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The distribution of the Wild Service Tree, *Sorbus torminalis* (L.) Crantz, in the British Isles

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ABSTRACT

The results of a survey of the Wild Service tree, *Sorbus torminalis* (L.) Crantz (Rosaceae), in the British Isles initiated by the Botanical Society of the British Isles and the Biological Records Centre in 1974 are summarised and analysed. It is confirmed that the tree is a useful indicator of ancient woodland and hedgerows and that it shows a marked preference for two kinds of soil: those derived from clays and those derived from harder limestones. The reasons for this are discussed as well as the occurrence of the species on other soils. It is suggested that the very low rate of reproduction from seed is mainly the result of seed predation and that the northerly limits of its range are influenced by the lower rate of seed production in places with cooler, less sunnier summers.

The pattern of modern records in England and Wales reflects to some extent the part the tree has played in the life of the countryside over many centuries. It has been conserved and planted in some areas for its fruit, its wood and for ornament, but in other areas it is scarcely known by local people and held in little regard. Today it is usually much commoner in the first of these areas.

Areas where the Wild Service tree grows have been divided into three types: those where it is relatively abundant, those where it is scattered but widespread and those where it is rare. These often, but not always, show a correlation with the solid or drift geology. Mapping in this way also shows that there are large areas of England and Wales where conditions appear suitable but from which the tree has not been recorded.

INTRODUCTION

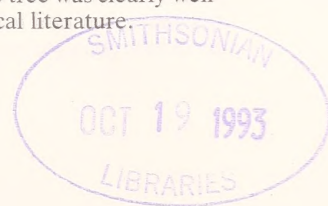
In 1974 the B.S.B.I. and the Biological Records Centre, Monks Wood (B.R.C.), organised a national survey of the Wild Service tree, *Sorbus torminalis* (L.) Crantz (Rosaceae) and in the same year I became coordinator of the survey.

The purpose of the survey was given by the Biological Records Centre as follows:-

"Wild Service is typical of ancient and undisturbed lowland primary woodland. Whilst the *Atlas of the British flora* gives a good idea of its general distribution it may have been overlooked in some areas. It will be of great use in recognising primary woodland for conservation to associate its occurrence with individual woods, not just grid squares, and to trace its distribution in hedgerows."

The initial phase of the survey was conducted by the distribution of standard record cards (see Fig. 1) from the B.R.C. to B.S.B.I. members, foresters, reserve wardens and others likely to have an interest. On return to the B.R.C. these were forwarded to me. Appeals were also made on radio, television and in the press to members of the general public which resulted in much further information not only on the distribution of the tree, but on its economic and folkloric roles. Many of these latter records came from people who were uncertain of the tree's identity, but leaves or fruit were sent for confirmation. Over 1000 records, both on cards and from other sources, were received, many from areas where the tree had not hitherto been reported and even after an interval of nearly 20 years records still occasionally arrive.

A comprehensive search of appropriate literature was also undertaken and this indicated areas where the tree had once occurred, and might still exist, but the data have not found their way into county Floras or other published material. In Pembrokeshire, for example, the tree was clearly well known to local people long before any formal record appeared in the botanical literature.



Grid Reference

Vice-County

Locality (name):

Date

Habitat (ring):

Woodland

Hedgerow

Park Tree

Woodland/Park name:

Area

Acre

Soil (ring):

Clay

Loam

Sand

Wet

Dry

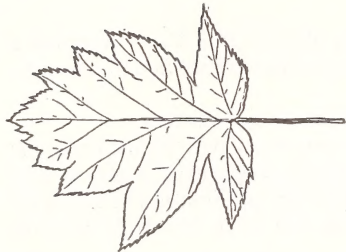
Distribution (ring):

Scattered

Local

Boundary

Sketch of occurrence — show distribution (indicate North and Scale)



**B.S.B.I.
Wild
Service-tree
Survey**

Sorbus torminalis (L.) Crantz

NEED FOR SURVEY

Wild Service is typical of ancient and undisturbed lowland primary woodland. Whilst the *Atlas of the British Flora* gives a good idea of its general distribution it may have been overlooked in some areas. It will be of great use in recognising remaining primary woodland for conservation to associate its occurrence with individual woods, not just grid squares, and to trace its distribution in hedgerows.

Apart from its distribution generally and in individual woodlands, notes on the size of the trees and on the presence of seedlings and suckers will be useful, but this information is not essential. Please send details of location of populations even if the additional sections are incomplete.

Return completed cards to:
B.R.C.,
Monks Wood,
Huntingdon

From where further cards may be obtained.

Number and size of trees* —

Measure at 5ft. from ground and put the number of trees in each size class in the appropriate column.

Less than 3" diam.	3-6" diam.	6-12" diam.	More than 12" diam.

Reproduction (ring): Flowers Fruit Seedlings Suckers

Notes —

Recorder: Address:

* Do not include suckers unless established as separate trees.

FIGURE 1. The standard record card used in the survey of the Wild Service tree.

GEOGRAPHICAL DISTRIBUTION

The Wild Service almost certainly entered Britain from the Continent after the last Ice Age, although it was probably one of the later arrivals, and spread north and west along river valleys (avoiding wetlands), or through the forests with which much of the country was covered. Its current altitudinal limit in Britain is around 300 m and it has forked east and west at the southern end of the Pennines and skirted the higher hills of the West Country and Wales. The northern advance, so far as modern records show, continued to the southern Lake District in the west and, following the Magnesian Limestone, to North Yorkshire in the east.

Deciding how best to present the geographical distribution of the Wild Service has not been easy. Many prefer a national or Watsonian vice-county dot map method, but this is only useful for giving a broad indication of the distribution across the country or in a vice-county. It also gives a potentially misleading picture of a species that is occasionally found at quite high densities, but also occurs as isolated plants in widely scattered locations. At first glance the species seems to be associated with certain geological areas, but closer inspection reveals that this presents only a partial picture with some baffling anomalies. The best explanation of its distribution in the wild is derived from an analysis of its occurrence in relation to both solid and drift geology coupled with as much data as one can obtain about socio-historical factors. The tree is widespread on the Weald Clay of Kent, Sussex and Surrey for example, but almost absent from an area east of Tonbridge where the Weald Clay is overlain by sand and gravel. Further east still it reaches one of its highest densities in an area where its fruit were once in much demand as food (Hanbury 1770; Maynard 1925; Pratt 1854–57; Roper 1975) and where it is still widely known by a dialect name (Chequer Tree) and cultivated to a greater extent than elsewhere. Its economic history, which has a considerable bearing on its present distribution, is reflected in its vernacular name 'Wild Service'. (Originally the species was known simply as the Service – in many alternative spellings – and Wild Services were simply those growing wild rather than in gardens or orchards. The usage is the same as in terms like 'wild blackberries' or 'wild boar'. When *Sorbus domestica* L. was introduced in the 17th century it was called '*sorbus legitima*' and this was translated as 'true service' to indicate that it was the *Sorbus* to which classical authors referred.)

I have based my observations largely on the ten mile (1:625000) solid and drift geology maps published by the British Geological Survey. The maps give a broad indication of the type of substrate and in some instances provide a very useful picture. However, drawing too many inferences from cartography at this scale is unwise and as accurate a picture as possible of local conditions should be obtained before reaching any firm conclusions on a particular site. The Wild Service, although favouring particular habitats and areas, will survive almost anywhere in lowland Britain, but this is quite a different matter from its being able to establish itself without any help from man and to reproduce successfully.

Bearing all these provisos in mind I have illustrated the present distribution by considering the more or less discrete areas in the British Isles where the species has been recently recorded (Figs 2 and 3) and its relative abundance within these areas. This distribution may reflect recording activity to some extent, but generally there seem to be other reasonably satisfactory explanations for the presence of the species and its density in a particular area. Equally interesting is its absence from large areas that appear suitable and often lie adjacent to places where it is relatively abundant.

1. WEST CORNWALL

There are a few scattered records from the area west of Bodmin. All are confined to the Lower Devonian and are often associated with the lower reaches of river valleys. Britain's most westerly record is from the Loe Pool south of Helston, although there is a planted tree at Castallack in Penwith.

2. CAMEL VALLEY, CORNWALL

The area surrounding the Camel estuary and the Camel river and its tributaries in central northern Cornwall had, in the recent past, a concentration of Wild Service trees of which a few remain (Hamilton Davey 1909; Thurston & Vigurs 1922). The area is rather complex geologically, but most locations are on the Upper and Middle Devonian formations.

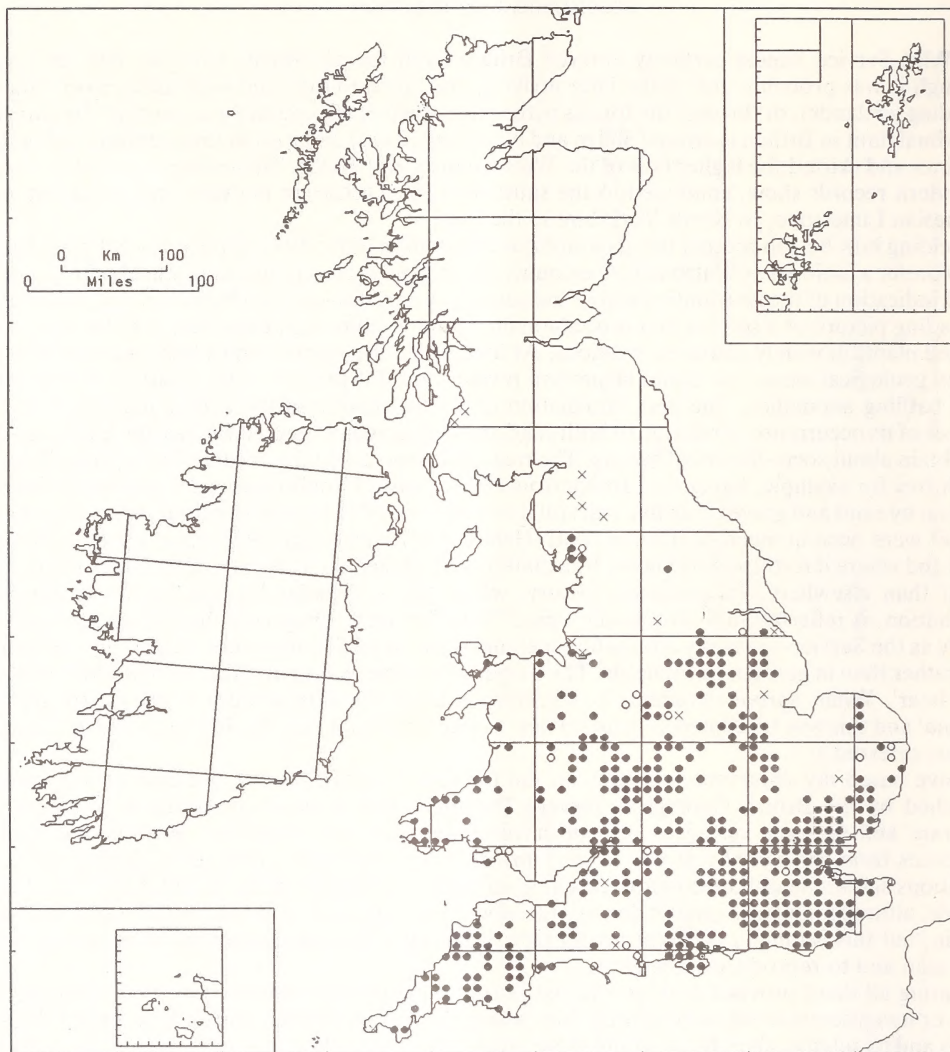


FIGURE 2. Distribution by 10-km squares of the Wild Service tree in England and Wales. This map, though useful, presents a potentially misleading picture due to the fact that some 10-km squares may contain only a single tree whilst others may have hundreds often growing together in suitable areas (cf. Fig. 3). ● 1950 onwards, ○ before 1950, × introductions. Planted trees in Irish gardens have not been included as there are few precise locations.

3. LOWER TAMAR VALLEY

The tree is widespread along the river Tamar that divides Devon from Cornwall in the south. In some places it has spread away from the river, in particular on to the soils derived from the Culm Measures of the Upper Carboniferous in south east Cornwall. Old records from the south east of Plymouth can be considered part of this grouping.

4. CENTRAL & NORTH DEVON AND NORTH EAST CORNWALL

The Culm soils that stretch right across this area have a thin scatter of Wild Services, often in hedges or on roadsides, although they are absent from a large tract of country west of Tiverton.

The association with the Culm Measures is marked and there are very few records from the

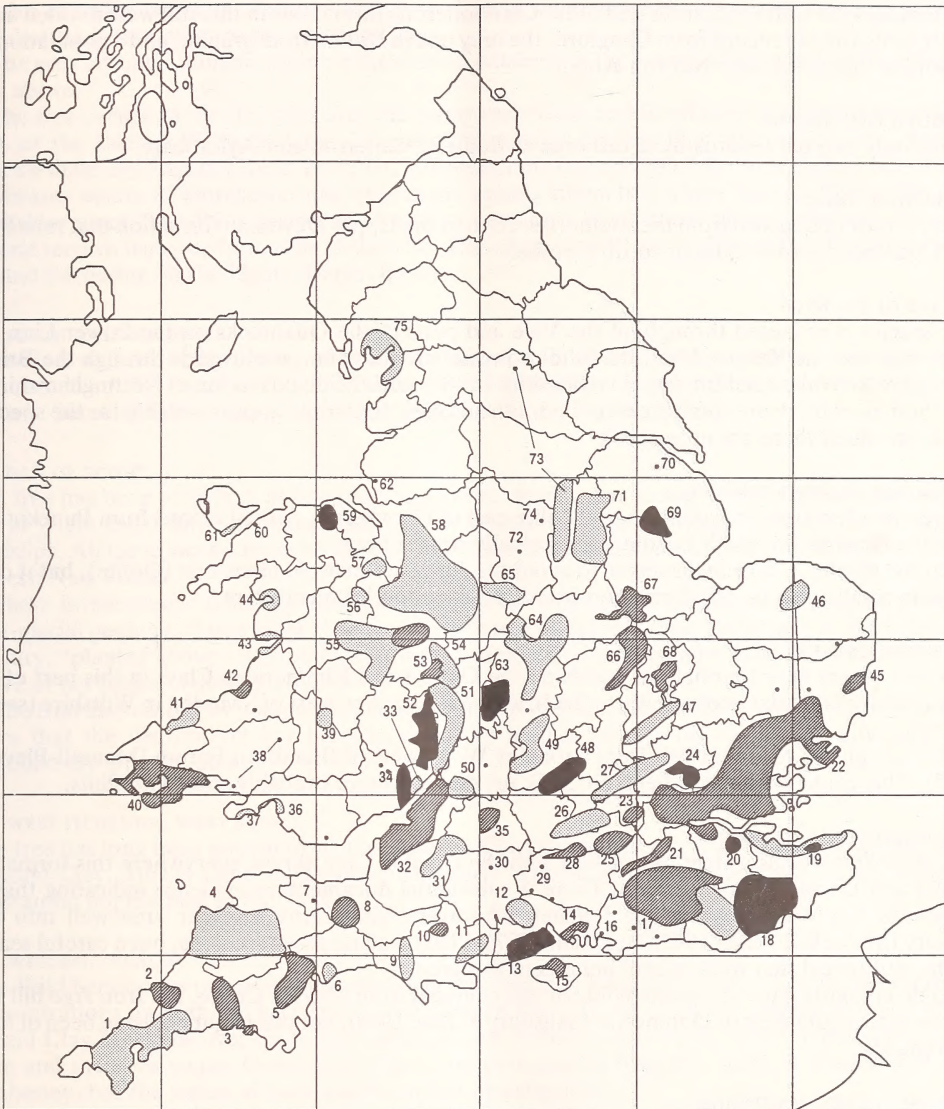


FIGURE 3. Relative density of distribution of the Wild Service tree. The map shows each of the areas covered in the text with isolated records as single dots. As well as these areas it is important to note that there are many apparently suitable places where the Wild Service has not been recorded. Boundaries are those of Watsonian vice-counties. The numbers refer to the sections in the text. ■ Areas where the species is generally not infrequent and, in places, reaches its highest concentrations. ▨ Well-established but at lower concentrations. ▩ Vulnerable or, in a few cases, apparently recently extinct (widely scattered, mainly as isolated trees with data often based on a high proportion of old records).

extensive formations of granite, Middle Devonian or New Red Sandstone that lie adjacent. The explanation is probably that the soils of the Culm are mainly clayey and water retentive, whereas the others drain more freely.

5. SOUTH EAST DARTMOOR

This is perhaps an extension of 4 above. There is a concentration of locations to the east and south

of Dartmoor on Culm Measures and other Carboniferous formations in this still well-wooded area. There is also an old record from Chagford, the only one in Britain from granite, and a population on Devonian limestone near Newton Abbot.

6. SOUTH EAST DEVON

I have only two old records from this area at Budleigh Salterton and Aylesbeare.

7. BRENDON HILLS

There is only one record from the southern section of the Upper Devonian formation that runs from the Quantocks across Exmoor to Ilfracombe.

8. VALE OF TAUNTON

The species is scattered throughout the Vale and parts of the Quantocks on the Lower Lias, the Devonian and the Keuper Marl, the latter a formation it favours, northwards through the Bristol area, across Worcestershire and Warwickshire to the north Midlands as far as Nottinghamshire.

In Somerset there are some areas to the south and east that would appear suitable for the species, but from which there are no records.

9. SOMERSET/DORSET JURASSIC

There are a few trees in woods on the Oolite east of Crewkerne. An old record from Puncknowle near the coast to the south is from a geologically similar area.

On the whole, *S. torminalis* seems to avoid the Jurassic Cotswold limestone (Oolite), but it does occur in small areas on this formation from Dorset to south Lincolnshire.

10. NORTH DORSET CLAYS

The tree occurs very sparingly in woods on the Oxford and Kimmeridge Clays in this part of the county which is similar geologically to the Braydon Forest area west of Swindon in Wiltshire (see 35 below).

There is an old record (1799) from Broadley Wood west of Blandford Forum (Mansell-Pleydell 1895). This could either have been on chalk or, perhaps more probably, clay with flints.

11. LONDON CLAY IN DORSET

The Wild Service has a clear association with the London Clay almost everywhere this formation occurs and Dorset is no exception. There is substantial documentary evidence indicating that *S. torminalis* was widespread in the Lytchett Matravers/Wimbourne Minister area well into this century (Mansell-Pleydell 1895; Marchant 1937). I have had no recent records, but a careful search might well reveal that the tree still persists in this area.

Archaeologists have identified Wild Service charcoal from Maiden Castle, the Iron Age hill fort on the chalk south west of Dorchester (Salisbury & Jane 1940), but this might not have been of local provenance.

12. TEST VALLEY, HAMPSHIRE

There are scattered records from the valleys running from Redlynch and Alderbury south east of Salisbury eastwards to the River Test and in the Test Valley itself south of Romsey. These are largely associated with the London Clay and earlier Tertiary formations, although one site is on chalk south west of Broughton and in the area south of Romsey the London Clay is much overlain with alluvium, gravel and river terrace deposits.

13. NEW FOREST

The distribution of the Wild Service in the New Forest is one of the most difficult to interpret and it perhaps reflects the way in which the forest has been managed as well as other factors. The trees are concentrated in three areas:—

- a. The south east of the Forest between the Beaulieu River and Lymington. This is partly on the Tertiary period Hampstead Beds and Bembridge Marls and partly on the overlying glacial gravels and sands from the more recent Quaternary period.
- b. An area between Totton and Beaulieu Heath on the eastern fringes of the Forest. This is largely

on the complex series of Tertiary gravels and clays comprising the Barton, Bracklesham and Bagshot Beds that overlies the London Clay.

c. The area around Cadnam, again on the eastern outskirts of the Forest. Geologically this is similar to b above.

The tree occurs on the clay soils over the Hampstead Beds and Bembridge Marls in the northern part of the Isle of Wight and here it clearly flourishes on this type of terrain. The Barton, Bracklesham and Bagshot Beds, however, cover not only large areas of the New Forest, but extend westwards nearly to Dorchester and over many square kilometres where Surrey, Hampshire and Berkshire meet. The Wild Service is absent, or very rare, in all these places although there are several records from the formation to the east of Southampton Water and in the Pamber Forest area around Silchester on the Hants./Berks. border.

14. SOUTH EAST HAMPSHIRE

There is a well-defined grouping of Wild Service in south east Hampshire almost entirely on soils associated with the London Clay, the Barton, Bracklesham and Bagshot Beds and overlying glacial gravels. Some of these trees are probably relicts from the Forest of Bere.

15. ISLE OF WIGHT

The tree has been recorded, at one time or another, from many woods in the northern part of the Isle of Wight and it still grows there, particularly beside estuaries and where there are low cliffs with landslips. All these locations are on the clay soils derived from the Tertiary Oligocene as in the south eastern New Forest.

There is one record from the Lower Greensand north west of Sandown in an area of complex post-glacial geology. It was quite close to here at Nunwell that Sir John Oglander, in the early 17th century, "planted above a hundred young elms and ashes, some chestnuts and service berries in the grove of my house" (Bamford 1936).

The fruit also used to be sold, mainly to children in Ryde (Bromfield 1856), and it would therefore seem that the distribution has been modified by human activity on the island, although it is undoubtedly a native plant.

16. WEST ITCHENOR, WEST SUSSEX

The tree has long been known from a location by Chichester Harbour where glacial gravels overlie London Clay. This is some 16 km from the nearest locations in Hampshire and 32 km from the substantial populations in the Weald.

17. WESTERN WEALD

The Wild Service has one of its strongholds in the Weald of Kent, Sussex and Surrey and there are concentrations on both the eastern and the western sides. In the west it is largely confined to the Weald Clay but spills over on to the Hastings Beds between Haywards Heath and Horsham and here and there on to the Greensand. There are two records from the chalk at Findon and near Amberley, but the status of these needs further investigation.

In the west, records stop abruptly at Petworth, although the Weald Clay continues for some 24 km along the Rother Valley.

The tree is also relatively scarce on the Weald Clay between Pevensey and Chailey in Sussex and between Yalding and Hildenborough in Kent. In the latter instance it is missing from the extensive river terrace gravels associated with the Medway that overlie the Weald Clay.

18. EASTERN WEALD

There is a strong concentration of Wild Services in the area north west of the Romney Marsh between Ashford in Kent and Robertsbridge in East Sussex. They grow on Weald Clay and the Wadhurst and Guestling Clays of the Hastings Beds, but are almost entirely absent from the sandstones and other light soils. I have searched many suitable looking woods on Gault Clay and on the clayey soils overlying the Purbeck Beds in areas close to strong Wild Service populations without locating a single tree, although the Midland Hawthorn, *Crataegus laevigata* (Poir.) DC., another indicator of ancient woodland that often grows alongside Wild Service, is abundant in these places.

This Wealden group of records spreads, at a thinner density, southwards and westwards almost to the coast at Hastings and Fairlight and to the Ashdown Forest area.

It is in this part of the Weald that the species is still widely known as the Chequer Tree, as it is in some other parts of south east England, and it has entered into the life of the rural community to a greater extent than anywhere else in Britain. There are several farms, houses and one wood named after the species and there is a clear association with the many Chequers Inns in the area (Maynard 1925; Roper 1975). The fruit, known as Chequers, were widely eaten within living memory (Pratt 1854-57 and D. Baird *et al.*, pers. comm., 1975) and were probably used to make a cider-like drink, hence their association with public houses. Because of this the tree is frequently planted in the area and has clearly been given preferential treatment that it has seldom received elsewhere in woods, hedges and on roadsides. The social history of the tree here and elsewhere in Britain and Europe has been covered by Roper (1975, 1987).

19. BLEAN, KENT

The species is plentiful in woods on the London Clay in the Blean area of north Kent. There are also a few records from the Sittingbourne and Rochester area of the London Clay and its underlying Tertiary beds further to the west, and older references (Hanbury & Marshall 1899) indicate that the trees were probably more widespread in the north Kentish clays.

20. SOUTHFLEET, NORTH WEST KENT

An area where the species occurs covering several square kilometres has been on record since the 16th century – “in Kent it groweth in great abundance, especially about Southfleet and Gravesend” (Gerarde 1597) – and it is still flourishing. Some trees grow on London Clay or associated Tertiary gravels, but others appear to be on clay with flints or chalk. Careful investigation of individual sites and the history of land management would be needed to establish why the trees are found here but are absent from similar places nearby.

21. SURREY COMMONS

There are scattered records from the London Clay commons of central and west Surrey from Wimbledon to just north of the Hog's Back. The species closely follows the narrow belt of clay between the sands and gravels to the west and north and the chalk to the south.

22. LONDON AND ESSEX

This is a larger geographical area than many considered here, but records spread in a continuum, with some local concentrations, from the Essex coast to the borders of Buckinghamshire and Berkshire in the west and Kent and Surrey in the south. Virtually all are associated with London or Boulder Clays and the gravelly soils that overlie them. Many represent survivors, or descendants, of trees from the large forests of Essex and Middlesex which encompassed the smaller forests of Epping, Hatfield and others.

The earliest record I have from anywhere in Britain (other than the report of Iron Age Wild Service charcoal from Maiden Castle, Dorset) is from Havering Park, Essex (enclosed as a royal park in the Middle Ages). In 1260 two Wild Service trees (described in the text as “alyeras”) were brought from the park to the Tower of London for the manufacture and repair of crossbows, a purpose for which the wood was renowned. Owing to a mistranslation of the Latin text these trees have been considered by some authors to be hawthorns, but this is incorrect.

Today there are concentrations of records from the Basildon area and to the south east of Chelmsford and these are associated with the Tertiary and Quaternary gravels overlying the London Clay. It has also been noted that trees here tend to be associated with places where the water supply is increased by the effect of differential percolation through the bedded strata.

In Epping Forest the trees grow mainly on London Clay, but north eastwards from Chipping Ongar to the Ipswich area records are scattered across the Boulder Clay, or its associated gravels. It is curious that, although the Boulder Clay sheet continues much further to the north, Wild Service records become very scattered indeed beyond the Suffolk/Essex border. I am inclined to think this is due to land and forest management over the last several thousand years rather than natural factors and in earlier times the Wild Service could have been much more widespread in East Anglia.

To the west the tree is still remarkably well-distributed within the London Clay triangle of north

west London, often in urban situations such as on Hampstead Heath and in Ken Wood (Gilmour 1972). There are also scattered records from south east London and an old record from Wimbledon Common, again on London Clay.

If these London and Essex records are plotted on a Quaternary geology map, their absence from hundreds of square kilometres of glacial river terrace deposits along the valleys of the Thames, the Lea and the Wey is very marked. It is remarkable that there are sufficient trees left to give such a clear indication of the ecology of the primaeval wildwood that once covered what is now one of the world's largest cities. It also highlights the Wild Service's ability to survive in unfavourable circumstances for long periods.

23. SOUTH EAST BUCKINGHAMSHIRE

In the well-wooded area around Burnham Beeches that lies in the rectangle between the M40 and the M4, and the A412 and the Thames at Cookham, there are a number of records from the river terrace deposits that the species seems to avoid elsewhere. Careful investigation of individual sites might provide the reason as might the history of woodland management in the area.

24. SOUTH EAST HERTFORDSHIRE

To the south west of Hoddesdon and the east of Welwyn, with an outlier west of Hatfield, there is a concentration of records in a county where the species is otherwise rare. Most are on Boulder Clay or associated gravels, with a few on London Clay.

In the 18th century the Wild Service tree was well-known in Hertfordshire: Miller (1768) said "in many parts of Hertfordshire there are large trees now growing". He may have been referring to the area north of Barnet where the tree still occurs in some quantity or to south east Herts. (Harper 1981). 92 years earlier M. Cook was planting them for the Earl of Essex on his estates at Hadham and Cassiobury. Apparently they fruited well on the Boulder Clay at Hadham, but at Cassiobury (Cook 1676) "we have them on a sharp gravel, the Fruit naught, and the trees bear very badly".

25. WINDSOR FOREST, BERKSHIRE

There is a strong concentration of the trees in the London Clay area of Windsor Forest, Berkshire. The trees are closely associated with the clay, avoiding the river terrace deposits to the north and the gravelly or sandy Tertiary beds to the south.

26. SOUTHERN CHILTERN

From the Reading area north across the Chilterns there are scattered records of the species over a 12 × 18 km. well-wooded, geologically complex area typified by clay with flints, river terrace deposits and other gravels cut by rivers down to the underlying chalk or, on the southern fringe, the London Clay. As with the trees in south east Buckinghamshire (see 23 above), a study of individual sites is needed to determine the conditions that favour the species in this area.

27. CENTRAL AND NORTHERN CHILTERN

There are very few records from the more elevated parts of the Chiltern range in Hertfordshire, Buckinghamshire, Oxfordshire and Berkshire. As far as I can determine the trees are confined to the clay with flints cappings on the hills.

28. PAMBER FOREST, HAMPSHIRE/BERKSHIRE BORDER

There is a group of records from the wooded area, formerly Pamber Forest, around Silchester on the Hants./Berks. border. They are mainly on Quaternary sands and gravels that overlie the London Clay.

The Tertiary formations running from the Kent, Essex and Suffolk coasts and with which the Wild Service is so closely associated reach their westerly limit immediately beyond Newbury before reappearing to the south of the chalk. There is one record from the area west of Newbury, then a long gap before the species is found again in any quantity in the Cotswolds near Bradford-on-Avon.

29. HAMPSHIRE CHALK

The Wild Service is recorded from three places on the Hampshire chalk, one of which, near Hurstbourne Tarrant, possibly refers to a clay with flints site. The locations are widely separated and

untypical and, in my view, do not constitute adequate evidence that the species once grew more widely on chalk soils under British conditions.

30. SOUTH WILTSHIRE

The only modern record I know of from v.c. 8 is of a Wild Service in a hedge between Wilsford and Beechingstoke. This is on the Gault Clay in the Avon Valley south east of Devizes. If the tree is growing on Gault, it is the only current record of which I am aware from a formation which, in many respects, seems well-suited to its requirements.

Aubrey (1685) said that "cervise-trees" grew at the foot of Heddington Hill and at Whitesheet (I presume the one at Mere) and the trees here may have grown either on Gault Clay or on chalk.

31. WILTS./AVON BORDER

There is a concentration of records, mainly from the Greater Oolite and Cornbrash, but spilling over on to the Oxford Clay along the Cotswold line from Castle Combe to Frome and roughly associated with the old forest of Selwood. Most of the records are from the lower lying parts of the River Avon catchment, but otherwise seem to have little in common. They lie in the counties of Wiltshire, Avon and Somerset although they only extend over an area of some 32×12 km.

There are outliers to the east on an area of Kimmeridge Clay and the Lower Greensand near Calne, and to the south on the Upper Lias near Evercreech.

32. WESTERN AVON

The Wild Service is widespread and sometimes fairly abundant from the Mendip Hills, through the Bristol area and northwards along the Vale of Berkeley. It occurs on the Keuper Marl, the Upper and Lower Lias and the Upper and Lower Carboniferous formations, in the latter instance sometimes on the limestones that make up much of the Mendip Hills and the Avon Gorge. In this it displays its two main habitat preferences: for open and often steep rocky areas and for nutrient rich, heavy clays.

Towards the north of the Vale of Berkeley the concentration of records increases in an area of complex Silurian and Cambrian geology. Similar areas occur across the River Severn to the north and these are more fully considered in 52 below.

33. FOREST OF DEAN

As Rackham (1986) has pointed out, the Forest of Dean was subjected to management regimes, largely in the 19th century, that have altered the existing tree composition almost beyond recognition. This is reflected in the virtual absence (very unusually for our ancient lowland forests) of the Wild Service. There are only a few near Brean and more on the outskirts of the forest in the Cinderford area. These belong, however, to the group of records running northwards away from the forest on the Silurian formations of the Malvern Fault.

Wild Services grow on the cliffs bordering the Severn Estuary at Chepstow and Lydney and in the Lower Wye Valley, but these again are not strictly part of the Forest of Dean.

36. LOWER WYE VALLEY

The Carboniferous Limestone of the Lower Wye Valley is renowned for botanical diversity and boasts a large number of *Sorbus* species. Wild Services are found in the open rocky woods and on cliffs from the Goodrich area to Chepstow, though not on the stretch where the river flows through Devonian strata. This and Weston Big Wood near Weston-super-Mare are the only areas in Britain from which the hybrid (*S. × vagensis* Wilmott) between the Wild Service and the Whitebeam, *Sorbus aria* (L.) Crantz, has been recorded.

There are two Wild Service records close together from Llanfihangel Ystum Llywern in the valley of the River Trothy in Gwent. This site is only 10–12 km from the River Wye, but the tree is found almost nowhere else in the very extensive Lower Devonian countryside through which much of the upper River Wye and its tributaries run, although it has its densest populations in some of the woods immediately adjacent to the eastern boundary of this area and reappears beside the Wye on the Wenlock Series in Radnorshire (Powys) (Anon. 1976).

35. FOREST OF BRAYDON, WILTSHIRE

Between Swindon and Malmesbury in north western Wiltshire there is a concentration of records from the woodland remnants of the Forest of Braydon, which lie mainly on the Kimmeridge Clays of the Upper Jurassic.

In general the species seems to be commoner on Oxford Clay and it is of note that the 50 km gap in records between Braydon and Wychwood on the Oxon/Bucks. border is largely across an area of the Thames Valley where the clay is overlain by river terrace deposits similar to those from which the tree is absent in south west London and the Medway Valley, Kent.

36. SOUTH WALES

There are very few current records for South Wales and if the species has ever been commoner there it could well have been largely restricted to the coast between Cardiff and the Gower and the immediate hinterland.

Many *Sorbus* species grow on cliffs close to the sea and their fruits fall on to the beach or into the water, sometimes in considerable quantities. They can also be washed down rivers into estuaries and must be able to travel for some distance by this means. From the beach to the cliffs is only a short distance for a bird or fructivorous mammal and some coastal colonies may have originated through seed being spread in this way rather than by overland routes.

Outside the Gower there are a few old records of probably planted trees in the Swansea area and another at Wenvoe south west of Cardiff. If they were indeed planted they could, as in some other places, have originated from wild trees in the area.

37. GOWER PENINSULA

There are several trees in the woods along the limestone cliffs on the southern side of the Gower Peninsula growing in similar circumstances to those in the Wye Valley, the Avon Gorge and the Arnside area of Westmorland.

Inland the Gower is almost covered in a sheet of Boulder Clay and there are no *S. tormalis* records.

38. CARMARTHENSHIRE

V.c. 44, now part of Dyfed, has records from three scattered locations that imply that the tree was once more widespread in lowland Wales. It is found at two sites in the heavily wooded Cwm Mawr valley on cliffs of Pennant Sandstone capped by Boulder Clay into which suckers are spreading. Further west there are five trees on a wooded estuarine Red Sandstone cliff of the Lower Devonian (also capped with Boulder Clay) north of Laugharne.

Well inland at Poor Man's Wood, near Llandovery, there are three trees in an oakwood that now belongs to the Dyfed Wildlife Trust on clay derived from rocks of the Upper Ordovician.

39. RADNORSHIRE AND BRECKNOCKSHIRE, POWYS

The Wild Service grows on cliffs of the Wenlock Series of the Silurian bordering the Wye to the south of Builth Wells and further upstream on similar cliffs by the River Ithon in v.c. 43, Rads. (now part of Powys). It is also found on this formation in Brecks. (v.c. 42) and further to the north. Further search will almost certainly reveal more locations in suitable lower lying parts of Wales, both inland and on the coast. In many cases plants have been kept small due to grazing by sheep, but several of these sites have now been fenced and the trees should now be able to grow to their full size.

40. SOUTH PEMBROKESHIRE

The Wild Service was first recorded formally from Pembro. (v.c. 45) only in 1971. Since then it has proved to be fairly widespread and even boasts a unique local name – maple cherry.

The majority of trees grow in oakwoods on the low cliffs or banks bordering the extensive estuarine system that runs out to sea at Milford Haven. The rock here is mostly Old Red Sandstone of the Lower Devonian and these groups of trees are analogous to those associated with some of the south Cornish estuary systems.

Further coastal records occur on the Coal Measure sandstones on the western side of Carmarthen

Bay and there are a few inland records from this geologically very varied peninsula north to the Newgale area (Anon. 1976).

Davis (1976) has observed that in this area the trees only fruit well after warm summers, confirming that it is a thermophilous species at the limit of its range in Britain. The same has been observed elsewhere in the west and the north in this country and elsewhere in Europe (Büsgen 1929; Conwentz 1895; Termena 1972). In the south of England the tree usually fruits well, but will frequently miss one, and sometimes more seasons, another phenomenon well-known in trees that prefer a warmer and sunnier climate than our own.

41. TEIFI AND NEVERN, DYFED

There are small Wild Service areas in woods adjacent to the lower reaches of the rivers Teifi and Nevern north of the Mynydd Preseli in northern Pembs. (v.c. 45) and southern Cards. (v.c. 46), now both in Dyfed.

The soils here are derived from Upper Ordovician rocks of the same type as those at Poor Man's Wood, Llandovery (see 38 above).

42. ABERAERON, DYFED

There is a scatter of records from the low-lying area inland from the coast at Aberaeron in Cards. (v.c. 46), mostly on steep, wooded river banks.

The soils here are derived from the Llandovery Series of the Silurian and cover much of western central Wales which is mainly free of boulder Clay and other drift. One record is from a hedge at Llangybi over 15 km from the coast and in a tributary valley of the River Teifi. The location is, however, still on the Silurian and falls within the grouping.

43. DOVEY VALLEY (CWM DYFI)

There is one record of a plant at the top of a steep, rocky, wooded slope in a valley off the main Dovey Valley between Machynlleth and the estuary. The whole of this area, as with 41 above, is on the Llandovery Series of the Silurian. The site is just in v.c. 47, Monts. (now part of Powys), and quite different from those in the east of the vice-county (see 56 below)

44. BARMOUTH

The most northerly of the west central Wales populations are the few trees that grow in steep, rocky woods on Cambrian formations close to the Mawddach estuary.

45. NORTH EAST SUFFOLK/SOUTH NORFOLK

There are a few records from the area to the south west of Southwold of trees growing on soils derived from the underlying Boulder Clay. One correspondent sent me leaves from the Southwold area and said he knew at least five sites for the species in the neighbourhood.

R. Mabey (pers. comm., 1976), has noted that members of the Yoxford Women's Institute knew that the tree grew wild in their district. This indicates that there may be more sites for botanists to discover in the area.

There is one outlier of this group of records well inland near Mendlesham, another near Hempsall south of Norwich (Withering (1818) said the trees grew at Bath Hills near Bungay not far from here) and a garden relict north east of Bury St Edmunds. The Wild Service has been quite widely planted in the past for ornamental and utilitarian purposes. The source of such plants is often local and older garden trees may indicate a wild population nearby.

Most of the woodland cover in East Anglia was removed long ago but a map in Rackham (1986) shows that this north east Suffolk/south Norfolk Wild Service area is broadly congruent with an area where villages still had their own woods at the time of the Domesday Survey in the 11th century. This area stretched north to the Foxley district in Norfolk (see 46 below).

46. CENTRAL NORTH NORFOLK

There are several Wild Services in Foxley Wood on the Boulder Clay sheet near Themelthorpe (E. Norfolk, v.c. 27) and a recent record from a wood at Mileham (W. Norfolk, v.c. 28), both to the north east of Dereham. Older records from the neighbourhood indicate that these are survivors from an earlier, more widespread woodland population.

47. SOUTH MIDLAND LOWER GREENSAND

There are five Wild Service locations along the Lower Greensand ridge that runs from south western Cambridgeshire to Leighton Buzzard in Bedfordshire. Although the correlation with the solid geology seems too close to be accidental, most trees are in fact on Boulder Clay and elsewhere the tree does not occur on soils derived from the Lower Greensand. Examination of the 1:50000 Ordnance Survey map shows that this ridge is more heavily wooded than the surrounding plain, perhaps because the countryside was less easily cultivated due to its hilliness. The survival of the Wild Service is almost certainly due to this rather than to the underlying solid geology.

48. BERNWOOD (BUCKINGHAM/OXFORDSHIRE BORDER)

There is a concentration of records of trees over the narrow, 16 km stretch of countryside from the Quainton, Bucks. area to just south of Oxford and associated with the ancient Forest of Bernwood.

None of this area is covered in glacial drift and most of the sites are in woods on Oxford Clay, with a few associated with the Greensand/Portland Beds complexes of the Kimmeridge Clay.

49. WYCHWOOD, OXFORDSHIRE

Before deafforestation, which followed enclosure in 1857, Wild Service berries from the Forest of Wychwood used to be sold in Burford market and probably elsewhere locally.

