

The current distribution and abundance of *Orchis ustulata* L. in southern England

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ABSTRACT

Orchis ustulata L. (Orchidaceae) was formerly widespread over much of the calcareous grassland of southern England. Three hundred and seventeen previously recorded sites in 152 separate 10-km squares have been identified, and a survey of the present status of the species at these shows that it has become extinct at many of them, and that there are now only 60 colonies (in thirty one 10-km squares) which definitely survive, only nine of which usually exceed 200 flowering plants. The past and present distribution of *O. ustulata* is illustrated, and some aspects of its ecological preferences and causes of decline discussed. Current colony strengths are indicated and all records traced are presented.

INTRODUCTION

In a previous survey (Foley 1987), the current distribution and abundance of *Orchis ustulata* L. in northern England was reviewed and the causes of its decline discussed. A similar survey of sites in southern England has now been completed and the results are reported below.

O. ustulata is widely distributed throughout central Europe and reaches its northern limit in the island of Gotland, southern Sweden (Ekstan *et al.* 1984), and the Leningrad region of the USSR at 60° N (Meusel, Jäger & Weinert 1965). It is most frequently found in the British Isles on the old, undisturbed chalk and limestone grasslands of southern and south-eastern England at which a light grazing regime has been maintained, and which have not been subjected to agricultural 'improvement'. The species is unrecorded in Ireland and Scotland, and the only record from Wales is almost certainly an error.

The area covered by this survey includes the whole of southern England, namely vice-counties 1–34, 36–40, 53, 55 and 55b, and completes the author's survey of the known distribution of *O. ustulata* within Britain (Foley 1987). The following account is based upon field-work carried out by the author and colleagues, and investigations into old records.

DISTRIBUTION

Three hundred and seventeen recorded sites have been identified in southern England, of which 186 are definitely extinct, a further 24 are possibly so, and 47 are of unknown status but likely to be either small or extinct. These last records are from Wiltshire (v.cc. 7–8) and E. Sussex (v.c. 14), where it has been difficult to trace precisely all of the many records in old Floras and other sources, some of which may duplicate known sites.

The past and present distribution of *O. ustulata* is shown in Figure 1. Out of a total of 152 recorded 10-km squares, this species is definitely present in only 31. The progressive extinction in other squares can be seen in Table 1. The great majority of sites were, and are, on calcareous ground – principally the chalk downs, but also on limestone grasslands. In the past, the highest density of sites was in Wiltshire, Hampshire and Sussex, but good colonies were also known in Dorset, Wight, Kent, Hertfordshire, Berkshire, Cambridgeshire, Bedfordshire, and Gloucestershire.

Even today, the main stronghold of *O. ustulata* is still the chalk downland of N. and S. Wilts.

