two were about 350 yards from the original site and were discontinuous along 30 yards of both verges of an access road. Here the *Pyrola* had to compete, on the wetter verge, with *Dryopteris filix-mas*, *Epilobium angustifolium*, *Festuca rubra*, *Plantago lanceolata*, *Rubus fruticosus* and *Salix repens*. On the opposite verge the *Pyrola*, on a dry bank under *Hippophae rhamnoides*, was even then in poor condition but did nevertheless survive the drought of 1976. The other stands were about 500 yards north of the first and deeper into the Forest, one in similar conditions to the first patch, the other in a damp hollow.

Mr F. W. Webb (*in litt.* 1976) and Mr N. S. Powell (*in litt.* 1975), the District and Local Forest Officers, have kindly given me details of the history of Pembrey Forest. After the failure of the initial direct sowing of tree seed, young stock was planted in the mid-1930s. This came from three sources: Inchnacardoch and South Laggan in the Inverness area; Glenbranter and Knapdale in the Argyll area; and the Tintern Nurseries, Monmouth. Tintern, about 70 miles to the east, is the nearest extant station for *P. minor*, although there is a record for it less than half that distance in the same direction at Scud Einion Gam in the Pyrddin valley above Pont Nedd fechan. This was found by Joseph Hooker in the early 1800s, but on which side of the Afon Pyrddin (which forms the boundary between Glamorgan and Brecon) is not known, nor has it been refound (G. Ellis *in litt.* 1976).

It is therefore reasonable to surmise that seeds or plants could have been introduced from Tintern with the young trees. Another possibility is that it could have been brought from the north by the Greenland White Fronted Geese (*Anser albifrons*) which formerly wintered in the Pembrey area in considerable numbers. Had either species of *Pyrola* been established in any quantity on these dunes by the mid-1930s, when A. E. Wade did extensive work on them, it is extremely unlikely that it would have escaped his observation. Current search by several botanists has, so far, found *P. minor* only in this limited area of the 2,400 acres of plantation.

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