The tree continues to be found at low concentrations in some of the few remaining woodlands, nearly all of which are on soils deriving from the rather complex Oolite and Upper and Middle Lias, that typify the Cotswold belt. The tree seems not to be found on the adjacent Lower Lias and is scarce on this formation everywhere in the south and west and virtually absent from it in the north and east. On a site near Kineton in Warwickshire on the Lower Lias some 32 km north of Wychwood, the tree appears to be on the overlying Boulder Clay.

Scattered records occur westwards towards Cheltenham and the Vale of Evesham and there were once, no doubt, trees in the woodlands throughout the whole of this area.

50. CIRENCESTER/STROUD

There is a somewhat isolated group of records of trees in Cirencester Park some of which are planted, and records from the Tetbury and Painswick areas in the Cotswolds. These locations are not dissimilar to those cited in area 48 above and again one can surmise that the tree was once more widespread locally. The fact that there is a unique Cotswold name for the species – ‘lizzory’ or ‘lezzory’, clearly derived from ‘alizer’, one of the Old French words for the species (Boulger 1908) – lends support to this hypothesis.

51. VALE OF SEVERN

There are records of the tree, mainly from the Keuper Marl but also on the Lower Lias near Pershore, from Gloucester to Stourport. Sometimes the tree grows on cliffs by the river, but more often in woods and sometimes hedgerows nearby.

52. MALVERN

The Malvern and Suckley Hills and their southward extension to the outskirts of the Forest of Dean are one of the strongholds of the Wild Service in Britain and are clearly associated with the complex Silurian strata of the Ludlow, Wenlock and Llandovery Series that go to make up these hills. On the spur of this formation that runs north west towards Hereford the Wild Service reaches one of its highest densities in Britain with up to 125 trees per hectare in Haugh Wood near Mordiford. Stoke Edith Wood, also in this area, is the type location and the source of the only British records of the *British Red Data Book* moth, *Stigmella tormalis* (Wood), whose larvae, like those of several other moths, mine the leaves of the tree (Emmet 1976; Shirt 1987).

53. WYRE FOREST

The Wild Service is not uncommon in the Wyre Forest and neighbouring parts of Worcestershire, Shropshire and Staffordshire growing mainly on soils derived from the Westphalian Series of the Upper Carboniferous. In the forest itself it is widespread, but occurs particularly along the central Dowles Brook. While there are probably more soil nutrients here, it is possible that the tree was

encouraged by the millers who had premises along the Dowles since its wood was among the best for making cogs for mill machinery (Du Breuil 1854; Hanbury 1770; Hickin 1971).

54. UPPER SEVERN VALLEY

The tree is found north of the Wyre Forest along the Severn Valley showing a marked preference for the Westphalian Series and largely avoiding the Lower Old Red Sandstone to the west as it does everywhere in western central England and eastern Wales. It is not found on the river terrace deposits, a distinctive feature of its distribution everywhere. Records become far scarcer north of the limit of glaciation, though there are a few from Boulder Clay-free areas east and north of Bridgnorth.

55. WENLOCK EDGE AND THE WELSH MARCHES

As with the Malverns (52 above), the Wild Service has been recorded from much of the Wenlock Edge and associated Silurian areas, with a concentration to the north around Ironbridge. There are scattered records to the south west as far as the northern tip of Herefordshire and the Welsh border at Knighton. There is one site near Pontesbury to the south west of Shrewsbury and two in the Welsh hinterland, one on the Severn at Abermule and the other on the Afon Banwy (a tertiary tributary of the Severn) south of Meifod. Both these are in Monts. (v.c. 47).

Unlike the more southerly areas of this type, the rocks of the Wenlock and other series of the Silurian are overlain by Boulder Clay and glacial sand and gravel and all the *S. torminalis* records from this area are on, or very close to, drift deposits. Sinker *et al.* (1985) say that in the Shropshire region the tree is "a characteristic member of the ancient broad-leaved woodland community together with holly, yew and small-leaved lime on sandstones and other freely drained acid rocks as well as on limestone".

56. WEST SHROPSHIRE LIMESTONE

There is one old and one more recent record from the Carboniferous Limestone west of Oswestry. This area is well known for its apomictic *Sorbus* species that are so often confined to open limestone areas and in this case the Wild Service is responding in the same way. The nature of the terrain reduces competition for light from more vigorous tree species and allows the *Sorbus* spp. to reach maturity whereas on richer soils in the same neighbourhood they would be shaded out.

57. UPPER DEE VALLEY

There is a small group of records from the Upper Dee Valley on the Shropshire/Clwyd border between the point where the river debouches from the Vale of Llangollen downstream to Bangor-is-y-Coed.

Unlike the lower part of the valley, this area is still heavily wooded. The geology is varied with much overlying clay and gravel drift.

58. NORTH WEST MIDLAND PLAIN

There is a very thin scatter of records, many of them old, across the low-lying agricultural plain of north-east Shropshire, west Staffordshire and Cheshire. Much of the soil is heavy and derived from the thick sheet of Boulder Clay left by the last glaciation, while elsewhere there are glacial sands and gravels. The underlying Permian and Keuper Marl appear here and there.

There seem to have been concentrations of the tree to the north and west of Shrewsbury, to the south of the Potteries and in the Delamere Forest area, although these are based on very few old records. Elsewhere there are, or were, isolated trees.

It is possible that the species was once widespread in this area, although perhaps always rare. If one looks, for example, at the records from the sticky soils of the Culm Measures in central and north Devon, one sees a similar, though slightly denser, pattern of scattered records.

59. VALE OF CLWYD

There is a surprising concentration of records in the Vale of Clwyd, mainly in the area around Denbigh some way inland, but with an outlying station south of Prestatyn. Some of these records are associated with Carboniferous Limestone, but the area is extensively covered with Boulder Clay and the trees are growing in woods and hedges rather than on cliffs.

60. GWYNEDD COAST

One tree has long been known from the Craig y Gigfran on Garth Point, an area of Cambrian and Ordovician rock on the coast of the Menai Strait in Bangor.

I also have an unconfirmed record of a tree alongside the Conwy Estuary on the Benarth Estate to the south east of Conwy itself. My informant thought it might have been planted, but the geology and the general situation are of the type favoured by the species and the area warrants further investigation.

61. ANGLESEY

There is a long history of the species (possibly planted) at Trefarthen, near Brynsiencyn close to the Menai Strait in the south-west of the island (Davies 1813) although it has not been seen recently as far as I know. Non-native trees, including *Sorbus* spp., have been extensively planted in some parts of Anglesey (Sell 1989), but there is no overriding reason why the Wild Service should not be native here.

The underlying rocks in this part of Anglesey are metamorphic Horneblende Schists, but almost the whole island is overlain by a mantle of Boulder Clay.

62. LIVERPOOL

There is a record of a Wild Service on the rocks at Knot's Hole, Liverpool "in a situation quite exposed to the salt water, and where it must occasionally be washed by the spray of the sea" (Withering 1818). There have been no recent reports. In many ways this location is analogous to those where the species grows on various parts of the coast of Wales, or further north around Morecambe Bay. The rocks at Knot's Hole are New Red Sandstone.

63. FOREST OF ARDEN

There is a strong concentration of records in the area south of Birmingham that is roughly congruent with the ancient Forest of Arden. The trees are found in woods and hedges, almost entirely on Keuper Marl.

64. NORTH EAST MIDLAND PLAIN AND FOREST OF CHARNWOOD

North of the Arden area the tree becomes very much scarcer. Its chances of survival have been reduced by urban development and agriculture and, as is the case in other areas, it does not grow as successfully on the extensive Boulder Clay and drift as on other soils. As in the south Midlands and places further north, it is absent from the very extensive Lower Lias.

There is a small concentration of trees on the Westphalian Series of the Carboniferous east of Sutton Coldfield and another in the northern part of Charnwood Forest. Elsewhere the records, mainly from Keuper Marl, are very thinly scattered and mostly date back some considerable time.

65. STAFFORDSHIRE AND SOUTH DERBYSHIRE

There are scattered records from the Needwood Forest and Bagot's Park area of Staffordshire with an isolated hedgerow tree from a neighbouring part of Derbyshire. Most are on Boulder Clay, although the underlying stratum is Keuper Marl throughout.

66. NORTHAMPTONSHIRE AND ROCKINGHAM FOREST

The tree has long been known in northern Northamptonshire and north western Cambridgeshire in the old Rockingham Forest area. The early 19th century poet John Clare, who came from this neighbourhood, was familiar with the tree and called it by its local name of Surrey as well as Service Tree in his writing (Clare 1832). J. R. Gilson (pers. comm., 1977) has reported that parish bounds in the Rockingham Forest area used to be beaten with branches of the tree, and the branches also used to be carried at the head of village processions (Grindon 1883). All this indicates that the tree has long been familiar in the countryside here.

It now grows almost exclusively in woods, and occasionally hedges, on soils derived from the Oolitic limestone formations that are so characteristic of this area and generally avoids places where there is a Boulder Clay covering. This is in contrast to the examples immediately to the north where the reverse is true and Boulder Clay seems to be preferred.

67. RUTLAND AND KESTEVEN

There are still widespread records from this once heavily wooded area, although many trees were destroyed during the replacement of deciduous woods by conifer plantations after the Second World War.

The tree is particularly concentrated on the Boulder Clay spur followed by the Great North Road from a few km north of Stamford to Grantham and records extend westwards on a similar substrate to Dunsby in Lincolnshire. To the south east there are scattered records across the Vale of Catmose area and from beyond Oakham.

Both in Rockingham Forest and this area, pheasant shooting has been popular, particularly on the large estates, since the last century. Many Wild Service trees grow in the coverts where the birds are raised or roost and the birds are known to be very fond of its fruit (Conwentz 1895). This may, to some extent, have helped the tree survive as gamekeepers undoubtedly know what their birds like. In some cases the species could have been deliberately introduced, particularly into the smaller woods that are wholly artificial and that were established with game and foxes in mind.

68. HUNTINGDONSHIRE

There is a group of records from central Huntingdonshire and one to the south near St Neots. These are on Boulder Clay and the underlying Oxford Clay. In the case of the latter, it is remarkable how the cluster of records to the south-east of Sawtry (which includes Monks Wood) almost exactly matches a small area where the Oxford Clay is not covered by glacial drift.

69. BARDNEY FOREST, LINCOLNSHIRE

Although much of the countryside to the east of Lincoln is now conifer plantation, there are still some remnants of the ancient wildwood that persisted here until the middle of the 19th century and the area is noted for its rich wildlife.

Records of the Wild Service are numerous and are concentrated in an area only some 14 × 20 km in size. They grow almost entirely on the Boulder Clay, although a few records seem to be from the alluvial soils in the Witham Valley.

The topography and geology of much of central England is not dissimilar to that in this area and this strong population of the Wild Service may give some indication of the density it once reached in many other places.

70. NORTH LINCOLNSHIRE

There is one record of a tree in a hedge on the chalk in north Lincolnshire far from any other Wild Service trees. It is almost certainly introduced.

71. EAST NOTTINGHAMSHIRE

The Wild Service is well-distributed, mainly in woods, throughout the Keuper Marl of eastern Nottinghamshire with a couple of records, clearly belonging to this group, on the other side of the River Trent at Gainsborough. This preference for the Keuper Marl in an area largely free of drift is striking and, apart from one record on the New Red Sandstone near Thoresby, the species remains on its preferred soil throughout the Sherwood Forest area.

The Keuper Marl continues north through Yorkshire to Teesmouth and the sudden cessation of *S. torminalis* records is clearly related to the fact that from north Nottinghamshire the formation vanishes under a great sheet of drift.

72. PEAK DISTRICT

There is one record from Wild Cat Tor on the Carboniferous Limestone at Matlock (Willmot 1975). Other *Sorbus* spp. grow well on the limestone eyebrows and other habitats created by the geology of this area and in this instance the Wild Service is responding to the environment like some of the related *Sorbus* spp., especially the apomicts.

73. MAGNESIAN LIMESTONE

The Wild Service appears in woods on Magnesian Limestone from its southern extremity and follows it up the Nottinghamshire/Derbyshire border northwards to the Chadwick-le-Street area in South Yorkshire. There are now some 20 known locations along this limestone belt and its

associated mudstones despite the fact that the formation is never more than about 9 km wide (Willmot 1975). It is also largely free of drift and the species is clearly responding, as many other plants do on this formation, to the soil conditions deriving from the solid geology.

Beyond Chadwick-le-Street it reappears, after a gap of over 60 km, on a Magnesian Limestone cliff near Fountains Abbey in Mid-W Yorks. (v.c. 64). It seems perfectly natural on this site, which is the most northerly so far discovered on this side of the country, but one should always be wary of the status of plants with some economic value growing near ancient monasteries.

74. DERBYSHIRE COAL MEASURES

In 1974 four bushes of Wild Service were found in a hedge bordering a green lane at Staveley, Derbyshire on Coal Measure shales only 8 or 9 km from plants on the Magnesian Limestone (Willmot 1975). The species occurs on this formation in one place in Pembrokeshire, but otherwise nowhere else, although it is very widespread.

75. MORECAMBE BAY AND THE SOUTHERN LAKES

The Wild Service occurs on Carboniferous Limestone rocks and in lowland woods with glacial drift derived soils in a number of places around Morecambe Bay (Piggott 1973/74). In the Arnside area many of these woods are known to be ancient and were part of the Chase of Harnessed and the deer park created there in the 16th century. The wildlife and social history of the other localities where the Wild Service is found also indicate that their vegetation is of natural origin.

Often in these steep rocky areas the Wild Service responds like other members of its genus, particularly the apomictic species (on Jack Scout it grows with *Sorbus aucuparia* L., *S. rupicola* (Syme) Hedlund and *S. lancastriensis* E. F. Warb.) but, in Grubbins Wood and elsewhere, it grows in similar situations to those in the more heavily wooded areas of the south.

There are good reasons to believe that old records from Plumpton near Ulverston, Brigsteer and Levens Park are authentic and new sites in this area may remain to be found. As recently as 1987 a long-established Wild Service was found on a low cliff on the shore of Lake Windermere, a place one would have thought had been quite well-worked botanically. This is the most northerly site in Britain where the species can be accepted as native. There are a few old records from further north on the Cumbrian limestones, but these trees are almost certainly planted.

From time to time one hears of 'service trees' in north-east England and southern Scotland. Sometimes these are simply misidentifications, but the Swedish Whitebeam, *Sorbus intermedia* (Ehrh.) Pers., is very widely known as the Service Tree in this part of the country and this is often the species meant. The Wild Service has been planted at several places in Ireland (Forrest 1985).

CONCLUSION

The Wild Service tree is, as other authors have established (Peterken 1974), a useful species for indicating primary woodland and ancient hedgerows, as well as some other types of relatively undisturbed habitat, and it is more likely to be found in an area that is still, or was once, part of an ancient forest, but its presence on any particular site does require interpretation. Apart from biological and ecological factors and the history of land and forest management in the British Isles, the tree has economic, aesthetic and other qualities that have favoured its survival in some districts to a greater extent than would be the case with many other species.

While the present survey has been as comprehensive as possible, it is clear that the Wild Service remains under-recorded. Although it grows to a large size – I know one tree over 18 m tall and with a spread of 21 m, while trees of between 22 and 24 m have been reported from several parts of Britain and of 25 m from the Crimea and the Caucasus (Elwes & Henry 1906; Howard 1947; Conwentz 1895) – it is easily overlooked, and there are many areas that have not been thoroughly searched. Despite this, the limits of its range in the British Isles are now reasonably well defined: it is essentially a lowland tree of England and Wales and has not been reported in the wild from Scotland, Ireland, the Isle of Man or the Channel Islands.

Its range is unlikely ever to have extended to Scotland. In the Atlas Mountains, where the Wild Service and the Whitebeam, *Sorbus aria* (L.) Crantz, grow (Jahandiez & Maire 1931–34; Quezel & Santa 1962), the Whitebeam extends to higher altitudes and this is an analogue of the situation in Britain where the Whitebeam is found further north in a cooler climate than the Wild Service. The

Whitebeam and *Sorbus devoniensis* E. Warb. are both found in Ireland (Clapham *et al.* 1962) and the latter species has recently been reported from the Isle of Man (Proctor *et al.* 1989; Sell 1989). If both these species could cross the Irish Sea, there would seem no reason why other *Sorbus* spp. could not do the same, so it is worth continuing to look out for the Wild Service in these places.

HABITAT PREFERENCES

The Wild Service in Britain and elsewhere grows in several distinct and apparently dissimilar habitats, although an understanding of the requirements of the species goes some way to providing an explanation of its distribution. These habitats can be divided into four broad categories:—

1. Nutrient-rich soils, clays in particular (Brown 1894). The species is more abundant and grows better on some clays than others. It does well on Weald and Wadhurst Clay in the south-east, and on London Clay and Oxford Clay (in the latter instance especially where there are, or were, ancient forests). It is widespread on the Culm Measures in the West Country and the Keuper Marl from Somerset to Nottinghamshire. It is less common on Boulder Clay, but grows well where it occurs, and is virtually absent from Gault. One possible explanation is that it grows better on clays with a lower calcareous mineral content, although woodland management over the centuries is a more likely factor.

Woodland soils overlying clays often do not share the characteristics of the underlying stratum: they are usually lighter and more acid and may be modified by downwash or other local conditions. While the Wild Service can send its roots below the surface soil layer, the natural distribution (as is the case with any forest tree) is governed by the conditions in which it has to develop as a young plant and the superficial soil qualities are therefore an important factor.

2. Areas of hilly or undulating gravel terrace and similar formations deposited in the glaciations of the Tertiary or Quaternary periods. There is some evidence that its presence on these formations is associated with bands where the water content is higher due to the slope and the layering of the material (Kozlowski 1962). Such gravels are often accompanied by seams of clay which may improve the nutrient content locally.

Those who cultivated the tree in the past noticed that they did not fruit as well on freely-draining gravelly soils as on clay (Cook 1676).

3. Coastal and inland cliffs, rocky hillsides, landslips and similar open or disturbed habitats.

4. Large river valleys, especially those containing cliffs and rocky slopes.

The Wild Service is capable of becoming a large forest tree reaching the canopy layer, and its absence from lighter lowland soils may be due to the fact that it competes poorly with oak and other trees (Longman & Coutts 1974). If it is overshadowed by trees that grow more rapidly, the Wild Service can survive, but will not flower and fruit. Away from nutrient-rich soils it depends on open habitats where there is less competition and where it can flower and fruit more successfully. In these places chances of seed survival are also higher due to their becoming lodged in crevices and similar positions where predators cannot easily reach them. The young plants are also less likely to be damaged by browsing or grazing due to their inaccessibility.

The present pattern of distribution indicates that the Wild Service was probably widespread, if seldom abundant, on the stiffer soils in the forests that covered much of the lowlands of England and Wales in the past. In many places it has been severely reduced, or eliminated, by human activity and this has been compounded by its low rate of reproduction from seed compared with many other native trees. There are two main reasons for the latter: climatic and ecological. Gabriëlian (1961) contends that the species evolved in dry, open woodlands and there is ample evidence to show that climatic conditions affect the tree's ability to flower and produce viable fruit. Warm summers promote fruit formation (Davies 1976; Büsgen 1929) and increase the number of seeds per fruit. In the warmer, drier parts of Britain many trees often fruit only every other year and in marginal habitats, particularly towards the edge of the range, even less frequently. Termena (1972) has

shown that both temperature and humidity affect pollen viability and fruit production of the species in the Bukovina area on the borders of the Ukraine and Romania. In northern Poland good crops of fruit were only produced every 25 years (Conwentz 1895).

Although the fruit is avidly devoured by birds, Wild Service seems only rarely to be bird-sown (the seed, with its thin testa, is probably digested in the bird's gut) (Prime 1960). In large, lowland forests wild boar and other animals, including domestic pigs and cattle, may well have been important agents for the dispersal and burial of Wild Service seed: wild boar are known to like the fruit and the effects of their trampling on woodland ecology have been well-documented (Conwentz 1895; Darling & Morton Boyd 1969; Goodwin 1975; Tansley 1968). Elsewhere seed was, and still is, extensively predated by birds, small animals and invertebrates so that almost none remains (Corbet 1974; Janzen 1970; Tansley 1968; Termena 1972).

The wild boar as well as burying much seed by rooting and trampling, destroyed many small rodents (Tansley 1968) as did the much higher numbers of predatory animals and birds that were formerly widespread. Populations of voles and mice have increased substantially as predators have declined and animals like rabbits, grey squirrels and pheasants (all of which eat seeds or seedlings of Wild Service) have been introduced and have spread.

Like many trees and shrubs within the family Rosaceae, Wild Service seeds need a period of some three months of near freezing temperatures before germination will take place (Gordon 1982). In places where winters are longer and colder than in much of Britain, germination will normally take place in the first spring following seed formation whereas in Britain two or more years are often needed and the seed is at risk for far longer. This is true of many tree seeds, but the first spring germination that would have taken place more regularly during periods when the climate was colder could have helped the Wild Service to reproduce from seed in slightly larger numbers in those days.

While a cooler, less continental, climate and increased seed and seedling predation coupled with other factors may have reduced populations of the Wild Service and prevented recolonisation, its survival in ancient hedges and woodlands has been helped by its ability to reproduce from suckers. Wild Services live a long time: Mitchell (pers. comm., 1975) has estimated the age of large old trees to be around 200 years and many of these may themselves have arisen from suckers produced from an earlier generation of trees. Some mature populations – that in Epping Forest, for example – have been shown to originate largely from suckers (Lloyd 1977) and O. Buckle (pers. comm., 1975) was of the view that virtually all the Wild Services that he knew of in West Sussex (for which he was B.S.B.I. vice-county recorder) had originated from suckers. No one knows how far back these sequences may have extended since the original seeds germinated, but it is clear that the species can survive for long periods before conditions recur in which seeds germinate freely. Suckers are often mistaken for seedlings and care must be taken in reaching a judgement on the origin of a given tree (the root from which a sucker arose can often be discovered just beneath the soil surface).

As a result of the survey the Wild Service has, in the last 19 years, been shown to be more abundant than was thought and it is clear that it had been overlooked in many places. Its range is known to extend slightly further north than Morecambe Bay and further into Yorkshire than was realised. It is also widespread, though rare, in the lower lying parts of Wales. There are, however, many areas in the British Isles where it might be expected to occur from which it has not been reported.

More evidence has come to light to show that the tree was formerly more abundant than today, though probably never common in most areas. There is no doubt that the species is found almost exclusively in ancient woodlands and hedges or on rocky outcrops, unless planted, and its value as an indicator of primary woodland is confirmed.

The survey has also revealed that the tree has had a considerable social and economic role much of which has not hitherto been recorded or gathered together and which has undoubtedly affected the current pattern of distribution since the tree has been conserved and planted in some areas and neglected or destroyed in others. This is the subject of a separate paper (Roper 1987).

Although the formal survey of the Wild Service is now complete, I am always interested to have any new records or information about the natural or social history of the tree. There is much work still to be done on its associations with insects, fungi, bryophytes and lichens and the uses to which the fruit and the wood were put.

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Cardamine bulbifera (L.) Crantz (Cruciferae) in the British Isles

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ABSTRACT

The taxonomy, reproduction, dispersal, habitats and distribution of *Cardamine bulbifera* (L.) Crantz (Cruciferae) in the British Isles are described, and all localities traced are listed. It is currently known from about 155 native and 27 introduced sites. It is a scarce plant in Britain; the main threats to its survival are woodland replanting and clearance.

INTRODUCTION

Coralroot (*Cardamine bulbifera* (L.) Crantz)* was first recorded in Britain by J. Goodyer, “at Mayfield in Sussex in a wood called Highreede”, in 1634 (Wolley-Dod 1937), and it is now known to be a very local, native plant of ancient woodlands in South East and Central England. It is widely introduced elsewhere in England, Scotland and Ireland. On continental Europe, the plant is also local, occurring widely from central France eastwards (though rare near the Mediterranean coast) to the Black Sea, the Caucasus and northern Iran, and northwards to 64° in southern Scandinavia.

At least 13 species of *Cardamine* have been recorded in the British Isles. In addition to *C. bulbifera*, there are five other native species: *C. amara* L., *C. flexuosa* With., *C. hirsuta* L., *C. impatiens* L. and *C. pratensis* L. (Rich 1991). *Cardamine chelidonia* Lam., non L., *C. glanduligera* O. Schwarz, *C. heptaphylla* (Villars) O. E. Schulz, *C. kitaibelii* Becherer, *C. pentaphyllos* (L.) Crantz, *C. raphanifolia* Pourret and *C. trifolia* L. have been reported as introduced and are variously naturalized. *C. bulbifera* is easily distinguished by the large pinkish-purple flowers, scaly rhizomes and axillary bulbils. Some authors (e.g. Rose 1981) transfer *C. bulbifera* to the genus *Dentaria* L.

Cardamine bulbifera is considered to be a scarce plant in Britain (Stewart & Pearman 1991). The purpose of this paper is to document its ecology, occurrence and current status.

TAXONOMY AND VARIATION

Cardamine bulbifera shows little morphological variation. Schulz (1903) and Hegi (1958) noted a number of varieties and forms, of which only two have been noted in Britain, in addition to the typical *C. bulbifera* forma *bulbifera*. Forma *ptarmicifolia* (DC.) O. E. Schulz is distinguished by the broadly serrate teeth on the leaves; the leaflets also tend to be ovate and more asymmetrical (Fig. 1), and the plant is generally bigger and with browner bulbils. It is probably native in scattered localities through Europe to the Caucasus but appears commonest in the Alps, and has been introduced to

*Nomenclature follows Stace (1991), and Jones (1964) for *Cardamine*.

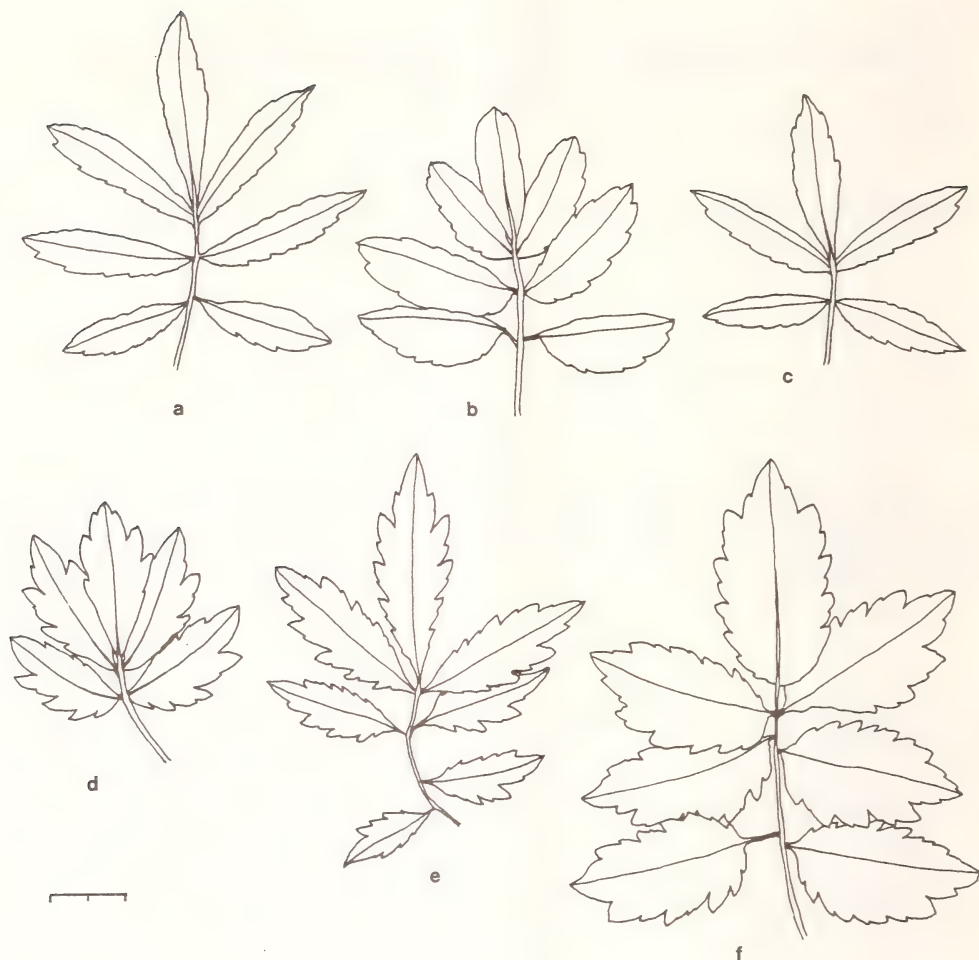


FIGURE 1. Basal leaf shapes of *Cardamine bulbifera*. a–c, forma *bulbifera* (native). a. Fennels Wood; b. Booker Common; c. Hawkhurst. d–f, forma *ptarmicifolia* (introduced). d. Silverdale; e. Trudoxhill; f. Warley Place. The scale bar is marked in cm intervals.

and naturalized in a number of localities in Britain. Forma *lactea* (Wirtgen) O. E. Schulz has white petals, and has only been cultivated in flower beds at Saville Gardens, Windsor Great Park (v.c. 17). Rich (1991) provides a description of native British material.

Examination of herbarium material of typical *C. bulbifera* show clinal variations in leaf shape across its natural distribution. The variation is most marked in basal leaves, but as these are rarely collected the variation is illustrated from middle stem leaves which are generally present on herbarium specimens (Fig. 2). Material similar in leaf shape to those of native British plants occurs in most of western Europe, specimens from Belgium being identical. Plants with broad leaves tend to occur mainly in the Alps. In Scandinavia, the leaflets tend to be longer and less toothed, and eastwards towards the Commonwealth of Independent States, the leaf shape is often narrower. In Bulgaria, Greece and Turkey, at the S.E. end of the range, the leaf margins often have pronounced teeth (but not as pronounced as in forma *ptarmicifolia*).



FIGURE 2. Clinal variation in representative middle stem leaf shapes of *Cardamine bulbifera* (distribution map redrawn from Hegi 1958). Outlying localities are shown as dots (●). The leaves are not drawn to exact scale.

REPRODUCTION AND DISPERSAL

Amongst the British flora, *C. bulbifera* is unusual in that it mainly propagates vegetatively by the axillary bulbils. The bulbils are probably reduced shoots with fleshy scale leaves (Hegi 1958), and are typically about 1 cm long, and black to dark purple. They are readily dislodged from the plant from June onwards. They fall to the ground and, after about four weeks, adventitious roots appear from the axils of the scale leaves, and then a few first leaves. In the second year, the plant produces the typical scaly rhizome with basal leaves, and in the third or fourth year, aerial shoots. Plants grown from bulbils have flowered in their third years in Britain (Ferroussat 1982). Occasionally, bulbils may start developing whilst on the plant; a plant brought to Maidstone Museum in late 1986 had some bulbils 10 cm long (E. G. Philp, pers. comm., 1989).

Many authors note that although flowering is common, *C. bulbifera* seldom produces ripe fruit or viable seed. Schulz (1903) had only seen fruiting specimens five times, and noted that they were all from near the coast, and that where it did fruit, bulbils were less numerous or not formed at all. This latter observation does not appear to apply to British material, fruiting plants regularly having bulbils. Hegi (1958) noted that fruit is only set under special conditions, usually in areas with high humidity and fresh limestone soils. These observations appear to be based on only a limited selection of material; examination of specimens at **K** and **BM** suggests that fruit set becomes more frequent at the south east end of the range, and in Turkey, some populations reproduce solely from fruit, lacking bulbils altogether. Reproduction by bulbils, does, however, seem to be the norm in Western Europe, and there may be a trade-off between fruit set and bulbil production – if the latter are stripped off the plant, fruit set is apparently more likely (Hegi 1958).

In the field in Britain, at least, it is generally not difficult to find a few fruits. Fruits are always borne on the larger plants (typically 22–25 cm tall, compared to the normal average of 19–21 cm).

whose stems and foliage remain green and fresh until the seeds are shed. Thus if a patch of flowering plants is revisited in June, there may be one or two fruits maturing on a small proportion of the plants, whereas on the remainder, the small green ovaries which showed some initial development will have dropped off and the plants will have started to die back. In July, when the fruits are ripe (though green) the seeds may be scattered a considerable distance when the siliquae dehisce explosively (as in some other species of *Cardamine*) (Showler 1988). These seeds can be germinated successfully, and plants grown from seed may flower in their third year (Ferroussat 1982). Fruit set appears to have been unaffected by the opening up of the tree canopy by the great storms of 1987 in Britain (C. I. Pogson, pers. comm., 1988).

None-the-less, the sexual reproductive performance of the plant is well below its potential. The plants flower for only a very short period of time in late spring, and Clapham (Clapham *et al.* 1987) reports that they are rarely visited by insects. B. (1866) notes that the flowers have a faint, sweet scent. Ferroussat (1982) noted that plants at Old Park Wood were pollinated by Orange-tip (*Anthocharis cardamines* L.) and Green-veined White (*Pieris napi* L.) butterflies, together with the Raspberry Beetle (*Byturus tomentosus* Degeer (*B. urbanus* Lindemann)) and flies. Occasional visits of beetles and flies have been seen during the current survey, though it is not known if these were pollinators. Often only a small proportion of the plants flower, many reproducing solely by bulbils. The flowers may require cross-pollination (many crucifers have well-developed self-incompatibility systems) to produce seed. Some stamens and ovaries may have retarded development (Hegi 1958), pollen grains may degenerate, and some ovules do not develop at all. There is no support for the observation of Deakin (1871) that the flowers "are often imperfect". The species is a high polyploid with $2n=96$ (duodecaploid) (Clapham *et al.* 1987), and the reduced fertility may also involve abnormal chromosome behaviour. Hegi (1958) points out that such reductions in fertility are often associated with taxa of hybrid origin, but there is no evidence to suggest this in *C. bulbifera*.

Cardamine bulbifera spreads vegetatively by creeping rhizomes and often forms patches.

Bulbils (and seed) may be dispersed naturally in a number of ways. Hegi (1958) reports that bulbils are often carried by ants in continental Europe, but this has not been observed in Britain. Many localities in Kent and Sussex are on, or close to, river banks and ditches, suggesting that dispersal by water may occur; Rose (1966) suggested that this may govern its micro-distribution in the Weald. Bulbils may also be transported by wheels, hooves or muddy boots; the majority of localities in the Chilterns and close by (v.cc. 20, 21 and 24) are alongside footpaths, though this could also reflect other ecological factors. It is also possible that small mammals play some part in distribution, but this has not yet been noted.

Whatever the mechanism, dispersal is obviously a limiting factor of distribution. Plants are often locally abundant but absent from apparently suitable sites nearby. On a wider scale, the distribution is often irregular and disjunct, and there are many gaps between populations (e.g. Hegi 1958). The plant does not appear currently to be limited climatically in Britain; it survives well in many introduced localities outside its native range, often persisting for long periods of time and spreading, as at Glenbervie (v.c. 91), where, since 1934 or before, it has colonised many parts of the extensive grounds and now forms a very large population.

HABITATS

In South East England, *C. bulbifera* is associated with two distinct types of woodland; first, the wet, generally acidic woodlands of the High Weald in Kent and Sussex, and second, the Chiltern Beech woods which are drier with basic soils. These two types are referred to subsequently as the High Weald and Chiltern.

The High Weald woodlands occur on both sides of the Kent-East Sussex border. They are for the most part ancient woodlands, often now broken into quite small areas, called 'shaws' or 'rews' – thin strips of woodland left between fields (Whitebread *et al.* 1989a, b). They have survived clearance primarily due to the presence of the many small, steep-sided streams or gills, which make the land unsuitable for agriculture. The soil is generally acidic to neutral (the soil pH ranged from 5 to 7) and clayey, and the tree canopy is predominantly *Quercus robur* L., *Fraxinus excelsior* L. and *Carpinus*

betulus L. (Table 1). In the shrub layer, *Corylus avellana* L. is common, often with much *Crataegus laevigata* (Poiret) DC. The herb layer is usually very dense with many spring flowers such as *Hyacinthoides non-scripta* (L.) Chouard ex Rothm., *Mercurialis perennis* L., *Ranunculus ficaria* L., *Lamium galeobdolon* (L.) Ehrend. & Polatschek and *Allium ursinum* L. *Carex pendula* Hudson is common in the damper places, and it is here especially that *C. bulbifera* is to be found, most frequently on the lower levels of the gills. It is often easiest to find the plant by walking up the stream beds, but even then the plants may not be easy to spot as in dappled sunlight small patches can be easily overlooked amongst *H. non-scripta* and other species of a similar height, and they are often very localised. For instance, by the Kent Ditch (a small stream marking the Kent-Sussex border for much of its length), *C. bulbifera* can occur on one bank but not the other 50 cm away. Many populations only have 15–20 flowering plants, usually, though not always, with juveniles, all occurring within a radius of 2–3 m. Plants are not always restricted to stream banks, and may be found nearby in damp, shaded areas of woodland. At a number of stations colonies are found on damp, sloping road verges, though these are often associated with ditches or water seepage.

Almost all the Kent and East Sussex sites are on Weald Clay or Wadhurst Clay and are of the High Weald habitat, as are the native sites in Surrey (two now destroyed) and those in the eastern part of West Sussex. However, at Harting (v.c. 13) (where the plants are probably introduced), High Rocks (v.c. 16) and Hawkenbury (v.c. 16), the plants are found on sandy soils. The single plant found near Brown's Wood (v.c. 14) is from a sandy road verge.

In contrast to the High Weald habitat, the Chiltern woodlands where *C. bulbifera* is also found are typically with a canopy of *Fagus sylvatica* L., often with some *Prunus avium* (L.) L. and *Fraxinus excelsior*, an understorey of *Corylus avellana* and *Ilex aquifolium* L., and a sparse herb layer (Table 1). The woodlands are relatively dry and on slopes, though aspect appears unimportant. The soil is generally a very thin layer of clay with flints over chalk; the pH of the soil around the roots of the plant ranges from about pH 6.0 to 7.5, and often there is a considerable amount of leaf litter. Hughes (1988) and Robinson (1988) acknowledge that *C. bulbifera* is a plant of ancient woodland and almost without exception, these woodlands are classified as such (Table 2). The herb layer confirms this, typically consisting of sparse *Mercurialis perennis*, *Rubus* spp., *Hedera helix* L., *Galium odoratum* (L.) Scop., *Arum maculatum* L. and *Lamium galeobdolon*. *Hyacinthoides non-scripta* is often absent reflecting its preference for the more acidic soils, and *Carex pendula*, a common associate in the High Weald, is totally absent.

Cardamine bulbifera can be found in such Chiltern woodlands in Buckinghamshire, Hertfordshire and Middlesex, generally in small patches or strips along the edges of footpaths or close to them. The sparse ground layer and gently sloping terrain makes the plants more conspicuous than in the High Weald woodlands. Again there are frequently only 20–30 flowering plants (though 100–150 is not uncommon), but the number of juveniles ranges from very few to several thousand. The plants will grow through a thin covering of *Mercurialis perennis*, *Rubus* spp., or *Hedera helix*, and sometimes *C. bulbifera* grows in open areas where leaf litter has blown clear, usually as a tight patch. There are only two Chiltern sites on road verges, but this may be because wooded verges are much less common in the Chilterns than the Weald. There is no association with water, and only two Chiltern sites are anywhere near water courses and one of these is man-made.

The plants in Staffordshire in the ancient Needwood Forest are found in a habitat which approximates to the Chiltern type, but are on flat land and on Keuper marl, not chalk.

Plants can often be found in replanted ancient woodland, provided that there has not been too much disturbance to the soil and ground layer. They are able to survive in deciduous woodlands, but are lost under dense conifer shade. Trimen (1862) noted that in Sussex "it appears to like copses recently cleared of underwood".

Elsewhere in Europe, *C. bulbifera* also occurs in a similar range of acidic and basic woodlands (e.g. Keller 1988), though most authors only note that it is characteristic of base-rich Beech woods. Hartmann (cited in Hegi 1958) suggests that in the more continental areas it prefers damper soils, and at lower altitudes, base-rich soils. In Southern Europe, it only occurs in the mountains, and often on north-facing slopes.

Table 2 classifies the known stations by woodland type as identified in the N.C.C. Inventories of Ancient Woodland (Hughes 1988; Robinson 1988; Whitebread *et al.* 1989a, b; Hutton 1990) for each vice-county. It should be borne in mind that areas of less than two hectares are excluded from these inventories so that some small sites are not classified.

TABLE 1. VASCULAR PLANT SPECIES RECORDED WITHIN 2 M OF *CARDAMINE BULBIFERA* IN THE HIGH WEALD AND CHILTERN HABITATS
Only species occurring in 15% or more of either site are included; a further 56 species were also noted at lower frequencies.