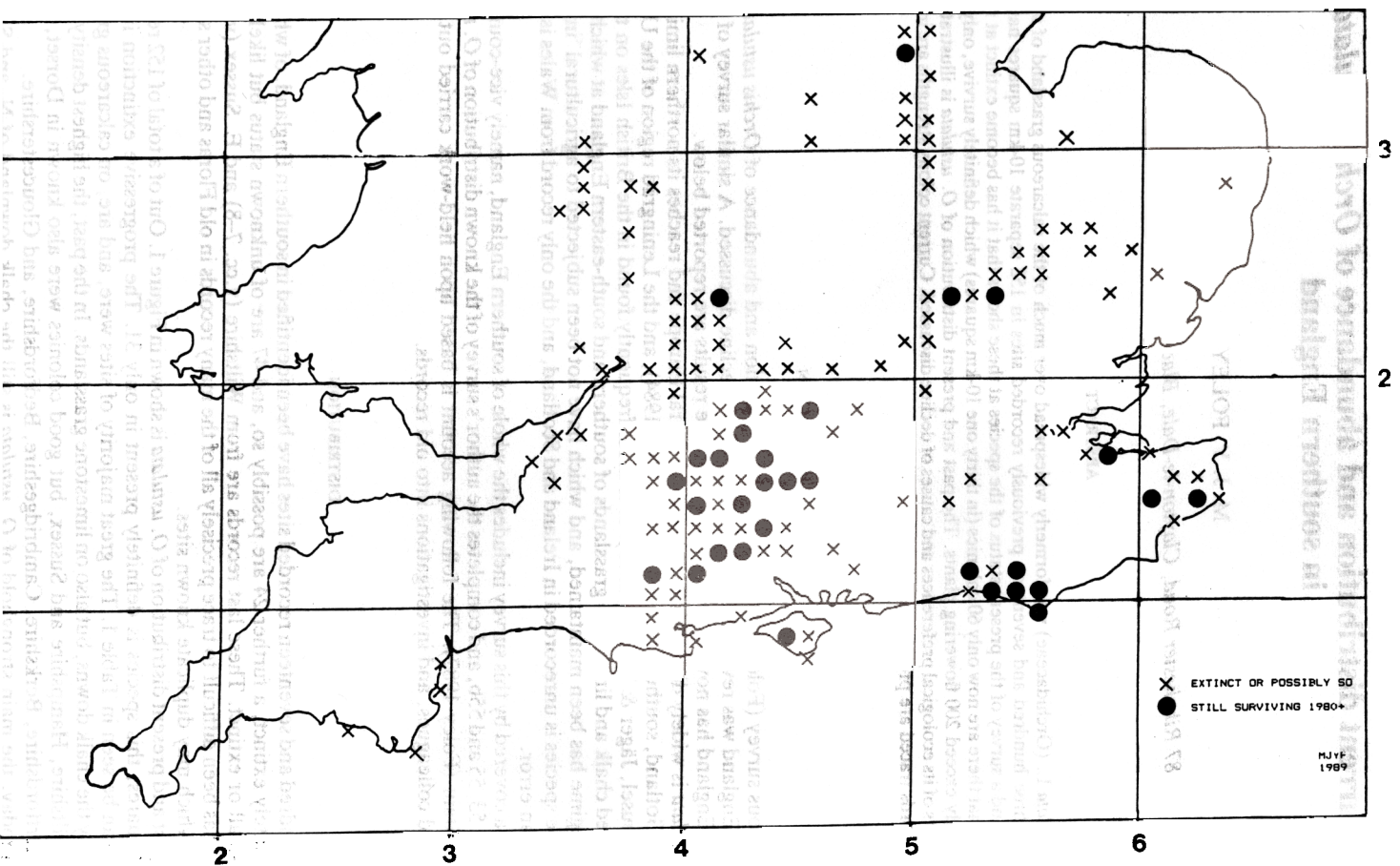


FIGURE 1. The past and present distribution of *Orchis ustulata* in southern England, v.cc. 1-34, 36-40, 53, 55, 55b. Plotted in 10-km squares.

TABLE 1. TIME-SCALE OF THE PROGRESSIVE EXTINCTION OF *O. USTULATA* FROM THE 152 RECORDED 10-KM SQUARES OF SOUTHERN ENGLAND

Extinction Period:—	Date Unknown	Pre- 1900	1900–29	1930–59	1960+	Extant	Total number of 10-km square records
Number of 10-km squares	25	55	13	14	14	31	152

(v.c. 7–8) and E. Sussex (v.c. 14), where the plant survives, often in very strong colonies, on some of those fragments of grazed downland which have escaped modern agricultural upgrading. Many of these are nature reserves or areas of special conservation interest relating to orchids and to chalk grassland plants in general. Unfortunately, and in contrast with many sites in northern England, where steep slopes or outcropping rock has prevented ploughing, most southern sites can be destroyed relatively easily in this way.

In southern England, the western limit of *O. ustulata* was formerly near Wembury, S. Devon (v.c. 3), but the presence of this colony has apparently not been confirmed since 1932. It may be that the small Fontmell Down colony, Dorset (v.c. 9), now represents the western limit of extant sites, which then rapidly increase in number eastwards, with Wiltshire (especially v.c. 8) possessing the largest populations in Britain.

ECOLOGY

O. ustulata is most frequently to be found in forb-rich, moderately grazed calcareous grassland which has been physically undisturbed in the past, and untreated by artificial fertilisers or herbicidal/pesticidal sprays. Fairly constant associates include *Poterium sanguisorba*, *Anthyllis vulneraria*, *Lotus corniculatus*, *Primula veris*, *Rhinanthus minor*, *Polygala* spp., and *Gentianella* spp.. The orchids, *Orchis morio*, *O. mascula*, *Platanthera bifolia*, *Gymnadenia conopsea*, and *Dactylorhiza fuchsii* are frequent associates also, and less often *Coeloglossum viride* and other plants such as *Blackstonia perfoliata* and *Campanula glomerata*.

The usual habitat is on gentle to steeply sloping calcareous ground. This can be of almost any aspect, but is most frequently warm, south-westerly to south-easterly-facing on rather steep-sided hollows, banks, and dry valleys in the chalk downs. Ancient earthworks, by virtue of having remained undisturbed for many hundreds of years, are often a favoured habitat and frequently harbour sizeable colonies. There are, however, very large areas of suitable grassland containing all the species normally associated with *O. ustulata*, but from which the plant is absent, and even some of the largest colonies are quite localized in extent. Only the three strongest located in this survey, each having several thousand flowering plants in a good season, have continuous populations covering an area greater than 1 ha, and many good sites are much smaller, or if not, the plants within them are thinly and sporadically distributed.

What is now probably the finest remaining British colony, consisting of an estimated 3000–5000 flowering plants, is in S. Wilts. (v.c. 8), and lies on gently undulating, multi-aspect downland forming a large continuous population with associated outliers. The site has a well-documented history of traditional grazing and agricultural usage reaching back possibly two millennia and is now fortunately fully protected as a nature reserve. A second very large colony, also in v.c. 8, and estimated at 2000–3000 plants, lies on the very steep west-facing slope of a dry valley and is quite different to the former in topography, and possesses probably the highest concentration of plants (1000+ per ha) of any of these very large sites.

Since the decline of the rabbit population through myxomatosis, the level and timing of managed grazing appears to be critical to the long-term survival of *O. ustulata*. Light grazing, preferably by sheep, from early Spring to the end of April, with a further spell in late July through until September, plus occasional dressings of natural organic manure, seems to be the favoured pattern at sites with the largest populations. This time-scale leaves ample opportunity for flowering and seeding. Cattle grazing, unless very light, may destroy the orchid by trampling or cause damage to

friable turf, thereby allowing the establishment of intrusive colonising plants, and is probably best avoided. Some sites are currently very overgrazed, e.g. Yarnbury Castle (v.c. 8), where small stunted plants, often only 3–5 cm in height, are found. In contrast it has been found (Foley 1987) that the plant can survive in quite rank, ungrazed localities, where tall specimens of 20–25 cm are normal, although survival of such colonies may be for a limited time only, and at least one such colony in northern England appears to have a diminishing number of plants.