Species	Recorded in % of sites	
	HIGH WEALD* (n = 27)	CHILTERN (n = 57)
<i>Acer pseudoplatanus</i>	15	12
<i>Alnus glutinosa</i>	19	0
<i>Carpinus betulus</i>	52	16
<i>Corylus avellana</i>	48	25
<i>Crataegus laevigata</i>	22	0
<i>Fagus sylvatica</i>	11	74
<i>Fraxinus excelsior</i>	26	33
<i>Ilex aquifolium</i>	7	21
<i>Prunus avium</i>	0	16
<i>Quercus</i> spp.	26	9
<i>Allium ursinum</i>	19	2
<i>Arum maculatum</i>	4	30
<i>Carex pendula</i>	30	0
<i>Circaea lutetiana</i>	15	5
<i>Galium aparine</i>	41	19
<i>Galium odoratum</i>	7	33
<i>Geranium robertianum</i>	15	7
<i>Hedera helix</i>	70	37
<i>Heracleum sphondylium</i>	15	2
<i>Hyacinthoides non-scripta</i>	30	30
<i>Lamium galeobdolon</i>	26	21
<i>Melica uniflora</i>	7	24
<i>Mercurialis perennis</i>	45	58
<i>Ranunculus ficaria</i>	19	11
<i>Rubus</i> spp.	74	69
<i>Urtica dioica</i>	19	16

* excluding High Rocks.

DISTRIBUTION

In Britain, *Cardamine bulbifera* is currently known as a native species in Sussex (v.cc. 13 and 14), Kent (v.cc. 15 and 16), Surrey (v.c. 17), Hertfordshire (v.c. 20), Middlesex (v.c. 21), Buckinghamshire (v.c. 24) and probably Staffordshire (v.c. 39) (Fig. 3). It has not been recorded in its sole Berkshire (v.c. 22) locality since 1944.

In view of their isolation from the other sites in South East England, and the regularity with which the plant is introduced, the Staffordshire sites must be viewed with caution. The first record from Pendeford (Pitt 1796) was unusual in that it occurred in "hedge sides on this farm"; however, Pitt's list also included other species of old hedgerows (e.g. *Rhamnus cathartica* L., *Frangula alnus* Miller) and is packed with detailed, careful botanical observations and there is no obvious reason to reject the record. There are at least three localities around Needwood Forest, which have sometimes been suggested to be introduced (Edees 1972), and there is an undoubted introduction at Trentham. Edees (1972), whilst quoting it as "rare and of doubtful status" accepts Pendeford and Blithfield as native localities. D. P. Earl (pers. comm, 1987) notes that colonies he has seen recently "look native on the Keuper Marl" but also points out that none of these are far from houses and two are close to a road or track, suggesting that they may have originally been planted. The evidence from Chiltern populations, also associated with tracks, suggests that this need not necessarily be so, but 'looking native' is not always a good guide to status either (Webb 1985). As the early dates of recording lend

TABLE 2. ASSOCIATION OF NATIVE POPULATIONS OF *CARDAMINE BULBIFERA* WITH ANCIENT WOODLANDS AS CLASSIFIED IN THE N.C.C. INVENTORIES OF ANCIENT WOODLAND

Vice-county	No. sites	Ancient woodland		Other habitats*
		Semi-natural	Replanted	
13. W. Sussex	8	4	1	3
14. E. Sussex	33	19	4	10
15. E. Kent	3	3	—	—
16. W. Kent	19	12	6	1
17. Surrey	1	—	1	—
20. Herts.	12	7	—	5
21. Middx.	2	2	—	—
24. Bucks.	56	38	13	5
39. Staffs.	2	—	2	—
Total	136	85 (62%)	27 (20%)	24 (18%)

*includes sites too small (less than 2 ha) to classify.

support to its native status, and as the plant also occurs in disjunct localities elsewhere in Europe, we currently accept the Needwood Forest plants as native.

Elsewhere in the British Isles, the plant has been introduced. It is often grown in gardens, perhaps as an unusual plant – it is certainly a pretty, early-flowering plant which can tolerate dense shade, though there are many other species with these attributes which flower for longer periods of time. Clear evidence is hard to come by, but *C. bulbifera* appears to have been cultivated in large gardens for many years (e.g. B. 1866). Once established, it can often increase rapidly and become almost a weed, as at Uffculme (v.c. 3), and at Knightshayes Court (v.c. 4) and Cliveden (v.c. 24) where it appears sporadically in flower beds. Escapes to adjacent verges or woodland, as at Bath (v.c. 6), Wellingore Hall Park (v.c. 53) and Silverdale (v.c. 60), are not uncommon, and it may persist for long periods of time. There are also many scattered records for introduced plants from the 1920s and 1930s, where it can no longer be found. Bulbils are easily collected, and the flourishing colony at Trentham (v.c. 39) may well have originated from the plants at Yoxall, and the casuals in v.c. 95 could have come from Glenbervie, not many kilometres away. Interestingly, the majority of West Country introductions are of forma *ptarmicifolia* suggesting a common origin. It would certainly be instructive to learn more of the history of the known introductions.

The plant has also been recorded as introduced to some localities in Germany (Hegi 1958).

RECORDS

Records have been collated from national and county Floras, journals, correspondence with the B.S.B.I. vice-county Recorders and numerous other botanists, and from the following herbaria: **BEL, BM, DBN, K, OXF, LANC, RNG, TCD and YRK**. Full details, including population forms, are lodged at the Biological Records Centre, Monks Wood.

In the following list of localities, vice-counties or sites where the plant is introduced are marked with an asterisk (*). The records are given in order of vice-county, 10-km square, and tetrad (tetrad nomenclature follows Ellis 1986). Exact grid references are given where known for extinct or unvisited sites. The names for modern sites are largely those on the First or Second Series 1:25,000 or 1:50,000 Ordnance Survey maps. An estimate of the total number of plants is given for most sites (sometimes only as the number of flowering plants counted). All undated sites have been visited recently between 1987 and 1992 by A.J.S., often with help from co-workers, unless otherwise stated. Sites where we have seen material of forma *ptarmicifolia* are noted.

*V.c. 3, S. Devon: Bere Ferrers (SX/4.6L), 1916, C. W. Bracken (Martin & Fraser 1939), presumed

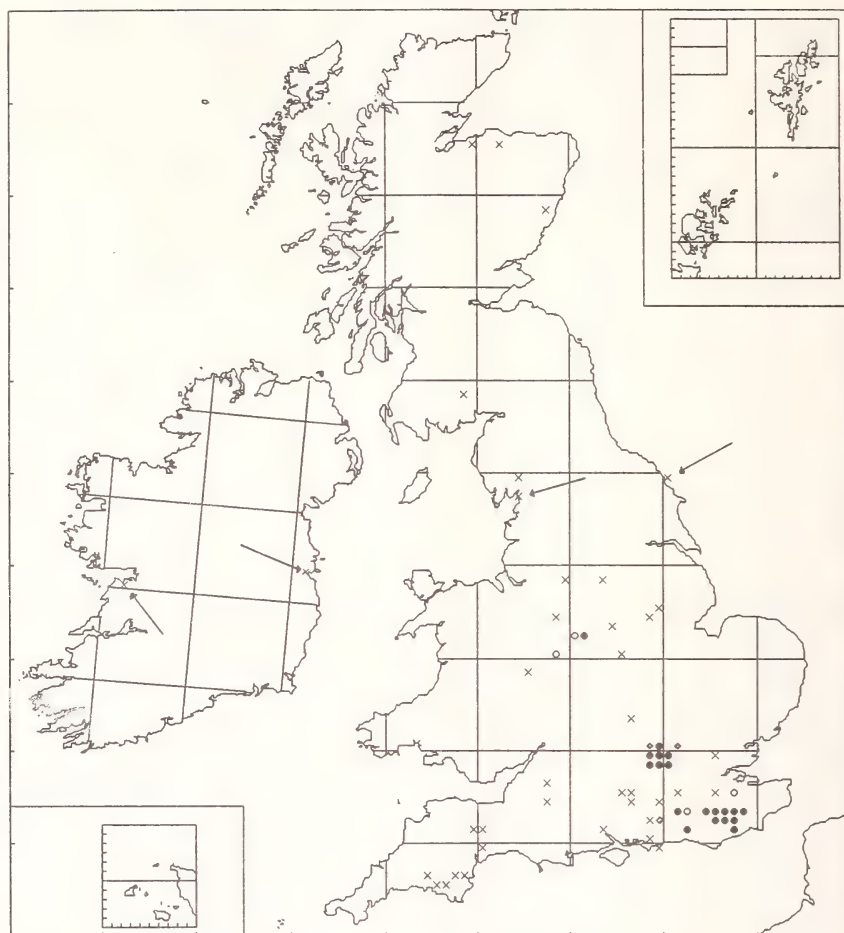


FIGURE 3. Current 10-km square distribution of *Cardamine bulbifera* in Britain and Ireland. ● native 1987 onwards, ○ native pre-1987, × introduction (all dates), ◇ record of uncertain status.

extinct. Plymstock (SX/5.5B), Plympton (SX/5.5N) and Harford (SX/6.5J), 1913, H. W. Smith (Martin & Fraser 1939), presumed extinct. Dartington Hall (SX/7.6W), woodland area of garden, C. Smith. Torbryan Plantation (SX/8.6I), "introduced by Mr Ogilvie and now spreading" (Martin & Fraser 1939), presumed extinct. Venn Ottery (SY/0.9R), over 800 plants, shaded lane verge, escaped from adjoining garden, W. Tucker (forma *ptarmicifolia*). Uffculme (ST/0.1R), garden of Yondercott House, thousands of plants over 0.25 hectare, in thin, damp woodland, Miss R. G. Laidlaw.

*V.c. 4, *N. Devon*: Sherwill (SX/7.6), 1884, Wainwright (Martin & Fraser 1939). Knightshayes Court, National Trust (SS/9.1S), gardens by house, Miss R. G. Laidlaw (forma *ptarmicifolia*).

*V.c. 6, *N. Somerset*: Millards Hill, Trudoxhill (ST/7.4L), in shrubbery and roadsides, escaped from Millards Hill House, P. Green & R. G. B. Roe (forma *ptarmicifolia*). Smallcombe Wood, Bath (ST/7.6S), scattered throughout but more frequent near ruins of adjacent garden, R. Randall & R. G. B. Roe (forma *ptarmicifolia*). Prior Park, Bath (ST/7.6), at one time abundant, destroyed by building work (Murray 1896). Batheaston (ST/7.6Z), about 500 plants, shaded track behind houses, probably dumped from garden, D. E. Green & R. G. B. Roe (forma *ptarmicifolia*).

*V.c. 11, *S. Hants.*: Millbrook (SU/3.1W), J. F. Rayner (1915); presumed extinct.

- *V.c. 12, *N. Hants.*: Long since disappeared from East Ockley House (SU/5.5Q), D. H. Scott. Small copse near Preston Candover (SU/6.4), 1879, H. R. P. Fitzgerald, and Basingstoke (SU/6.5), 1916, G. W. Willis (Townsend 1904; Rayner 1929).
- V.c. 13, *W. Sussex*: *Hotham Park, Bognor (SZ/9.9J), garden of former Bognor Museum, now demolished (H. W. Matcham teste M. Briggs). *Hunstan Copse (SU/8.0, R/Q), H. L. F. Guernonprez, ancient wood; searched for recently without success by N. J. H. Sturt, and probably last seen in the 1940s by F. Rose (pers. comm. to Mrs M. Briggs, 1987). *Harting Combe (SU/8.2C), one large clump, road side in Beech wood. A record for SU/8.2D (Hall 1980) is probably an error for this site. Half-way between Midhurst and Petworth (SU/9.2); this record, cited in Arnold (1907) and Wolley-Dod (1937), is based on a specimen said to be in **herb. Borrer**, which cannot be traced at **K**. Although the area is suitable, there are no other records and this site must be treated with caution. Warnham (TQ/1.3), "small copses in the parish", 25 April 1862, H. Trimen (Trimen 1862); exact site not traced, and presumed extinct. Langhurst Copse (TQ/1.3S), wooded verge south of, 2000+ plants. Tickfold Gill (TQ/1.3T), by stream in wood, 29 plants ("hundreds" were reported for this site in 1987, F. Rose *et al.* (pers. comm. to M. Briggs, 1987) so possibly overlooked). Nuns Wood (TQ/1.3, X and Y), a few plants in the woodland at the southern end, Mrs M. Briggs, 1961, and very sparse in western stream gully in 1988. Great Benhams (TQ/1.3Y), north of, about 200 plants, shaded bank of Boldings Brook by bridge; this site is declining due to invasion by *Heracleum mantegazzianum* (A. Knapp, pers. comm., 1992). Horsegills Wood, Rusper (TQ/1.3Y), wet woodland, 600+ plants, Mrs M. Briggs, 10 May 1991. Terry's Cross (TQ/2.1H), 500 plants in hedge. (The record for TQ/2.2M (Briggs 1990) is an error.) Faygate (TQ/2.3), near, C. E. Salmon (Wolley-Dod 1937), probably extinct. There is a 40-column record card held at B.R.C. with details "Rusper, 11 June 1957, Collyers School Herbarium" which has the grid reference "TQ/20-32-". As this grid reference refers to Roffey, Horsham, about 5 km south of Rusper, and *C. bulbifera* is known near Rusper in TQ/1.3, this record is dubious. Unfortunately, the Collyers School Herbarium cannot now be traced (Kent & Allen 1984) and it is impossible to check if the grid reference was correctly transcribed, or was added later to the B.R.C. card.
- V.c. 14, *E. Sussex*: Withyham (TQ/4.3X), 140 plants in wood by Hewkins Bridge and also in churchyard, Miss E. J. Rich, 1992. Mayfield, Lawyers Wood (TQ/5.2T), Miss E. J. Rich, 6 July 1987; fruiting plants seen in 1992. Highreede Wood, Mayfield (TQ/5.2), J. Goodyer 1634; exact site not traced (Wolley-Dod 1937). Old Place Farm (TQ/5.2Y), one plant, E. side of road, Mrs P. Donovan, 1992, and roadside copse, Miss E. J. Rich, fruiting in 1992. Coggins Mill, by bridge (TQ/5.2Y), Miss E. J. Rich, 1992. Heronry Wood (TQ/5.2Z), 15 plants, wet muddy area close to entrance of wood near stream. P. C. Hall noted it as abundant in this wood when he was recording for the *Sussex plant atlas* (pers. comm., 1991) so possibly some colonies were overlooked. Furnace Wood (TQ/5.2Z), 6 m long patch on east verge of lane, Mrs P. Donovan, 1992. Banky Wood (TQ/5.2Z), four scattered groups in wet woodland, some on stream bank. TQ/5.3N, Hall (1980), further details not traced. Houndsell Place (TQ/5.3V), in 'wild garden' (wood), P. C. Hall, 26 April 1970. Mark Cross (TQ/5.3), in a hedge by the road side about a mile (1.5 km) from (Deakin 1871); presumed extinct. Great Wood (TQ/5.3X), P. C. Hall, 31 May 1969. Coggins Mill, (TQ/6.2D) stream bank 200 m east of, Miss E. J. Rich, 1992. Tidebrook (TQ/6.2E), large numbers of plants along 50–100 m length of road verge in woodland, and 20 flowering plants in damp, shady woodland to north. Mousehall (TQ/6.2E), 110 plants in lane east of Mill, and two in garden of Mousehall Cottage on old dam embankment, Mrs E. Gibb, 1992. Sharnden (TQ/6.2E), about 40 plants, wet woodland. Hawksden Park Wood, west of Hare Holt (TQ/6.2I), about 15 plants in hedgebank and ditch. Foxholes Wood (TQ/6.2G), J. Goodyer, 1634; not seen subsequently (Wolley-Dod 1937). TQ/6.2K, Hall (1980), exact site not recalled, possibly Cox's Mill (pers. comm., P. C. Hall, 1991). Burwash Weald (TQ/6.2L), three sites: steep bank near Mousehole Farm, 325 plants; Willingford bridge, 25 flowering plants on steep woodland stream bank and then clumps along the north bank of the R. Dudwell for about 1.5 km S.W. of bridge (F. R. Philips, pers. comm., 1987); Blackbrooks, about 100 scattered, flowering plants in wood. Coalpit Wood and Wet Wood (TQ/6.2M), about 500 plants in damp woodland. Wood N.W. of Stonegate Station (TQ/6.2, N & T), about 100 plants in damp Hornbeam wood. Rye Green Farm (TQ/6.2R), two sites: woodland west of farm with about 100 scattered, flowering plants; Bog Wood, 100 flowering plants on south bank, 60 on north bank. Bateman's (TQ/6.2R), 140 plants

flowering along 25 m of dense hedge, and 500 plants in copse to north. Fonthill Farm (TQ/6.2W), farm track, 60 plants. Copse between Boarders Farm and Dudwell House (TQ/6.2X), P. C. & J. F. Hall, 31 March 1968; site now destroyed. Shoyswell Wood (TQ/6.2, ?Y/Z), Mrs M. Warren, 1972 (there is some doubt about the exact location of this site as the original grid reference was given as TQ/688.261). Burgham (TQ/699.284Z), un-named wood N.W. of, Mrs M. Warren, 1972. Wardsbrook Farm (TQ/6.2Z), about 500 plants in wood by stream. Singehurst Farm (TQ/6.2Z), neglected, small, swampy wood S.E. of, probably only a few plants, Mrs L. B. Burt, 1984; not seen in 1989 but probably overlooked. Rivenhall (TQ/6.3B), large patch (5 m long) on road verge with a few plants in ditch behind, Mrs M. Vincent-Smith, 1992. Brown's Wood, road verge opposite Coker's Down (TQ/6.3D), one flowering plant. (The record for TQ/6.3E in Briggs (1990) refers to High Wood, v.c. 16.) Brown's Wood, near Sunninglye Farm (TQ/6.3J), with 180 plants on verge in hedge, 30 flowering plants on verge in edge of wood, and 215 plants in wood. Sluice Wood (TQ/6.3M), thinly scattered on stream bank in dense woodland, mostly on north side of stream, one large patch on south side of stream. Win Bridge (TQ/6.3M), 30+ flowering plants in small copse by administrative county (but not v.c.) boundary (presumably same site as Bayham Abbey (Arnold 1907, etc.)). Flosket Wood (TQ/6.3N), nine plants in wood by stream; this site is in the administrative county of Kent. Park Wood, near Sidley Green (TQ/7.1, F/K), H. J. Sargent (Wolley-Dod 1937); not seen recently. Goldspur Wood (TQ/7.1J), one very large clump. Hollington Wood (TQ/7.1V), A. H. Simpson, 1918 (K); now apparently built on, though recorded for this tetrad in Hall (1980). Beauport Park (TQ/7.1, ?W/X) (Wolley-Dod 1937); this site is now a caravan park and the plant is presumed extinct. Bluemans (TQ/7.1X), wet, shady woodland, with 50 flowering plants (many fruiting). Brookside Farm, wood (TQ/7.2C), 10+ plants on edge of recent woodland/verge. Fleet Wood (TQ/7.2D), about 40 flowering plants on edges of muddy bridleway in damp, shady conditions. Little Boarzell, Swiftsden House (TQ/7.2, E & J), about 120 flowering plants (and more vegetative) mainly in the wild garden but also on verge. Wood between Mountfield and Robertsbridge (TQ/7.2, F/G), 1944, Miss Hanson (Peatfield 1944). Etchingam, Gimore Wood (TQ/7.2H), 20 plants in ancient woodland. Peagle Wood (TQ/7.2J), 85 plants in wood on Sussex side of Kent Ditch, and damp woodland close to road in adjacent tetrad (TQ/7.2P), about 3000 plants, many flowering. Copse in fork of A265 and minor road to Merrimants Shaw (TQ/753.284J), P. C. Hall, 8 May 1970; wood cleared and plant extinct by 1988. TQ/7.2M, Hall (1980), further details not traced. Merrimants Shaw (TQ/7.2P), several patches with over 400 flowering and many vegetative plants in ancient woodland on Sussex side of Kent Ditch. Crossroads Farm (TQ/7.2P), about 200 plants in wood by A229 on Sussex side of Kent Ditch, and about 75 plants in wood 300 m south west of cross-roads. Terrace Wood (TQ/7.2, S/T), about 200 plants on both sides of A229, plus one by stream. Bodiam Wood (TQ/7.2T), one large patch near wet hollow. Records from "about Hastings" presumably refer to sites at Hollington, Beauport Park and Bluemans (Peatfield 1943), and there are no localised sites in TQ/8.1.

V.c. 15, E. Kent: Holman's Wood (TQ/777.287U), woodland with wet gills, F. Rose; not seen 1991, but probably still present. Kitchenham Farm (TQ/7.2Y), wood by Kent Ditch, E. G. Philp, sometime between 1971 and 1980. Detling, Maidstone (TQ/7.5), A. D. Melvin, 21 June 1867 (BEL); this is a surprising record. N.E. of Hawkhurst (TQ/763.313Q), last seen 1950s (E. G. Philp, pers. comm., 1991). Rolvenden, wood east of Halden Lane Farm (TQ/8.3L), 50+ flowering and many vegetative plants. Little Halden (TQ/8.3L), 17 flowering plants on steep north facing bank by stream near ancient woodland, plus one downstream; this is probably the same general locality as Little Oven Wood (Hanbury & Marshall 1899). Little Halden (TQ/861.326R), F. Rose, 1949 (MNE), site now destroyed.

V.c. 16, W. Kent: TQ/5.3P, Philp (1982), likely to be near High Rocks, but further details not known. High Rocks, Tunbridge Wells (TQ/5.3U), one large dense patch by railway with about 2400 plants, and two smaller patches to west with 250 plants; about 100 plants in scattered colonies on dry sandstone ridges and rocks at eastern end of rocks; more plants north of rocks by stream. Hungershall Park, Tunbridge Wells (TQ/5.3U), 300 flowering plants in dry woodland, presumably the same locality as Tunbridge Wells Common, K. E. Bull (Wallace 1954). Mount Sion (TQ/5.3Z), in a wood (Forster 1816); probably built on. *Platt (TQ/616.562), D. McClintock, c. 1960, patch in woodland and in a hedge nearby, probably escaped from garden. Palmers Farm, wood (TQ/6.3E), about 100 flowering and more vegetative plants in ancient

woodland. High Wood (TQ/6.3E), scattered plants in five areas, with 60 flowering plants on verge, 100 in cleared strip, and 100 in woodland, and 300 plants on dry sandy trackside in ancient woodland, and 130 in deep grass on cleared edge of wood. Mouseden (TQ/6.3E), on stream banks in fragments of ancient woodland, three groups with 17, 12 and 75 plants, extending into tetrad J. Pembury, wood east of Larkfield Hall (TQ/6.3J), twelve plants by stream. N.W. of Lamberhurst (TQ/661.377T), E. G. Philp, last seen about 1957, not refound, area spoiled by pheasant management. TQ/7.2J, Philp (1982), further details not traced. Kent Bridge Farm (TQ/7.2P), two sites: 1120 plants on bank of ditch in wood; 40+ plants on shaded road verge to north. Winch's Plantation (TQ/7.2P), 80 flowering plants in ancient woodland, well above stream level. Peagle Wood (TQ/7.2P), a few plants on Kent side of Kent Ditch. Merriments Shaw (TQ/7.2P), several plants on Kent side of Kent Ditch (see also v.c. 14). Goudhurst (TQ/708.374D), near A262 west of, F. Rose, last seen 1950s; site now destroyed. Little Pix Hall Farm (TQ/7.3F), wood north of, only two flowering plants seen, possibly more present. Furnace Wood (TQ/7.3H), south side, one dense patch with 30 flowering plants and a few stragglers in woodland by track. Wet Wood (TQ/7.3H), several plants near stream in replanted, wet ancient woodland; extinct at another site at TQ/733.358. N of Hawkhurst, (TQ/757.313K), last seen 1950s (E. G. Philp, pers. comm., 1991); possibly same as Highgate (Hanbury & Marshall 1899). Hedgingford Wood (TQ/7.3M), two sites; north side, two patches in woodland near stream, one with 600, the other to south with 650 flowering plants, and N.E. corner, 23 plants by stream in Hornbeam wood. Hartley, Forestry Commission wood (TQ/7.3M) west of, 42 plants on edge of ride just clear of conifers, an old site to east has been lost due to conifer planting. Another site at TQ/750.384M has disappeared under conifers.

V.c. 17, Surrey: *Hog's Back (TQ/0.5), demesne of 'Greyfriars', south-facing Beech wood, one patch, J. R. Akeroyd, May 1968. *Box Hill (TQ/1.5Q), by the River Mole, Miss B. M. C. Morgan, 1966, probably planted (Lousley 1976). About 250 plants seen in 1989, though few were flowering. Grove Copse (TQ/1.3T), many plants in 1949, only one visible in 1966, D. P. Young. Timber Gill (TQ/1.3T), about 100 plants in wooded ravine. Lower Gages Farm, ravine of Fylls Brook (TQ/184.378Y), numerous small plants seen on edge of stream, Surrey Flora Committee meeting, 1967; extinct by 1989 (and probably long before) due to activities of pigs. In deep ravine near Garrett Farm, Ockley (TQ/1.3; precise farm not traced), both on Sussex and Surrey banks, E. Straker, 15 May 1880 (BM); presumed different from above sites and now extinct. (The record for Waddington (Brewer 1863) is an error for *Lathraea squamaria* (Salmon 1931).)

*V.c. 18, S. Essex: Warley Place (TQ/5.9V), still to be found in 1992 after 55 years in the derelict garden of A. E. Wilmott's home, where it was introduced (forma *ptarmicifolia*), D. C. Bloomfield (Jermyn 1974).

V.c. 20, Herts.: Baldwins Wood (TQ/0.9E), L. J. Stearn, pre-1967; not seen 1989–1991 but possibly overlooked. Bottom Wood (TQ/0.9G), one patch with 15 flowering stems. Chorleywood, Great Greenhills Wood, west of M25 (TQ/0.9H), 200 plants (see also tetrad M). Chorleywood, west of Dell Farm (TQ/0.9I), thousands of plants; also E.N.E. of Dell Farm, over 2000+ plants on south and west side of wood. *Chorleywood Common (TQ/0.9I), 640 plants in secondary woodland N.E. of pond; probably introduced. Bullscroft Spring (TQ/0.9I), patch about 4 m², G. Salisbury & J. Saunders, 1990. Sarrattmill Bridge, N.W. of (TQ/0.9J), 250 flowering plants in thin strip of woodland. Limeshill Wood (TQ/0.9J), "a scattering of plants amongst *Hyacinthoides* on a steep bank", G. Salisbury, 1991. Hanging Lane Wood (TQ/0.9J), over 2000 plants widespread in woodland. Springwell, Garrett Wood (= High Wood near Rickmansworth (Webb & Coleman 1849)) (TQ/0.9L), numerous plants remaining in Beech wood, though half of the wood (mainly the Middlesex part, where it was once abundant) has been lost to a quarry. Chorleywood, Great Greenhills Wood east of M25 (TQ/0.9M), 3000–4000 in west half, and many thousands in the east half, one of the largest, continuously covered areas seen. Beechengrove Wood (TQ/0.9N), "masses over quite a large area", G. Salisbury, 1991. Loudwater (TQ/0.9N), road verge bordering large house, 150 plants possibly relict from Loudwater Wood (Webb & Coleman 1849), and possibly the same as "larch plantation above Loudwater to the north, but adjoining the road from Croxley Green to Solesbridge" (Jackson 1887). Another Jackson (1887) record "in a wood a little further towards Solesbridge Wood" probably refers to Long Spring (TQ/052.970N) (T. J. James, pers. comm., 1991). Scrubbs Wood (TQ/0.9, N/P), L. J. Stearn, presence now doubtful, and probably the same locality as Blunt Wood, 20 April 1947, R. A. Graham, also not seen

- recently. Sawpit Spring (TQ/059.982P), P. J. Ellinson, 1992; a small wood mostly destroyed during construction of the M25. Harrocks Wood (TQ/0.9T), 400 plants in scattered colonies. Assumed to be the same site as "wood at Red Heath", Mrs E. Shute (Webb & Coleman 1849). Whippendell Wood (TQ/0.9T), many, mostly small, scattered colonies (including Rousebarn Lane, P. J. Ellinson), over 3000 plants. Lees Wood (TQ/0.9U), S. & P. Blackmore, 2 June 1978. A B.R.C. 40-column record card from "wood opposite Chandlers Cross, May 1922, P. W. Richards" (NMW), presumably referring to Harrocks Wood or Whippendell Wood, was allocated the grid reference TL/0.0 for the B.S.B.I. Maps Scheme (Perring & Walters 1962) rather than TQ/0.9; this appears to be an error and there are no other records for TL/0.0. There is also a record for "Brickett Wood, West Watford" (OXF). Bricket Wood (TL/1.0F) was in the 19th century an ancient wood (now the Building Research Station) and could conceivably have supported the species as it was species-rich, calcareous and damp, but there are no other records for this site (T. J. James, pers. comm., 1991).
- V.c. 21, Middlesex:* Harefield Church (TQ/0.8P), wood east of, many plants in ancient mixed woodland. Park Wood (TQ/0.9K), 100+ plants along west end of footpath in ancient wood. Jacks Lock (TQ/0.9K), copse N.E. of, last seen by R. M. Hamilton in 1972 who described it as "abundant"; wood now over-grown and not refound in 1989. Springwell, Garrett Wood (TQ/0.9L); see *v.c. 20*.
- V.c. 22, Berks.:* Last recorded in Park Wood, Bisham (SU/8.8M) (presumably same as Bisham Wood; Druce 1926), 29 April 1944, A. J. M. Bailey. A specimen in RNG labelled "Newbury, C. Grant, 1966", has a grid reference referring to the University Campus in Reading.
- V.c. 23, Oxon:* Recorded from Oakley Hill, near Chinnor (SU/7.9P) but probably in error (R. Fitter, pers. comm., 1990).
- V.c. 24, Bucks.:* Bloom Wood (SU/8.8U), about 3000 plants in ancient woodland. Horton Wood (SU/8.8U), thousands of plants in ancient Beech wood. Warren Wood (SU/871.899U), no other details available. *Cliveden, National Trust (SU/9.8C), in the gardens near the pond. Booker Common and Spring Coppice (SU/8.9F), a large population with about 800 plants flowering in ancient Beech wood. Yewtree Hill Plantation (SU/8.9I), 13 plants on edge of ancient woodland. The Coppice (SU/8.9I), 500+ plants in ancient Beech wood. Park Wood (SU/8.9J), Buckinghamshire tetrad record collected 1965–1985 (R. Maycock, pers. comm., 1988), but not refound 1991–1992. Common Wood (SU/8.9M), several thousand plants in ancient woodland, plus a few young plants on disturbed land 200 m W.S.W. Piggott's Wood (SU/8.9P), three populations with 300, 660 and 630 plants in main ancient wood, and one small colony with 20 plants on west side. Deangarden Wood, near Keep Hill (SU/8.9Q), about 500+ plants in ancient Ash-Beech woodland. The Rye (SU/8.9R), 30+ plants scattered in woodland (probably ancient). Millfield Wood (SU/8.9S), about 500 flowering plants in ancient Beech wood. Hanging Wood (SU/8.9S), 2000–3000 plants, ancient woodland. Green Wood (SU/8.9S), about 1700 plants in four small patches in ancient Beech woodland. Gomm's Wood (SU/8.9T), about 5000 plants in ancient Beech woodland. Hughenden Valley, ancient Beech woods north of Boss Lane Farm (SU/8.9T), several thousand plants. Longrove Plantations (SU/8.9T), about 500 plants in replanted woodland. Hughenden Valley, Citers Wood (SU/8.9U), Buckinghamshire tetrad record, 1978 (R. Maycock, pers. comm., 1988), not refound 1991–1992. Fennell's Wood (SU/8.9V), 400+ plants in ancient Beech wood. Deangarden Wood, near Abbey Barn Farm (SU/8.9V), about 360 flowering and more vegetative plants in ancient Ash-Beech woodland. Barrowcroft Wood (SU/8.9V), 20+ plants in ancient Ash-Beech woodland. Highfield Wood (SU/8.9W), several thousand flowering and numerous vegetative plants scattered through ancient Beech woodland. Gomm Valley (SU/8.9W), two small patches, old woodland bank in Nature Reserve, M. Young, May 1991. Kings Wood (SU/8.9W) about 800 plants in ancient Beech wood. Woolman's Wood (SU/9.8D), about 1000 plants, edge of clearing in replanted ancient woodland. Lower Pyebushes (SU/9.8U), scattered in replanted ancient Oak-Ash wood. Cut-throat Wood (SU/9.9A), scattered in ancient Beech wood, about 3000 plants. Hogback Wood (SU/9.9F), about 2400 plants in ancient woodland. Seagrave's Farm (SU/9.9G), wood N.W. of, 500 plants in ancient Beech woodland, and 120 plants to east in narrow strip of ancient woodland. Ash Grove (SU/9.9J), 3500 plants near railway in replanted ancient woodland. Keeper's Wood (SU/9.9J), about 1000 plants in new plantation of Beech and Oak. Great Beards Wood (SU/9.9L), scattered populations totalling about 6000 plants in replanted ancient woodland (some under conifers), and 100 plants in wood to

north. Blue Close Wood (SU/9.9L), thousands of plants, on edge of pine plantation and likely to disappear. Owls Wood (SU/9.9L), 315 plants on edge of ancient wood and bank of old hedge. Bottom Wood and Starveacre Wood (SU/9.9L), 180 flowering plants in replanted ancient woodland. Stockings Farm (SU/9.9M), ancient woodland west of, three large populations with 3500, 300 and 210 plants. Wheatsheaf Wood (SU/9.9Q), 35 plants in recent Beech wood. Great Legs Wood (SU/9.9, Q & V), 2000–3000 plants in four main areas in ancient Beech wood. SU/9.9R, Buckinghamshire tetrad record collected 1965–1985, site details unavailable (R. Maycock, pers. comm., 1988). Ongar Hill Farm (SU/9.9S), wood west of, J. Pitt, 1977; not found in 1989, now overgrown. Parsonage Wood (SU/9.9T), 50+ plants in ancient Beech woodland. The Ash Beds (SU/9.9V), 370 plants by track in mixed, recent woodland. *Stowe, National Trust (SP/6.3Y), in the Japanese gardens, R. Maycock; several thousand plants of a variant approaching *ptarmicifolia* were seen in 1992. SP/8.0Q, Buckinghamshire tetrad record collected 1965–1985, site details unavailable (R. Maycock, pers. comm., 1988). Hyde Heath, Hyde House Wood (SP/9.0F), D. Ferguson, 1986. White's Wood (SP/9.0F), 200 plants, all vegetative, under dense Spruce canopy, and 250, also all vegetative, under Beech. White House Farm (SP/9.0K), Gracelets Wood north of, 3000 plants in old game covert. Monk's Wood (SP/9.0K), numerous plants in ancient wood and on bared strip. Elvidge Wood (SP/9.0K), ancient Beech wood west of, 500+ plants. Lower Bois, Hodds and Hilsbury Woods (SP/9.0Q); good numbers of plants spread along N. edge of ancient wood, and a few plants in N.W. corner of Lower Bois Cemetery. The Larches (SP/9.0X), only one plant seen in neglected, ancient, deciduous woodland. Newland Park (TQ/0.9B, possibly also in tetrad C), C. J. Smith, 1979, recent woodland. Carpenters Wood (TQ/0.9D), 120 plants in ancient woodland. Chenies (TQ/0.9E), 500 plants in wood adjoining ancient woodland. Chenies Bottom (TQ/0.9E), in two main groups with 52 and 60 plants plus a scattering of vegetative ones elsewhere. West Wood (TQ/0.9E), a very dense patch with 1350 plants in replanted ancient woodland. Turveylane Wood (TQ/0.9J); two small populations, one with about ten plants, the other with about 20 plants, replanted ancient woodland. Mount Wood (TQ/0.9J), three large groups plus scattered plants elsewhere in ancient woodland, about 650 plants. Denham Green, Ranston Covert (TL/0.8P), about 30 plants in ancient Beech Wood at foot of very steep slope.

V.c. 39, *Staffs.*: Pendeford, "hedge sides on this farm" (SJ/8.0), Pitt (1796). Blithfield, grove by the churchyard (SK/0.2), Mr Stanmers (Garner 1844); this site was thought to be a probable introduction by Perring & Walters (1962), though on what basis is not known; Pendeford is at the west end of Needwood Forest and if accepted as native at the eastern end, could well be native here too. Needwood Forest (SK/0.1 or 0.2), Garner (1844). Ridge (1922–1929) "failed to find the plant anywhere in Needwood Forest", and others have followed his caution in accepting the record. Yoxall (SK/1.2L), 40+ flowering plants on wooded road verge, replanted ancient woodland. Edees (1972) also gives "abundantly in a copse between Newchurch and Scotch Hill . . . and in the wood, formerly known as Coalpit Slade, on the east side of the road near Darleyoak Farm". *Ash Green, Trentham (SK/8.4, ?P/Q), wood of park, about 3000 plants.

*V.c. 40, *Salop.*: Broncroft Castle (SO/5.8), Miss M. B. Fuller, 1978–1992 (Sinker *et al.* 1985).

*V.c. 53, *S. Lincs.*: Wellington Hall Park (SK/9.5Y), 1962, Miss E. J. Gibbons. Small Hornbeam copse, with *Mercurialis perennis* and *Adoxa moschatellina*, probably escaped from the Hall gardens (Mrs I. Weston, pers. comm., 1988).

*V.c. 55, *Leics.*: Glenfield, Leicester (SK/5.0I) "shady border in gardens of the Gynsills", 1971 (Primavesi & Evans 1988); this site is now partly under a hotel.

*V.c. 57, *Derbys.*: Between Marple and Strines, near the River Goyt (SJ/9.8), T. Barker (Linton 1903). Long Eaton (SK/4.3J) (Clapham 1969). Sheffield (SK/3.8L), in woodland in Graves Park, first noted 12 April 1938, but no longer known (M. Shaw, pers. comm., 1992).

*V.c. 60, *W. Lancs.*: Silverdale (SD/4.7S), several patches in woodland, escaped from adjoining Nursery. During a visit in 1988, Mr Kaye described *C. bulbifera* as more or less a weed, which he had dug out in masses.

*V.c. 62, *N.E. Yorks.*: Scalby (TA/0.9A), "long established; the *Natural History of the Scarborough District* lists it as 'Rare. Scalby Churchyard, 1964 *et seq.* . . .'. It was then in a much more restricted area than now. I assume it was originally planted on a grave . . . since it reached the wall of the churchyard it has not looked back" (T. F. Medd, pers. comm., 1988). This colony even

received a mention in *The Dalesman*, January 1900 "—it thrives throughout the village" (an over-statement).

- *V.c. 69, *Westmorland*: Bowness (SD/4.9), W. Clitheroe, 1940 (forma *ptarmicifolia*).
- *V.c. 72, *Dumfriess*: Dardarroch, Dunscore (NX/8.8N), roadside verge, C. Rogers, 14 May 1981; Mrs M. E. R. Martin, 1988 (forma *ptarmicifolia*). The status of another record from Maxwelton House requires confirmation. Hooker (1870) listed *C. bulbifera* as "doubtfully native" in Ayr (v.c. 75), Lanarks (v.c. 77) and Perth (v.c. 87–89) but no specimens or further details have been traced. Watson (1873) attributes the Ayr record to a specimen from a James Wilson.
- *V.c. 91, *Kincardines*: Glenbervie House (NO/7.8Q), very widely distributed in the garden, known since at least 1934. The biggest introduced colony.
- *V.c. 95, *Moray*: Dyke (NH/9.5Z), one plant, garden of Rose Cottage, M. McC. Webster, 1972, introduced with plants from Blackhills (see next record). Blackhills House (NJ/2.5U), woodland policies, M. McC. Webster, 1963 (Webster 1978).
- *V.c. H9, *Co. Clare*: Ballyvaughan (M/2.0), outside P. O'Kelly's house in a field and adjacent hedge, 1987.
- *V.c. H21, *Co. Dublin*: Malahide Castle (O/1.3), in the demesne, 1980, J. G. D. Lamb (Lamb 1983). Rathfarnham (O/1.3), Marley Park, 1981, P. J. Jackson (Jackson 1983) (forma *ptarmicifolia*).

CURRENT STATUS

Cardamine bulbifera has thus been recorded in about 200 native sites; it is probably still present in about 155 sites, has been lost from about 30 sites, and about 17 are untraceable or unchecked. Most of the native sites have disappeared due to woodland clearance, but replanting, especially with conifers, is currently the main threat to the remaining populations. It has also been recorded from about 45 introduced sites of which it is still present in 27.

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Orobanche reticulata Wallr. populations in Yorkshire (north-east England)

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ABSTRACT

In the British Isles, *Orobanche reticulata* Wallr. (Orobanchaceae) has only been recorded with certainty from Yorkshire. Its distribution and abundance within this area are reviewed, and the circumstances surrounding its original discovery and those of other early records are described. The plant, a protected species, has been recorded from at least 68 separate populations in ten 10-km squares, and 52 of these populations are extant, although many are very small; it is particularly frequent in two separate but limited riverside areas.

INTRODUCTION

Orobanche reticulata Wallr. (Orobanchaceae) occurs in the British Isles as a root parasite of thistles, especially *Cirsium* species (Asteraceae). All confirmed records are from Yorkshire (v.cc. 61, 62, 64, 65) where it occurs mainly, but not exclusively, on the magnesian limestone. In Europe its principal area of distribution is in the alpine region but there are also many outlying, isolated localities in northern Europe, including Scandinavia, the Baltic states, Holland, and north Germany (Hegi 1965; Chater & Webb 1972; Meusel *et al.* 1978). The plant also occurs in Russia, the Balkans, North Africa, and extends eastwards into western Asia.

Its restriction to such areas of Yorkshire is unique amongst British native plants, and perhaps because of this, doubts have been raised about its status (e.g. Pugsley 1926). Roman roads and settlements occur near some of the earliest known localities and so an early introduction is a possibility. However, when its British distribution is considered in the context of its overall European pattern, where similar fragmented occurrences are frequent, especially near the limits of its range, it seems most likely that the plant is genuinely native in Britain. Variability witnessed in some populations (Foley 1992) supports this view, whilst an apparent reliance on a limited host range suggests a persistent, isolated group of native populations.

O. reticulata is confirmed from 68 separate populations in ten 10-km squares, mainly in central Yorkshire (v.c. 64) where there are two principal areas of distribution: between Leeds and Wetherby and near Ripon. It also occurs at an isolated locality in v.c. 61, as well as on the extreme south-western borders of v.c. 62 and v.c. 65, but has not been recorded from v.c. 63. In the few large populations, the number of plants varies from one year to the next, but many populations are very small, often with less than ten flowering plants annually. Owing to its rarity and very limited distribution, it is a scheduled species protected under the Wildlife and Countryside Act, 1981 and has been given a *Red Data Book* rating of 11E – Endangered (Perring & Farrell 1983). Unfortunately, the host species are a great nuisance to farmers and landowners, and consequently are frequently destroyed. *O. reticulata* therefore comes under an additional threat to that from which other plants suffer.

In the field, confusion with other *Orobanche* species is unlikely although this may occur with robust *O. minor* Sm. which occasionally shares the same host. Nevertheless, *O. reticulata* is quite distinctive, being tall (up to c. 70 cm) and robust, with a fairly dense inflorescence, especially in the upper part, and with cream-coloured corollas marked distally with blue-purple glands. The corolla is cylindrical-campanulate and has a curved dorsal line which is especially characteristic amongst British broomrapes. The stigma lobes are mauve-purple and the filaments glabrous to sparsely hairy proximally, but can be somewhat glandular above. Even as a herbarium specimen, the plant is still

distinctive, particularly with regard to its corolla shape, and in this state confusion is really only likely to occur with *O. rapum-genistae* Thuill., or with *O. elatior* Sutton.

Many infraspecific taxa have been described from populations in continental Europe, and these are summarised by Beck-Mannagetta (1930) and Gilli (1966), although none was recognised by Chater & Webb (1972). British plants have been referred to *O. reticulata* var. *procera* (Koch) Beck, which was differentiated from other varieties by its shorter, curved (not nearly straight) corollas. However, further work may reveal that var. *procera* cannot be maintained even at varietal level. Colour variants and forms of *O. reticulata* are much less frequent in Yorkshire than in Europe, but some records have been noted recently (Jones 1989; Foley 1992).

In Britain, typical habitats are those of its hosts, rough pastures, road verges, and especially river banks, river flood plains and associated light scrub. *Cirsium arvense* (L.) Scop. appears to be the most frequent host, but *C. vulgare* (Savi) Ten., *C. eriophorum* (L.) Scop., *C. heterophyllum* (L.) Hill and *Carduus nutans* L. are recorded, and also occasionally *Cirsium palustre* (L.) Scop. (e.g. 1932, Vachell, NMW). *Scabiosa*, *Knautia* (Dipsacaceae) and *Cistus* (Cistaceae) species are also said to be parasitised in Europe. As with other *Orobanche* species, some claims for host can be erroneous, since actual attachment to the roots is difficult to establish in the field. *O. reticulata* seems to be at least partially perennial in Britain, flowering in early July, with the dead flower spikes persisting for several months afterwards.

The account given below is based upon field work carried out over several years during which all extant populations were visited by the author, many on several occasions. Estimates of plant numbers were made and the various habitats assessed. Many herbarium specimens have also been examined and if necessary re-determined by the author or by F. J. Rumsey. Relevant archival records have also been consulted.

THE ORIGINAL DISCOVERY AS A BRITISH PLANT

In August 1907 H. E. Craven, a pharmaceutical chemist of Roundhay, Leeds, found an *Orobanche* at Hetchell Crags, south-west of Wetherby, which he was unable to name. It appeared to be parasitic on *Cirsium eriophorum* and was closest to *O. minor*. The following year, on seeing a letter from G. C. Druce in the *Pharmaceutical Journal* in which he referred to the Botanical Exchange Club, Craven wrote to Druce, asking for further details and enquiring whether membership of the Club would enable him to get doubtful plants named as he had a few puzzling plants, one of which was an *Orobanche*. Craven offered to send Druce some fresh specimens and this he did on 31 July 1908, having kept two plants in water, which had apparently become rather shrivelled. He also offered to send a spike pickled in formalin, as well as duplicates from his previous year's (1907) collection, for Druce to forward to Beck-Mannagetta of Prague, the authority on European *Orobanche*. A detailed description of the fresh plant and some duplicates were sent to Druce in August 1908, and Druce exhibited the *Orobanche* at the Linnean Society that autumn, convinced that it was not a known British species. During the summer of 1908, Craven also sent plants to E. M. Holmes for naming. Holmes agreed that it was not previously known in Britain but suggested it might be a hybrid; he also showed a specimen to the herbarium curator at Kew who was unable to identify the plant. However, some months later, apologising for the delay due to illness, Beck-Mannagetta replied to Druce (9 January 1909) naming the plant *Orobanche reticulata* f. *procera* (Koch) Beck (= *O. procera* Koch). An original specimen sent to Beck-Mannagetta is in his herbarium (PRC) and Beck-Mannagetta's letter is appended to a sheet in Druce's herbarium (OXF) on which the latter mounted a specimen described "First as British" – presumably one of Craven's original specimens. Other early collections by Craven are in BM and MANCH. During the summer following Beck-Mannagetta's determination of the Hetchell plants as *O. reticulata*, Craven (17 July 1909) despatched most of his remaining duplicates for Druce's retention, along with a map and a detailed sketch of the habitat at Hetchell stating that the *Orobanche* grew there and nowhere else. He also remarked that the tenant farmer had mown down all the thistles during the previous summer (1908) and that he was concerned for the future of the plant. (This point is also made in subsequent annotations to another sheet (1909, Lees & Pickard, YRK).)

Another Yorkshire botanist involved in the early recognition of the plant in Britain was F. A. Lees. On receiving Beck-Mannagetta's determination from Druce, Craven informed Lees and

presumably sent him a specimen, since one is preserved in Lees' herbarium (July 1908, *Craven, BM*); on the label, in Lees' handwriting is the comment "*Orobanche procera*, Koch (*teste* Dr Beck, *per* Druce *ad* Craven 12.1.09)". Also attached to the sheet are three photographs of the plant at Hetchell Crag taken by J. H. Gough on 19 July 1913. On 29 July 1909, Lees, with J. F. Pickard, went to see the plant at Hetchell, and one of the three specimens which they collected is preserved (29 July 1909, *Lees & Pickard, YRK*). Writing to Druce on the following day, Lees commented that the parasitised *Cirsium eriophorum* appeared to be very unhealthy, and that he had established the connection from the *Orobanche* to the roots of the thistle. In this same letter Lees asked Druce to publish a description of the plant which he subsequently did (Druce 1909a), and also offered to send him specimens. Despite this, and Craven's offer of a map on 17 July, Druce, along with A. H. Evans, had already visited the site the previous month since a specimen exists which he collected at the time (30 June 1909, *Druce, OXF*). This is added to a sheet of material collected by Craven in 1908, although Druce (1909a) stated that his visit was in July. From his correspondence with Druce, it appears that Lees was the first person to raise the suggestion that the plant could be a Roman introduction. He was aware that close to Hetchell Crag is the Pomporcali, where the Romans had their summer camp, and that there were also Roman roads and earthworks nearby.

Whilst the credit for the discovery of *O. reticulata* in Britain (and at Hetchell Crag) goes to Craven, this is perhaps not strictly correct. The plant was first found there on 16 August 1902 by J. F. Pickard (Lees' companion in July 1909) but the specimen which he collected was erroneously identified as *O. elatior* by Pickard and Lees (see notes on herbarium sheets: 1909, *Pickard, BM*; 1909, *Lees & Pickard, YRK*; 1910, *Pickard, BM*), and considered to be "*O. major*" by Lees (quoted by Cheetham & Sledge (1941)). Shortly afterwards, Pickard was away on business for two years (see annotation, 1909, *Lees & Pickard, YRK*) and presumably did not question this identification further. Craven subsequently re-found the plant at Hetchell, and not satisfied with these diagnoses (Lees 1909), had it re-determined as described above. Pickard's 1902 specimen has so far not been traced. Although evidence points to the contrary, Druce appears to have indicated that the first correct determination of the plant was his own, given directly on receipt of Craven's original specimens (Druce 1909a, 1911). However, in another statement, Druce (1909b) stated only that he was convinced it was not a British plant, and had therefore sent a specimen to Beck-Mannagetta for identification (see also Druce's letter in herb. Beck (*PRC*)). Beck-Mannagetta's reply to Druce (9 January 1909) reads as a determination rather than a confirmation, and that is probably the case.

Shortly after Craven's letter to Druce on 17 July 1909, it was thought that the *Orobanche* had been exterminated at Hetchell. This resulted from a report in the *Yorkshire Weekly Post* of an address given by J. G. Wilkinson, who was blind, to a Leeds Naturalist Club meeting. To disprove this, on 25 August 1909, Pickard and Wilkinson went to the place where Pickard saw the plant in 1902 (and also in July 1909 with Lees) and found two in flower and eleven in fruit. Pickard stated that Wilkinson considered that this locality was a different one "higher up on the slope and further on than Craven's", and Pickard was of the opinion that Craven's population had been exterminated. Even though Wilkinson was blind, he was considered reliable, and it is likely that there had been two separate populations, with Craven's being lost shortly after discovery. Examination of the general area around the present site at Hetchell, together with the sketch which Craven sent to Druce, contemporary notes on the flora, and Druce's description (1909a) of Craven's site – "a grassy slope with bushes" – all support this view. Ironically, immediately after his visit in 1909, Druce had received assurances from the landlord at Hetchell, that the thistles would be preserved.

OTHER EARLY RECORDS

Although the acceptance of *O. reticulata* as a British plant dates from the Pickard/Craven find, specimens exist from other localities well before this date. These were, however, erroneously referred to other *Orobanche* species. In the Leeds/Wetherby area a specimen was collected in 1868 from Roundhay Lime Hills (*Lees & Abbott, CMM*); it was identified as *O. major* (= *O. rapum-genistae*) and thought to be growing on whin (*Ulex europaeus*), but is undoubtedly *O. reticulata*. Roundhay is only a few kms from Hetchell Crag. Shortly after the Hetchell discovery, the plant was also recognised from the large and already known broomrape colony at Hook Moor, Aberford (a few kms south-east of Hetchell) whence it had variously been recorded as *O. major* and *O. minor*.

Several specimens exist from here which are thus mistakenly labelled, with one collected as *O. major* as early as 1878 (Webster, CMM). Despite assertions about the host for this specimen – “One root especially was only one or two inches from the gnarled stem of *Ulex* being far advanced to ripeness. I did not trace any actually to the root of *Ulex*, altho’ I have no doubt” – and another identified as *O. minor* “on *Trifolium*” (1883, Williamson, YRK), both are nevertheless *O. reticulata*. This illustrates the difficulty in being positive about which plant is actually parasitised. The first contemporarily confirmed record at Hook Moor may be that of F. Ashwell (1916, LES) and there is also a specimen from the previous year (1915, Cockerline, LES), but which may not have had contemporary confirmation.

Another early record for *O. reticulata* is from Linton Common (again quite near Hetchell Crag) where it was described by the finder as *O. major*. The date on the sheet (Pickard, CMM) is unclear, being either 1901 or 1907. By 1907, Pickard might have been wary of this plant, following his involvement at Hetchell in 1902 with what he thought was *O. elatior*, and so 1901 is perhaps the more likely date. There is also a later annotation to a herbarium sheet (1909, Lees & Pickard, YRK) stating that Pickard had also found and pressed the plant at Linton Common, where it was rare, but that it was still there in 1936.

A second main centre of distribution is in the Ripon area of v.c. 64. In contrast to the Leeds/Wetherby localities for which many early records can be confirmed by herbarium specimens, there is little similar from here. The only specimen of *O. reticulata* so far traced which approximates to the date of the Pickard/Craven find at Hetchell is one described as *O. major* “on gorse?”, collected by C. A. Cheetham on 18 July 1903 (C.A.C., BM). Unfortunately the label simply states “Ripon” with no further details of the locality. This specimen is erroneously referred to *O. rapum-genistae* by Lees (Cheetham & Sledge 1941). It was not until 1939 that a localised Ripon area specimen was preserved – from Bridge Hewick (Rob, YKN), although possible evidence for the plant’s early presence in the area can be gained from the old Floras. In the Ripon area, nearly all modern records for *O. reticulata* have been from riverside habitats, and the plant is now especially frequent there along an 8 km stretch of the Ure, where at least 38 separate populations are extant. This lends credence to the suspicion that some of the nineteenth century riverside Flora localities for other *Orobanchae* species in this area were misidentifications for *O. reticulata*. Those given for *O. minor* near Nunwick, at Slensingford, Howe-upon-Swale, Ure Banks, Burnistone, and Bishopton (Baker & Nowell 1854; Baker 1863; Slater 1883/4; Lees 1888), and for *O. rapum-genistae* below Tanfield (Cheetham & Sledge 1941) are mostly close to extant *O. reticulata* populations, and may well have been mistaken for that plant. Misidentifications for *O. reticulata* have already been shown to occur for some nineteenth century specimens collected elsewhere as *O. major* and *O. minor*. Flora records from Roundhay and from Lotherton Moor (Hook Moor) both given by Lees (1888) must, in fact, have been *O. reticulata*, and it is very likely that the same applied near Ripon.

Unfortunately it is rare for specimens of *Orobanchae* to have been preserved from localities near Ripon; ironically one of the few traced is undated (but prior to 1922) and was collected close to the Ure between Ripon and Hutton Conyers (Lees, CMM). Lees finally determined this specimen as *O. reticulata* but it is in fact *O. elatior*. An isolated occurrence lying to the east of the main area of distribution was at Backhouse’s Nurseries, York (1886, Backhouse, K) where it was found in a garden on *Cirsium heterophyllum*, presumably a casual occurrence. This is probably the first correct identification of the host plant in Britain.

The first record from south-east Yorkshire (v.c. 61) was made in 1953 at North Grimston (Sledge 1954), at which site the plant is extant. In the same year it was also found at a nearby quarry (W. A. Sledge, pers. comm.), but was not seen there again until 1992 during this survey; it is not known elsewhere in v.c. 61. There are apparently only three instances of the plant being definitely recorded from v.c. 62, and two of these are rather obscure. The first is an 1852 specimen (the earliest so far traced from Yorkshire) of atypical *O. reticulata* collected from near Thirsk as *O. elatior* (Fowler, OXF). Interestingly, there is also a collection (two sheets as *O. minor*) made in the previous year from Sowerby, also near Thirsk (Baker, 1851, herb. Boswell-Syme, BM); the specimens are intermediate between *O. reticulata* and *O. minor* and may possibly represent the hybrid. This record deserves further investigation since natural hybrids of *O. reticulata* are not recorded in Britain although they have recently been deliberately cultivated (Jones 1989). Whilst Fowler’s 1852 plant is distinct from those collected by Baker, it is quite possible that they could be from the same population. (Dead flower spikes, similar to the Sowerby plants, and again possibly of hybrid origin,

were seen near the Ure in 1992.) The second vice-county collection of *O. reticulata* is slightly more recent and is typical, although labelled *O. minor* (1881, Webster, BM) but is unfortunately unlocalised simply as "N.E. Yorkshire" (see also Bennett 1917). Thereafter, it was not until 1984 that the plant was found in a riverside habitat in the extreme south-west of the vice-county, where a flourishing colony survives. Before about 1980 there were apparently no records from v.c. 65, but nine populations are now known, all on river margins, where only the past vagaries of the river channel have resulted in their inclusion within that vice-county.

Outside Yorkshire, there are several dubious or erroneous records for *O. reticulata*. One which may be significant is that given as *O. major* from Nottinghamshire (1835, Cooper, in herb. H. C. Watson, K). The magnesian limestone does extend southwards into that county, but some of Cooper's specimens are considered to be of dubious provenance (Rumsey & Jury 1991) and this one would benefit from independent verification. A record from Cheshire (v.c. 58) (Druce 1918; Perring & Walters 1962; Perring & Farrell 1983) is erroneous since the specimen is *O. minor* (1918, Dallman, OXF), as is an earlier one from Guildford (v.c. 17) quoted by Druce (1918) (1916, Kennedy, OXF). Another error is that for Falmouth Dock (v.c. 1) in 1917 which again was *O. minor* (F. J. Rumsey, pers. comm.). A record for var. *pallidiflora* (Wimm. & Grab.) Beck based on a specimen collected from Brecon (v.c. 42) in 1905 (Knight, BM) has also been shown to be an error (Pugsley 1940; Graham 1957; Rumsey & Jury 1991); a duplicate from this collection is in PRC. Reports from E. Norfolk (v.c. 27) (Jones 1989) including one of an *Orobanche* parasitising *Cirsium vulgare* are thought to be errors for other species (A. L. Bull, pers. comm.).

DISTRIBUTION AND HABITAT

The magnesian limestone formation occurs as a narrow band running north-south from Durham to Nottinghamshire. In the area of distribution of *O. reticulata* it is rarely more than 10 km wide, and is crossed in a roughly eastwards direction by the rivers Swale, Ure, Nidd, Wharfe and Aire. Magnesian limestone is well-known for its species-rich flora.

10-km squares and tetrads (2 × 2-km squares) for which there are confirmed records for *O. reticulata* are mapped in Fig. 1 and Fig. 2 respectively, and fall within an area approximately 50 km square. The two principal centres of distribution in the vicinity of Leeds/Wetherby and Ripon, the disposition of the magnesian limestone formation and the principal rivers of the area, can all be clearly seen.

Following the recognition of *O. reticulata* as a British plant there was a lull in the discovery of new localities until the 1930s find by the river at Bridge Hewick, Ripon. Since then, other riverside ones have been found some distance upstream from this site, many of which survive, and the plant is particularly frequent in that area. Downstream also, new localities have occasionally come to light, including one on the Ouse (formed by the confluence of the Ure and the Swale) found in 1984, the first confirmed modern record for v.c. 62; there are, however, no definite records near the Swale itself. Apart from a small population just south of Ripon and away from the Ure, all other post-1930 colonies in this northern (Ripon) area are on river banks or flood plains, and it seems clear that rivers play an important role in dispersing seed. Also, plants often occur close to river banks and eventually may be dislodged by water erosion. It is quite possible that these together with their host will sometimes become established elsewhere. Favoured habitats for *O. reticulata* are near the upper flood limit by the river bank, and especially the flat pasture borders nearby; occasionally they grow some distance from the river but in places where winter flooding occurs. These are also the areas where the host species are plentiful.

In the southern (Leeds/Wetherby) area most newly-found localities are again in similar habitats on the banks of the Wharfe, where propagation or dispersal has presumably occurred in a similar manner. Population sizes can vary, but some appear to persist for many years with just a few plants annually. The Linton Common locality is such an example. Here, even at the beginning of this century only a few plants were recorded, and the same is the case today. Similarly at Hetchell Crag where the plants occur on the magnesian overlay of the gritstone substrate and well away from the river, numbers have apparently never been high. Cheetham & Sledge (1941) quoted a contemporary account of F. A. Lees in which he stated that an increase in thistles had been observed at Hetchell Crag between 1870 and 1879 but that he was certain that the broomrape was not present

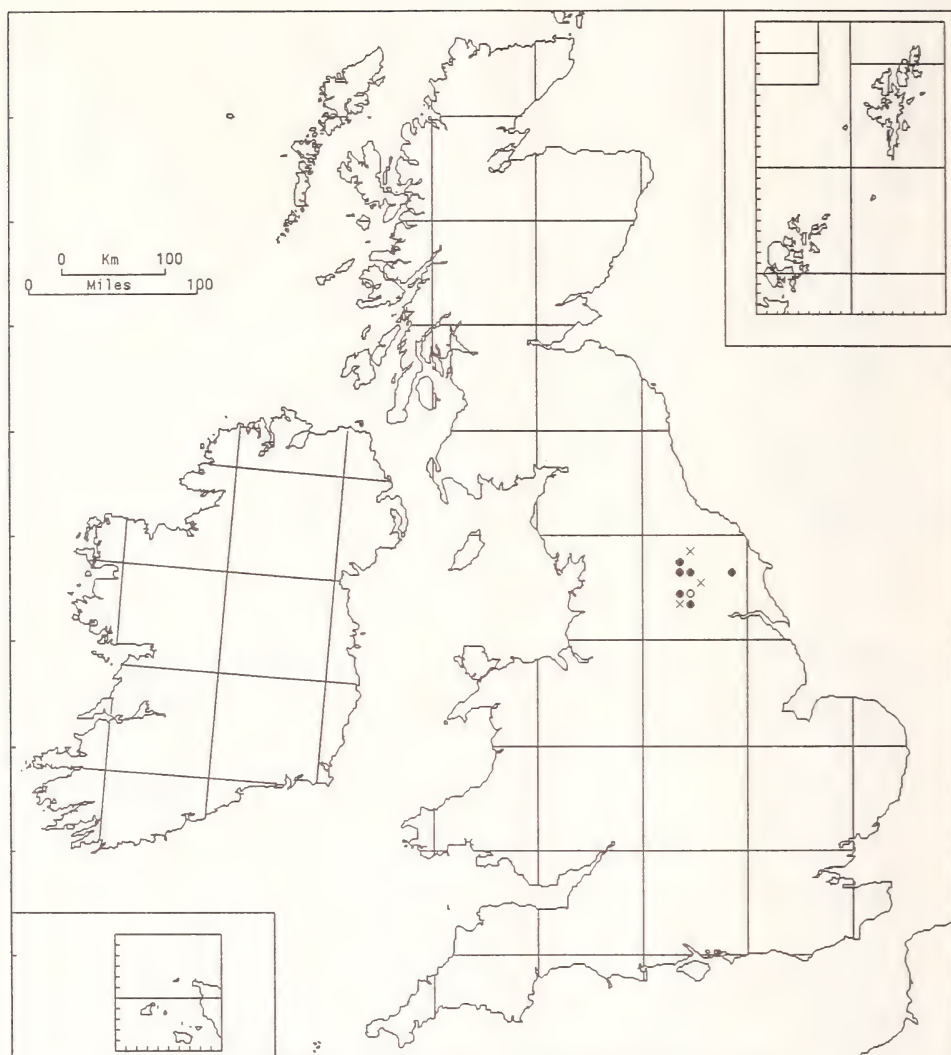


FIGURE 1. The British distribution of *O. reticulata* shown on a 10-km square basis for which there are confirmed records: ● 1991 onwards; ○ 1901–1990; × up to 1900.

during that time; this suggests a relatively recent colonisation just prior to its discovery there in 1902. During the 1920s about 20 plants were known at Langwith Scrub (W. A. Sledge, pers. comm.) and today similarly small numbers still persist close by.

At Hook Moor, the classic site was unfortunately ploughed out about 1940, but surprisingly, and despite reservations expressed at the time (Sledge 1942), what is still the largest British population occurs on road embankments within the vicinity. Earth from the former site may have been removed and used in construction of the present embankments and thus led to the plant's presence there, although natural recolonisation cannot be ruled out. Being on steep slopes, this is very well drained and is also multi-aspect. It is rather different from the moister riverside localities favoured elsewhere, and as the plant thrives here, it suggests that it may be a preferred habitat to the more opportunistic riverside ones. Close to this re-colonised area, there is at least one, more natural, yet very small population on an arable field border, probably a remnant of the former pre-1940 colony.

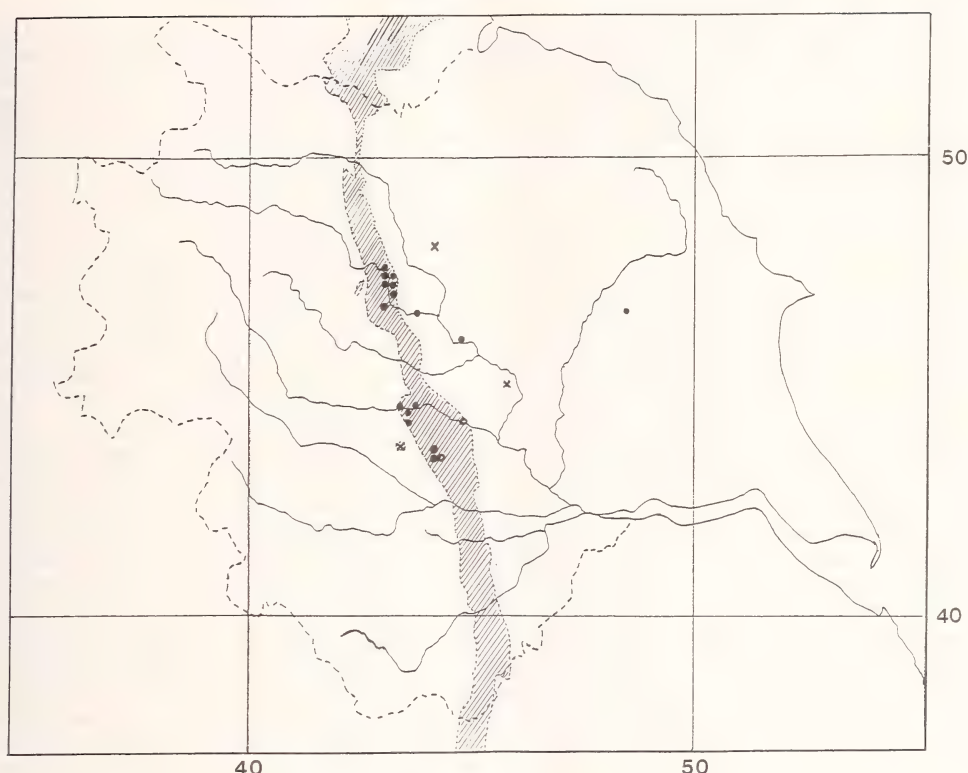


FIGURE 2. The British distribution of *O. reticulata* showing tetrads from which there are confirmed records: ● 1991 onwards; ○ 1901–1990; × up to 1900; the major river pattern and the disposition of the magnesian limestone (hatched) are also indicated.

Roundhay limehills are mainly commercially developed nowadays and the plant is presumably long extinct. Craven, the original discoverer in Britain, lived at Roundhay at the turn of the century and would presumably have recorded it if he had known it there, and so it had perhaps gone even in his day. Nothing is known of the plant's habitat or frequency there, but Roundhay and Hook Moor are both well away from major rivers, and could be remnants of an earlier area of distribution, from which it has subsequently expanded.

All the localities mentioned occur on, or just eastwards of, the magnesian limestone formation. Those to the east of it are usually close to major rivers and their occurrence there is likely to be a result of downstream dispersal by water into habitats rich in alluvial deposits. No records for *O. reticulata* have been traced to the west (upstream) of the magnesian limestone, and this reinforces the argument for the downstream river dispersal through and away from this formation. However, a magnesian limestone soil is not an essential requirement as shown by the plant's occurrence in v.c. 61 on the chalk at North Grimston, where it formerly thrived (W. A. Sledge, pers. comm.) but is now much less abundant. This locality is separated from all others and distant from any rivers, and its presence there could possibly be from accidental introduction, since it has only been known since 1953.

Within the last 60 years or so, *O. reticulata* appears to have become more widely distributed in Yorkshire than formerly, but whether this is due to a genuine expansion of range or results from being previously overlooked, is uncertain. Some populations are highly stable, appearing on the same area of thistle year after year, but others are more dynamic. These latter may change in size and spatial distribution, apparently dying out (at least temporarily) in one part of the population, only to appear a short distance away. Whether this depends on the vigour of the host or on some

other local factor, is not clear. Observations in the field indicate that it is not the most dense stands or the most robust thistles which are parasitised, but often smaller plants in scattered groups, although it is not clear whether this state is caused by, rather than the cause of the parasite's distribution. However, even in the most favoured localities *O. reticulata* can remain highly localised, with vast numbers of the host plant remaining un-parasitised, and it is assumed that critical ecological factors control its ultimate viability.

SUMMARY

Of the 68 recorded populations of *O. reticulata*, at least 52 survive. The majority are on the magnesian limestone formation and whilst this might not be an essential ecological requirement, calcareous soils are favoured. Many populations have been found recently, but it is uncertain whether these are newly-formed, or are much older and had been overlooked or even misidentified. Many are small in numbers, but this is no indication of length of colonisation, since some colonies are known to have persisted for over 70 years whilst consisting of only a few plants.

Of the extant populations, more than 85% are within the influence of river flood water and dispersal and population formation by such means must clearly take place. Interestingly, these are mostly restricted to two short reaches of the Ure and Wharfe and it is difficult to explain the absence of similar records from the Nidd, which crosses the magnesian limestone between these two rivers. Maybe a population has never developed sufficiently close to the Nidd to allow other riverside ones to become established by water-borne means? Two other Yorkshire rivers which cross the magnesian limestone also lack confirmed records in their vicinity, but the Swale does so over a very narrow exposure and well to the north of the plant's restricted area of distribution, whilst the Aire although closer, is heavily industrialised. It is interesting that *Potamogeton × suecicus* K. Richter is apparently also restricted in England (excluding the River Tweed on the Scottish border) to largely similar reaches of the Ure and Wharfe, and is again not recorded from other rivers within the area. New populations of *O. reticulata* will doubtless continue to form in favoured riverside localities but colonisation elsewhere is likely to be rare, and if it occurs off the limestone, may originate from inadvertent introduction.

The main threats to its survival result from the deliberate destruction of its hosts, from adverse agricultural practices, and through engineering operations such as road construction. Some populations may be lost when river banks are eroded, whilst gravel extraction is yet another threat. Nevertheless it appears to be relatively resilient, occasionally reappearing at sites from which it was thought to be extinct. There is much scope for investigation of the autecology and population dynamics of *O. reticulata*.

RECORDED LOCALITIES AND RELEVANT HERBARIUM SPECIMENS

Whilst it is recognised that the number of flowering spikes can fluctuate annually and that two or more may sometimes represent just a single plant, an attempt has been made to estimate a typical size for each population. This is indicated using the following notation: A = 1–10 plants; B = 11–50; C = 51–200; D = 201–1000; E = 1000+; X = probably extinct. Even if in fairly close proximity to others, populations are considered to be separate if they are clearly observed as such in the field even when consisting of just one or two plants. All populations shown as extant (A–E) have been checked since 1991.

Localities which are *not* on the magnesian limestone formation are indicated by (*); those well away from the influence of river flood water by (#).

Being a protected species, precise details of the populations are not given here, but have been deposited at English Nature, York, and the Biological Records Centre, Monks Wood.

Herbarium specimens quoted earlier in the text are not usually repeated here, but their existence is indicated by the code (Hb) inserted after the locality name. Others of relevance are listed after each locality entry and although not exhaustive, they represent the majority of the more interesting, historical specimens held in major national, or locally important herbaria. The fact that *O. reticulata* is a *Red Data Book* plant is stressed and therefore further collections should not be made, but the

specimens quoted used for reference or examination. Where specimens have been redetermined these are shown in this section as follows: (i) by F. J. Rumsey, (ii) by M. J. Y. Foley.

Notts., v.c. 56:

Based upon the single unlocalised (Hb) record of a specimen of doubtful provenance.

S.E. Yorks., v.c. 61:

SE/8.6, North Grimston (* #), found in 1953 (Sledge 1954) on chalk, well away from magnesian limestone and river influence. Recently decreased, but still survives (B); herbarium specimens: 1953, *Sledge* (CMM, RNG). In 1953 also recorded at a nearby quarry but not seen again until 1992 (B). It is possible that there has been a recent introduction nearby at Wharram.

N.E. Yorks., v.c. 62:

SE/4.6, Linton-on-Ouse (*), first found in 1984, probably formed from a population further upstream (B). There is also an unlocalised herbarium specimen from north-east Yorkshire (Hb) collected as *O. minor* (ii).

SE/4.8, near Thirsk (* #) in 1852, based upon atypical specimens (Fowler, OXF). Two other sets of specimens collected near here (at Sowerby) in 1851 (Baker, BM) may be of hybrid origin and are possibly from the same population. Apparently not recorded since (X).

Mid-W. Yorks., v.c. 64:

SE/3.3 Roundhay Lime Hills (#), the early specimen as *O. major* (ii), (1868, Lees & Abbott, CMM) is the only record traced. The site is now mostly developed and industrialised (X).

SE/3.4, East Keswick A, first noted in 1990 in a rough pasture (C). The following year several interesting variants were observed (Foley 1992); East Keswick B, overgrown scrub, known since about 1985 (B); Hetchell Craggs (Hb), calcareous grassland above the gritstone escarpment, the locality from which the first identified British *O. reticulata* specimens were collected by Craven in 1907 (B). It is probable that two populations formerly existed here, one becoming extinct in 1909 (X); herbarium specimens from Hetchell include: 1907, *Craven* (MANCH); 1908, *Craven* (OXF); 1908, *Druce ex Craven* (PRC); 1908, *Craven* (BM, CGE); 1908, *Craven* (OXF); 1909, *Lees & Pickard* (CMM); 1909, *Pickard* (LES, CGE); 1910, *Palmer* (BM); 1913, *Horrell* (LES); 1919, *Cockerline* (LES); 1951, *Boniface* (NMW); 1966, *Hodgson* (LANC); Whitwell, north bank of river, first found in 1991 by P. P. Abbott (A); Langwith Scrub, known from this riverside locality since the 1920s (W. A. Sledge, pers. comm.) and thought extinct, but a few plants were found close by in 1991 (A). Lees' (1888) record for *O. major* at Langwith Woods is very likely an error for *O. reticulata* and there are also herbarium specimens probably from here: 1917, *Horrell* (OXF, LES); Linton Common (Hb), recorded just after the beginning of this century, and still present in small numbers (A).

SE/3.6, South Ripon (#), an area of limestone grassland, where occasional plants have been found since 1989 including a single plant in 1992 (A); Roecliffe (*), a rough riverside pasture, first recorded in 1969 in small numbers. Thought to be extinct, but four plants were found close by in 1992 (A).

SE/3.7, near Queen Mary's Dubbs, five populations found in 1992, but a further one lost to ploughing some years earlier (A, A, A, A, B, X); Ripon Parks, formerly several populations with five still remaining on the flood plain of the Ure on Ministry of Defence land. Two others were lost when the ground was ploughed in the early 1980s. Fasciated plants have been recorded from this locality (A, A, A, A, C, X, X); Norton Conyers A, east bank of the Ure, ten populations mostly found in 1992, one of which possibly contained hybrid plants ($\times$ *O. minor*) (A, A, A, A, A, A, B, B, B, B); near Nunwick, four populations found recently (A, A, B, B); north of Ure Bank found in 1992 (A); Bridge Hewick (Hb) where two separate populations flourished about 1940–1950 on opposite banks of the Ure. Rob (1953) commented that the plant had decreased here, but there were about 70 plants at one population in 1954 (H. J. M. Bowen, pers. comm.). Apparently extinct at one of the old localities but four populations were found near the other in 1992 (A, A, A, B, X). Herbarium specimens from Bridge Hewick include: 1952, *Bangerter* (BM); 1954, *Rob* (YKN); 1954, *Bowen* (RNG). Other specimens only partially localised and probably from near here are: Ripon, as *O. major* (i), 1903, *C.A.C.* (BM); near Ripon, 1956, *Branson* (E, RNG).

SE/4.3: Hook Moor (#) (Hb), one of the classic sites from which specimens can be found in most major herbaria (often under the alternative locality names of Micklefield or Lotherton Moor), one such early specimen dating from 1878. Formerly widespread prior to the site being ploughed

in about 1940. Since then good populations have developed on road embankments within the vicinity, plants or seed possibly having been brought in with the soil during road construction, or even formed by natural re-colonisation. Probably the strongest British population (D, possibly E); there are two other nearby localities: a probable relict population on an arable field border. (A), and another on a road embankment to the north (A). Three other records in the period 1952–1972 from other areas of Hook Moor (#) have not been recently confirmed (X, X, X). Herbarium specimens include: as *O. eu-minor* (ii), 1881, Webster (BM); as *O. minor* (i), 1881, Webster (E); 1892, Foggitt (BM); 1919, Sledge (CMM); 1922, Barnett (LES); 1922, Roper (LDS); 1929, Jones (LDS); 1930, Foggitt (BM); 1932, Vachell (NMW); 1932, Vachell & Knowling (NMW); 1936, Sledge (LIV, RNG); 1936, Jackson (K); 1937, Lousley (LIV, RNG, K); 1937, Woodhead (LANC); 1938, Chapple (OXF); 1939, Lousley (NMW); 1946, Lousley (E, RNG); 1946, Libbey (LTR); 1949, Raven (LTR); 1953, Frankland (three sheets) (LIV); 1988 (photographs only), Rumsey (RNG). There is an unlocalised specimen probably from here: near Leeds, as *O. rubra* (i), 1922, Rogers (CGE).

SE/4.4, near Tadcaster, the sole record is based upon a semi-localised herbarium specimen collected in 1935 (W.R.W., K) and now presumed extinct (X); near the Dunsforths, rumoured to have been found here in the mid-1980s, but no definite records traced.

SE/5.5: The Nurseries near York (* #), based on Backhouse's 1886 specimen (K). At this date, Backhouse's nurseries were in what are now the south-western suburbs of the city. Presumably a casual introduction with no records since (X).

N. W. Yorks., v.c. 65:

SE/3.7, Badger Bank, five separate populations on the east bank of the Ure (A, A, A, A, B); Norton Conyers B, east bank of the Ure, first found in 1988, including one broken, fasciated plant, Norris & Lloyd-Evans (LES) (A); North Stainley, on a nature reserve on the west side of the Ure. Recorded here in 1984, this population has apparently died out, but a second one appeared close by in 1992 (A). There is a further population a short way downstream (A); Low Batts, discovered here about 1980 (B).

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Skunkweed (*Navarretia squarrosa* (Eschsch.) Hook. & Arn.) and other Polemoniaceae in Britain

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ABSTRACT

The discovery of a large population of Skunkweed, *Navarretia squarrosa* (Eschsch.) Hook. & Arn. (Polemoniaceae) in Windsor Great Park, Berks. (v.c. 22) has prompted further investigation into this little known alien, which is described, illustrated and discussed in conjunction with related species. A key is given to separate four relevant genera.

INTRODUCTION

Skunkweed, *Navarretia squarrosa* (Eschsch.) Hook. & Arn. (Polemoniaceae), has a long history of periodic occurrence in Britain but is not treated in recent Floras (Clapham *et al.* 1987; Stace 1991). In early July 1990, M.F.G. was informed that a large population of *N. squarrosa* had been discovered on private land within Windsor Great Park (v.c. 22, Berks.). On investigation it was found that the colony of several thousand plants was thickly scattered on more or less bare sandy ground which had until recently been a rubbish dump. This site had been sown the previous autumn with a grass and wild-flower amenity mixture, the grass seed of which had originated from Oregon. Germination of the sown mixture had been almost non-existent and instead the area was sparsely covered by mainly mosses and several early colonising species such as *Spergularia rubra* (L.) J. & C. Presl and *Gnaphalium uliginosum* L. It was interesting to note that grasses were almost absent. The whole area was almost flat with a few slight hollows which presumably held water during the winter. In June these were covered with the annual White Forget-me-not *Plagiobothrys scouleri* (Hook. & Arn.) I. M. Johnston., a member of the Boraginaceae which is also a native of western North America (Stace 1991).