In southern England *O. ustulata* has a peak flowering period from late May to early June, after which the plants rapidly senesce, especially if seed has not been set. However, a late-flowering variant flowering in early- to mid-July occurs at several sites forming colonies often quite separate from the earlier-flowering variant, although for example at Willingdon, E. Sussex (v.c. 14), both variants may grow together. Most records of this late-flowering variant are from Wiltshire, Hampshire, and Sussex, where it occurs in relatively close proximity to the earlier-flowering variant, but such colonies seem to comprise comparatively few plants, usually less than 100. Later-flowering variants have been recorded from continental Europe, but are unknown in northern England. Morphologically, there are no obvious differences between the two variants, although late-flowering plants sometimes appear to have darker sepals. In N. Wilts. (v.c. 7), one colony of late-flowering plants lies within 1 km of one of the early-flowering ones, both in a typical habitat for *O. ustulata* and with similar associates. Both also form discrete colonies, and such a difference in flowering period is difficult to ascribe; rather surprisingly, in this case, these late-flowering plants are somewhat smaller than the nearby normal variant. It is possible that heavy Spring grazing over a period of many years, might lead to the development of a late-flowering ecotype, but whatever the reason, it requires further study.

White-flowered variants of *O. ustulata*, referable to var. *albiflora* Thielens, have been recorded in the past from several sites in southern England (see Records), but none were encountered in the course of the present survey, although recently reported from two sites in northern England (Foley 1987).

CURRENT STATUS AND CAUSES OF DECLINE

The current status of *O. ustulata* at each site is denoted below (Records) by the letters: A = typically 1–10 flowering plants; B = 11–25; C = 26–50; D = 51–200; E = 201–1000; F = 1000+; PX = possibly extinct; X = extinct; U = unknown status, but likely to be either small colonies or extinct. Most extant sites and many other recent and less recent ones have been visited by the author and colleagues within the last few years, and estimates of colony size are usually based on observations made over several seasons. Comments relating to the above scale of estimates and to presumptions of extinction have been made previously (Foley 1987) and are equally applicable to the present survey.

Of the 42 vice-counties in the survey area, *O. ustulata* has in the past been recorded from 35, at some 317 separate sites. The present survey has shown the species to be now extinct, or probably so, in 21 vice-counties (Table 2); in a further eight, the number of sites is now reduced to less than 20% of those recorded in the past. In a further three the position is slightly healthier, but even here

TABLE 2. CURRENT STATUS OF *O. USTULATA* IN SOUTHERN ENGLAND BY VICE-COUNTY (SEE RECORDS)

Not recorded	Presumed extinct	Surviving at present in less than 20% of recorded sites in v.c.	Modest populations survive	Main populations
1, 2, 4, 5, 18, 27, 38.	3, 6, 16, 17, 19, 21, 23, 24, 25, 26, 28, 29, 31, 32, 34, 36, 37, 39, 40, 55, 55b.	9, 10, 13, 20, 22, 30, 33, 53.	11, 12, 15.	

TABLE 3. ABUNDANCE OF *O. USTULATA* FOR EACH VICE-COUNTY OF SOUTHERN ENGLAND

Vice-county		Colony status (see code)									Number of colonies
Number	Name	A	B	C	D	E	F	U	PX	X	
1	W. Cornwall										No record
2	E. Cornwall										No record
3	S. Devon									3	4
4	N. Devon										No record
5	S. Somerset										No record
6	N. Somerset									7	7
7	N. Wilts.	3	2		2	1		2		1	18
8	S. Wilts.	6				3	3	36		1	51
9	Dorset	2								9	12
10	Wight			1						10	12
11	S. Hants.	1								4	7
12	N. Hants.	5		2						9	16
13	W. Sussex			1						5	6
14	E. Sussex	5	5		2			9		2	25
15	E. Kent	6								8	15
16	W. Kent									3	3
17	Surrey								2	8	10
18	S. Essex										No record
19	N. Essex									2	2
20	Herts.								1	9	11
21	Middlesex									1	-
22	Berks.								7	9	17
23	Oxon								1	1	2
24	Bucks.									5	5
25	E. Suffolk									1	1
26	W. Suffolk									5	5
27	E. Norfolk										No record
28	W. Norfolk									1	1
29	Cambs.									12	12
30	Beds.									9	10
31	Hunts.									1	1
32	Northants.									4	4
33	E. Gloucs.									19	21
34	W. Gloucs.									8	8
36	Herefs.									2	2
37	Worcs.									5	5
38	Warks.										No record
39	Staffs.									2	2
40	Salop									6	6
53	S. Lincs.	1								9	10
55	Leics.									2	2
55b	Rutland									3	3
Total		30	11	6	4	5	4	47	24	186	317

populations are generally small, and an examination of Table 3, in which current colony strengths in each vice-county are displayed, shows that S. Hants (v.c. 11) has only two small populations remaining, N. Hants (v.c. 12) has seven modest ones, and E. Kent (v.c. 15) has seven small ones. Apart from the total extinctions indicated above, other rates of decline have been dramatic – Gloucestershire (E. Gloucs., v.c. 33, and W. Gloucs., v.c. 34) had a total of at least 29 separate populations in the past, but only one colony was definitely found to survive during the course of this survey, and other vice-counties with many previously recorded populations show the same trend, e.g. Dorset, v.c. 9, (two remaining from twelve), Berks., v.c. 22, (one from 17), Wight, v.c. 10, (one from twelve), Herts., v.c. 20, (one from eleven), and Beds., v.c. 30, (one from ten). The stronghold