In 1991 both *N. squarrosa* and *P. scouleri* reappeared in considerable numbers suggesting that seed had been successfully set the previous year. However, long-term persistence is unlikely, as the ground will probably become overgrown again. In mid-June only small seedlings of *N. squarrosa* were present and on walking through these plants their foetid smell, resembling petrol or rotten eggs, was very prominent.

DESCRIPTION OF NAVARRETIA SQUARROSA

The genus *Navarretia* (Polemoniaceae) contains 30 annual species of which 29 are native to western N. America and one is native to Chile and Argentina (Mabberley 1987). Many species of *Navarretia* look somewhat similar and the following description defines *N. squarrosa*.

Navarretia squarrosa (Eschsch.) Hook. & Arn., *Bot. Beechey's Voy.* 8: 368 (1839). Fig. 1.

Synonyms: *Hoitzia squarrosa* Eschsch., *Mém. Acad. Sci. St Pétersb.* 10: 283 (1826); *Gilia pungens*



FIGURE 1. *Navarretia squarrosa* (Eschsch.) Hook. & Arn., Skunkweed.

Douglas ex Hook., *Bot. Mag.* 57: t. 2977 (1830); *Gilia squarrosa* (Eschsch.) Hook. & Arn., *Bot. Beechey's Voy.* 4: 151 (Oct. 1833); *Aegóchloa pungens* (Douglas ex Hook.) Benth., *Edward's Bot. Reg.* 19: sub pl. 1622 (1 Oct. 1833); *Navarretia pungens* (Douglas ex Hook.) Hook., *Fl. Bor. Am.* 2: 75 (1838).

Erect annual 5–35 cm, with usually one main stem, rather stout and rigid, the lateral branches more or less well developed producing a top-heavy plant narrowing to a slender base; all parts except flowers glandular-viscid, with a strong, unpleasant odour (hence the vernacular name). Leaves alternate, sessile, 1.5–3.5 × 1–2.5 cm, varying from bipinnate to pinnately and palmately dissected,

the linear lobes spinescent. Flowers in capitate, bracteate clusters; calyx tube 7–10 mm, scarious between the ribs, with unequal, subulate, spinescent lobes; corolla 7–13 mm, infundibuliform, blue to whitish, barely exceeding the calyx; stamens 5, slightly unequal, inserted in corolla throat; stigmas 3. Capsule ellipsoid, 3-locular, each loculus with 6–8 or more ovules. Seeds 0.6–0.8 mm, dark brown, irregularly angled-ovoid, rugose. Native to western N. America, from Vancouver Island in the north, south to California (Hitchcock *et al.* 1959).

Cantua pungens Torrey, *Ann. Lyc. Nat. Hist. N. York* 2: 221 (1828) was described on the basis of a specimen collected by Edwin P. James in 1820, in the valley of the Loup Fork (Nebraska). This is obviously not the same specimen as the type of *Gilia pungens* Douglas ex Hook. (collected by David Douglas on the Multnomack River, California); because the respective type descriptions of *C. pungens* and *G. pungens* differ in several important points (e.g. *C. pungens*: flowers solitary, axillary; *G. pungens*: flowers in capitate clusters), *C. pungens* is not considered to be synonymous with *Navarretia squarrosa*, although *Index Kewensis* considered it to be so (R. R. Mill, pers. comm.). The type locality of *C. pungens* is also far outside the geographical range of *N. squarrosa*.

Voucher specimens of *Navarretia squarrosa* and *Plagiobothrys scouleri* have been deposited in **RNG**, **E**, **herb.** **E.J.C.** and **herb.** **M.F.G.** Specimens of *N. squarrosa* were also collected and distributed by the University of Reading through the Société pour l'Échange des Plantes Vasculaires de l'Europe et du Bassin Méditerranéen. It is interesting to note that the oils within the plant are volatile and pressed specimens soon totally lose their foetid odour. *N. squarrosa* seems to be very poorly represented in the literature and in herbaria as a British adventive. For example, there are no specimens held by **BM**, **CGG** and **K**.

HISTORY OF OCCURRENCE IN BRITAIN

1828–1830

The species was probably first cultivated in Britain in 1829 or 1830, when plants were raised by the Horticultural Society of London from seed collected by David Douglas in North America. He collected seed from plants growing on moist ground in mountain valleys near to the sources of the Multnomack river, one of the southern branches of the Columbia river in western North America. Plants from this collection were subsequently illustrated in the *Botanical Magazine*, tab. 2977 (Hooker 1830) and although not garden worthy, references to *Navarretia squarrosa* have persisted in horticultural literature to the present day (Huxley 1992).

1915–1933

The species was first collected as an alien by Miss I. M. Hayward in August 1915 under Ladhope Bridge, Galashiels, Selkirks., v.c. 79, where it was growing on shingle beside Gala Water and had presumably been introduced with wool shoddy (Druce 1916; Hayward & Druce 1919). It was determined by A. Thellung as *Gilia pungens* Douglas ex Hook. & Arn. Some eight years later it was collected from Sleaford, S. Lincs., v.c. 53, by Miss Landon where it was thought to have been introduced with chicken corn (Druce 1924); again determined by Thellung, this time as *G. squarrosa* Hook. & Arn. (**OXF**). The same year it was also collected from Hythe Quay, Colchester, N. Essex, v.c. 19, where it was thought to have been introduced with malting refuse. Plants were still being recorded from the same locality the following year (Brown 1930, **OXF**). The next recorded occurrence was reported by Miss C. M. Rob from Topcliffe, near Thirsk, N. E. Yorks., v.c. 62, where it came up in a newly made lawn. In this case the plant may have been introduced with sawn wood which originated from California and was used for constructing the doors of the house (Pearsall 1934).

1978–1979

Nearly half a century passed before the species was seen again in Britain, this time as a weed in a rose bed by Mrs M. Baecker at Carr Bank, Milnthorpe, Westmorland, v.c. 69, in 1978 and 1979 (Clement 1979, **herb.** **E.J.C.**).

OCCURRENCE ELSEWHERE

Navarretia squarrosa has also been recorded as a bird seed alien in the Netherlands (Ooststroom & Reichgelt 1963) and as a ruderal in Denmark (Hansen 1979). Outside Europe it is recorded in the floras of New Zealand and Australia, having first been noted early in the century by Black (Robertson 1957); it persists there to the present day (Toelken 1986; Webb *et al.* 1988).

OTHER POLEMONIACEAE IN BRITAIN

There is only one member of the Polemoniaceae native to Britain and Ireland. Jacob's Ladder, *Polemonium caeruleum* L., occurs in limestone grassland, on screes, on rock ledges and on the borders of woodland in northern England and is reported (Stace 1991) as a sporadic garden escape elsewhere. However, B. Wurzell (pers. comm.) warns that since a number of similar *Polemonium* species, varieties and hybrids are grown in gardens, no wild plant of such provenance should be attributed to *P. caeruleum* without careful verification. Stace (1991) also lists *Phlox paniculata* L., another North American species, as sporadically naturalised on rough and waste ground in England. At the last published tally (Druce 1928), twelve alien Polemoniaceae were listed, the genus *Gilia* contributing most taxa. None of these was included in the two more recent lists of British plants (Dandy 1958; Kent 1992). *Phlox drummondii* Hook. and *P. subulata* L. have been observed as adventives on urban wasteland (B. Wurzell, pers. comm.)

KEY TO THE GENERA OF POLEMONIACEAE OCCURRING IN BRITAIN

The following key may aid the identification of three of the commonest genera most likely to be confused with *Navarretia*:

1. Calyx green and herbaceous throughout 1. *Polemonium*
1. Calyx with prominent scarious or hyaline intervals between the green and more herbaceous costae 2
2. Staminal filaments very unequally inserted; leaves opposite 2. *Phlox*
2. Staminal filaments equally or almost equally inserted; leaves alternate 3
3. Calyx-lobes obviously unequal; leaf segments spine-tipped 3. *Navarretia*
3. Calyx-lobes equal or nearly so; leaf-segments not spine-tipped 4. *Gilia*

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Who was the author of *Montbretia crocosmiiflora*?

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ABSTRACT

Montbretia crocosmiiflora, the basionym of *Crocospia* × *crocosmiiflora* (Iridaceae) was published by Victor Lemoine in *The Garden*, 1880, not by E. Morren; the correct citation of the current name is *Crocospia* × *crocosmiiflora* (Lemoine) N.E.Br.

INTRODUCTION

Montbretia crocosmiiflora is the basionym of the currently accepted name for the well-known garden plant, *Crocospia* × *crocosmiiflora* (Iridaceae), which has escaped and become widely naturalized in coastal parts of the British Isles (Stace 1991; Nelson 1993). Although the generic name *Montbretia* has long since been abandoned, it remains in everyday use as the vernacular name especially for the naturalized plant. *C. × crocosmiiflora* is an artificial hybrid created by Victor Lemoine of Nancy, France, who pollinated *C. pottsii* (Baker) N. E. Br. with pollen from *C. aurea* (Hook.) Planch.; the seedlings first bloomed in August 1880.

For many years standard botanical accounts (e.g. de Vos 1984) credited publication of *Montbretia crocosmiiflora* to C. J. Edouard Morren (1881), and the usual citation of the hybrid's name was *Crocospia* × *crocosmiiflora* (Lemoine ex E. Morren) N. E. Br. (cf. de Vos 1984). Kosteljik (1984) pointed out that Morren's account, published in *La Belgique Horticole* 31 late in 1881 to accompany plate 472, was predated by a note printed in the October 1881 number (118) of *The Floral Magazine*, edited by Richard Dean, but Kosteljik (1984) and Wijnands (1986) omitted to note that the September issue of the same periodical had an earlier account, reading as follows

“... *Montbretia crocosmaeflora*, a novelty sent by Mons. Lemoine, Nancy, France; much the same in colour as *M. Pottsii*, but perhaps a little more yellow, and the flowers larger.”

Kosteljik (1984) proposed altering the citation to *C. × crocosmiiflora* (Lemoine ex Burb. & Dean) N. E. Br.; this was noted by Wijnands (1986), and taken up by Trehane (1989), Stace (1991) and Kent (1992) among others.

EARLY DESCRIPTIONS OF LEMOINE'S HYBRID

Kosteljik's bibliographic search was not exhaustive. The following are even earlier accounts in which the binomial *Montbretia crocosmiiflora* was used:

The Garden 21 August 1880 (p. 188)

“New Hybrid *Montbretia*. – Mons. V. Lemoine, of Nancy, sends us a new bulbous plant, which he has obtained by fertilising *Montbretia Pottsii* . . . with *Tritonia* (*Crocospia* [sic] *aurea*). The progeny Mons. Lemoine proposes to name *Montbretia crocosmaeflora*. The flowers, he says, are four or five times the size of *M. Pottsii*; and this successful cross he considers to be the starting point for the production of a race of beautiful hardy varieties. The flowers sent are borne in the same manner on the spike as those of *M. Pottsii*, but they are much larger and of a deeper colour. The cross seems to be precisely intermediate between the two parents.”

The Garden 30 July 1881 (p. 125)

“*Montbretia crocosmaeflora*, similar in every respect to *M. Pottsii* [sic] . . . but more robust in habit, and having larger flower-spikes.”

The Gardener's Chronicle 30 July 1881 (p. 153)

"Mr Barron also showed *Montbretia crocosmaeflora* [sic], one of Mons. Lemoine's novelties, much the same colour as *M. Potsii* [sic], perhaps a little more yellow, but the flowers larger – a very good plant . . ."

The Garden 27 August 1881 (p. 203)

"MONTBRETIA CROCOSMAEFLORE – A very promising plant with orange and red flowers, very bright, but somewhat withered owing to its journey from Nancy . . . From M. Lemoine."

DISCUSSION

The first quotation from *The Garden* (18: 188, dated 21 August 1880) must have been written very shortly after the seedlings bloomed for the first time; it contains a diagnosis that is adequate under the *International Code of Botanical Nomenclature* (Greuter *et al.* 1988; Art. 32.2) to validate the binomial *Montbretia crocosmiiflora*. It must be stressed that both the binomial and at least part of the description are explicitly attributed to Lemoine, and the passage is written in the present tense. But, by including the clause "Mons. Lemoine proposes to name . . .", does the author perhaps fall foul of Art. 34.1, that a name is "not validly published . . . when it is merely proposed in anticipation of . . . a particular circumscription"?

The two subsequent notes, both published almost one year later on 30 July 1881, do not contravene any articles of the current *I.C.B.N.* and thus the binomial was validly published as early as 30 July 1881 – unless description in the issue of *The Garden* of 21 August 1880 is *not* ruled out.

Deciding which of the 30 July 1881 issues of the separate periodicals was the first published seems a pointless exercise, but they predate *The Floral Magazine* notices by at least one month, so that the protologue of *Montbretia crocosmiiflora* may be credited to one or other of these, or both. At this period *The Gardener's Chronicle* was edited by M. T. Masters, and *The Garden* by its founder, William Robinson, and thus possible citations might include 'Lemoine ex Masters', and 'Lemoine ex W. Robinson'.

The publication of names in reports of horticultural shows is a matter that is not addressed by the *I.C.B.N.* There is no reason to reject names, accompanied by diagnostic statements, when included in such reports, except when they contravene particular articles of the code. Under the *I.C.B.N.* (Art. 29, Berlin 1988), publication in non-scientific newspapers was forbidden after 1 January 1953; thereby there is the implication that before that date publication of binomials in such periodicals is valid. The descriptions of *Montbretia crocosmiiflora* quoted above appeared in reports of the Royal Horticultural Society's exhibition on 26 July 1881, and it is possible that London newspapers of 27 July contained reports in which there were descriptions – I have made *no* attempt to trace any such reports. It is even possible that French periodicals and newspapers contained even earlier reports of the first flowers in August 1880, for example.

The consequences of this conundrum is that it is impossible unambiguously to assign *Montbretia crocosmiiflora* to a single author. Both Masters and Robinson were describing the same plant, having seen the same specimens on the same day, although it cannot be established that Masters or Robinson personally wrote the news items concerned; they were the editors of the respective periodicals, and one of their journalists could have contributed the show reports. Furthermore, because of the real possibility that newspapers printed in August 1880 and July 1881 carried descriptions and the binomial, it may be impossible to determine if the original place of publication was really *The Gardener's Chronicle* or *The Garden*.

CONCLUSIONS

Each of the quoted descriptions is of the same, indeed the original hybrid, so the best solution to this conundrum is to accept that the name was first devised and used by Victor Lemoine, that it was published validly in *The Garden* on 21 August 1880, and that because the clause "proposes to name" is in the present tense this diagnosis need not be regarded as provisional and thus contrary to Art. 34.1. Thus the citation should read:

Crocasmia × **crocosmiiflora** (Lemoine) N. E. Br., *Transactions of the Royal Society of South Africa* **20**: 264 (1932).

Basionym: *Montbretia crocosmiiflora* Lemoine, *The Garden* **18**: 188 (21 August 1880) [as 'crocosmaeflora']; *The Garden* **20**: 125 (30 July 1881); *The Gardener's Chronicle* **16** (n.s.): 153 (30 July 1881); *The Garden* **20**: 203 (27 August 1881); *The Floral Magazine* no. 117 (September 1881); *The Floral Magazine* no. 118, tab. 472 (October 1881); *La Belgique Horticole* **31**: 229, tab. 14 (1881) [with formula "× *Montbretia aureo-pottsi*"].

TYPIIFICATION OF *MONTBRETIA CROCOSMIIFLORA*

de Vos (1984) designated the illustration published in *La Belgique Horticole* **31** (tab. 14) as the lectotype of *Montbretia crocosmiiflora* Lemoine ex Morren, but this is not acceptable (see *I.C.B.N.* Art. 7) and must be rejected. In this instance the published illustration cannot be a lectotype but could be selected as a neotype, as long as there are no herbarium specimens preserved of the original materials received from Lemoine by Robinson in August 1880. However, better candidates for selection as neotypes would be herbarium specimens prepared from the material displayed at the Royal Horticultural Society in July 1881.

ORTHOGRAPHY

The earliest notes used either 'crocosmiaeflora' or 'crocosmaeflora'. These are improperly formed compounds; under the *I.C.B.N.* (Art. 73), the epithet should be corrected to 'crocosmiiflora', as is standard practice.

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(Accepted February 1993)

Short Notes

CONTRIBUTIONS TO A CYTOLOGICAL CATALOGUE OF THE BRITISH AND IRISH FLORA, 3

This note continues our series presenting the results of a cytological survey of British and Irish vascular plants (Hollingsworth *et al.* 1992). Here we report the chromosome numbers of 88 species from 95 populations. A suffix 'S' denotes supernumerary chromosomes. Only one plant per population was counted, except where stated. All counts were made on squashes of root-tips. Voucher specimens have been deposited in **LTR**.

- Ajuga reptans* L., 2n = 32: Leics., v.c. 55, Swithland Wood, SK/53.12.
Alchemilla glaucescens Wallr., 2n = c. 110: Westmorland, v.c. 69, Crosby Gill, NY/61.11.
Alchemilla xanthochlora Rothm., 2n = c. 107: W. Lancs., v.c. 60, near Carnforth, SD/507.706.
Allium scorodoprasum L., 2n = 16: W. Lancs., v.c. 60, Potts Corner, SD/41.57.
Andromeda polifolia L., 2n = 48: Westmorland, v.c. 69, Meathop Moss, 3 km N.E. of Lindale, SD/44.81.
Apium inundatum (L.) Reichb.f., 2n = 22: Caerns., v.c. 49, Cilan, near Abersoch, SH/29.24.
Barbarea vulgaris R.Br., 2n = 16: W. Lancs., v.c. 60, River Lune, near Lancaster, SD/488.640.
Brassica napus L. subsp. *oleifera* (DC.) Metzger, 2n = 38: Dorset, v.c. 9, c. 1.5 km W. of Burton Bradstock, SY/47.89.
Calystegia soldanella (L.) R.Br., 2n=22: Caerns., v.c. 49, Pwllheli, SH/37.34.
Cardamine amara L., 2n = 16: W. Lancs., v.c. 60, near Carnforth, SD/507.706.
Carex acutiformis Ehrh., 2n = 38: W. Lancs., v.c. 60, Lancaster University campus, SD/48.57.
Chrysosplenium oppositifolium L., 2n=42: W. Lancs., v.c. 60, near Millbeck footbridge, SD/648.638.
Circaea lutetiana L., 2n = 22: Dorset, v.c. 9, Kingcombe Meadows, c. 1.5 km N.E. of Toller Porcorum, SY/55.99; W. Lancs., v.c. 60, near Millbeck footbridge, SD/648.638.
Crataegus monogyna Jacq. subsp. *nordica* Franco, 2n = 34: Caerns., v.c. 49, Penarwel valley, near Llanbedrog, SH/32.32.
Crithmum maritimum L., 2n = 20: Dorset, v.c. 9, Weymouth, landward side of Fleet Lagoon, SY/66.76.
Dactylorhiza purpurella (T. & T. A. Stephenson) Soó, 2n = 80: W. Lancs., v.c. 60, SD/5.7.
Daphne laureola L., 2n = 18: Dorset, v.c. 9, Todber, ST/79.19.
Dryopteris filix-mas (L.) Schott, 2n = 164: W. Lancs., v.c. 60, near Yealand Conyers, SD/509.745.
Equisetum telmateia Ehrh., 2n = c. 216: Caerns., v.c. 49, track from Carreg to Porth Oer (Whistling Sands), SH/16.29.
Eryngium maritimum L., 2n = 16: Caerns., v.c. 49, Pwllheli, south beach, SH/37.34.
Euonymus europaeus L., 2n = 32: Dorset, v.c. 9, Winterborne Kingston, SY/86.97.
Euphorbia peplus L., 2n = 16: Dorset, v.c. 9, Portland, Church Ope Cove, SY/69.70.
Fraxinus excelsior L., 2n = 46: Leics., v.c. 55, Outwoods, Jubilee Wood, SK/511.165; Leics., v.c. 55, Swithland Wood, SK/53.12; W. Lancs., v.c. 60, Gait Barrows N.N.R., near Silverdale, SD/480.776.
Geum rivale L., 2n = 42: W. Lancs., v.c. 60, near Forton, SD/486.534.
Geum urbanum L., 2n = 42: W. Lancs., v.c. 60, near Lancaster, SD/473.594.
Glaucium flavum Crantz, 2n = 12: Dorset, v.c. 9, c. 1.5 km W. of Burton Bradstock, SY/47.89.
Hydrocotyle vulgaris L., 2n = 96: W. Lancs., v.c. 60, Leighton Moss R.S.P.B. reserve, near Silverdale, SD/488.757.
Hypericum androsaemum L., 2n = 40: W. Lancs., v.c. 60, near Lancaster, SD/473.594.
Hypericum elodes L., 2n = 16: S. Devon, v.c. 3, Dartmoor, SX/66.80.

- Kickxia elatine* (L.) Dumort., 2n = 36: Dorset, v.c. 9, near Blandford Forum, ST/88.06.
- Lamium album* L., 2n = 18: W. Lancs., v.c. 60, W. of Heysham, SD/427.616.
- Lemna gibba* L., 2n = 40: Cambs., v.c. 29, River Delph, bridge c. 6 km E. of Chatteris, TL/470.858.
- Lemna minor* L., 2n = 40: Cambs., v.c. 29, River Delph, bridge c. 6 km E. of Chatteris, TL/470.858.
- Ligustrum vulgare* L., 2n = 46: W. Lancs., v.c. 60, Gait Barrows N.N.R., near Silverdale, SD/483.775.
- Lithospermum officinale* L., 2n = 28 + 1S: W. Lancs., v.c. 60, Gait Barrows N.N.R., near Silverdale, SD/479.776.
- Littorella uniflora* (L.) Asch., 2n = 24: Caerns., v.c. 49, Mynydd Cilan, SH/29.24.
- Lotus pedunculatus* Cav., 2n = 12: W. Lancs., v.c. 60, River Lune, near Lancaster, SD/483.628; Westmorland, v.c. 69, Lowick Common, SD/292.847.
- Luzula pilosa* (L.) Willd., 2n = 66: W. Lancs., v.c. 60, near Millbeck footbridge, SD/648.638.
- Lysimachia nummularia* L., 2n = 43: W. Lancs., v.c. 60, near Capernwray, SD/528.714.
- Lysimachia vulgaris* L., 2n = 84: W. Lancs., v.c. 60, River Lune, near Lancaster, SD/484.641.
- Malva sylvestris* L., 2n = 42: Dorset, v.c. 9, c. 1.5 km W. of Burton Bradstock, SY/47.89; W. Lancs., v.c. 60, near Bank Houses, W. of Cockerham, SD/430.531.
- Marrubium vulgare* L., 2n = 34: Dorset, v.c. 9, Bats Head, SY/79.80.
- Medicago lupulina* L., 2n = 16: Dorset, v.c. 9, c. 1.5 km W. of Burton Bradstock, SY/47.84 (two plants); W. Lancs., v.c. 60, River Lune estuary, edge of new sports centre, near Lancaster, SD/463.624.
- Menyanthes trifoliata* L., 2n = 54: W. Lancs., v.c. 60, near Lancaster, SD/458.612.
- Myosotis stolonifera* (DC.) Gay ex Leresche & Levier, 2n = 24: Westmorland, v.c. 69, Lowick Common, SD/292.847.
- Myrica gale* L., 2n = 48: Dorset, v.c. 9, Hartland Moor N.N.R. (W. side of road), c. 4 km S.E. of Wareham, SY/96.85.
- Nepeta cataria* L., 2n = 36: Dorset, v.c. 9, between Blandford Forum and Thornicombe, ST/87.04.
- Nymphoides peltata* Kuntze, 2n = 54: Cambs., v.c. 29, Block Fen gravel pit, near Chatteris, TL/431.839.
- Oenanthe crocata* L., 2n = 22: W. Lancs., v.c. 60, estuary of River Lune, near Lancaster, SD/460.621.
- Ononis repens* L. subsp. *repens*, 2n = 60: Caerns., v.c. 49, Abersoch, N. end of Porth Fawr, SH/31.27.
- Oxalis acetosella* L., 2n = 22: Dorset, v.c. 9, Kingcombe Meadows, c. 1.5 km N.E. of Toller Porcorum, SY/55.99.
- Parietaria judaica* L., 2n = 26: Dorset, v.c. 9, Portland Church Ope Cove, SY/69.70.
- Persicaria amphibia* (L.) Gray, 2n = 96: W. Lancs., v.c. 60, near Carnforth, SD/507.706.
- Persicaria bistorta* (L.) Samp., 2n = 48: S. Lancs., v.c. 59, Rochdale, Norden, Lower Mancroft Gate Farm, SD/841.148; Westmorland, v.c. 69, near Arnside, SD/457.767.
- Persicaria maculosa* Gray, 2n = 22: W. Lancs., v.c. 60, near Lancaster, SD/465.624.
- Petasites hybridus* (L.) P. Gaertner, B. Mey. & Scherb., 2n = 60: W. Lancs., v.c. 60, near Quernmore, SD/508.599.
- Pimpinella saxifraga* L., 2n = 40: Dorset, v.c. 9, Fontmell Down, c. 5 km S.S.E. of Shaftesbury, ST/88.18.
- Polystichum aculeatum* (L.) Roth, 2n = 164: W. Lancs., v.c. 60, near Lancaster, SD/473.594.
- Populus nigra* L. subsp. *betulifolia* (Pursh) W. Wettst., 2n = 38: W. Lancs., v.c. 60, near Lancaster, SD/454.615.
- Potentilla palustris* (L.) Scop., 2n = 35: Westmorland, v.c. 69, Lowick Common, SD/292.847.
- Primula veris* L., 2n = 22: W. Lancs., v.c. 60, near Silverdale, SD/470.749.
- Prunella vulgaris* L. (white-flowered), 2n = 28: Westmorland, v.c. 69, Broughton Beck, SD/285.825.
- Ranunculus flammula* L. subsp. *flammula*, 2n = 32: W. Lancs., v.c. 60, Heysham Moss, dismantled sidings, SD/422.604.
- Ranunculus penicillatus* (Dumort.) Bab. subsp. *pseudofluitans* (Syme) S. Webster var. *vertumnus* C. Cook, 2n = 48: Mid-W. Yorks., v.c. 64, Bishop Monkton, SE/32.66.
- Ribes nigrum* L., 2n = 16: Westmorland, v.c. 69, near Arnside, SD/477.782.
- Ribes rubrum* L., 2n = 16: W. Lancs., v.c. 60, near Lancaster, SD/473.594.

- Rosa arvensis* Hudson, $2n = 14$: W. Lancs., v.c. 60, near Lancaster, SD/459.613.
Rumex obtusifolius L. subsp. *transiens* (Simonkai) K. H. Rech., $2n = 40$: Surrey, v.c. 17, Richmond, River Thames, TQ/1.7.
Ruppia maritima L., $2n = 20$: W. Lancs., v.c. 60, near Carnforth, SD/482.702.
Salix viminalis L., $2n = 38$: W. Lancs., v.c. 60, W. of Heysham, SD/428.612.
Samolus valerandi L., $2n = 26$: W. Lancs., v.c. 60, near Carnforth, SD/483.704.
Sanguisorba minor Scop. subsp. *minor*, $2n = 28$: W. Lancs., v.c. 60, Leighton Moss R.S.P.B. Reserve, near Silverdale, SD/489.758.
Sanicula europaea L., $2n = 16$: W. Lancs., v.c. 60, Leighton Moss R.S.P.B. Reserve, near Silverdale, SD/489.759.
Scirpus sylvaticus L., $2n = 62$: W. Lancs., v.c. 60, River Lune, near Lancaster, SD/485.638.
Sedum forsterianum Smith, $2n = c. 90$: Rads., v.c. 43, Stanner Rock, 4 km N.W. of Kington, SO/26.58.
Silene vulgaris Garcke subsp. *vulgaris*, $2n = 24$: W. Lancs., v.c. 60, River Lune, near Lancaster, SD/488.640.
Sonchus oleraceus L., $2n = 32$: Dorset, v.c. 9, c. 1.5 km W. of Burton Bradstock, SY/47.89.
Sorbus aucuparia L., $2n = 34$: W. Lancs., v.c. 60, Gait Barrows N.N.R., near Silverdale, SD/481.776.
Spirodela polyrhiza (L.) Schleiden, $2n = 40$: Cambs., v.c. 29, River Delph, bridge c. 6 km E. of Chatteris, TL/470.858.
Stachys arvensis (L.) L., $2n = 10$: Dorset, v.c. 9, Chamberlayne's Heath, c. 8 km N. of Wool, SY/83.91.
Stachys officinalis (L.) Trev., $2n = 16$: W. Lancs., v.c. 60, Gait Barrows N.N.R., near Silverdale, SD/478.773.
Taxus baccata L., $2n = 24$: Dorset, v.c. 9, Hod Hill, near Blandford Forum, ST/85.10.
Thalictrum flavum L., $2n = 84$: W. Lancs., v.c. 60, estuary, near Carnforth, SD/493.714.
Trifolium medium L., $2n = 80$: W. Lancs., v.c. 60, Gait Barrows N.N.R., near Silverdale, SD/478.772.
Valeriana dioica L., $2n = 16$: W. Lancs., v.c. 60, above Saltmire Bridge, by canal, SD/519.754.
Veronica anagallis-aquatica L., $2n = 36$: Dorset, v.c. 9, near Sydling St Nicholas, ST/63.00.
Veronica beccabunga L., $2n = 18$: Westmorland, v.c. 69, near Arnside, SD/477.782.
Veronica officinalis L., $2n = 36$: Caerns., v.c. 49, Garn Fadryn, SH/27.35.

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POLYGONUM MARITIMUM L. IN EAST SUSSEX (V.C. 14)

On 18 June 1992 a number of plants of *Polygonum maritimum* L. (Polygonaceae), Sea Knotgrass, were discovered growing on the beach at Brighton, East Sussex by one of us (A. S.). This was an exciting find as this very rare plant has never before, to our knowledge, been recorded from East Sussex (v.c. 14) and was last recorded in West Sussex (v.c. 13) by W. Borrer, although no station is given and there is apparently no specimen in his herbarium. A previous record from Bognor in 1854

by Professor I. B. Balfour was thought by H. C. Watson to be *Polygonum oxyspermum* C. A. Meyer & Bunge ex Ledeb. subsp. *raii* (Bab.) D. A. Webb & Chater, and consultation of the herbarium of the Royal Botanic Garden, Edinburgh (E) confirms this.

Following notification to English Nature, under the terms of the Wildlife & Countryside Act 1981, as a fully protected species under Schedule 8, a specimen was collected (herb. P. A. Harmes) and confirmed by Dr J. R. Akeroyd. About 14 plants were found, of which eleven or so were growing together in a clump, seeming at first glance to be a single plant. They ranged in size from seedlings, with stems no more than 8 cm, up to mature plants with stems 60 cm in length. The plants were procumbent and were in flower and fruit, which continued throughout the summer and they were still flowering in late November. They grew well above the high tide mark and seemed to have a preference for areas of fine shingle. The presence of a number of plants growing in a clump suggests that this species may have been flowering here un-noticed in previous years, and had seeded itself.

The small shingle beach where the plants were found was already well-known for its botanical interest and supports a number of plants found nowhere else along this coast. Species recorded here already include *Atriplex glabriuscula*, *A. littoralis*, *A. portulacoides* (*Halimione portulacoides*), *Crambe maritima*, *Cakile maritima*, *Raphanus raphanistrum* subsp. *maritimus*, *Beta vulgaris* subsp. *maritima*, *Honkenya peploides*, *Spergularia media*, *Calystegia soldanella*, *Crithmum maritimum*, *Glaucium flavum*, *Tripleurospermum maritimum*, *Parapholis strigosa*, *Elymus atherica* (*E. pycnanthus*) and *Catapodium maritimum*. Nomenclature follows Stace (1991).

The beach is largely composed of flint pebbles with patches of fine shingle or sand, as well as areas with some humus cover. It is only about 110 m in length and, at its widest, about 50–60 m down to the high tide mark, with vegetation restricted to about half of the area. For such a small site it has a surprisingly rich maritime flora. The beach is enclosed on three sides by a groyne, the sea wall and the western breakwater of Brighton Marina. This breakwater is about 640 m long and was completed in about 1972. The beach in its present form and position probably dates from this time and if this is the case, then all the plants here are recent colonists.

A build-up of shingle above the high tide mark has probably occurred here as the western breakwater prevents its eastern drift. It seems also that this breakwater traps great amounts of jetsam which is washed or blown on to the beach above the shingle ridge, where it tends to accumulate. The jetsam consists of plastic, polystyrene, wood, ropes, nets, tar and cans as well as plant material, including *Fucus vesiculosus* L. (Bladder-wrack), fruit and seeds, and accumulates in lower-lying parts of the beach to form a rich mulch in which seeds can be seen germinating. As the Channel current (North Atlantic Drift) and the prevailing wind through the summer come from the south-west, it seems quite possible that seed of *P. maritimum* could have originated from sites in Cornwall or S. Hants., or from the Channel Isles or Northern France. Less likely is the possibility that seeds were brought in by birds; Greenfinches are the only seed-eating species (apart from Sparrows) which frequent the beach.

P. maritimum is a characteristic species of the coasts of the Mediterranean region and is at the northerly edge of its range in southern England. The recent confirmation of this plant at three other stations in mainland Britain, together with records from S. E. Ireland and the Netherlands, suggest that it may be extending, or at least consolidating, its range and this might be related to the hotter, more Mediterranean-type summers that we have experienced in the south of England in recent years (Akeroyd 1991). If this is the case, then we may see it turning up on other suitable beaches in this country in the future. Table 1 shows the number of plants known in mainland Britain (excluding the Channel Isles).

TABLE 1. *POLYGONUM MARITIMUM* L. IN BRITAIN

Location	Number of plants in colony
W. Cornwall (v.c. 1), Gunwalloe	250
E. Cornwall (v.c. 2), Lantic Bay	1
S. Hants. (v.c. 11), Christchurch	49
E. Sussex (v.c. 14), Brighton	14

There are other factors which have enabled coastal plants to become established at this locality. Unlike many other shingle beaches in Brighton, this one is not regularly bulldozed, perhaps because there is no access. It is not used much by the public and the amount of sea-borne rubbish as well as the tar deter most people. Past threats to the beach have come from plans to extend Volk's Electric Railway, from Southern Water's proposal to dump chalk, as well as from over-zealous beach cleaning. These are hopefully no longer a threat, though beach parties and camp fires still occur. Brighton Borough Council has, however, recently declared the beach a Site of Nature Conservation Importance and there is a proposal to extend the adjacent S.S.S.I. to include this site. We hope these measures will protect the plants here and we will be monitoring the site to see if *P. maritimum* survives and increases.

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WHITE-BLOSSOMED *PINGUICULA GRANDIFLORA* LAM. (LENTIBULARIACEAE) IN THE BURREN, COUNTY CLARE, IRELAND

Pinguicula grandiflora Lam. (Leith Uisce, Kerry (or Large-flowered) Butterwort) has been reported occasionally from Ireland with white flowers. There are late 19th century records, the earliest by 'Veronica' (a nom-de-plume used by Frederick W. Burbidge, curator of Trinity College Botanic Garden, Dublin (cf. Nelson 1987)) being published in *The Garden* on 11 September 1886: "As peculiar to Ireland, or nearly so, we have . . . *Pinguicula vulgaris* var. *grandiflora* [i.e. *P. grandiflora*], in white, rosy lavender and dark violet forms" ([Burbidge] 1886). Scully (1916) recorded that in Co. Kerry while "colour variants are very rarely met with . . . forms with pure white flowers are . . . occasionally seen and have been gathered in the Gap of Dunloe by *Lady Godfrey* and on the east side of Caragh Lake by *Capt. Creaghe-Haward* . . . pale lilac forms . . . by Mrs. Jenner from the Gap of Dunloe, and are recorded in the *Irish Naturalist* 1906, p. 154, as occurring also on the shores of the Lower Lake, Killarney." No one has reported white-blossomed Kerry Butterwort in more recent decades.

In 1903 *P. grandiflora* was discovered by Professor Ambrose Birmingham at Lisdoonvarna, Co. Clare (Nelson & Walsh 1991), a habitat to the north of the long-known ones in counties Cork and Kerry. In 1949, even further north, near Ballyvaughan, another colony was found (Heslop-Harrison 1949), and in 1973, at about the same latitude, yet another (Roden 1984). These latter colonies, growing in the environs of springs issuing from Carboniferous limestone, are within the region known as The Burren (Webb & Scannell 1983; Nelson & Walsh 1991).

In 1956, D. A. Webb collected a plant of *P. grandiflora* "with very pale, almost white flowers" near Ballyvaughan and sent it to Steiger (1987) – nothing more is recorded about this plant, although Webb & Scannell (1983) reported that "for several years around 1970, a small proportion of the plants . . . had flowers of a very pale lilac colour, but searches in 1974 and 1975 failed to rediscover them."

During the summers of 1989, 1990, and 1991 in one of The Burren populations, white-flowered plants were seen and photographed by the present author, on the first occasion in company with Mr and Mrs J. Leonard. The flowers were entirely white, without any purple or pink marks or tints; however in 1990 a very young bud of one particular plant, just as it began to rise above the rosette, had a light pink flush but this was not apparent on the fully open flowers at anthesis. In 1989 and 1990 plenty of seed was produced and shed by the white-blossomed plants.

Steiger (1987) published a photograph of a series of flowers of *P. grandiflora* variants, including examples named *P. grandiflora* f. *pallida* (Gaudin) Casper and *P. grandiflora* subsp. *rosea* (Mutel) Casper. In f. *pallida* the corolla throat was purple, and in subsp. *rosea* not only was the calyx purple but the corolla throat was lined with darker pink. The white-blossomed Burren examples did not have coloured markings on the corolla and the calyx is entirely devoid of red pigment. A search of the literature (see e.g. Casper 1962, 1966) suggests that no entirely white variant of *P. grandiflora* has been described hitherto. *P. grandiflora* subvar. *albescens* Rouy (1909: "corolle blanche lavée de rose") could be interpreted as including The Burren variant. (Schlauer (1986) listed "*P. grandiflora* Lam. var. *albescens* Rouy" but I can find no trace of any legitimate publication of the combination at varietal level.) However Rouy's subvariety has been relegated to synonymy under *P. grandiflora* subsp. *rosea* (Casper 1962, 1966) which certainly cannot encompass white-flowered plants ("*corollae . . . fauce violacea vel pallida violacea-pilosa . . .*"; Casper 1962: 85).

To designate the variant with a white corolla as a variety is extravagant, and thus I proposed elsewhere (Nelson & Walsh 1991: 214, 318) that these occasional white-flowered plants should be placed within a distinct form, *P. grandiflora* f. *chionopetra*. I suggest (without having any specimens to confirm the proposition) that f. *chionopetra* may also still occur in Co. Kerry, having been reported from that county before 1903 by Scully (1916).

***Pinguicula grandiflora* Lam. forma *chionopetra* E. C. Nelson forma nova.**

Corolla candidissima, vel aliquando alabastrum novellum colore roseo suffusum; calyx flavovirens nihil rufescens vel purpurascens.

Corolla pure white, or at most the very young unopened flowers tinted pink; calyx yellow-green without red or purple tints.

HOLOTYPE: 35 mm Kodachrome 64 colour transparency (no. 16, 25.05.90; accession number 1991.1) [precise locality withheld], County Clare, 12 May 1990, *E. C. Nelson* (DBN).

The epithet *chionopetra* is derived from *chion* (snow) and *petra* (rock), alluding to the white flowers and the unique rocky habitat; it is equally appropriate for plants from Co. Kerry should this form be collected there again.

A colour photograph is designated as the holotype because, for conservation reasons, I considered it was unacceptable to remove material from the solitary plant for preservation as an herbarium specimen. This is permissible under the *International Code of Botanical Nomenclature*, Art. 9, whereby an illustration may be a type of an infraspecific name.

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CORKSCREW RUSH (*JUNCUS EFFUSUS* L. FORMA *SPIRALIS* (J. McNAB) HEGI) (JUNCACEAE) IN IRELAND AND BRITAIN

Henderson (1992) suggested that the spiral-stemmed variant of *Juncus effusus* L. (Juncaceae), found in western Scotland and the Northern Isles of Scotland, represents a taxon different from the “original”, long-cultivated one variously called, in common parlance, Corkscrew Rush, Irish Rush, or Spiral Rush. He also stated, incorrectly, that the latter had only been reported once from the wild.

The corkscrew rush (*J. effusus* var. *spiralis* J. McNab) was first collected by David Bishop (a Scot, one-time curator of Belfast Botanic Garden – see Anon. 1849; Nelson 1984, 1987) in “the wilds of Connemara”, western Ireland, before 1849 and not in “Northern Ireland . . . in 1869” as noted by Henderson (1992) repeating McNab’s (1873a, 1873b) faulty recollection. The exact date of discovery cannot now be ascertained but Bishop died in 1849, so he must have collected the Corkscrew Rush some time earlier. Indeed, the first report of the variant appeared in an obituary of Bishop (Anon. 1849):

“this extraordinary plant was exhibited at a meeting of the Botanical Society of Edinburgh, from the collection at Dalkeith, by Mr. James M’Nab, and created great interest . . .”

I cannot trace a report of this particular exhibit. Several decades later, in April 1873, James McNab read a brief account of the Corkscrew Rush to the Botanical Society in Edinburgh (McNab 1873a, 1873b), and indicated that it had been on display at the British Association for the Advancement of Science’s 1871 meeting in Edinburgh; again I cannot trace any specific mention of the rush’s appearance at the Association.

Henderson (1992) separated the western Scottish Spiral Rush from the Irish one by stating that the latter has “quite erect [stems] . . . much more obviously spiral six to eight turns as against two or three [in Scottish plants]”, but this is not the case. I have examined living individuals of the Irish Corkscrew Rush, as cultivated in the National Botanic Gardens, Glasnevin, and nursery-grown plants (source unknown) (September 1992); these possessed stems with as many as 14 complete rotations in the spiral, ranging to stems with a single attenuated rotation (the stem was merely curved), as well as erect, untwisted stems. The largest proportion of the spiral stems (50%) had fewer than five rotations; only 33% had 5–9 rotations. The stems projected at all angles, the less spiralled ones tending to spread almost horizontally (i.e. these were suberect) because of the spiral. Thus cultivated plants, propagated vegetatively from long-established Irish stock, do not have the characteristics suggested by Henderson (1992); his variety is dubiously distinct from the cultivated plant.

Several herbarium specimens in the Royal Botanic Garden, Edinburgh (see below), have remarkable corkscrewing stems, but clearly these particular stems were selected because of their form; they do not represent accurately the habit and range of spiralling in the original clone. The earliest illustration of the Corkscrew Rush from Ireland (*The Gardeners’ Chronicle and Agricultural Gazette*, 10 May 1873: 647 (McNab 1873a; reprinted in McNab 1873b: 503)) showed a plant with erect and spreading stems, some markedly spiralled but many merely curved (Fig. 1), exactly as in those cultivated plants I have examined. A photograph published by Tutenberg (1905) also clearly displays variation in habit. Those authors presumably had plants derived from Bishop’s original collection.

As for Irish populations, Praeger (1934: 406), repeating records of this taxon from Inishturk (Co. Mayo, v.c. H27) off the Connemara coast (Praeger 1907: 123 – “the form with spreading stems was several times observed”), stated that it had

“spreading loosely spiral stems . . . The spiral rush just mentioned would appear to be an Atlantic



FIGURE 1. Corkscrew Rush, *Juncus effusus* L. forma *spiralis* (McNab) Hegi; illustration published in *The Gardeners' Chronicle and Agricultural Gazette*, 10 May 1873: 647 (designated as neotype herein).

form: it is common on many of the Irish western islands, and is stated to be abundant in Orkney . . ."

Praeger (1934: 424) also repeated records from Inishmurray (Co. Sligo, v.c. H28) –

"Perhaps the most curious plant of the island was a diffuse form of *Juncus conglomeratus* [= *J. effusus*; fide Praeger (1934)], the stems of which, instead of growing erect in a compact clump as usual, spread out at every angle, from horizontal to vertical, giving the whole plant a very strange appearance . . . this curious rush was abundant in damp places with the typical form." (Praeger 1896: 178)

– and from Achill Island (Co. Mayo, v.c. H27; Praeger 1934: 408) –

"Near Sraheens village occurred a form with widely spreading stems, many of them spirally curved, with several convolutions. I have gathered the same form from Inishmurray, Co. Sligo. Mr Beeby informs me that in Orkney these spiral forms are frequent." (Praeger 1904: 285)

Spence (1906, 1914, 1919) reported spiral-stemmed *J. effusus* from Orkney (v.c. 111), and Druce (1922: 524) and Scott & Palmer (1987: 343) recorded this variant from Shetland (v.c. 112); the latter authors suggested that the spiralling stems are deformed by wind –

"'*Juncus effusus* var. *spiralis* McNab', recorded from various localities by Druce [1922], was surely no more than a wind-blown state with slightly curved stems, not the monstrosity with corkscrew-like stems which James McNab grew . . ."

The Spiral Rush has been recorded in Surrey (v.c. 17) (see list of specimens below, and Leslie 1981), and collected in Carmarthenshire (v.c. 44, see below).

For at least a century, botanists have assigned to McNab's variant all plants of *J. effusus* producing spiral stems. Having examined herbarium material and living plants, I have been unable to detect any difference between the variable Irish original and Henderson's newly described taxon. Perhaps a case can be made on the basis of habit – that western Scottish plants lack any erect stems – but the range of variation within 'populations' of vegetatively propagated plants is so substantial that such an argument could not be justified. I conclude, therefore, that all plants of this species with spiral stems, irrespective of the degree of spiralling or angle of inclination, should be placed, as generally done by previous authors, within the same taxon. Henderson's varietal epithet is deemed unnecessary and is here relegated to synonymy.

The status of the Spiral Rush is debatable. McNab (1873b) and Henderson (1992) reported that seedlings have spiralling stems so it is a distinct genotype. While horticulturists have considered it little more than a cultivar (*J. effusus* 'Spiralis' is then the valid name; cf. Nelson 1984), its occurrence in the wild, especially in western Ireland and Scotland, suggests that it deserves recognition as a botanical variety or form. As the variant is clearly distinguished from the common rush only by its spiral stems, both erect and spreading, I suggest it is best treated as a botanical form; it does not warrant recognition at varietal level.

Hegi (1909: Bd 2: 147, fig. 274) was the first author to employ the epithet 'spiralis' at form level (*Juncus effusus* f. *spiralis*). Hegi did not attribute the epithet to any author and did not cite McNab's original paper, but it is unlikely that he was doing anything other than employing McNab's well-known epithet for the cultivated Irish plant at a revised rank; he was not describing a new taxon. To argue that Hegi was describing a new taxon is unhelpful, because his epithet 'spiralis' becomes illegitimate (Arts. 24. note 1: 64.4) and a new epithet becomes necessary for the form. Praeger (1934: entry no. 406) also used *J. effusus* f. *spiralis*; he did not acknowledge Hegi but did refer to Spence's note (1919) which in turn referred to an earlier account (Spence 1906) that contains explicit mention of McNab's description (1873b). The synonymy may be summarised as follows:

Juncus effusus L. forma *spiralis* (J. McNab) Hegi, *Illustrierte Flora von Mittel-Europa*, 1909: Bd. 2(16), 147.

Basionym: *J. effusus* var. *spiralis* J. McNab, *Gard. Chron.* 10 May 1873: 647, fig. 125; *Trans. bot. Soc. Edinb.* **11** (1873): 502–504.

Neotype: [here designated] icon in *Gard. Chron.* 10 May 1873: 647, fig. 125.

Synonym: *J. effusus* var. *suberectus* D. M. Henderson, *Watsonia* **19** (1992): 133–134.

Holotype: Big Sand, Gairloch, W. Ross, v.c. 105, 6 December 1988, D. M. Henderson (E!).

Other specimens examined:

Sandy edge of site of Frensham Great Pond, Surrey, v.c. 17, [19 August 1943], A. J. Wilmott 19430819 (BM); "grouse moor . . . Carmarthenshire Vans", v.c. 44, 12 August 1904, E. Milner-Jones (K); Orkney, v.c. 111, 1 September 1906, M. Spence (E); Deerness, Orkney, v.c. 111, September 1908, M. Spence (BM); Rannsdale, Orphir, Mainland, Orkney, v.c. 111, 10 September 1923, H. H. Johnston 2474 (E, BM, K); Sutherland, Flotta, Orkney, v.c. 111, 15 August 1932, J. Sinclair 762 (E); Mainland, Shetland, v.c. 112, June 1890, R. M. Barrington (DBN); roadside, Lax Firth, Mainland, Shetland, v.c. 112, 27 July 1950, J. E. Lousley (K); by burn of Sandibanks, Scalloway, Mainland, Shetland, v.c. 112, 25 July 1950, J. E. Lousley (K); near Sraheens, Achill Island, v.c. H27, 30 July 1904, R. L. Praeger (DBN); boggy place centre of island [Inishtrahull, Co. Donegal], v.c. H34, 16 August 1939, D. J. Sullivan (DBN).

Cultivated specimens:

Edin[burgh] Bot. Garden, September 1876, F.M.W. (E); Botanic Garden [Edinburgh], 1886, (E); Wakehurst Place, Sussex (acc. no. 000–69–19251), 20 July 1980, S. Andrews (K); sine loc. ('Herb. Hort. Kew'), Aug. 1881 (K).

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Plant Records

Records for publication must be submitted to the appropriate Vice-county Recorder (see *B.S.B.I. Year Book for 1993*), and *not* the Editors. The records must normally be of species, hybrids or subspecies of native or naturalized plants belonging to one or more of the following categories: 1st or 2nd v.c. record; 1st post-1930 v.c. record; only extant v.c. locality, or 2nd such locality; a record of an extension of range by more than 100 km. Such records will also be accepted for the major islands in v.cc. 102–104 and 110. Only 1st records can normally be accepted for *Rubus*, *Hieracium* and hybrids. Records for subdivisions of vice-counties will not be treated separately; they must therefore be records for the vice-county as a whole. Records of *Taraxacum* are now being dealt with separately, by Dr A. J. Richards, and will be published at a later date.

Records are arranged in the order given in the *List of vascular plants of the British Isles* by D. H. Kent (1992), from which the species' numbers, taxonomy and nomenclature are taken. The B.S.B.I. is to set up a procedure to register changes to this list, and a number of records of additional species have been held over until the new arrangements are in place. The Ordnance Survey national grid reference follows the habitat and locality. With the exception of collectors' initials, herbarium abbreviations are those used in *British and Irish herbaria* by D. H. Kent & D. E. Allen (1984). Records are field records if no other source is stated.

Records from the following vice-counties are included in the text below: 2, 4–6, 9, 11, 14, 17, 21, 22, 24–30, 35, 38, 39, 41–53, 57–59, 64, 67–73, 75, 77–81, 83, 85–87, 89, 93, 98–103, 108.

The following signs are used:

* before the record: to indicate a new vice-county record.

† before the species number: to indicate that the plant is not a native species of the British Isles.

‡ before the record: to indicate a species which, though native in some parts of the British Isles, is not so in the locality recorded.

[] enclosing a previously published record: to indicate that the record should be deleted.

4/1.1. *EQUISETUM HYEMALE* **42**, Brecks.: Stream-bank near Hay-on-Wye, SO/243.404. W. J. H. Price, 1992. 2nd record. **98**, Main Argyll: Stony flush, Coire Dearg, Fraochaidh, NN/043.518. R. Leishman *et al.*, 1992. 2nd record. **108**, W. Sutherland: Banks of burn, Allt na h-Airbhe, NC/12.23. P. A. & I. M. Evans, 1992, **herb. I.M.E.** 2nd confirmed post-1930 record.

4/1.8 × 9. *EQUISETUM PALUSTRE* × *E. TELMATEIA* (*E. × FONT-QUERI*) ***11**, S. Hants.: Roadside, South Baddesley, Boldre, SZ/349.966. M. W. Rowe, 1991, **E**, det. C. N. Page.

9/1.1. *PILULARIA GLOBULIFERA* ***108**, W. Sutherland: Loch Borralan, NC/26.10. E. Charter, 1983. Shallow water, Cam Loch, NC/22.12. P. A. & I. M. Evans, 1992, **herb. I.M.E.** 1st and 2nd records.

11/1.1 × 2. *POLYPODIUM VULGARE* × *P. INTERJECTUM* (*P. × MANTONIAE*) ***64**, Mid-W. Yorks.: Hackfall Wood, Grewelthorpe, SE/23.77. D. J. & J. S. Tennant, 1991, det. R. H. Roberts. ***75**, Ayr.: Cliffs, Ailsa Craig, NX/02.99. B. Zonfrillo, 1992, det. A. McG. Stirling.

11/1.2. *POLYPODIUM INTERJECTUM* ***64**, Mid-W. Yorks.: Near Beezley Falls, Ingleton, SD/70.74. D. J. Tennant, 1979. Scotton Banks, Knaresborough, SE/33.57. D. J. Tennant, 1985. 1st and 2nd records, both det. R. H. Roberts.

15/2.5c. *ASPLENIUM TRICHOMANES* subsp. *PACHYRACHIS* ***67**, S. Northumb.: Calcareous rock wall, Hareshaw Linn near Bellingham, NY/842.854. J. M. Ide, 1992, **BM**, det. A. C. Jermy.

15/2.6. *ASPLENIUM TRICHOMANES-RAMOSUM* ***46**, Cards.: Wheelpit and shafts of leadmine, Esgair-Fraith, SN/741.912. S. P. Chambers & J. A. Martin, 1992.

17/1.1. *POLYSTICHUM SETIFERUM* **59**, S. Lancs.: Base of wall near Chorlton Brook, Chorlton, SJ/813.931. D. Bishop, 1991. 1st post-1930 record.

17/3.2 × 3. *DRYOPTERIS FILIX-MAS* × *D. AFFINIS* (*D. × COMPLEXA*) ***58**, Cheshire: Trackside, Roman Lakes, Marple, SJ/968.876. B. Porter, 1992, **NMW**, det. H. Corley.

17/3.3b. *DRYOPTERIS AFFINIS* subsp. *CAMBRENSIS* *83, Midlothian: Rocky moorland slope N. of White Craig, NT/072.543. D. R. McKean, 1992, det. A. C. Jermy.

17/3.8 × 9. *DRYOPTERIS CARTHUSIANA* × *D. DILATATA* (*D. × DEWEVERI*) *83, Midlothian: Marshy area in wood, Hermands Birchwood S.W.T. Reserve near West Calder, NT/0.6. A. F. Dyer, 1986, **E**, conf. C. N. Page.

26/2.2. *NUPHAR PUMILA* *73, Kirkcudbrights.: Kirriereoch Loch, NX/364.866. O. M. Stewart, 1991, **E**.

†28/6.1 × var. *ACONITUM NAPELLUS* × *A. VARIEGATUM* (*A. × CAMMARUM*) *44, Carms.: Roadside verge, Llangunnor Road, Carmarthen, SN/422.196. G. Hutchinson, 1990, **NMW**. *50, Denbs.: Roadside, Trefnant, SJ/056.712. G. Battershall, 1992.

28/13.7. *RANUNCULUS PARVIFLORUS* 24, Bucks.: Grazed turf by old gravel pit S. of Ritchings Park, TQ/038.782. D. Green, 1992. 1st post-1930 record.

28/13.14. *RANUNCULUS REPTANS* *98, Main Argyll: Sandy silt on loch shore, Loch Awe near Collaig, NN/022.204. B. H. Thompson, 1992, **LTR**, det. R. J. Gornall.

28/17.3. *THALICTRUM FLAVUM* 45, Pembs.: Tall fen, Castlemartin Corse, SR/899.997. F. A. Abraham, 1992. 2nd record.

†29/2.1. *MAHONIA AQUIFOLIUM* *77, Lanarks.: Roadside bank between Biggar and Coulter, NT/0.3. A. C. & P. Macpherson, 1992.

†30/1.1. *PAPAVER ORIENTALE* *73, Kirkcudbrights.: Disused quarry E. of Haugh of Urr, NX/805.673. O. M. Stewart, 1992.

†31/2.2. *CORYDALIS CAVA* 6, N. Somerset: Dominant plant in ground flora, Terrace Wood, Ston Easton, ST/630.540. S. Preddy, 1992. 1st record since 1922 record from Ston Easton.

40/2.1 × †2. *ALNUS GLUTINOSA* × *A. INCANA* (*A. × PUBESCENS*) *46, Cards.: Wet alder wood and adjacent waste ground, Llanilar railway station, SN/628.752. A. O. Chater, 1992, **NMW**.

†40/2.2. *ALNUS INCANA* *50, Denbs.: Roadside wood, Llanfair Dyffryn Clwyd, SJ/169.506. J. A. Green, 1992.

†43/3.1. *ATRIPLEX HORTENSIS* *58, Cheshire: Shore just above tideline, Hoylake, SJ/210.890. V. Gordon, 1992.

43/3.4. *ATRIPLEX LONGIPES* *77, Lanarks.: Tidal shore of R. Clyde, Linthouse, Glasgow, NS/53.66. P. Macpherson, 1985, **herb. P. M.**, det. J. M. Mullin. Not refound.

43/4.1a. *BETA VULGARIS* subsp. *MARITIMA* 75, Ayr.: Shingle near mouth of Pinbain Burn, Lendalfoot, NX/138.916. A. McG. Stirling, 1992. Only extant locality.

43/6.4. *SALICORNIA OBSCURA* *6, N. Somerset: Bare mud of lower salt marsh, St George's Wharf, Easton-in-Gordano, ST/495.779. M. A. R. & C. Kitchen, 1991, det. F. Rose.

43/6.6. *SALICORNIA FRAGILIS* *6, N. Somerset: Pebbly, sandy bare area in lower salt marsh, St George's Wharf, Easton-in-Gordano, ST/492.775. M. A. R. & C. Kitchen, 1991, det. F. Rose.

†46/1.4. *ARENARIA BALEARICA* 43, Rads.: Silty concrete top of unfinished dam, Dolymynach Reservoir, SN/909.619. R. G. Woods, 1992. 2nd record.

46/7.11. *CERASTIUM PUMILUM* 50, Denbs.: Limestone grassland, Rhyd y Foel, SN/917.777, and Colwyn Bay, SN/830.799. Both G. Battershall, 1992. 1st and 2nd post-1930 records.

46/9.1. *MOENCHIA ERECTA* *41, Glam.: By paths through *Agrostis curtisii* heath on S.-facing hillside E. of Nottill, SS/537.885. Q. O. N. Kay, 1992, **NMW**. 44, Carms.: Dry, S.-facing bank near Cynghordy, SN/820.390. I. K. Morgan, 1992, **NMW**, conf. G. Hutchinson. 2nd post-1930 record.

46/17.3. *SPERGULARIA MARINA* *80, Roxburghs.: Edge of A6088 road near Southdeanrig, NT/646.085. Edge of A68 road near Mossburnford, NT/663.155. Both M. E. Braithwaite, 1992, **herb.**

R. W. M. Corner. 1st and 2nd records. ***81**, Berwicks.: Edge of A697 road near Carfraemill, NT/517.526. M. E. Braithwaite, 1992, **herb. M.E.B.** 1st inland record.

†46/18.1. *LYCHNIS CORONARIA* ***51**, Flints.: Track leading to disused sand pit near Ddôl Uchaf N.R., Ysceifiog, SS/140.715. J. Hughes, 1992.

†46/22.2. *SAPONARIA OCYMOIDES* ***28**, W. Norfolk: Steep wooded bank, King's Lynn, TF/625.189. R. M. Payne, 1992.

46/25.5. *DIANTHUS DELTOIDES* ***79**, Selkirks.: Rocky basic pasture, Tinnis Top, Old Tinnis, NT/383.292. D. J. Methven, 1992, conf. R. W. M. Corner.

†47/1.7. *PERSICARIA AMPLEXICAULIS* ***39**, Staffs.: Rough grassland by A515, Draycott in the Clay, SK/159.295. J. Clarke, 1992, **herb. B. R. Fowler.**

47/1.11 × 14. *PERSICARIA MACULOSA* × *P. HYDROPIPER* (*P. × INTERCEDENS*) ***30**, Beds.: Bank of R. Great Ouse, Great Barford, TL/13.52. J. G. & C. M. Dony, 1987, **LTN**, conf. J. Timson.

47/1.12. *PERSICARIA LAPATHIFOLIA* ***80**, Roxburghs.: Field margin, Clarilaw, Hawick, NT/525.184. M. E. Braithwaite, 1992, **herb. R. W. M. Corner**, det. J. R. Akeroyd. 1st confirmed post-1930 record.

47/1.16. *PERSICARIA MINOR* ***44**, Carms.: Edge of pond, Gwaith Go-Bach Pond, Dinefwr Castle Woods, SN/619.221. I. K. Morgan, 1992, **NMW**, det. G. Hutchinson. 2nd record. ***67**, S. Northumb.: Stony lake margin, Greenlee Lough, NY/772.695. G. A. & M. Swan, 1992, **herb. G.A.S.**, det. J. R. Akeroyd. 2nd record.

47/4.1. *POLYGONUM MARITIMUM* ***14**, E. Sussex: Stable shingle beach, W. side of Brighton Marina, TQ/33.03. A. Spiers, 1992, **herb. P. A. Harmes**, conf. J. R. Akeroyd. 15 plants. (see pp. 271–273.)

47/4.5. *POLYGONUM BOREALE* ***73**, Kirkcudbrights.: Vegetable patch, New Abbey, West Maryfield, NX/970.664. O. M. Stewart, 1991, conf. D. R. McKean. Still present in 1992. Turnip field, Milnmark, NX/657.820. O. M. Stewart, 1992, **E**, conf. J. R. Akeroyd. 1st and 2nd records. ***103**, Mid Ebudes: Ground trampled by cattle, The Reef, Tiree, NM/006.449. B. H. Thompson, 1990, **GLAM**, det. B. T. Styles. 2nd record.

47/5.†1 × †2. *FALLOPIA JAPONICA* × *F. SACHALINENSIS* (*F. × BOHEMICA*) ***50**, Denbs.: Waste ground, Wrexham, SJ/338.490. K. Watson, 1992, conf. V. Gordon. ***59**, S. Lancs.: Waste ground beneath Pier, Southport, SD/833.177. V. Gordon, 1992, det. A. P. Conolly.

47/8.13b. *RUMEX CRISPUS* subsp. *LITTOREUS* ***58**, Cheshire: Boulder clay sea-cliffs, Thurston, SJ/23.83. G. M. Kay, 1992. ***98**, Main Argyll: Coastal shingle and rock, Loch Gilp. NR/86.85. A. McG. Stirling & B. H. Thompson, 1992. Rocky shore, W. coast of Kerrera, NM/80.29. B. H. Thompson, 1992. 1st and 2nd records.

47/8.13b × 18. *RUMEX CRISPUS* subsp. *LITTOREUS* × *R. PULCHER* (*R. × PSEUDOPULCHER*) ***25**, E. Suffolk: Stable shingle, Aldeburgh, TM/46.56. G. D. Kitchener, 1992, **herb. G. D. K.**, conf. J. R. Akeroyd. Recorded here in 1976 by J. R. Akeroyd & C. D. Preston. 1st ever record of this hybrid with subsp. *litoreus* as *R. crispus* parent.

47/8.13 × 19. *RUMEX CRISPUS* × *R. OBTUSIFOLIUS* (*R. × PRATENSIS*) ***103**, Mid Ebudes: Garden, Isle of Erraid, NM/30.20. J. W. Clark, 1992, **E**, det. D. R. McKean.

47/8.20. *RUMEX PALUSTRIS* ***24**, Bucks.: Dry, overgrown ditch between Colnebrook and Sutton, TQ/025.781. D. Green, 1992, **AYM**.

48/1.10d. *LIMONIUM BRITANNICUM* subsp. *CELTICUM* ***69**, Westmorland: On limestone, Frith Hall, estuary of R. Leven, SD/3.7. W. H. Pearsall, 1916, **YRK**. Stonework of Arnside railway viaduct, SD/4.7. C. Webb, 1988, **LANC**. 1st and 2nd records of species, both det. M. Ingrouille.

51/1.7b. *HYPERICUM MACULATUM* subsp. *OBTUSIUSCULUM* ***81**, Berwicks.: Woodland edge near Carfraemill, NT/510.529. M. E. Braithwaite, 1992, **herb. M.E.B.** 1st record since 1938 and only extant locality.

51/1.12. *HYPERICUM PULCHRUM* 75, Ayr.: Ailsa Craig, NS/01.00. B. Zonfrillo, 1992, **GL**. 1st record from Ailsa Craig.

52/1.1. *TILIA PLATYPHYLLOS* †*50, Denbs.: Hedge, Colwyn Bay, SH/837.778. G. Battershall, 1992.

53/1.1. *MALVA MOSCHATA* †*98, Main Argyll: Area of hard-standing, Loch Ederline, NM/870.029. A. McG. Stirling & B. H. Thompson, 1992.

†53/1.2. *MALVA ALCEA* *41, Glam.: Waste ground, Sully, ST/163.679. S. G. Lambert, 1991, **NMW**, det. D. McClintock. 1st Welsh record.

†53/1.6. *MALVA PUSILLA* *28, W. Norfolk: Waste ground by track in Oxborough Wood, TF/722.012. J. E. Caffney, 1992, det. N. K. B. Robson.

53/3.1. *ALTHAEA OFFICINALIS* 28, W. Norfolk: Dikeside, Marshland St James, TF/503.103. R. M. Payne, 1992. 2nd record.

57/1.4 × 6. *VIOLA RIVINIANA* × *V. CANINA* (*V. × INTERSITA*) *73, Kirkcudbrights.: Disused railway, Waterside, NX/723.676. O. M. Stewart, 1992, det. A. J. Silverside.

57/1.6. *VIOLA CANINA* 83, Midlothian: Forest ride, Gladsmuir, NT/919.572. J. Muscott, 1992. 1st post-1930 record.

†57/1.11 × 12 × alt. *VIOLA* × *WITTROCKIANA* *71, Man: Dumped garden rubbish, Ramsey Mooragh, SC/451.955. L. S. Garrad, 1989.

61/2.2 × 3. *SALIX FRAGILIS* × *S. ALBA* (*S. × RUBENS*) *47, Monts.: River bank, Cilcewydd, Welshpool, SJ/227.034. I. C. Trueman, 1991, det. C. A. Sinker.

†61/2.6. *SALIX DAPHNOIDES* 44, Carmar.: Coastal dunes, Pembrey Forest, SN/405.012. R. D. Pryce *et al.*, 1992, **NMW**, det. G. Hutchinson.

61/2.9 × 12. *SALIX VIMINALIS* × *S. AURITA* (*S. × FRUTICOSA*) *47, Monts.: River bank, Cilcewydd, Welshpool, SJ/226.033. I. C. Trueman, 1991, det. C. A. Sinker.

61/2.10 × 12. *SALIX CAPREA* × *S. AURITA* (*S. × CAPREOLA*) *46, Cards.: Scrub on riverbank, Afon Rheidol by Glanyrafon Industrial Estate, SN/614.804. A. O. Chater, 1991, **NMW**, conf. R. D. Meikle.

61/2.12 × 15. *SALIX AURITA* × *S. PHYLICIFOLIA* (*S. × LUDIFICANS*) *83, Midlothian: Marsh by Gala Water, Heriot House, NT/40.54. R. Learmouth, 1992, **herb. R.L.**, det. R. D. Meikle.

†61/2.13. *SALIX ERIOCEPHALA* *46, Cards.: Amongst *Molinia caerulea* on bank of Afon Ystwyth, Llanfarian, SN/588.778. S. P. Chambers & A. O. Chater, 1992, **NMW**, conf. R. D. Meikle.

†62/7.1. *ERYSIMUM CHEIRANTHOIDES* *46, Cards.: Newly reconstructed verge of A44(T), Lovesgrove, SN/631.811. A. O. Chater, 1992, **NMW**.

62/12.5. *RORIPPA SYLVESTRIS* *93, N. Aberdeen: Waste ground, Inch, NJ/629.278. D. Welch, 1992, **ABD**, conf. T. C. G. Rich.

†62/16.1. *AUBRIETA DELTOIDEA* 50, Denbs.: Disused quarry N. of Bryn Euryn, SH/8.8. R. Lewis, 1992. 2nd record.

62/21.4. *DRABA MURALIS* †*52, Anglesey: Disused limestone quarry near Llangoed, SH/60.81. D. F. Evans, 1991.

62/22.3. *EROPHILA GLABRESCENS* *79, Selkirks.: Rocks by R. Tweed below Yair Bridge, NT/459.325. *80, Roxburghs.: Rocky pasture, Smailholm Craigs, NT/637.347. Both R. W. M. Corner, 1991, **herb. R.W.M.C.**, det. T. T. Elkington.

62/30.3. *LEPIDIUM HETEROPHYLLUM* 28, W. Norfolk: Field edge, Marham, TF/732.103. J. Williamson, 1992, det. K. A. & G. Becket. 2nd record.

62/30.5. *LEPIDIUM RUDERALE* **70**, Cumberland: Gullery, S. end of Rockcliffe Marsh, NY/310.626. D. Hawker, 1992, **LANC**. Disturbed roadside verge, Brunstock, Carlisle, NY/426.592. P. Burton, 1992, **LANC**. 1st records since 1908.

†62/30.8. *LEPIDIUM DRABA* **81**, Berwicks.: Railway bank, Reston, NT/878.619. A. R. Jermyn, 1992. 1st record since 1892. Side of A6112 road between Duns and Grantshouse, NT/812.645. M. E. & P. F. Braithwaite, 1992. 2nd extant locality.

†62/30.8b. *LEPIDIUM DRABA* subsp. *CHALEPENSE* ***6**, N. Somerset: Salt marsh, St George's Wharf, Portbury, ST/500.780. M. A. R. & C. Kitchen, 1991, det. T. C. G. Rich. ***29**, Cambs.: Waste area at corner of arable field, Morden Grange chalkpit, TL/295.401. A. Showler, 1992, det. T. C. G. Rich.

†62/36.1. *ERUCASTRUM GALLICUM* ***5**, S. Somerset: Disturbed roadside bank, Bayford, ST/728.290. I. P. Green, 1992. Gravel heap, Henstridge Marsh, ST/754.200. I. P. Green, 1992. 1st and 2nd records.

†62/37.1b. *COINCYA MONENSIS* subsp. *RECURVATA* **44**, Carms.: Penrhynwgwyn, Machynys, Llanelli, SS/517.973. I. K. Morgan, 1992. **NMW**, det. G. Hutchinson. 2nd record.

†62/38.1. *HIRSCHFELDIA INCANA* ***42**, Brecks.: Roadside verge near Brecon, SO/067.278. M. Porter, 1991. ***71**, Man: Tip S.W. of Point of Ayre, NX/460.040. B. A. Tregale, 1988.

63/1.3. *RESEDA LUTEA* ***93**, N. Aberdeen: Disused gravel pit, Memsie, NJ/985.620. D. Welch, 1991, **ABD**.

64/1.1b. *EMPETRUM NIGRUM* subsp. *HERMAPHRODITICUM* **73**, Kirkcudbrights.: Rocky ground on E. side of Carlin's Cairn, Corserine, NX/498.882. R. W. M. Corner, 1992, **E**. 2nd record.

65/13.2. *VACCINIUM MICROCARPUM* ***93**, N. Aberdeen: *Sphagnum* flush, Buck of Cabrach, NJ/417.238. R. W. M. Corner, 1991, **herb. D. Welch**. 2nd record.

66/1.3. *PYROLA ROTUNDIFOLIA* ***93**, N. Aberdeen: Acidic flush, Buck of Cabrach, NJ/413.239. R. W. M. Corner, 1992. 1st localised record.

67/1.1b. *MONOTROPA HYPOPITYS* subsp. *HYPOPHEGEA* **†58**, Cheshire: Large colony in old tree nursery, Priory Gardens Reserve, Sale, SJ/802.926. A. & S. Bell, 1992. Only extant locality.

69/1.2. *PRIMULA ELATIOR* ***24**, Bucks.: Ancient woodland over calcareous clay, Bovington Great Wood, TL/002.052. R. Mabey, 1977. Heather Grove, SP/994.055. R. Mabey, 1977–1989. 1st and 2nd records.

69/1.3. *PRIMULA VERIS* **73**, Kirkcudbrights.: Short turf near shore, Burnfoot, NX/742.446. O. M. Stewart, 1991. Only extant locality.

†69/4.4. *LYSIMACHIA CILIATA* **98**, Main Argyll: Damp ground by Loch Ederline, NM/870.029. A. McG. Stirling & B. H. Thompson, 1992. 2nd record.

69/8.1. *SAMOLUS VALERANDI* ***24**, Bucks.: Margin of lake formed after gravel extraction, Great Linford, SP/845.439. C. Machaddie, R. Maycock & A. Woods, 1991.

†72/1.1. *ESCALLONIA MACRANTHA* ***49**, Caerns.: Woodland edge, Coed Tan yr Allt between Pontwgan and Rowen, SH/761.717. R. Lewis, 1992, **NMW**, det. R. G. Ellis & G. Hutchinson.

†72/2.4. *RIBES SANGUINEUM* ***98**, Main Argyll: Forest roadside, Minard Castle, NR/970.951. B. H. Thompson, 1992.

†73/1.3. *CRASSULA HELMSII* ***30**, Beds.: Pond near Podington, SP/937.628. M. Powell, 1988, **LTN**, conf. C. R. Boon. ***70**, Cumberland: Water 70 cm deep, Lord's Bay, Derwent Water, NY/266.218. G. Halliday, 1992, **LANC**, det. C. D. Preston.

†73/5.7. *SEDUM SPURIUM* ***28**, W. Norfolk: On concrete, Ickburgh, TL/823.950. K. A. Beckett, 1992.

†73/5.10. *SEDUM RUPESTRE* *98, Main Argyll: Steep bank between road and seashore near Kilchoan, Loch Melfort, NM/803.131. B. H. Thompson, 1992. Churchyard wall between North Connel and Ardchattan, NM/944.359. B. H. Thompson, 1992. 1st and 2nd records.

†74/4.1. *DARmera PELTATA* *73, Kirkcudbrights.: Marshy ground, Carruchan, NX/949.734. O. M. Stewart, 1992.

†75/3.1 × 3. *SPIRAEA SALICIFOLIA* × *S. DOUGLASII* (*S.* × *PSEUDOSALICIFOLIA*) *29, Cambs.: By footpath leading from road between Swavesey and Over, TL/368.701. J. C. A. Rathwell, 1992, CGE. 1st confirmed record.

†75/3.2. *SPIRAEA ALBA* 70, Cumberland: Roadside hedge, Aikshaw, Westnewton, NY/124.463. E. Marper, 1992, LANC, det. A. J. Silverside. 1st record since 1876 collection from same site.

†75/3.2 × 3. *SPIRAEA ALBA* × *S. DOUGLASII* (*S.* × *BILLARDII*) *75, Ayr.: Side of A736 at Bloak Moss, Kilwinning, NS/36.45. J. Flanagan & K. Cruikshank, 1976, herb. A. J. Silverside, det. A. J. S. Overgrown river shingle, R. Stinchar near Colmonell, NX/1.8. A. McG. Stirling, 1991, E, det. A. J. Silverside. 1st and 2nd records.

†75/3.6. *SPIRAEA CANESCENS* *46, Cards.: Rocky scrub, Allt Goch quarries, Cwrtnewydd, SN/491.483. A. O. Chater, 1991, NMW.

†75/8.6. *RUBUS PARVIFLORUS* *50, Denbs.: Deciduous wood, Gresford, SJ/340.542. K. Watson, 1992, det. V. Gordon.

†75/8.8. *RUBUS PHOENICOLASIUS* *4, N. Devon: Sourton Quarry, SX/523.896. L. J. Margetts, 1992, herb. W. H. Tucker. *77, Lanarks.: Pebbly shore of Canting Basin, Old Princes Dock, Glasgow, NS/56.65. P. Macpherson, 1991, herb. P.M., det. A. Newton.

75/8.16. *RUBUS BRIGGSIANUS* *5, S. Somerset: Forest ride, Staple Hill, ST/23.16. L. J. Margetts, 1991, det. A. Newton.

75/8.45. *RUBUS CRUDELIS* *27, E. Norfolk: Hedgerow by lane near woodland, Saxthorpe, TG/11.32. A. L. Bull, 1992, herb. A.L.B., det. A. Newton. Extension of range c. 160 km northwards.

†75/8.55. *RUBUS LACINIATUS* *4, N. Devon: Car park, Tiverton, SS/960.128. B. Benfield, 1992.

75/8.98. *RUBUS CURVISPINOSUS* *21, Middlesex: Bushy slope and open woodland, East Heath, Hampstead, TQ/28.86. D. E. Allen, 1992, BM, conf. A. Newton.

75/8.117. *RUBUS POLYANTHEMUS* 75, Ayr.: Shingle shore near the pier, Ailsa Craig, NX/02.99. B. Zonfrillo, 1992, GL, det. A. McG. Stirling. 1st Ailsa Craig record.

78/8.123. *RUBUS SEPTENTRIONALIS* *11, S. Hants.: Under gorse, Rockford Common, SU/17.08. D. E. Allen, 1986, herb. D.E.A., det. A. Newton. 75, Ayr.: Ailsa Craig, NX/0.9. B. Zonfrillo, 1992, GL, det. A. McG. Stirling. 1st Ailsa Craig record.

75/8.134. *RUBUS ARMENIACUS* *98, Main Argyll: Side of road to Bonawe Ferry, Taynuilt, NN/0.3. A. McG. Stirling, 1992.

75/8.136. *RUBUS HYLOPHILUS* *11, S. Hants.: Among gorse, Hamble Common, SU/484.059. D. E. Allen, 1992, BM, det. A. Newton.

75/8.142. *RUBUS ULMIFOLIUS* 75, Ayr.: Near the lighthouse, Ailsa Craig, NX/024.997. B. Zonfrillo, 1992, GL, det. A. McG. Stirling. 1st Ailsa Craig record.

75/8.156. *RUBUS LEUCOSTACHYS* *25, E. Suffolk: By path through woodland, Martlesham, TM/257.464. A. L. Bull, 1991, herb. A.L.B., conf. A. Newton. *27, E. Norfolk: Secondary woodland, Pretty Corner, Sheringham, TG/15.41. A. L. Bull, 1992, herb. A.L.B., conf. A. Newton.

75/8.172. *RUBUS MUCRONATOIDES* *42, Brecks.: Deciduous wood, Llandefaelog-fach, SO/028.324. M. Porter, 1990, herb. M.P., conf. A. Newton.

75/8.206. *RUBUS ANISACANTHOS* *27, E. Norfolk: *Tilia cordata* wood, Hockering Wood, TG/0.1. A. L. Bull, 1992, **herb. A.L.B.**, det. A. Newton.

75/8.224. *RUBUS BLOXAMII* *42, Brecks.: Ride in plantation, Crychan Forest N. of Glan Dulas, SN/87.42. M. Porter, 1991, **herb. M.P.**, det. A. Newton.

75/8.270 *RUBUS HYLOCHARIS* *11, S. Hants.: Wood margin, Johnston's Coppice, Purbrook, SU/689.078. D. E. Allen, 1992, **BM**, det. A. Newton.

75/8.305. *RUBUS BRITANNICUS* *11, S. Hants.: Gundymoor Wood, Havant, SU/69.07. D. E. Allen, 1992, **BM**, det. A. Newton. *27, E. Norfolk: Wood margin, Wolferton Park, TG/16.31. A. L. Bull, 1992, **herb. A.L.B.**, det. A. Newton.

75/8.313. *RUBUS NEMOROSUS* *42, Brecks.: Riverbank, Llanhamlach, SO/078.274. M. Porter, 1991, **herb. M.P.**, conf. A. Newton.

75/9.2. *POTENTILLA PALUSTRIS* 5, S. Somerset: Elworthy, ST/065.240. P. R. Green, 1992. 2nd record.

75/9.13 × 15. *POTENTILLA ERECTA* × *P. REPTANS* (*P. × ITALICA*) *73, Kirkcudbrights.: Steep grassy bank, Little Raebury, NX/704.436. O. M. Stewart, 1991, **E**, det. D. R. McKean.

†75/18.3. *ACAENA OVALIFOLIA* *98, Main Argyll: Forest roadside above Benmore Gardens, NS/137.856. B.H. Thompson, 1990, conf. P. F. Yeo.

75/19.10b. *ALCHEMILLA FILICAULIS* subsp. *VESTITA* 46, Cards.: Neutral grassland in meadow by Ddol-wen, S.E. of Aberaeron, SN/467.611. A. O. Chater, 1992, **NMW**. 2nd record.

75/21.4 × 11. *ROSA ARVENSIS* × *R. STYLOSA* (*R. × PSEUDORUSTICANA*) *29, Cambs.: Narrow ride, Triangle Ride, Hayley Wood, TL/291.532. C. D. Preston & A. L. Primavesi, 1992, **CGE**, det. A.L.P.