TABLE 4. ABUNDANCE OF *O. USTULATA* IN THOSE 10-KM SQUARES OF SOUTHERN ENGLAND IN WHICH THE SPECIES SURVIVES

10-km square	Number of colonies	Colony status (see code)
	1	A
	1	E
	1	C
	3	A,A,B
	4	C,E,E,F
	1	A
	4	A,A,F,F
	4	B,E,D,D
	2	A,A
	1	A
	2	A,B
	1	A
	1	A
	1	A
	1	A
	4	A,A,C,C
	1	A
	1	B
		C
		A
	4	B,B,B,D
		C
		D
	1	F
	1	A
	7	A,A,A,A,B,B,E
	1	A
	1	B
	1	A
	1	A
	5	A,A,A,A,B
Total	31	60

of distribution is now undoubtedly S. Wilts (v.c. 8), E. Sussex (v.c. 14), and to a lesser extent, N. Wilts (v.c. 7), all of which have some excellent thriving colonies, and on some of the extensive downland especially in S. Wilts., other relatively small colonies may yet await discovery. However, it can be seen that of the 60 extant colonies confirmed during this survey, there are now only nine which in a good year contain typically 200+ flowering plants, and only four of these exceed 1000. A breakdown of current colony size by 10-km square is given in Table 4.

Causes of decline appear to be more frequently due to agricultural improvement than to other direct physical causes, and to some extent this contrasts with the situation in northern England where other pressures such as building and industrial encroachment have taken their toll. Ploughing with or without re-seeding, and the use of artificial fertilisers or herbicides are the main causes of site loss in southern England. During World War II, much downland, which because of its gentle topography could be easily worked agriculturally, was pressed into use, and many suitable habitats for *O. ustulata* were consequently lost. Overgrazing may also have had a detrimental effect, and still occurs at many sites. This, whilst perhaps not too damaging in the short term will, if prolonged over many years, greatly reduce population numbers, although usually some plants may persist in a vegetative state.

Other than physical destruction, an examination of the records for *O. ustulata* (see also Figure 1) reveals a declining distribution towards the south and east of England, and to those geographical centres of former population density. This reinforces the theory of a deteriorating climatic situation, causing a contraction of range perhaps over the last several decades, and a similar observation has

been made for *Ophrys sphegodes* (Hutchings 1987), another orchid of calcareous grassland, which like *O. ustulata* is also near the limit of its range in southern England and is in decline. If such is the case, recently extinct but still intact sites for *O. ustulata* would be less likely to be subsequently recolonised in the less favourable conditions pertaining, and the existence of much seemingly suitable but unoccupied habitat in the survey area is typical of a species at the edge of its range – and if now under conditions of a deteriorating climate, is likely to remain so. Other, minor causes of loss of sites include scrub colonisation, quarrying, and building development.

Fortunately many of the surviving colonies are protected either as nature reserves or by having S.S.S.I. status, and here *O. ustulata* should respond to management. Other colonies not so protected usually lie on easily worked ground and at these sites agricultural upgrading will remain a threat.

During the course of this survey, some of the more obscure old records have been found difficult to trace and have not yet been fully identified; but work on these continues. Publication of this survey may generate information on these and other sites, which the author will be interested to receive, with a view to presenting a future summary.

RECORDS

Note: References in the form 00/0.0 refer to 10-km squares, whilst four-figure references placed after localities and in the form (00.00) refer either to tetrads or to 1-km squares; however these latter are not given for large populations or for sensitive localities.