75/21.4 × 12. *ROSA ARVENSIS* × *R. CANINA* (*R. × VERTICILLACANTHA*) *29, Cambs.: Parish boundary hedge S.E. of Wood Farm, Hardwick, TL/365.571. C. D. Preston & A. L. Primavesi, 1992, **CGE**, det. A.L.P. *46, Cards.: Roadside bank N.W. of Blaen-twrch, SN/677.501. A. O. Chater, 1990, **NMW**, det. A. L. Primavesi.

75/21.5. *ROSA PIMPINELLIFOLIA* *29, Cambs.: Swaffham Prior, TL/5.6. Dr Jermyn, 1826 & 25.6.1827, **CGE**, det. A. L. Primavesi. Confirmation of records hitherto thought dubious.

†75/21.7. *ROSA 'HOLLANDICA'* *46, Cards.: Scrub on waste ground near site of Llanilar Station, SN/625.753. A. O. Chater, 1992, **NMW**.

75/21.11. *ROSA STYLOSA* 35, Mons.: Rough grassy common, Snowball Common, Portskewett, ST/499.884. T. G. Evans, 1991, conf. G. G. Graham. Trackside, Minnetts Wood, ST/453.895. T. G. Evans, 1992, **herb. T.G.E.**, conf. G. G. Graham. 1st and 2nd post-1930 records.

75/21.11 × 12. *ROSA STYLOSA* × *R. CANINA* (*R. × ANDEGAVENSIS*) *29, Cambs.: Side of ditch, Fen Road, Bassingbourn, TL/325.449. P. D. Sell, 1982, **CGE**, det. A. L. Primavesi. *35, Mons.: Streamside and grassy bank, S. E. Carleon below Christchurch, ST/342.897. T. G. Evans, 1990, **herb. T.G.E.**, det. G. G. Graham. 1st Welsh record.

75/21.11 × 14. *ROSA STYLOSA* × *R. OBTUSIFOLIA* *29, Cambs.: Hedge N.W. of Park Farm Cottages, Stetchworth, TL/660.565. C. D. Preston & S. E. Yates, 1992, **herb. A. L. Primavesi**, det. A.L.P.

75/21.12 × 13a. *ROSA CANINA* × *R. CAESIA* subsp. *CAESIA* (*R. × DUMALIS*) *46, Cards.: Hedge S. of Blaenpistyll, Tremoen, SN/232.475. A. O. Chater, 1985, **NMW**, det. A. L. Primavesi.

75/21.12 × 13b. *ROSA CANINA* × *R. CAESIA* subsp. *GLAUCA* (*R. × DUMALIS*) *28, W. Norfolk: Edge of track N. of Hockwold cum Wilton, TL/739.893. C. D. Preston, 1992, det. A. L. Primavesi. *35, Mons.: Lower White Castle, SO/38.16. T. G. Evans, 1992, **herb. T.G.E.**, det. G. G. Graham. *47, Monts.: Hedge, Llanwnnog, SO/04.94. A. Franks & J. Clarke, 1991, det. A. L. Primavesi.

75/21.12 × 14. *ROSA CANINA* × *R. OBTUSIFOLIA* (*R. × DUMETORUM*) *29, Cambs.: Hedge along footpath between Burton End and Leys Wood, TL/626.494. C. D. Preston & A. L. Primavesi. 1992. **CGE**, det. A.L.P.

75/21.12 × 18. *ROSA CANINA* × *R. RUBIGINOSA* (*R. × NITIDULA*) *29, Cambs.: Milton Country Park, TL/48.62. G. M. S. Easy, 1992, **CGE**, det. A. L. Primavesi.

75/21.13b. *ROSA CAESIA* subsp. *GLAUCA* *35, Mons.: Parkland, E. Blackwood, ST/17.96. R. Fraser, 1990, **herb. T. G. Evans**, det. G. G. Graham.

75/21.15. *ROSA TOMENTOSA* *35, Mons.: Narrow wood, Llantarnam Abbey, ST/305.927. T. G. Evans, 1992, **herb. T.G.E.**, det. G. G. Graham. 2nd post-1930 record.

75/21.15 × 16. *ROSA TOMENTOSA* × *R. SHERARDII* (*R. × SUBERECTIFORMIS*) *46, Cards.: Hedge, Derlwyn W.N.W. of Tregaron, SN/662.605. A. O. Chater, 1992. **NMW**, det. G. G. Graham.

75/21.16. *ROSA SHERARDII* 9, Dorset: By old track, Stalbridge, ST/74.17. L. J. Margetts & J. Ounsted, 1992, det. G. G. Graham. 2nd record.

75/21.16 × 19. *ROSA SHERARDII* × *R. MICRANTHA* *46, Cards.: Hedge W. of Capel Maen-y-groes, New Quay, SN/384.589. A. O. Chater, 1992, **NMW**, det. G. G. Graham.

†75/22.3. *PRUNUS CERASIFERA* *49, Caerns.: Copse between Tan-y-groes and Tal-y-cafn Bridge, SH/783.718. R. Lewis, 1992, **NMW**, det. R. G. Ellis & G. Hutchinson.

†75/22.12. *PRUNUS SEROTINA* *26, W. Suffolk: Scrub on grass heath, Barnham Cross Common, TL/867.817. K. A. Beckett, 1992.

†75/22.14. *PRUNUS LAUROCERASUS* *49, Caerns.: Edge of woodland opposite Maenan Abbey Hotel, SH/79.65. R. Lewis, 1992. Small copse between Tan-y-groes and Tal-y-cafn Bridge. SH/78.71. R. Lewis, 1992. 1st and 2nd post-1930 records.

†75/28.21. *SORBUS CROCEOCARPA* *47, Monts.: Trackside hedge. Brooks. SO/146.996. P. J. M. Nethercott, 1991.

†75/28.23. *SORBUS LATIFOLIA* *25, E. Suffolk: Between road and dyke, Wolsey Bridge, Wangford, TM/47.76. Suffolk Wildlife Trust member, 1990, **CGE**, det. P. D. Sell.

†75/32.40. *COTONEASTER STERNIANUS* *11, S. Hants.: Foot of gravelly bank of A35, Markway Hill. SU/244.026. R. P. Bowman, 1992. **herb. R.P.B.**, det. J. Fryer. *83, Midlothian: Edge of golf course, Levenhall, Musselburgh, NT/35.73. D. R. McKean, 1988, **E**, det. J. Fryer.

75/35.7 × 8. *CRATAEGUS MONOGYNA* × *C. LAEVIGATA* (*C. × MACROCARPA*) *77, Lanarks.: Overgrown hedge, Sunnyside, S.E. of Hamilton High Parks. NS/74.51. A. McG. Stirling, 1979. **herb. P. Macpherson**, conf. B. Wurzell.

†77/7.1d. *ANTHYLLIS VULNERARIA* subsp. *CARPATICA* †*77, Lanarks.: Grassy waste ground, Garden Festival site, Glasgow. NS/56.65. P. Macpherson, 1992. **herb. P.M.**, det. J. R. Akeroyd (as var. *pseudovulneraria*).

77/7.1e. *ANTHYLLIS VULNERARIA* subsp. *LAPPONICA* *75, Ayr.: Coast, Ardrossan, NS/2.4. G. A. C. Macpherson, 1963, **herb. P. Macpherson**, det. J. R. Akeroyd.

77/14.1. *VICIA OROBUS* 75, Ayr.: Slown's Cairn, Glenmuck, NS/510.033. E. L. Birse, 1958. 2nd record.

†77/15.6. *LATHYRUS TUBEROSUS* *58, Cheshire: Canal bank, Hassall Green, SJ/771.587. J. E. Hawksford, 1992.

†77/15.7. *LATHYRUS GRANDIFLORUS* *58, Cheshire: Bank of old railway. Portwood, Stockport. SJ/904.915. E. & O. Kearns, 1992, det. G. M. Kay.

77/15.12. *LATHYRUS NISSOLIA* †42, Brecon.: Roadside verge near Brecon, SO/073.275. M. Porter, 1991. 2nd record. †58, Cheshire: Railway embankment. Wardle. Nantwich. SJ/603.580. G. M. Kay, 1992. Only persistent population.

77/18.2a. *MEDICAGO SATIVA* subsp. *FALCATA* †*50, Denbs.: Colwyn Bay by-pass, SH/823.787. J. A. Green, 1990, **NMW**.

77/19.1. *TRIFOLIUM ORNITHOPODIOIDES* 44, Carms.: Colliery tip, Morlais Colliery, Llangennech, SN/571.021. I. K. Morgan, 1992, **NMW**, conf. G. Hutchinson. 2nd record.

†77/19.19a. *TRIFOLIUM INCARNATUM* subsp. *INCARNATUM* 52, Anglesey: Disturbed soil above shore E. of Amlwch Port, SH/46.93. J. Clarke, 1991. 2nd record. *80, Roxburghs.: Turnip field N. of Synton Mossend, NT/478.213. M. E. Braithwaite, 1992, **herb. R. W. M. Corner**. 1st record except for wool aliens.

†77/22.2. *LABURNUM ALPINUM* 44, Carms.: Hedge along B4333 E. of Dangoilan, SN/342.332. I. K. Morgan, 1992, **NMW**, det. A. O. Chater. 2nd record.

†77/23.2. *CYTISUS MULTIFLORUS* *81, Berwicks.: Rocky bank above railway, Penmanshiel. NT/796.671. M. E. & P. F. Braithwaite, 1992, **herb. M.E.B.**

77/26.2. *ULEX GALLII* 80, Roxburghs.: Bank above Rule Burn E. of Ruletownhead, NT/619.129. M. E. Braithwaite, 1992, **herb. R. W. M. Corner**. 1st confirmed record for over a century.

†79/2.2. *MYRIOPHYLLUM AQUATICUM* *29, Cambs.: Ditch, Willingham, TL/408.703. C. D. Preston & S. E. Yates, 1992.

79/2.4. *MYRIOPHYLLUM ALTERNIFLORUM* 24, Bucks.: Recently cleared pond, Naphill Common, SU/845.964. D. Showler, 1992. 1st post-1930 record.

84/1.1 × 3. *EPILOBIUM HIRSUTUM* × *E. MONTANUM* (*E. × ERRONEUM*) *39, Staffs.: Rough grassland slope, Fauld Crater, SK/183.277. I. Brown, 1986, det. T. D. Pennington. *83, Midlothian: Verge of A7 N. of Fountainhall, NT/41.52. R. Learmouth, 1990, E, det. T. D. Pennington.

84/1.3 × †8. *EPILOBIUM MONTANUM* × *E. CILIATUM* *64, Mid-W. Yorks.: Trackside, Burley-in-Wharfedale, SE/165.473. Yorkshire Naturalists' Union excursion, 1992, det. T. D. Pennington.

84/1.4. *EPILOBIUM LANCEOLATUM* †28, W. Norfolk: Gravelly garden, Stradsett, TF/669.053. R. M. Payne, 1992. 2nd record. 38, Warks.: Dry diorite dust at pool margin in quarry, Atherstone, SP/306.958. J. W. Partridge, 1990, **WAR**, det. T. D. Pennington. 2nd record. *45, Pems.: Slate quarry spoil, Teifi Marshes, Cardigan, SN/189.451. A. O. Chater, 1992.

84/1.5. *EPILOBIUM TETRAGONUM* *68, Cheviot: Margin of lake, Nelly's Moss Lakes, NU/081.023. G. A. Swan, 1991, **herb. G.A.S.**, det. T. D. Pennington. 1st confirmed record.

84/4.2. *OENOTHERA FALLAX* 25, E. Suffolk: Verge of Viewpoint Road, Landguard Common. TM/28.32. A. Copping, 1992, **herb. E. & M. Hyde**. 2nd record. *46, Cards.: Disused railway. Llanfarian, SN/591.778. S. P. Chambers, 1992, det. J. C. Bowra.

†85/2.1. *AUCUBA JAPONICA* *71, Man: Trollaby Lane, SC/352.784. L. S. Garrad, 1971. Hedge, Ballachurry, Andreas, SC/402.968. M. Devereau, 1989. 1st and 2nd records.

88/1.1. *EUONYMUS EUROPAEUS* *71, Man: Deep river gorge between limestone and Manx Slate rocks, Santon Gorge, SC/297.695. B. A. Tregale *et al.*, 1990.

†89/1.1 × per. *ILEX AQUIFOLIUM* × *I. PERADO* (*I. × ALTAOLERENSIS*) *46, Cards.: Mixed deciduous woodland, Penglais Woods, Aberystwyth, SN/590.821. A. O. Chater, 1992.

91/2.9. *EUPHORBIA LATHYRIS* †*73, Kirkcudbrights.: Shingle on shore, Carsethorn, NX/991.599. O. M. Stewart, 1992. Present for at least three years here.

91/2.12. *EUPHORBIA PORTLANDICA* *101, Kintyre: Coastal sand dunes, Carskey Bay, NR/661.078. M. E. Mitchell & A. J. Silverside, 1991.

†93/1.1. *VITIS VINIFERA* *46, Cards.: Bank of Afon Rheidol N.W. of Pont Pen-y-bont, Penparcau, SN/590.806. A. O. Chater, 1992, **NMW**.

†102/1.4. *OXALIS EXILIS* *26, W. Suffolk: Garden paths, Bacton Green, TM/035.656. R. Addington, 1991, **herb. E. & M. Hyde**.

103/1.9. *GERANIUM SANGUINEUM* †*46, Cards.: Grassy roadside verge, Penparc, SN/201.479. A. O. Chater, 1992, **NMW**.

†103/1.17. *GERANIUM MACRORRHIZUM* *77, Lanarks.: Grassy waste ground, Garden Festival Site, Glasgow, NS/56.64. P. Macpherson, 1992, **herb. P.M. Spreading**.

103/1.20. *GERANIUM PURPUREUM* †*71, Man: Garden, The Grove Rural Life Museum, N. Ramsey, SC/444.955. L. S. Garrad, 1990. Established for over 60 years.

†106/1.1. *HEDERA COLCHICA* *6, N. Somerset: Steep-sided combe, Combe Lane, Glastonbury, ST/507.391. P. R. Green, 1992. *43, Rads.: Wood, Garth Dingle Wood, Llowes, SU/189.420. R. G. Woods, 1992.

†107/4.2. *ERYNGIUM PLANUM* *77, Lanarks.: Grassy bank, Garden Festival Site, Glasgow, NS/56.65. P. Macpherson, 1991, **herb. P.M.**, det. D. R. McKean. Spreading.

107/6.2. *ANTHRISCUS CAUCALIS* 81, Berwicks.: Sandy roadside bank, Pease Bay, NT/793.707. M. E. & P. F. Braithwaite, 1992, **herb. M.E.B.** 1st record since 1893.

†107/14.1. *AEGOPODIUM PODAGRARIA* 75, Ayr.: Near lighthouse, Ailsa Craig, NX/024.998. B. Zonfrillo, 1992, **GL**. 1st Ailsa Craig record.

107/17.1. *CRITHMUM MARITIMUM* *59, S. Lancs.: Artificial shingle beach derived from builders' rubble, Hightown, SD/295.023. V. Gordon, 1992.

107/26.3. *BUPLEURUM TENUISSIMUM* 51, Flints.: Side of R. Dee, Shotton, SJ/311.693. G. R. Sloman, 1992. 1st post-1930 record.

107/34.2. *CARUM VERTICILLATUM* *22, Berks.: Species-rich meadow, Winkfield, SU/911.721. J. L. Francis & A. L. Morton, 1992, **RNG**, conf. S. L. Jury.

108/3.3. *CENTAURIUM LITTORALE* *51, Flints.: Dune slacks between Point of Ayr and the Warren, Talacre, SJ/111.851. P. Frost, 1991, det. F. Ubsdell. 1st post-1930 record.

111/3.2 × †4. *CALYSTEGIA SEPIUM* × *C. SILVATICA* (*C. × LUCANA*) *48, Merioneth: Thicket, Gloddfa Road, Barmouth, SH/615.157. P. M. Benoit, 1992, **NMW**. 1st confirmed record.

†111/3.3. *CALYSTEGIA PULCHRA* *28, W. Norfolk: Hedge, Litcham, TF/889.173. K. A. Beckett, 1992.

113/2.1. *NYMPHOIDES PELTATA* †*46, Cards.: Ditch in marsh near Brimstone Wildlife Centre, Penuwch, SN/609.630. I. S. Francis, 1992. Slow-flowing meanders of Afon Aeron at Winllan, Trefilan, SN/567.573. A. O. Chater & I. S. Francis, 1992. 1st and 2nd records.

116/2.1. *ECHIUUM VULGARE* 73, Kirkcudbrights.: Reclaimed land, Mutehill, NX/686.486. O. M. Stewart & A. White, 1992. Only extant locality.

116/4.3. *SYMPHYTUM TUBEROSUM* †47, Monts.: Churchyard, Penstrowed, SO/070.916. C. A. Small, 1991. 2nd record.

†116/7.1. *CYNOGLOTTIS BARRELIERI* *25, E. Suffolk: Well established in sandy waste ground, Lewis Lane, Stutton, TM/138.348. E. M. Hyde, 1992, **herb. E. & M. Hyde**, det. E. J. Clement.

†116/10.1. *TRACHYSTEMON ORIENTALIS* 49, Caerns.: Under trees by R. Ro near Rowen, SH/762.717. R. Lewis, 1992. 2nd record.

116/15.9. *MYOSOTIS RAMOSISSIMA* 73, Kirkcudbrights.: Sandy ground near shore, Mossyard, NX/549.515. O. M. Stewart, 1992. 2nd extant locality.

†116/16.1. *OMPHALODES VERNA* *71, Man: Overgrown cemetery, Braddan New Cemetery, SC/365.772. L. S. Garrad, 1991.

118/1.5 × 6. *STACHYS SYLVATICA* × *S. PALUSTRIS* (*S.* × *AMBIGUA*) *50, Denbs.: Damp grassland, Llay, SJ/325.553. K. Watson, 1992.

†118/4.1c. *LAMIASTRUM GALEOBDOLO* subsp. *ARGENTATUM* *48, Merioneth: Near Pen-y-Cefn, Dolgellau, SH/722.185. R. G. Ellis, 1987, NMW. *71, Man: Small wooded area by stream, Ballavitchell Road, Crosby, SC/328.799. L. S. Garrad, 1982. Still present in 1991. Streamside, Agneash, Lonan, SC/432.863. L. S. Garrad, 1988. 1st and 2nd records. *80, Roxburghs.: Bank of R. Teviot at Hornshole Bridge, Hawick, NT/533.167. M. E. Braithwaite, 1992.

118/9.1. *MARRUBIUM VULGARE* 44, Carms.: Grey dunes, Pembrey Burrows, SN/435.002. I. K. Morgan & R. D. Pryce, 1992. Only extant locality.

†118/13. rac × nep. *NEPETA RACEMOSA* × *N. NEPETELLA* (*N.* × *FAASSENII*) *50, Denbs.: Railway bank, Llandulas, SH/9.7. G. Battershall, 1992.

118/23.4. *MENTHA SUAVEOLENS* †*59, S. Lancs.: Grassland, Martin Mere Wildfowl Trust reserve, SD/42.14. P. J. Wisniewski, 1991.

118/25.4. *SALVIA VERBENACA* †75, Ayr.: Banks, Ardstinchar Castle, NX/086.825. A. McG. Stirling & A. Rutherford, 1992. Only extant locality, where first recorded before 1903.

120/1.2. *CALLITRICHE TRUNCATA* *9, Dorset: Ornamental lake, Forde Abbey Lake, ST/359.049. H. J. M. Bowen, 1992.

120/1.4. *CALLITRICHE PLATYCARPA* 25, E. Suffolk: Ditch S. of New Dyke, Shipmeadow, TM/388.907. C. D. Preston & N. F. Stewart, 1989. 1st post-1930 record.

†121/1.6. *PLANTAGO ARENARIA* *4, N. Devon: In great quantity on new roadside verges of A399, Berrynarbor, SS/567.473. W. H. Tucker, 1992, conf. B. Wurzell.

124/1.2. *VERBASCUM VIRGATUM* †*59, S. Lancs.: Waste ground between Higginshaw and Manchester, SD/934.057. A. Frank & P. Tolfree, 1988.

†124/1.5. *VERBASCUM PHLOMOIDES* *38, Warks.: Waste ground, Longford, Coventry, SP/34.84. J. Robbins, 1981, WAR, det. I. K. Ferguson. Waste ground, Leamington Spa, SP/324.649. J. W. Partridge, 1986, WAR, det. P. J. Copson.

124/1. †5 × 7. *VERBASCUM PHLOMOIDES* × *V. THAPSUS* (*V.* × *KERNERI*) *29, Cambs.: Waste ground, Hauxton Gravel Pits, TL/437.521. G. M. S. Easy & P. H. Oswald, 1992, herb. G.M.S.E. With both parents.

†124/4.1. *MIMULUS MOSCHATUS* 98, Main Argyll: Coastal flush, Achnacloich, Loch Etive, NM/959.342. B. H. Thompson, 1992. 2nd record.

†124/11.2. *CYMBALARIA PALLIDA* *50, Denbs.: Old wall, Eglwys Bach, SH/823.665. B.S.B.I. excursion, 1991.

†124/13.3. *LINARIA PURPUREA* 75, Ayr.: Kilwinning, NS/3.4. B. Simpson, 1975. Rubbish tip, Doon Bridge, Dalmellington, NS/461.059. A. McG. Stirling & O. M. Stewart, 1992. 1st and 2nd records.

†124/16.18. *VERONICA PEREGRINA* 2, E. Cornwall: Base of old wall, Lostwithiel, SX/145.605. E. Griffiths, 1991. 1st record since 1923.

†124/16.25. *VERONICA LONGIFOLIA* 73, Kirkcudbrights.: Bank of R. Cree S. of Creebridge, NX/412.653. O. M. Stewart, 1992. 2nd record.

124/18.1. *SIBTHORPIA EUROPAEA* *9, Dorset: Moist ground in streamside wood, Hewood Bottom, ST/363.030. B. Edwards, 1992, conf. C. D. Preston.

124/20.5b. *EUPHRASIA ARCTICA* subsp. *BOREALIS* 83, Midlothian: Heathy grassland near Stow, NT/46.41. M. Little, 1985, E, det. A. J. Silverside. 1st post-1930 record.

124/20.19. *EUPHRASIA SCOTTICA* 81, Berwicks.: Base-rich flush, Whalplaw Burn, NT/548.568. M. E. Braithwaite & D. G. Long, 1992, herb. M.E.B., det. A. J. Silverside. 2nd record.

124/24.1. RHINANTHUS ANGUSTIFOLIUS †*35, Mons.: Artificial grassy bank, Greenmeadow Community Farm, ST/27.96. C. Titcombe *et al.*, 1992, det. C. T. & T. G. Evans. 2nd Welsh record.

125/2.1. OROBANCHE PURPUREA *9, Dorset: On *Achillea millefolium*, Small Mouth, Portland, SY/67.75. J. Pyatt, 1992, det. F. J. Rumsey. 1st confirmed record. †*17, Surrey: On *Achillea millefolium*, Royal Botanic Gardens, Kew, TQ/1.7. T. A. Cope & B. R. Spooner, 1992. Not deliberately introduced.

128/2.4. UTRICULARIA STYGIA *98, Main Argyll: Oligotrophic loch, Corran Lochan, NS/216.953. A. McG. Stirling & B. H. Thompson, 1990, E. Edge of mire pool, Altan Airigh Mhic Chainnich, NN/032.112. B. H. Thompson, 1992, det. A. McG. Stirling & B.H.T. 1st and 2nd records.

†129/1.4. CAMPANULA PERSICIFOLIA *51, Flints.: Dune grassland, Talacre Dunes, Point of Ayr, SJ/120.849. R. G. Ellis, 1988, NMW, det. G. Hutchinson.

129/1.12. CAMPANULA TRACHELIUM †*64, Mid-W. Yorks.: Stonework of old bell pit, Grass Wood, Grassington, SD/988.655. M. Hanson, 1991. 1st confirmed record, previous reports being errors for *C. latifolia*.

†129/9.1. DOWNINGIA ELEGANS *26, W. Suffolk: New golf course, Elveden, TL/8.8. P. G. Lawson, 1992, conf. E. J. Clement (from photograph).

†131/3. orb × mic. SYMPHORICARPOS ORBICULARIS × S. MICROPHYLLOS (S. × CHENAULTII) *46, Cards.: Bank of Nant Ardal, Llanilar, SN/623.751. S. P. Chambers, 1992, NMW.

133/1.3. VALERIANELLA RIMOSA *27, E. Norfolk: Cornfield, High Kelling, TG/1.4. Mrs Gomersal, 1939, det. G. Foggitt. Recorded here until 1945.

†135/1.2. ECHINOPS EXALTATUS *99, Dunbarton: Waste ground, Forth & Clyde Canal E. of Temple Lock, Glasgow, NS/55.69. G. McGhee, 1989, E (photograph), det. D. R. McKean.

135/2.1. CARLINA VULGARIS *98, Main Argyll: Dry, S.-facing ledges on cliffs of raised shore platform, Rubha Seanach, Kerrera, NM/80.25. B. H. Thompson, 1992, herb. B.H.T.

135/3.1. ARCTIUM LAPPA *46, Cards.: Rough grass and scrub, Teifi Marshes, Cardigan, SN/182.455. A. O. Chater, 1992, NMW.

135/3.2a. ARCTIUM MINUS subsp. PUBENS 46, Cards.: Edge of paddock E. of St Dogmaels Abbey, SN/168.459. A. O. Chater, 1992. 2nd record. *50, Denbs.: Roadside, Holt, SJ/401.538. K. Watson, 1992. 1st confirmed record.

†135/11.2. CENTAUREA MONTANA 49, Caerns.: Overgrown cemetery, Llangelynin Church, SH/771.735. R. Lewis, 1992. 2nd record and only extant locality.

135/16.3. LEONTODON SAXATILIS 98, Main Argyll: Dry, gravelly road verge, Poliphail, NR/933.692. E. Stewart & B. H. Thompson, 1992, herb. B.H.T., conf. A. McG. Stirling. Only extant locality.

135/22.1. LACTUCA SERRIOLA 44, Carms.: Newly built roadside verge, Machynys, SS/511.987. I. K. Morgan, 1992, NMW, conf. G. Hutchinson. 1st record since 1912. 46, Cards.: Building site by St Anne's churchyard, Penparcau, SN/592.799. A. O. Chater, 1992, NMW. 2nd record.

135/26.2. CREPIS MOLLIS 81, Berwicks.: Base-rich rocky knowe, Brunta Burn, NT/595.505. M. E. & P. F. Braithwaite, 1992, herb. M.E.B. 1st record since 1924.

135/28.25. HIERACIUM STEWARTII *93, N. Aberdeen: By R. Deveron, Ardmiddle, NJ/687.494. D. Welch, 1991, herb. D.W., det. D. J. McCosh.

135/28.33. HIERACIUM LISSOLEPIUM *79, Selkirks.: Rocks by R. Tweed, Yair Bridge, NT/45.32. D. J. McCosh, 1990, E.

135/28.83. HIERACIUM CAESIOMURORUM *93, N. Aberdeen: Shady rock ledge in gorge, Craig Castle, NJ/472.247. D. Welch, 1990, herb. D.W., det. D. J. McCosh.

135/28.91. *HIERACIUM OISTOPHYLLUM* *48, Merioneth: Scree, Penant Dyfi, Upper Dovey Valley, SH/9.2. P. H. Raven, 1961, **BM**, det. D. J. McCosh.

135/28.92. *HIERACIUM SILVATICOIDES* *89, E. Perth: Gorge, Allt Feith Lair, Fealar, NO/00.79. D. J. McCosh, 1990, **BM**.

†135/28.115. *HIERACIUM SCOTOSTICTUM* *24, Bucks.: Old beech wood, Lucas Wood, High Wycombe, SU/874.934. A. Showler, 1992, det. J. Bevan.

135/28.142. *HIERACIUM ORIMELES* *86, Stirlings.: Rocks by waterfall, Loup of Fintry, NS/66.88. D. J. McCosh, 1991, **CGE**, det. P. D. Sell. *87, W. Perth: Balquharn Glen, Alva, NS/86.97. D. J. McCosh, 1989, **E**, det. P. D. Sell.

135/28.145. *HIERACIUM SCOTICUM* *102, S. Ebudes: Coastal rocks near Allt na Gile, Jura, NR/47.78. D. J. McCosh, 1991, **herb. D.J.McC.**, det. P. D. Sell.

135/28.171. *HIERACIUM EBUDICUM* *102, S. Ebudes: Sea cliffs near Glen Trosdale, Jura, NM/67.00. D. J. McCosh, 1991, **CGE**, det. P. D. Sell.

135/28.180. *HIERACIUM BRITANNICIFORME* *100, Clyde Is.: Base of felsite cliff, Creag Dubh, Bannan Head, Arran, NR/997.207. A. R. Church, 1988, **herb. D. J. McCosh**, conf. P. D. Sell.

135/28.185. *HIERACIUM EUSTOMON* *46, Cards.: Base of sea cliff, Penbryn, SN/2.5. J. H. Salter, 1928, **NMW**, det. J. Bevan.

135/28.191. *HIERACIUM IRICUM* 103, Mid Ebudes: Rough grassland, Cornaigbeg, Coll, NM/234.630. A. Walker, 1991, **herb. J. Clark**, det. A. McG. Stirling. 1st Coll record.

135/28.196. *HIERACIUM HEBRIDENSE* *102, S. Ebudes: Waterfall in gorge, Allt nan Dearc, Jura, NR/67.98. D. J. McCosh, 1991, **herb. D.J.McC.**, det. P. D. Sell.

135/128.198. *HIERACIUM SHOOLBREDII* *72, Dumfriess.: Rock by Spoon Burn, Moffat, NT/153.107. D. J. McCosh, 1988, **CGE**, conf. P. D. Sell.

135/28.209. *HIERACIUM VENNICONTIUM* *86, Stirlings.: Cliffs W. of Spout of Ballochleam, NS/6.9. D. J. McCosh, 1991, **herb. D.J.McC.**, det. P. D. Sell. *87, W. Perth: Main crags, Craig Horn, Alva, NN/8.0. D. J. McCosh, 1988, **PTH**. *102, Mid Ebudes: Coastal rocks N. of Allt Bun an Eas, Jura, NR/45.76. N. F. Stewart, 1991, **E**, det. P. D. Sell.

135/31.1. *ANTENNARIA DIOICA* *81, Berwicks.: Dry bank, Dye Water between Byrecleuch and Trottingshaws, NT/63.58. K. Robeson & S. Williams, 1992. 2nd extant locality.

†135/40.4. *SOLIDAGO GIGANTEA* *81, Berwicks.: Bank of R. Whiteadder below Paxton, NT/93.53. M. E. Braithwaite, 1992, **herb. M.E.B.**

†135/41.4 × 5. *ASTER NOVI-BELGII* × *A. LANCEOLATUS* (*A.* × *SALIGNUS*) *39, Staffs.: Grassland, Christian Fields N. of Lichfield, SK/111.113. B. R. Fowler, 1992. *73, Kirkcudbrights.: Grassland near shore, Gillfoot, NX/976.554. O. M. Stewart, 1980, **E**, det. P. F. Yeo. Banks of R. Cree below Creebridge, NX/4.6. O. M. Stewart, 1992. 1st and 2nd records.

†135/41.5. *ASTER LANCEOLATUS* *73, Kirkcudbrights.: Banks of R. Cree below Creebridge, NX/4.6. O. M. Stewart, 1992.

†135/44.1. *CONYZA CANADENSIS* *81, Berwicks.: Roadside verge by Chesterfield Caravan Park, NT/772.700. M. E. Braithwaite, 1992, **herb. M.E.B.** 83, Midlothian: Flourishing colony on waste ground near Victoria Dock, Leith Docks, NT/268.768. O. M. Stewart, 1989. 1st record since 1905.

†135/44.2. *CONYZA SUMATRENSIS* *41, Glam.: Garden weed, Coed Glas Road, Llanishen, Cardiff, ST/168.817. D. Hart, 1991, **NMW**. 1st Welsh record.

†135/51.1. *SANTOLINA CHAMAECYPARISSUS* 41, Glam.: Roadside embankment, Penarth Road, Leckwith, Cardiff, ST/169.738. J. P. Curtis, 1980, **NMW**, det. D. McClintock (as subsp. *tomentosa* (Pers.) Arcangeli). 2nd record, 1st since 1946.

†135/57.1. *LEUCANTHEMELLA SEROTINA* **25**, E. Suffolk: Coastal dunes, Minsmere, TM/478.661. E. Beaumont, 1991, det. R. M. Burton. 2nd record.

135/60.1 × 2. *TRIPLEUOSPERMUM MARITIMUM* × *T. INODORUM* ***46**, Cards.: Grassy slope by sewage works, Aberystwyth harbour, SN/582.813. A. O. Chater, 1992, **NMW**.

†135/61.4. *COTULA SQUALIDA* ***83**, Midlothian: Weed in closely mown lawn, Royal Botanic Garden, Edinburgh, ST/24.75. D. R. McKean, 1989, **E**, det. D.R.McK. & J. Cullen. A population of female plants, apparently established for at least 30 years.

135/62.†1 × 10. *SENECIO CINERARIA* × *S. JACOBÆA* (*S.* × *ALBESCENS*) ***50**, Denbs.: Waste ground, Colwyn Bay, SH/856.776. G. Battershall, 1992. ***99**, Dunbarton: Side of footpath, John Street, Helensburgh, NS/29.82. A. Rutherford, 1992, **E**, conf. A. McG. Stirling.

135/62.10 × 11. *SENECIO JACOBÆA* × *S. AQUATICUS* (*S.* × *OSTENFELDII*) ***81**, Berwicks.: With both parents on riverside, Abbey St Bathans, NT/763.617. M. E. Braithwaite, 1992, **herb. M.E.B.**

†135/71.2. *PETASITES JAPONICUS* ***75**, Ayr.: Grassy roadside bank near Knockdolia Castle, Ballantrae, NX/12.85. A. McG. Stirling & A. Rutherford, 1992.

135/86.1. *EUPATORIUM CANNABINUM* **83**, Midlothian: Steep, wet slope near Crichton Castle, NT/379.613. D. R. McKean, 1992. 1st post-1930 record.

136/1.1. *BUTOMUS UMBELLATUS* ***43**, Rads.: Shallow water at edge of R. Wye, Cabalva, Clyro, SO/233.457. D. R. Drewett & D. C. Boyce, 1992.

138/2.1. *STRATIOTES ALOIDES* †**28**, W. Norfolk: Pond in chalk pit, Wells-next-the-sea, TF/929.429. P. R. Banham, 1986. Muddy stream, Caldecote, TF/73.02. M. Keene, 1992. Only extant localities.

†138/3.1. *EGERIA Densa* ***41**, Glam.: Amongst *Typha latifolia* in small pond, Fairwater Park Pond, Cardiff, ST/143.778. M. E. Gillham, 1988, **NMW**, det. D. A. Simpson. 2nd Welsh record.

†138/4.2. *ELODEA NUTTALLII* ***50**, Denbs.: With *E. canadensis* in R. Dee near Rodens Hall, SJ/416.489. K. Watson, 1990, **NMW**. ***73**, Kirkcudbrights.: In R. Dee near Threave Island, NX/743.624. N. F. & O. M. Stewart, 1990.

142/1.5 × 9. *POTAMOGETON LUCENS* × *P. PERFOLIATUS* (*P.* × *SALICIFOLIUS*) ***28**, W. Norfolk: Dike, Hilgay, TL/642.978. H. Williamson, 1991, det. C. D. Preston.

142/1.9 × 19. *POTAMOGETON PERFOLIATUS* × *P. CRISPUS* (*P.* × *COOPERI*) ***70**, Cumberland: Shallow water at edge of R. Eden, Carlisle, NY/41.56. C. D. Preston, 1989, **CGE**, and G. Halliday, 1992, **LANC**, conf. C. D. Preston.

142/1.20 × 21. *POTAMOGETON FILIFORMIS* × *P. PECTINATUS* (*P.* × *SUECICUS*) ***85**, Fife: Abundant at edge of bay, Loch Fitty, NT/126.913. P. Hollingsworth & C. D. Preston, 1992, **CGE**.

†147/2.1. *LYSICHITON AMERICANUS* **99**, Dunbarton: Marshy ground, shore of Loch Lomond near Boturich Castle, NS/38.84. J. Mitchell *et al.*, 1992. 2nd record.

148/2.3. *LEMNA TRISULCA* ***78**, Peebles.: Ornamental pond, Baddingsgill, NT/1.5. D. J. McCosh, 1992.

†148/2.4. *LEMNA MINUTA* ***46**, Cards.: Garden pond, Cenarth, SN/266.417. A. O. Chater, 1992, **NMW**, conf. A. C. Leslie.

151/1.6. *JUNCUS FOLIOSUS* ***99**, Dunbarton: Peaty ditch, Carman Muir, Cardross, NS/36.78. A. McG. Stirling, 1992, **E**.

151/1.13 × 14. *JUNCUS ARTICULATUS* × *J. ACUTIFLORUS* (*J.* × *SURREJANUS*) ***80**, Roxburghs.: Fen margin, Branxholme Wester Loch, NT/419.108. R. W. M. Corner, 1991, **herb. R.W.M.C.**, det. C. A. Stace.

152/3.5. *ELEOCHARIS QUINQUEFLORA* 2, E. Cornwall: Small coastal stream between Doyden Point and Port Quin, SW/968.805. M. G. C. Atkinson, 1992, det. L. J. Margetts & R. J. Murphy. 1st post-1930 record.

152/4.1. *BOLBOSCHOENUS MARITIMUS* *108, W. Sutherland: Shallow brackish pool, Rubha Ruadh, Loch Laxford, NC/168.571. R. E. C. Ferreira, 1984.

152/7.2. *SCIRPUS TABERNAEMONTANI* *108, W. Sutherland: *Phragmites australis* swamp in shallow, brackish water, Upper Invernaver Saltings, NC/709.598. R. E. C. Ferreira, 1986.

152/8.2. *ISOLEPIS CERNUA* *70, Cumberland: Eroded bank at top of beach, Silecroft, SD/1.8. M. M. Gill, 1992, **LANC**. 1st authenticated record.

†152/11.2. *CYPERUS ERAGROSTIS* *58, Cheshire: Shallow pool in old railway sidings, Crewe, SJ/705.555. J. E. Hawksford, 1992, **herb. G. M. Kay**, det. E. J. Clement.

152/13.2. *RHYNCHOSPORA FUSCA* *108, W. Sutherland: Bog, Laxford Bridge, NC/23.46. R. E. C. Ferreira, 1980, **E**.

152/16.5. *CAREX OTRUBAE* *108, W. Sutherland: Brackish pool, Loch a' Mhuilinn N.N.R., NC/15.39. R. E. C. Ferreira, J. G. Roger & S. Angus, 1980.

152/16.10. *CAREX ARENARIA* 39, Staffs.: Disused railway sidings, Bushbury, Wolverhampton, SJ/916.022. B. R. Fowler, 1992, **herb. B.R.F.** 2nd record.

152/16.11. *CAREX DISTICHA* 43, Rads.: Damp peaty hollow, Newmead Farm, Llanelwedd, SO/050.536. S. M. Gooch, 1992. 2nd record.

152/16.13. *CAREX DIVISA* *45, Pembs.: Damp roadside near the sea 0.5 km N. of Dale, SM/808.066. J. W. Donovan, 1992, det. A. O. Chater.

152/16.20. *CAREX ELONGATA* *35, Mons.: Boggy ditch, Coed Robert Wood near Raglan, SO/397.098. R. Fraser, 1992, **herb. T. G. Evans**, det. A. O. Chater & T.G.E.

152/16.23. *CAREX HIRTA* *108, W. Sutherland: Tall fen grassland, Eriboll Farm, NC/435.569. R. E. C. Ferreira & J. G. Roger, 1978, **E**. Marsh at mouth of Strathy River, NC/835.656. R. E. C. Ferreira, 1978. 1st and 2nd records.

152/16.24. *CAREX LASIOCARPA* 26, W. Suffolk: Hopton Fen N.R., TL/990.800. M. J. Ausden, 1991, conf. A. C. Jermy. Only extant locality.

152/16.25. *CAREX ACUTIFORMIS* 93, N. Aberdeen: Alder woodland by river, Glass, NJ/463.403. D. Welch, 1992, **ABD**, det. A. O. Chater. 1st post-1930 record.

152/16.29. *CAREX VESICARIA* *108, W. Sutherland: *Carex rostrata* mire, mouth of Strathnaver River, NC/451.503. R. E. C. Ferreira, 1980.