- S. Devon, v.c. 3: 20/5.4, Wembury (Bovisand), recorded in 1932 (PX); 20/8.3, Start Point, specimen in DMTH, J.R.P. Furze, undated (X); 20/9.5, Berry Head, Brixham, prior to 1860 (X); 20/9.6, Babbacombe Down and Torquay, pre-1860 (X). (An old 19th century record for 20/5.6, Shaugh Vale, near Plymouth is thought to be an error.) Ivimey-Cook (1984) states: "There is no evidence for the continued existence of *Orchis ustulata* L., the Burnt Orchid, in Devon".
- N. Somerset, v.c. 6: 31/3.6, Worlebury Hill (32.62), last record in 1838 (X); 31/4.5, Mendip Hills, three sites, at two of which it became extinct in last century (near Churchill (44.58) in 1847; and at Wavering Down, W. F. Miller, (40.56) in 1892) (Roe 1981); whilst at the third site, Callow Hill, it was last seen in 1959 by J. Hodgson, shortly after which the site was quarried away (R. G. B. Roe pers. comm.), but there is a specimen in LANC from the Cheddar area collected by E. Hodgson in 1961 in a "limestone copse" which may be the same site as Callow Hill (X, X, X); 31/4.7, Weston-in-Gordano (44.74) last recorded in 1850 (X); 31/5.7, Leigh Down (54.72) last recorded in about 1850 (X); 31/7.6, Claverton Down, Bath, (76.62) plentiful up to the end of the 19th century and last recorded in about 1920 by N. Y. Sandwith (Roe 1981), after which it is thought to have succumbed to human pressure and changes in agricultural practice (X); known in the Bath area since c. 1760.
- N. Wilts., v.c. 7: 31/8.6, South Wraxall (Grose 1957) (X); 41/0.6, Morgan's Hill, Roundway Hill, Tan Hill, Beckhampton Down, four sites all mentioned by Grose (1957), but agricultural spraying in this area may have eliminated some populations (D. Green pers. comm.) (PX,PX,PX,PX); Cherhill S.S.S.I. (04.68), 8 plants in 1978 (D. Green pers. comm.) (A); 41/1.6 Pewsey Down N.N.R., very strong group of early- and late-flowering populations which include Wansdyke (10.64) (B); Milk Hill (E); Walkers Hill (D); and the late-flowering Knap Hill colony (D); Martinsell Hill, Golden Ball Hill (Grose 1957) (PX,PX); 41/1.7, Rockley Down (Grose 1957) (U); 41/1.8, Wroughton (Grose 1957), last reported in 1888, now very doubtful (D. Green pers. comm.) (PX); 41/2.7, Peaks Downs (24.78), 11 plants in 1985 (D. Green pers. comm.) (B); Aldbourne (Grose 1957) (U); Bailey Hill (26.78), less than 10 plants in 1987 (D. Green pers. comm.) (A); 41/2.8 Russley Down, (26.80), 6 plants in 1987 (D. Green pers. comm.) (A).
- S. Wilts., v.c. 8: 31/8.3, Mere (Grose 1957) (U); 31/8.5, Westbury Downs (Grose 1957) (U); 31/9.3 (or 9.4), Bishopstrow Down and Stockton Down (Stearn 1975) (U,U); Park Bottom (95.37) (Stearn 1975) (U); near Grant Ridge Wood (Grose 1957) (U); 31/9.4, Scratchbury Camp, Heytesbury, near Warminster, 3 sites given by Grose (1957) (U,U,U); 31/9.5, Great Cheverell Hill, nature reserve, south-facing slope with *Platanthera bifolia*, up to 500 plants in good years (E), some with pure white flowers (Stearn 1975); Bratton (Grose 1957) (U); 31/9.6, Heddington (Grose 1957) (U); 41/0.2, Bishopstone (Grose 1957) (U); 41/0.3, Stapleford, collected by W. M.

Rogers in 1873, LANC (U); Little Langford, Ebsbury Hill, Barford Down, Steeple Langford – Cow Down, 4 sites given by Grose (1957) (U,U,U,U); 41/0.4, Yarnbury Castle, Winterbourne Stoke, around ancient earthwork, heavily grazed, but potentially a strong colony (E); Parsonage Down, two very strong populations, respectively (E,F); West Down, Tilshead (06.48) M.O.D. area with heavy vehicles active, formerly robust plants with *Orchis morio* (B. G. Tattersall pers. comm.) but now 'improved' (X); Orcheston Down, 50 plants in 1988 (B. G. Tattersall pers. comm.) (C); near the Bustard, some with white flowers (Stearn 1975) (U); 41/0.5, near Wilsford (Grose 1957) (U); 41/0.6, Etchilhampton Hill (Grose 1957) (U); 41/1.2, Pennings Lane (11.24) seen in 1987 (A. Hutchison pers. comm.) (U); Homington Down (12.24), two small colonies in 1987 (A. Hutchison pers. comm.) (A,A); Odstock Down, very strong population on west-facing steep slope (F); Clearbury Down, extensive population on gentle south-facing slope (F); 41/1.3, High Post (Stearn 1975) (U); Netton, Laverstock, (Grose 1957) (U,U); 41/1.4, Stonehenge, recorded by J. R. Akeroyd in 1966 when (B), W. M. Rogers, specimen in LANC (PX); near Fittleton and Nether Avon, Amesbury, Milston, Larkhill, (Grose 1957) (U,U,U,U); 41/1.5, Milton Lambourne (Grose 1957) (U); 41/2.2, Witherington Down (20.24) currently heavily grazed (A); Dean Hill (Grose 1957) (U); Pepperbox Hill (21.24), occasional in 1985 (A. Hutchinson pers. comm.) (A); 41/2.3, Winterslow (Grose 1957) (U); 41/2.5, Sidbury Hill, Ludgershall, Everleigh, Easton Hill, all given by Grose (1957) (U,U,U,U); 41/3.5, Fosbury (30.56), two plants of late-flowering variant, July 1988 (A. Hutchinson pers. comm.) (A); 41/3.6, between Ham Hill and Rivar Hill (Stearn 1975) (U); Ham Hill Reserve, about ten plants of late-flowering variant, July 1988 (A. Hutchison, S. L. Jury & J. R. Akeroyd pers. comms) (A). (Grose (1957) comments that although there are many sites scattered throughout v.cc.7–8, many have only a very few plants. This is probably even more the case today.)

Dorset, v.c. 9: 30/8.8, Lulworth, last recorded in 1895 (X); East Stoke, last record 1895 (X); 30/8.9, Milborne St Andrew in 1895 (X); 31/8.0, Stourpaine, last seen in 1904 (X); 31/8.1, Hod Hill, last recorded in 1930, but may still persist (PX); Fontmell Down (H. J. M. Bowen pers. comm.) (A); 31/9.0, Blandford, not seen since 1799 (X); 31/9.1, Gussage St Michael in 1895 (X); Farnham in 1895 (X); Ashmore in 1895 (X); 40/0.8, Old Harry Cliffs (05.82) in 1895 (X); 41/0.1, Bokerley Ditch, Martin Down (05.17), still surviving (H. J. M. Bowen pers. comm.) (A).

Wight, v.c. 10: 40/4.8, Garstons Down, discovered in 1973 at a bowl-shaped depression in the chalk, usually 20–30 plants, but over 300 in 1974 (C) (B. Shepard pers. comm.); 40/5.7, Rew Down (54.76) last recorded in 1966, now thought to be extinct due to scrub colonisation (X); 40/5.8, Ashey Down (57.87) last seen in 1966 since which time there has been a change in the grazing pattern (PX).

Recorded from some 12 chalk pasture sites on the island since about 1820, but reputedly known at very few to any one generation of botanists (B. Shepard pers. comm.).

S. Hants., v.c. 11: 40/2.9, West Lymington in 1883 (X); 41/0.1, Bokerley Ditch, Martin Down (04.18) few plants on the side of an ancient ditch (B. G. Tattersall pers. comm.) (B); also a second site nearby (A), and variant with white flowers (A. Hutchison pers. comm.); 41/3.2, near Bossington (32.28), chalk alluvial water meadow, late-flowering variant occurring with *Gymnadenia conopsea* var. *densiflora* in atypical habitat for the species, 14 spikes in 1956, last recorded in 1962, but site planted with *Populus* sp. in c. 1970 (R. P. Bowman pers. comm.) (PX); Romsey area, last known in 1883 (X); 41/4.2, Compton Down (prob. 46.24) recorded last in 1878 (X); 41/6.2, Pink's Hill, Warnford (60.22) in 1848–50 (X).

N. Hants., v.c. 12: 41/2.4, Tidworth Golf Links (20.48), small population (Lady A. B. M. Brewis pers. comm.) (A); Kimpton Downs (24.46), ploughed in 1870 (X); 41/3.3 Chattis Hill (32.36) last recorded in 1936 (X); Danebury Hill (32.36) not recorded from 1964 to 1985, and thought to have become extinct due to undergrazing following the demise of the rabbit population until rediscovered in 1986 by P. Wilson (A. J. Byfield pers. comm.) (A); 41/4.3, The Gallups, Worthy Down (44.34) ploughed in 1952 (X); Flower Down (44.30) last recorded in 1799, subsequently built upon (X); 41.45, Woodcott Down (44.56) ploughed after 1892 (X); Litchfield Down (44.54) recorded in 1892 but ploughed at a later date (X); Ladle Hill around ancient earthwork but often heavily grazed, late-flowering variant (C); near Old Burghclere, transplanted here in 1985 from a nearby threatened area, but has still not flowered (P. Brough pers. comm.) (A); Ashley Warren, late-flowering variant, recently threatened by motor-cycle scrambling and undergrazing (C); Watership Down, north of Gallups (49.56), late-flowering variant, two plants in 1988 (A); 41/5.4,