152/16.32. *CAREX SYLVATICA* 108, W. Sutherland: Edge of river, Loch Druim Suardalain, NC/12.21. P. A. & I. M. Evans, 1992, **herb. I.M.E.** 2nd record.

152/16.39. *CAREX LAEVIGATA* 81, Berwicks.: Shaded flush by Bruntaburn Wood, NT/595.511. M. E. Braithwaite, 1992, **herb. M.E.B.** 1st record since 1892.

152/16.46c. *CAREX VIRIDULA* subsp. *VIRIDULA* 26, W. Suffolk: Lakenheath Poor's Fen N.R., TL/702.827. M. Harding, 1992, conf. A. C. Jermy. Only extant locality.

152/16.64. *CAREX AQUATILIS* 108, W. Sutherland: Edge of Ledmore River, NC/22.12. P. A. & I. M. Evans, 1992, **herb. I.M.E.** 2nd post-1930 record.

†153/3.1. *SASA PALMATA* *83, Midlothian: shady ditchside in woodland, Cramond, NT/177.768. J. Cook & D. R. McKean, 1991, **E**.

153/12.4. *FESTUCA ALTISSIMA* *81, Berwicks.: Wooded burnside, Brunta Burn, NT/596.505. M. E. Braithwaite, 1992, **herb. M.E.B.**, det. D. R. McKean.

153/12.6. *FESTUCA ARENARIA* *46, Cards.: Embryo dune, S. end of Ynys-las Dunes, SN/605.928. A. O. Chater, 1992, **NMW**, conf. C. A. Stace.

153/12.9. *FESTUCA VIVIPARA* *83, Midlothian: Scree slope, Arthur's Seat, Edinburgh, NT/267.730. R. Saville, 1990, **E**, det. D. R. McKean. 1st record since 1824.

†153/12.15. *FESTUCA BREVIPILA* *39, Staffs.: Disused railway near Common Lane, Wombourne, SO/870.924. C. B. Westall, 1991, **herb. B. R. Fowler**, det. M. A. Wilkinson.

153/12.1 × †13.2. *FESTUCA PRATENSIS* × *LOLIUM MULTIFLORUM* (× *FESTULOLIUM BRAUNII*) *69, Westmorland: Wet area by path, Dalton-in-Furness, SD/224.739. P. Burton, 1989, **LANC**.

153/12.2 × 13.1. *FESTUCA ARUNDINACEA* × *LOLIUM PERENNE* (× *FESTULOLIUM HOLMBERGII*) *99, Dunbarton: Grassy pathside near Duchess Woods, Helensburgh, NS/286.833. A. McG. Stirling & A. Rutherford, 1992, **E**.

153/13.1 × †2. *LOLIUM PERENNE* × *L. MULTIFLORUM* (*L. × BOUCHEANUM*) *2, E. Cornwall: Arable field, Hudsland Farm E. of Kilhampton, SS/283.125. T. W. J. D. Dupree & R. M. H. Hodgson, 1992, det. P. J. O. Trist.

153/14.5. *VULPIA UNILATERALIS* *9, Dorset: Five Barrow Hill, SY/876.838. H. J. M. Bowen *et al.*, 1992.

153/16.2. *PUCCINELLIA DISTANS* 50, Denbs.: Edge of forest road, Llanfiangel Glyn Myfyr, SJ/032.510. J. A. Green, 1989, det. G. Hutchinson. 2nd record. *80, Roxburghs.: With *Spergularia marina* on gravel by A68 road, Carter Bar, NT/697.068. M. E. Braithwaite, 1992, **herb. R. W. M. Corner**.

153/18.6. *POA ANGUSTIFOLIA* *69, Westmorland: Side of railway, Appleby-in-Westmorland, NY/681.211 and NY/666.247. R. W. M. Corner, 1992, **LANC**, det. J. Edmondson. 1st and 2nd records. 70, Cumberland: Railway bank, Lazonby, NY/545.404. R. W. M. Corner, 1992, **LANC**, det. J. Edmondson. *75, Ayr.: Ailsa Craig, NX/0.9. B. Zonfrillo, 1992, **GL**, det. A. McG. Stirling. *83, Midlothian: Dry grassland, Sunnybank Place, Edinburgh, NT/276.743. A. J. Silverside & E. H. Jackson, 1989, **herb. A.J.S.** 99, Dunbarton: Grassy waste ground, Erskine Bridge, NS/46.72. A. McG. Stirling, 1992, **E**. 2nd record.

153/20.1. *CATABROSA AQUATICA* *98, Main Argyll: Silty sand with freshwater seepage, bay below Balure near Benderloch, NM/876.382. B. H. Thompson, 1992, **CGE**, conf. A. McG. Stirling. Muddy, cattle-trodden ground with freshwater seepage, Bran Phuir, Lynn of Lorn, NM/883.410. B. H. Thompson, 1992, conf. C. D. Preston. 1st and 2nd records.

153/22.1. *SESLERIA CAERULEA* *57, Derbys.: Calcareous grassland on skeletal soil, Monk's Dale, SK/136.736. H. Buckingham, 1989, conf. R. Smith. Extension of range 80 km southwards.

153/31.2. *KOELERIA MACRANTHA* 75, Ayr.: Ailsa Craig, NX/0.9. B. Zonfrillo, 1992, **GL**, det. A. McG. Stirling. 1st Ailsa Craig record.

153/32.3. *DESCHAMPSIA FLEXUOSA* 29, Cambs.: Edge of woodland ride, Gamlingay Wood, TL/243.536. T. C. E. Wells, 1991. Only extant locality.

153/39.8. *AGROSTIS VINEALIS* 43, Rads.: Dry acidic grassland, Camnant, SO/080.835. R. G. Woods, 1992. 2nd record.

138/40.2. *CALAMAGROSTIS CANESCENS* *24, Bucks.: Edge of ride through hazel coppice, Leckhamstead Wood, SP/727.403. R. J. Hornby, L. M. Jones-Walters & J. Spencer, 1989.

153/50.2. *BROMUS COMMUTATUS* 42, Brecks.: Meadow N. of Llanwrtyd Wells, SN/860.487. S. Gooch, 1990, **herb. M. Porter**, det. T. A. Cope. 2nd record.

153/51.2. *BROMOPSIS BENEKENII* 42, Brecks.: Limestone gorge N. of Cefn Coed, SO/024.087. T. C. G. Rich, 1992. 2nd record, 1st since 1899.

†153/53.1. *CERATOCHLOA CARINATA* *2, E. Cornwall: Waste ground by track, Saltermill, SX/430.637. A. Atkinson, 1991, conf. L. J. Margetts.

153/54.1. *BRACHYPODIUM PINNATUM* *49, Caerns.: Limestone grassland, Great Orme, SH/7.8. P. W. Ball, 1959, **LIV**. 1st confirmed record. †83, Midlothian: Heath near limestone ballast from railway, Cobbinshaw Loch, NT/019.591. R. Saville, 1992, **E**, det. D. R. McKean. 2nd record.

153/59.4. *HORDEUM SECALINUM* 46, Cards.: Roadside hedgebank W. of Llanfihangel-y-Creuddyn, SN/658.761. A. O. Chater, 1992, **NMW**. 2nd record.

†153/66.1. *CYNODON DACTYLON* *39, Staffs.: Well established on former railway sidings, Wolverhampton, SJ/916.022. B. R. Fowler, 1992, **herb. B.R.F.**

153/67.1 × †3. *SPARTINA MARITIMA* × *S. ALTERNIFLORA* (*S.* × *TOWNSENDII*) *98, Main Argyll: Silty tidal inlet, An Sailean, Benderloch, NM/895.402. B. H. Thompson, 1990, det. T. A. Cope. Plants recorded in 1984 at NM/888.418. and 902.418. as *S. anglica* were presumably this taxon.

154/1.1d. *SPARGANIUM ERECTUM* subsp. *OOCARPUM* *46, Cards.: Ditch at edge of *Typha* swamp, Pentwd Marshes, Cardigan, SN/184.449. A. O. Chater & A. P. Fowles, 1990.

158/7.1. *COLCHICUM AUTUMNALE* [73, Kirkcudbrights.: Delete record published in *Watsonia* 19: 151 (1992); plant is *Crocus nudiflorus*.]

158/20.2 × †3. *HYACINTHOIDES NON-SCRIPTA* × *H. HISPANICA* 50, Denbs.: Grassland, Bryn Euryn, Colwyn Bay, SH/832.798. G. Battershall, 1992.

†158/24.4. *ALLIUM NEAPOLITANUM* *27, E. Norfolk: Grassy hedgebank, Eaton Hill, Norwich, TG/20.06. E. T. Daniels, 1991. Known here for 25 years. *71, Man: Hedgebank, Bride Hills, NX/447.005. M. Devereau, 1991. Known here for several years.

†158/24.9. *ALLIUM PARADOXUM* 73, Kirkcudbrights.: Bank of R. Urr, W. of Haugh of Urr, NX/801.660. O. M. Stewart, 1992. 2nd record.

158/24.11. *ALLIUM OLERACEUM* 58, Cheshire: River bank, Catton Hall near Frodsham, SJ/545.773. G. M. Kay, 1992. 2nd record.

†158/24.12. *ALLIUM CARINATUM* *53, S. Lincs.: Saxilby Road, Skellingthorpe, SK/92.72. M. Hill, 1992, conf. I. Weston. [58, Cheshire: Delete record published in Newton, A. (1991) *Supplement to Flora of Cheshire* p. 39; plant is *A. oleraceum*.]

158/24.13. *ALLIUM AMPELOPRASUM* var. *BABINGTONII* †*50, Denbs.: Railway bank, Llandulas, SH/918.783. G. Battershall, 1992. 1st record of species.

158/24.14. *ALLIUM SCORODOPRASUM* 99, Dunbarton: Shore N. of Ardmore Point, NS/32.79. A. Rutherford, 1990. 2nd record.

†159/5.2. *IRIS SIBIRICA* 77, Lanarks.: Damp wood, Busby, NS/58.55. P. Macpherson, 1991, **herb. P.M.**, det. B. Wurzell. 2nd record.

†159/5.4. *IRIS VERSICOLOR* *6, N. Somerset: Pond, Emborough, ST/613.507. P. R. & I. P. Green, 1992.

†159/8.3. *CROCUS NUDIFLORUS* *70, Cumberland: Grass verge of path near Rose Castle, S. of Dalston, NY/372.465. E. E. Marper, 1992, **LANC**. *73, Kirkcudbrights.: Mill Island, R. Cree N. of Newton Stewart, NX/409.662. J. McCleary, 1989.

†159/13.1. *CROCOSMIA PANICULATA* *70, Cumberland: Muncaster Park, SD/090.958. M. M. Gill, 1992, **LANC**, det. O. M. Stewart.

†159/13.3. *CROCOSMIA POTTSII* *98, Main Argyll: Streamside near Scout Cottage, Lunga, NM/809.084. B. H. Thompson, 1992.

162/14.1. *ANACAMPTIS PYRAMIDALIS* 58, Cheshire: Roadside embankment, Ringway, SJ/807.836. J. McHarry, 1992. Only extant locality.

162/18.3 × 5. *DACTYLORHIZA INCARNATA* × *D. PURPURELLA* (*D.* × *LATIRELLA*) *80, Roxburghs.: With parents in calcareous flush, Murder Moss, NT/503.286. R. W. M. Corner, 1991, det. I. Denholm (from photographs).

Book Reviews

Random-access guide to selected British Hawkweeds. J. Bevan, based on a program by C. J. Legg; illustrated by K. J. Adams. Pp. 24 + disk. National Museum of Wales & Field Studies Council, Cardiff & Preston Montfort. 1992. Price £15 (ISBN 0-7200-0367-9).

The development of computer-assisted keys to critical groups of British plants has accelerated in recent years; see also the review in *Watsonia* 19: 199–200 (1993) of the *FLORA* program. Despite the modest reference in its title to 'selected' British Hawkweeds, this program actually covers 251 taxa of British species of *Hieracium* (excluding *Pilosella*), three more than are recognised in Kent's *List of vascular plants of the British Isles* (see review in this issue). Colin Legg's program, a version of which also exists for the genus *Carex*, is fast becoming a general-purpose tool which can handle data from different genera using standardised procedures.

Having obtained the review copy only a few days before helping to run a practical class for first-year biology undergraduates, we were able to give it a baptism of fire by testing its effectiveness among a number of first-time users. The results were reassuringly good; both the software and the data scoring have evidently been thoroughly tested. Terminology is explained in a well-illustrated leaflet which accompanies the program; both macroscopic and microscopic characters are used. Glandular hairs, which are so effective for differentiating the species of *Doronicum* sect. *Macrophylla* in south-west Asia, are equally valuable here in providing useful characters from both phyllaries and peduncles. Geographical data are coded into twelve units, six of which cover Scotland; 16 habitat types and three altitudinal zones are also covered.

Perhaps the most sophisticated feature of the program, and one which greatly contributes to its effectiveness, is the system of the character weighting. Each of the 324 character states is rated according to how well it differentiates between species, allowing the program to place more weight on 'good' characters when computing a coefficient of similarity. Results are presented either in descending order of number of simple matches or of weighted matches, the choice being left to the user. Having obtained a list of provisional results, one can also display the characters which are most effective to differentiate the top 20 species in the list.

Once one has entered data from an unknown specimen, there are several ways of interpreting the results. These include: identifying and describing the species most similar to the unknown one; tabulating characters for the top-ranking species; comparing pairs of species; and matching the character states of the unknown species with those of the species chosen by the program as the one it most closely resembles.

The booklet concludes with lists of subjective and unhelpful characters, and a short bibliography. The key does assume that the user can recognise a member of the genus *Hieracium*, and provides no means of excluding other Compositae other than *Pilosella*. The section on getting started ends with the very sensible advice that it is essential to check identifications against specimens named by experts in well-curated herbaria. No herbarium with a computer which runs MS-DOS should be without this program. A version also exists for BBC computers.

J. R. EDMONDSON

The Orchid book: a guide to the identification of cultivated orchid species. Edited by J. Cullen. Pp. xxxvi + 529; illustrated. Cambridge University Press, Cambridge. 1992. Price £24.95 (ISBN 0-521-41856-9).

Basically an identification guide to the genera and species of orchid in general cultivation, this book is based on the Orchidaceae account published in *The European Garden Flora* 2, but with updated

text. It is essentially a work of reference with about 900 species briefly described. The selection of which species to include has been governed by the criterion that on the whole they should be representative of general European collections of cultivated orchids, and occasionally of others held elsewhere in the world. Consequently only a small proportion of those which have at one time or another been in cultivation has been covered.

An introductory section outlines the basic structure of the orchid flower, the growth habit of the plant, and makes brief reference to cultivation techniques. Next is a set of keys which firstly divide the family into five apparently separate morphological groups and subsequently into their respective genera. The main section follows and comprises descriptive text of the selected genera and species. It is arranged in the format of a Flora with a brief summary given for each genus including information on geographical range, cultivation conditions and important literature references. Diagnostic characters for each genus are usually briefly stated and may be followed by sub-keys which break them down into their component species. These are then summarised under a series of standard headings which cover descriptions of floral structures, habit, climatic hardiness, native distribution range, synonyms, and also include a list of literature sources where illustrations may be found. For some species, where floral description is difficult, there are small accompanying sketches, but other illustrations in the book are limited to just 16 colour photographs.

Published so as to be available for the World Orchid Congress held in Glasgow in 1993, it is primarily aimed at the orchid grower and will be of only limited interest to the British botanist. To the latter its main value lies in the insight it gives into the more exotic species occurring world-wide, and in the most useful reference list to orchid illustrations. Its treatment of native British and European orchids is very basic and brief; for example in *Dactylorhiza*, *D. majalis* is listed without reference to any of the distinctive components of the aggregate, whilst *D. sambucina* is dismissed in less than 50 words. Whilst the keys are no doubt capable of separating the selected species covered within the book, they are very brief and generalised and likely to be of only limited use to practical botanists. Nevertheless, it is a well-produced book in which great attention has been given to detail both in the text and floral sketches. It should become an essential source of reference for both amateur and specialist grower.

M. J. Y. FOLEY

Stewart and Corry's Flora of the North-east of Ireland, 3rd edition. Edited by P. Hackney. Pp. 419, with 17 figures, nine black and white plates and 14 colour plates. Institute of Irish Studies, The Queen's University, Belfast. 1992. Price £17.50 (ISBN 0-85389-446-9).

The first edition of this *Flora* (1888) was mainly the work of Samuel Alexander Stewart. Thomas Corry was tragically drowned while botanising on Lough Gill some years previously but since he had jointly initiated work on the flora of the three North-east counties of Down, Antrim and Londonderry, his name was added as joint author and the *Flora* published with financial help from the Corry family. Stewart told the story of the tragic drowning in his introduction to the *Flora*, and paid handsome tribute to the young man who was Babington's assistant at Cambridge and who seemed certain to make a significant contribution to both British and Irish botany. In the second edition of the *Flora* (1938) Robert Lloyd Praeger paid tribute to Stewart's critical and painstaking approach to the work, noting that he had waged "ruthless war on imposters and claimants without sufficient credentials" and provided a really reliable list of the local flora, "so accurate indeed that the ensuing fifty years . . . has revealed very little that must now be withdrawn – a remarkable tribute to the compiler".

This third edition is firmly rooted in tradition. Prominence is given to the old records and the aim has been to update, verify and assess the status of each species. 280 pages in 2-column format have been given over to the catalogue, allowing for a generous inclusion of localities, annotations and comments. Bryophytes have been omitted from this edition. The now standard practice of recruiting specialists to write the accounts of critical groups or including only those records critically examined by specialists, duly acknowledged, has been applied.

Part of Praeger's 'Botanist's Guide' to the area from the second edition of the *Flora* has been retained. It is supplemented by further chapters by Paul Hackney on the topography of the area and

its outstanding botanical features, as well as comparisons of the flora with that of the rest of Ireland and with South-west Scotland (the Mull of Kintyre is only 20 km away from the Antrim coast). There are chapters on the climate by Nicholas Betts and on the history of the vegetation by J. R. Pilcher, each containing much that is of interest to the general reader.

The northerly position and relatively mild climate of the area are reflected in the flora. Atlantic species such as *Trichomanes speciosum* and *Hymenophyllum tunbrigense* manage to survive while *Geranium pratense*, *Gymnocarpium dryopteris*, *Carex magellanica* and *Carex pauciflora* are confined to this north-east corner of Ireland. Among the surprising absentees from this large and complex area is *Gentianella amarella*, common on the southern Irish dunes and extending to the far north of Scotland.

The appendix of doubtful records, casuals and species without good credentials has been dispensed with. All records are included in one list but with appropriate comments. Widely cultivated species such as forestry and hedging species are included. Stewart might not have approved of these departures. The almost smiling face of this tough little man, whose only fault according to Praeger was his "overweening modesty", greets the reader on p. 8. He would, I feel sure, have quickly overcome his earlier reservations and heartily approved of this splendid production which is remarkably low-priced for the quality of paper, printing and binding and sets a high standard for Irish regional Floras to follow.

D. SYNNOTT

Verbreitungsatlas der Farn- und Blütenpflanzen Kärntens. H. Hartl, G. Kniely, G. H. Leute, H. Niklfeld & M. Perko. Pp. 451, 16 colour plates and c. 2450 maps. Verlag des Naturwissenschaftlicher Verein für Kärnten, Klagenfurt. 1992. Price 360 Austrian Schillings (ISBN 3-85328-000-5).

The history of botany in this most beautiful part of Austria goes back to, at least, the 1700s and the time of Franz Xaver Freiherr v. Wulfen, commemorated by Jacquin in *Wulfenia carinthiaca*. Since then, there has been continuous activity in the study of the plants of Carinthia's high mountains, its forests, lakes and valleys. With an area of about 10 000 sq km and a flowering plant and fern total of almost 2500 species it has, for its size, a very rich and varied flora. And a glance through the colour photographs of this finely produced book shows how the combination of a scenic environment and interesting or beautiful plants blend to make Carinthia a place of special attraction for the field botanist. But this is not a coffee-table book to be browsed over and laid down. It is a scholarly work stemming from the distillation of much scientific knowledge gleaned over more than two centuries; its presentation has also been meticulously planned. The period from inception, gestation to appearance covered almost 25 years and the impressive list of European botanists who were involved testifies to its impeccable credentials.

The main aim of the book is to present by computerised dot-maps, together with complementary symbols and notes, the present-day Carinthian distributions and status (i.e. endangered, synanthropic, alien, doubtful status, etc.) of all its fern and flowering plant species. The province is divided into c. 88 grid squares. The text covers c. 40 pages of introduction, botanical history, geography; there are twelve pages of colour plates, twelve to a page, 307 pages of dot maps, arranged alphabetically by genus (which makes for easy reference) and about 70 pages of very useful supplementary information covering particular species, hybrids, literature and local names.

It is unlikely to be a best-seller among British botanists, but for those who do buy it or can otherwise consult it, it will act as an incentive to get the reader out to Klagenfurt, the Wörther See and the Kärawanken.

Any book devoted to an artificial area is likely to have a built-in likelihood of being insular in concept and of limited readership appeal. The criticism could be made here, but nevertheless it is a significant contribution to botanical knowledge in a floristically important part of S.E. Europe.

The Klagenfurt Natural History Society deserve congratulations for supporting the project and seeing it through to such a satisfactory conclusion; at 360 Austrian Schillings (c. £23) it is not, by present standards, expensive.

I. C. HEDGE

An illustrated guide to Fungi on wood in New Zealand. I. A. Hood. Pp. 424. Auckland University Press, Auckland. 1992. (Distributed outside New Zealand by Oxford U.P.) Price £19.50 (ISBN 1-86940-063-1).

I write this review from the standpoint of a 'consumer'. The book will be of particular interest to an experienced amateur mycologist like myself who is about to visit New Zealand on a natural history tour, because it is aimed at "amateur naturalists in general". In this respect, it achieves its purpose admirably.

The acknowledgment in the Foreword that there is a need for a much better appreciation of the indispensable role played by fungi in the ecology of the New Zealand forests is pertinent, as this matches a currently developing change of focus in the study of fungi in Europe. There is an excellent Introduction to the book, comprising sections on historical background, biology and ecology, amongst others. Very clear, concise accounts of the processes of reproduction and dispersal, growth and nutrition, hosts and distribution are given with minimal resort to technical language. This is most encouraging for the non-specialist reader.

The accounts incorporate appropriate references to particular species illustrated in the text. The pen-and-ink drawn figures are delightful. Producers of other field guides might learn from these. Coloured drawings are not always an advantage and may indeed be counterproductive for the beginner. The figures are laid out spaciouly with details of the fungi clearly identified; eight pages of colour plates, each with six small (occasionally too small) images, are included. The text is equally well presented and illuminating. The keys are adequately explained, and are easily followed. In conclusion, this book can be highly recommended for the amateur naturalist.

R. COOK

The botanizers. Amateur scientists in nineteenth-century America. E. B. Keeney. Pp. xii + 206, with eleven black and white illustrations. University of North Carolina Press, Chapel Hill & London. 1992. Price \$29.95 (ISBN 0-8078-2046-6).

No, this is not a history of the B.S.B.I.'s counterpart in America (not that there is any quite similar body there): it is a general study of amateur botany in the United States during the period when, in the author's words, it "rapidly became the most popular science in America for recreational and pedagogical purposes". Oddly, despite this, and despite the profusion of historians of science on the other side of the Atlantic and the multiplicity of their doctoral theses (of which this book is itself the outgrowth of one), the subject has never previously come in for the degree of scholarly attention it deserves. This reflects the much greater emphasis long placed over there on professional status and the proportionately weak survival of an amateur scholarly tradition – in striking contrast to Britain and the Netherlands. As a result, as the author points out, American historians "have often overlooked the nearly self-evident fact that amateurs and professionals pursue science for different reasons . . . and the influence of those differences on the science that these professionals and amateurs pursued." People whose prime motive is self-cultivation are ipso facto not of much interest to historians of science, who tend in any case to think that too few of them left writings to make it feasible to study them as a collective entity. That this is a serious misconception Elizabeth Keeney amply demonstrates: quite apart from the records and publications of societies there is "a vast array of commonly untapped sources heavily laden with information on amateur science", ranging from popular journals to advice manuals and works of fiction. These she has energetically quarried, with results that are eminently readable.

Despite the alien context, B.S.B.I. members will find much in these pages that is very familiar, for amateur botany on the two continents seems to have run broadly in parallel. At the same time they will be surprised to find what continue to be normal and everyday field botany practices portrayed as quaint, bygone Victoriana. The author appears to have seen or talked to no present-day plant taxonomists, either amateur or professional, and has consequently failed to realise that the world she describes is by no means the irrecoverably antique one that she supposes.

The volume is attractively produced, with a number of well-chosen, out-of-the-way illustrations

(two photographs of the Josselyn Botanical Society on an outing in Maine in 1896 are particularly appealing), numerous source-notes and an exhaustive bibliography.

D. E. ALLEN

List of vascular plants of the British Isles. D. H. Kent. Pp. xvi + 384. Botanical Society of the British Isles, London. 1992. Price £11.50 (ISBN 0-90115-821-6).

This is a numbered list of more than 4200 taxa of vascular plants "known at the present time to be native to or introduced and established in" the British Isles. For each taxon there is a tripartite number for family, genus and species; subspecies are indicated by letters and hybrids by the numbers of their parents. Many synonyms are given but the list is not comprehensive. The inclusion of basionyms is a welcome innovation; it also provides some startling facts. Did you know, for example, that *Symphoricarpos albus* was originally thought to be a *Vaccinium*? or that *Lysimachia terrestris* was first described as a mistletoe?

The arrival of Kent's *List* was keenly anticipated and has fully lived up to expectations. Admittedly, much of what is new, such as the classification and nomenclature, had already appeared in Stace's *New Flora* (reviewed in *Watsonia* 19: 161-163 (1992)), as had the use of tripartite numbers rather than Dandy's bipartite system, but it is only in Kent's *List* that the full impact of these changes becomes apparent. Rigorous application of the rules of priority and "the attempt . . . to take into account taxonomic studies in Europe as a whole when determining the status of British and Irish representatives" has resulted in wholesale name changes. Such changes, found in both Kent and Stace, are rarely welcome but the majority must be accepted if we are ever to reach a stable nomenclature. Others are still a matter of opinion – do you prefer to split *Scirpus* into seven genera as in Kent and Stace, or to leave them united as in Dandy?

There is no doubt that Kent's *List* is an essential companion that must be on the bookshelf of all botanists, amateur or professional, who have an interest in the British and Irish flora. I do, however, have a few quibbles. Why, for instance, are extinct aliens excluded? They are present in many herbaria and will no doubt be included in many Floras and Checklists; if one of the purposes of the *List* is to aid herbarium or Flora arrangement (as Dandy's *List* was stated to be) then I would have preferred to see them in. The omission of some important crop plants such as *Hordeum vulgare* is especially puzzling. Given the choice, I would have included all the aliens numbered in Stace. This would at least have resulted in a standard numbering system for both books rather than the confusing double system we have now. As early as family 21, the numbering in Kent and Stace diverges when Kent omits the Taxodiaceae, the Redwood family. Numbering of genera within families and species within genera is similarly inconsistent and the decision by Kent not to give unique numbers to any hybrids, although given to some of the commoner ones in Stace, adds to the inconsistency. A useful feature found in Dandy but omitted here is the provision of genus numbers in the index.

This is the first B.S.B.I. publication to have been produced by computer and yet it omits much useful information that one imagines could have been included almost at the proverbial 'touch of a button'! Why, for instance, were the genus and species numbers and even the genus names not repeated at the top of each left-hand page when a genus was split over two pages? It would make consulting the *List* so much easier for the user and would not have taken much extra effort. Less important but still annoying (to me at least) are the many instances of a single line of a two- or multi-lined entry found at the top or bottom of a page. Similarly I prefer not to see authors' initials and surname, and genus initial and species name split over two lines or even over two pages. With a little extra effort in adjusting spaces (there is an awful lot of blank space on each page) these visual imperfections could have been avoided. Another small point concerns the printing of hybrid names and formulae – a multiplication sign (×) looks so much better than an x, and could have been substituted easily.

Proof-reading appears to have been well done; spelling and punctuation mistakes are relatively few, although on page 45 the specific epithet *decalvans* is twice misspelt *decalvens* and is once, incorrectly, preceded by a hybrid sign. It also appears that the computer has occasionally slipped a synonym into the wrong species, the most amusing instance is finding *Cotoneaster humifusa* listed as

a synonym of *Taraxacum hamatifforme* not only on page 236, but also (by implication) in the index. In a book such as this, which is relied upon to give the correct name, authority and synonym, it is slightly worrying that so obvious an error was not spotted.

Despite the above points, I already find Mr Kent's *List* an invaluable source of information which I am referring to constantly. British and Irish botanists will remain in his debt for many years to come.

R. G. ELLIS

Atlas écologique des fougères et plantes alliées – illustration et répartition des Ptéridophytes de France. R. Prelli & M. Boudrie. Pp. 277 with 124 black and white plates. Éditions Lechevalier, Paris. 1992. Price F.fr. 260 (ISBN 2-225-82527-0).

If ever a book arrived at a good time for reviewing, this was it. Two days before I left for France was more than enough time to convince me that this was the one book I must take. It now meant that I had something more manageable than *Atlas Florae Europaeae* or the *Atlas of North European Vascular Plants* when setting off to look for pteridophytes in a part of France that was new for me.

The book is not an identification manual as such as it contains no keys, although good descriptions accompanied by beautiful photographs and distribution maps make this an ideal field guide for the pteridologist in France. Prelli's excellent *Guide des Fougères et Plantes Alliées* (reviewed in *Watsonia* **16**: 98–99, 1986, 1st ed.; *Watsonia* **18**: 442, 1991, 2nd ed.) was written instead as an illustrated key for identifications. Most of the commoner species are also found in Britain so English keys will be sufficient for identification in most cases. The authors have not arranged the species in any taxonomic or alphabetical order. Instead they have grouped them by habitat; firstly into lowlands, mountains or Mediterranean and then subdivided either into open, woodland or wetland species or by the type of rock on which they live. The absolute beginner will probably find this approach difficult to follow and a little confusing because several species grow in more than one of the delimited habitats; the authors have placed the species in the habitats in which they are most commonly found. Nevertheless the photographs and the brief descriptions are good and the reader is made aware of the other most similar species. The authors have thoughtfully chosen their photographs to illustrate whole plants or enlargements of parts of them as appropriate for each species. Perseverance should therefore direct the patient observer to the correct result. Reference to the accompanying maps and range descriptions will give additional support to the identifications.

The maps themselves give information about the relative abundance of the plants in each of the French Départements and the coloured map on the back cover shows at a glance which areas are the richest for pteridophytes.

The authors are to be congratulated on producing such a fine book. Anyone heading for France with even a passing interest in pteridophytes would do well to acquire a copy.

B. A. THOMAS

British plant communities. Vol. 3: *Grasslands and montane communities.* Edited by J. S. Rodwell. Pp. x + 540, with 36 figures. Cambridge University Press, Cambridge. 1992. Price £95 (ISBN 0-521-39166-0).

This is the third of the five volumes describing plant communities in Britain, and follows the same format as the previous two volumes (reviewed in *Watsonia* **19**: 49, 1992, and **19**: 198, 1993). A general introduction is followed by three main sections describing 13 mesotrophic, 14 calcicolous (calcicolous meaning 'with calcicoles') and 21 calcifugous grassland and montane communities. Finally, there are indices to vegetation synonymy and the occurrence of species in the communities, and an extensive bibliography.

Rodwell's prose is so seductive that it is easy to get side-tracked and learn much in the process. There are mouth-watering accounts of the mesotrophic MG3 *Anthoxanthum* — *Geranium* hay meadows of Teesdale, the calcicolous CG1 *Festuca* — *Carlina* oceanic rock garden grasslands, and

in the calcifugous grasslands and montane communities, the U17 *Luzula* — *Geum* tall-herb community of mountain ledges. A particular strength of the work is the synthesis of an enormous amount of research, relating the vegetation extensively to soil, climate and treatment.

In general, the book is well-presented, though Fig. 20 is poorly integrated into the text; it takes time to find the start of the sub-community descriptions as the synonymy runs into them, and the sub-communities are not numbered in the text. The tables are simpler than the confusing ones of Volume 1, but would still benefit from labelling (e.g. 'Constants', 'associates', etc.). The maps are ordered across rather than down the page (cf. Volumes 1 and 2 respectively). Most of the records on the map for U16c are missing from the map for U16. 'Subspecies' is excluded from the names (thus adopting zoological convention) but 'variety' is included.

The influences of the sampling and analysis should have been dealt with in more detail. For instance, data for the CG1f *Carlina* — *Scilla* sub-community were abstracted from the Biological Flora for *Draba aizoides* whose quadrats were deliberately centred on that species, resulting in an over-estimation of its frequency in the tables. Over half of the samples analysed for the calcicolous grassland chapter were collected by T. C. E. Wells *et al.* in a small area of Dorset, Hampshire and Wiltshire using 1 × 1 m quadrats and including few bryophytes, resulting in under-estimations of the frequencies of some species and the numbers of species per quadrat, and localized clusters of records on the maps.

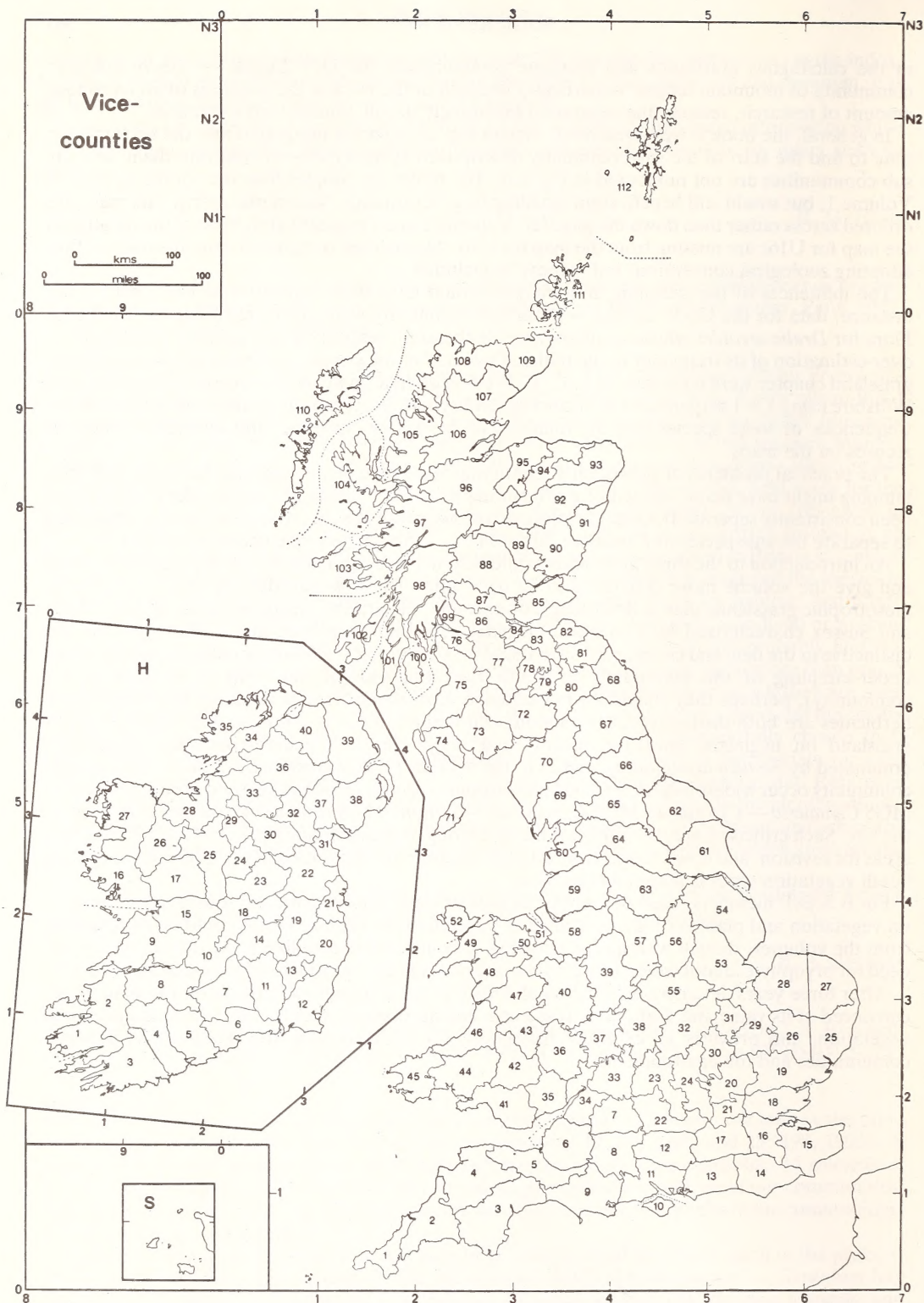
The practical problems of consistently identifying vegetative plants suggests that more judicious lumping might have been adopted (e.g. *Poa pratensis* and *P. humilis* (*P. subcaerulea*) cannot have been consistently separated). Oddly for the calcicolous grasslands, the recorders "always attempted to separate the subspecies of *Cerastium diffusum* . . ." though only one occurs in Britain.

An introduction to the three grasslands would help to place a grassland in its appropriate section, and give the volume more coherence in its own right. There is considerably more variation in mesotrophic grasslands than is described. For example, the grazing meadows on the levels in Kent and Sussex characterized by *Cynosurus cristatus*, *Hordeum secalinum* and *Lolium perenne* are distinctive in the field and clearly related to the MG6 *Cynosurus* — *Lolium* grasslands; in light of the under-sampling of this community in South East England (cf. the map of samples of the community), perhaps they should be re-examined. Grasslands heavily modified by broad-leaved herbicides are both distinctive and common, and deserve more mention as does *Elymus repens* grassland on neglected land and recent road verges (e.g. M25 embankments). Grasslands dominated by *Festuca arundinacea* similar to the MG12a *Festuca* grassland *Lolium* — *Holcus* sub-community occur widely inland. Any odd mesotrophic vegetation always keys out unsatisfactorily to MG5 *Centaurea* — *Cynosurus*, MG6 *Cynosurus* — *Lolium* or MG7 *Lolium* grasslands at the end of the key. Such criticisms are inevitable for the first airing of such a major work, and indicate possible areas for revision, and it will be interesting to see whether the dissolution of metalliferous and chalk heath vegetation types is adopted elsewhere.

For B.S.B.I. members, this book will be an invaluable reference work as a source of information on vegetation and plant ecology. Accounts of vegetation for County Floras could be summarised from the volumes, though widespread mapping of communities is unlikely to catch on due to the need for bryophyte identification (especially in the north and west) and the high cost of the volumes.

After three years' intensive application of *British plant communities* in the field, I remain firmly convinced of its value and usefulness. It is a convenient, practical tool for describing and assessing vegetation, and provides an excellent framework for understanding the relationships between communities and the environment.

T. C. G. RICH



INSTRUCTIONS TO CONTRIBUTORS

Scope. Authors are invited to submit Papers and Short Notes concerning the taxonomy, biosystematics and distribution of British and Irish vascular plants, as well as topics of a more general or historical nature.

Manuscripts must be submitted *in duplicate*, typewritten on one side of the paper, with wide margins and double-spaced throughout.

Format should follow that used in recent issues of *Watsonia*. Underline where italics are required. Names of periodicals in the References should be abbreviated as in the *World list of scientific periodicals*, and herbaria as in *British and Irish herbaria* (Kent & Allen 1984). Further details on format can be found in *B.S.B.I. News* 51: 40–42 (1989).

Tables, figure legends & appendices should be typed on separate sheets and attached at the end of the manuscript.

Figures should be drawn in black ink and identified in pencil on the back with their number and the author's name. They should be drawn no more than three times final size, bearing in mind they will normally be reduced to occupy the full width of a page. Scale-bars are essential on plant illustrations and maps. Lettering should be done with transfers or high-quality stencilling, although graph axes and other more extensive labelling are best done in pencil and left to the printer. Photographs can be accepted if they assist in the understanding of the article.

Contributors are advised to consult the editors before submission in cases of doubt. Twenty-five offprints are given free to authors of Papers and Short Notes; further copies may be purchased in multiples of 25 at the current price. The Society takes no responsibility for the views expressed by authors of Papers, Short Notes, Book Reviews or Obituaries.

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Plant Records: the appropriate vice-county recorder, who should then send them to C. D. Preston, Biological Records Centre, Institute of Terrestrial Ecology, Monks Wood, Abbots Ripton, Huntingdon, PE17 2LS.

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