- Downs near Micheldever Station (50.42) last recorded in 1873 and later ploughed (X); near Southwood Farm (58.46) in 1859 and later ploughed (X); 41/5.5, near Wolverton Farm (54.56) in 1870, ploughed (X); White Hill, east-facing slope, discovered here recently, late-flowering variant (P. Brough pers. comm.) (A).
- W. Sussex, v.c. 13: 41/7.1, Harting 1889 (Arnold 1907) (X); 51/2.0, Portslade, Southwick (Arnold 1907), since built upon (X); 51/2.1, Newtimber Hill, Poynings, refound in 1983 by D. Batchelor when 33 plants, nine plants in 1984, 52 plants in 1985 (M. Briggs, D. C. Lang pers. comm.) (C); this area Newtimber/Saddlescombe/Pyecombe (Arnold 1907; Wolley-Dod 1937) could have been the same formerly more extensive colony (X); Henfield (Arnold 1887) (X). (The locality of a record for "Summersdean", E. Payne (Arnold 1887) has not been traced (X)).
- E. Sussex, v.c. 14: 50/5.9, known from nine tetrads (Hall 1980), and scattered frequently in the pastures near Beachy Head (Arnold 1907), including Seven Sisters (52.98), 15 plants in 1985 (B); and same area (52.96) (Hall 1980) (U); Cuckmere Haven (50.96) (Hall 1980) (U); Kiln Combe, East Dean (Bullock Down), a north-facing, undergrazed chalk slope (B. G. Tattersall pers. comm.) (D); also near East Dean (54.96) (Hall 1980) (U); near Friston (54.98) (Hall 1980) (U); Cow Gap (58.96), (Arnold 1907), ten plants in 1967 (B); downs above Meads (58.98) (Arnold 1907) (U); Whitbread Hollow (58.94) small colony (B); 51/3.0, Castle Hill, Falmer, south-facing downland with several colonies of varying size (B. G. Tattersall pers. comm.) but in total (D); Telscombe Tye (38.00) formerly (B) but destroyed c. 1970 (D. C. Lang pers. comm.) (X); 51/3.1, Standean, Patcham (30.10) formerly (A) but now destroyed (D. C. Lang pers. comm.) (X); 51/4.0, Mount Caburn, Glynde, 1000+ plants in a good year (B. G. Tattersall pers. comm.), short grazed turf on and around an ancient earth fort (F); also at (44.08) (U); near Firle Beacon (48.06) (Hall 1980) (U); 51/4.1, Cliffe Hill (43.10) (Arnold 1907) (U); Saxon Down, Glyndebourne (44.10) (A); 51/5.0, Cradle Hill, High and Over (50.00) 20 plants in 1972 (B); The Rails, Alfriston (50.02) four plants in 1965 (A); east of Alfriston (52.02) (Hall 1980) (U); Charleston Bottom (52.00) two plants in 1973 (A); Lullington Heath (54.02) (A), but 50 plants in 1981; Jevington (56.00) recorded in 1979 (A); Meachants, Willingdon, late-flowering variant, often 200+ plants (E) (B. G. Tattersall pers. comm.) and merging with a second colony of c. 15 early-flowering plants on a north-facing chalk slope (Combe Hill) (B. G. Tattersall pers. comm.) (B); 51/9.1, Rye Harbour (Hall 1980) is considered to be an error (M. Briggs pers. comm.). (Some tetrads listed by Hall (1980) in 50/5.9 are now possibly extinct, due to public pressure on the Downs.)
- E. Kent, v.c. 15: 51/7.6, Bluebell Hill, prior to 1900 (X), some with white flowers (Hanbury & Marshall 1899); 51/8.6, Queen Down Warren, south-facing chalk downland, very small colony with *Ophrys sphegodes*, *Aceras anthropophorum*, and *Orchis morio* (B. G. Tattersall pers. comm.) (A); 61/0.4, Wye Downs (06.44) (A); 61/0.6, Badgen Downs, near Faversham (Hanbury & Marshall 1899) (X); 61/1.3 (or 2.3), west of Folkstone, downland c. 1890 (X); 61/1.5, near Canterbury (Hanbury & Marshall 1899) (X); 61/2.4 Warren Bottom, two small colonies (24.44) with *Ophrys sphegodes* and *Orchis morio* (B. G. Tattersall pers. comm.) (A, B); Lydden, three small colonies (26.44) (B. G. Tattersall pers. comm.) (A, A, A); 61/2.5, near Wingham (Hanbury & Marshall 1899) (X); 61/3.4, St Margaret's at Cliffe in 1901 (X); Langdon Bay (34.42) recorded in 1954 and surviving for perhaps a further ten years (E. G. Philp pers. comm.) (X); downs near Dover, one specimen with white flowers (Hanbury & Marshall 1899) (X).
- W. Kent, v.c. 16: 51/5.5, between Knockholt and Wrotham, several colonies, last recorded in 1845 (X); 51/5.7, Dartford, recorded in 1821 (X) (E. G. Philp pers. comm.); 51/6.7, Gravesend (Hanbury & Marshall 1899) (X).
- Surrey, v.c. 17: 41/9.4, Hog's Back, Guildford, last recorded in 1874 (X); 51/1.4, White Downs, reported in 1976 but not substantiated (Lousley 1976), also very old record for this or the adjacent 10-km square (specimen in BON collected by A. Halley) for Dorking area in 1841 (PX); 51/2.5, Buckland Hills (22.52), small colony in 1946 (X); Walton Downs (22.57) known here since 1927, one plant seen in 1966 and now thought to be lost due to scrub colonization (X); Gatton Park (26.52), last recorded in 1965 (X); Betchworth recorded in 1884 (X); Wingate Hill in 1965 (Lousley 1976) (PX); Juniper Hill, Reigate Hill and Headley Hill, three 19th century sites (Salmon 1863) (X, X, X).
- N. Essex, v.c. 19: 52/4.4, near Strethall, possibly on the strip lynchets of Coploe Hill in about 1860, lost probably due to arable cultivation (Gibson 1862; Jermyn 1974; K. J. Adams pers. comm.) (X); 52/8.3 (or 8.4), Sudbury. Recorded here by G. S. Gibson in the last century (Gibson 1862),

- but some doubt as to whether the site might be actually in Suffolk. Lost probably due to arable development (K. J. Adams pers. comm.) (X).
- Herts., v.c. 20: 42/9.1, Tring (92.10) recorded in 1815, probably lost due to changing agricultural practices (X); near Tring Station (94.12) in 1883, changes in agriculture and scrub colonisation causing loss (X); Aldbury (96.12) in 1887 lost due to scrub colonisation (X); 52/0.1, near Isle of Wight Farm, Kensworth (00.18) in 1887, lost to agriculture (X); 52/0.2, Ravensthorpe Castle (08.28) last record 1924, subsequently afforested (X); 52/1.3, High Down (13.30) in 1843 lost to agricultural changes (X); Bury Mead (18.30) recorded in 1843, site now built upon (X); 52/2.3, Arbury Banks (26.38) in small numbers up to the late 19th century, when agricultural methods changed (X); 52/3.3, Therfield Heath, two sites (32.38) – last record here was of a single plant in 1979 (B. Sawford pers. comm.) (A,PX), and also 52/3.4, scattered sparingly in the 1880s but lost with the cessation of grazing (34.40) (X).
- Middlesex, v.c. 21: 51/0.9, Harefield, pre-1737 record from a chalk pit – J. Blackstone 1737 (X).
- Berks., v.c. 22: 41/2.8, Kingstone Down and Whitehorse Hill, formerly two sites but no records traced since 1890 and 1964 respectively (X,PX), (but see Steel & Creed (1982) for records for this 10-km square 1970–82) and may survive in small numbers at the latter; 41/3.8, Lambourn Downs in 1838 (X); Wantage, last record in 1859 (X); 41/3.9, Cherbury Camp in 1867 (X); 41/4.8, Gore Hill, last record 1966 (PX); East Hendred in 1961 (PX); Farnborough Downs (Bowen 1968) (PX), (but see Steel & Creed (1982) for records for this 10-km square 1970–82), may still survive in small numbers; 41/5.8, Aston Upthorpe Downs, a nature reserve especially managed for the species (H. J. M. Bowen, B. G. Tattersall, pers. comms.) (B); Blewburton Hill last record 1964 (PX); Streatley in 1950 (PX); Ilsley in 1920 (X); Churn in 1930 (X); Moulsoford Downs (Bowen 1968) (PX); 41/6.7, Basildon last recorded in 1879 (X); 42/4.0, Chilswell Hill pre-1820 (X); Botley pre-1820 (X).
- Oxon., v.c. 23: 42/3.0, Bampton, alluvial meadow in 1930, recorded by P. G. Beak (X); 42/4.1, Yarnton, occasional plant recorded here in the 1970s, possibly still surviving in very small numbers but no recent confirmation (H. J. Killick pers. comm.) (PX).
- Bucks., v.c. 24: 41/7.8, Hambleden (78.86) prior to 1926 (Druce 1926) (X); 42/6.0, near Albury in 1935, recorded by J. Chapple (X); 42/8.0, Coombe Hill (88.08), last recorded in 1961 (X); 42/9.1, Pitstone Hill (94.14) in 1936 (X); Ivinghoe (96.16) prior to 1926 (Druce 1926) (X). The plant has not been recorded during field work for *The flora of Buckinghamshire*.
- E. Suffolk, v.c. 25: 62/3.8, Bungay, specimen in BON pre-1903 (X) – this however could be for E. Norfolk (v.c. 27) in 62/3.9, possibly from Bath Hills. The Shelling and Hadleigh records (see below) given under v.c. 26, may in fact be from E. Suffolk.
- W. Suffolk, v.c. 26: 52/7.5 (or 7.6), Dalham, last recorded pre-1889, by F. Tearle (Hind 1889) (X); 52/7.6 (or 7.7), Cavenham in 1773, by Sir J. Cullum (Hind 1889) (X); 52/7.6 (or 8.6), Risby Heath, chalk bank in c. 1860 (Hind 1889), also recorded here in 1939 by J. E. Lousley & E. C. Wallace (X); 52/9.5 (or 9.6) or 62/0.5 (or 0.6), Shelling, record in *East Anglia Daily Times*, F. Woolnough, 1921 (X); 62/0.4, near Hadleigh in 1961, Sir C. Morris (X). (Also 52/6.6, Newmarket Heath in c. 1828 (Hind 1889), but this site may be same as that for Cambs., v.c. 29 (X)).
- W. Norfolk, v.c. 28: 53/6.0 (or 6.1), Shouldham, old 18th century record by R. Formby (X). No other records (C. P. Petch pers. comm.).
- Cambs., v.c. 29: 52/4.4, Ickleton before 1860 (X); 52/4.5, Cherry Hinton chalk pit (48.55) last recorded c. 1880 (X); Gog Magog Hills in 1863 (X); between Stapleford and Babraham, last record pre-1860 (X); 52/5.4 near Hildersham before 1860 (X); Linton in 1832 (X); 52/5.5, Balsham Heath pre-1870 (X); Fleam Dyke (53.55) last recorded in 1941 (X); 52/5.6, Devil's Ditch in 1907 (X); 52/6.6, Devil's Ditch (62.60) in 1955 (X); Newmarket Heath pre-1889 (X); Chippenham before 1820 (X). Main causes of extinction in v.c. 29 are thought to be a combination of ploughing after enclosure of grass heaths in the 19th century, and lack of grazing of the remaining chalk grasslands.
- Beds., v.c. 30: 52/0.2, Ravensburgh Castle (08.28) last recorded in c. 1930 at which time a large heap of manure was deposited on the colony from which it never recovered – site now ploughed (X); Streatley, Sundon, Sharpenhoe, Luton Downs, Warden Hills, Galley Hill (Dony 1953) (X,X,X,X,X,X,X); 52/0.3, Barton in the Clay, two colonies, one of which at (08.30), was last known c. 1935 subsequently lost to scrub colonisation (X,X); 52/1.3, Knocking Hoe N.N.R., small

- colony of usually 6/20 plants (T.C.E. Wells pers. comm.) (B). Apparently the decline began in c. 1930 when sheep grazing of the downland ceased.
- Hunts., v.c. 31: 52/0.9, Stibbington (06.98 or 08.98) record based upon a specimen collected in 1890 by Cpt. Vipan and sent to the Marchioness of Huntly who recorded this in her journal (T. C. E. Wells pers. comm.) (X).
- Northants., v.c. 32: 52/0.8, Biggin (00.88) on chalk drift pre-1930 and thought to have been subsequently ploughed (X); 53/0.0, Barnack (07.04) last recorded c. 1900 by Rev. H. Slater (X); Sutton Heath (08.00) in 1926 by Miss Powell (X); Southorpe (08.02) on rough grass near railway bridge in 1956 by H. F. Tebbs (X) (Biological Records Centre record), also Rigard (1957).
- E. Gloucs., v.c. 33: 31/9.9, Jackaments Bottom (95.97) small numbers recorded until the 1950s, subsequently lost to agricultural 'improvement' (X); 32/9.0, Edgworth, Miserden, Duntisbourne, Cirencester Park area (Riddelsdell *et al.* 1948) (X,X,X,X); 32/9.1, Brimpsfield to Elkstone (Riddelsdell *et al.* 1948) (X); Leckhampton Hill in 1862, specimen in **CHEL** (X); Crickley Hill, scarce in 1914 (Riddelsdell *et al.* 1948) (X); 32/9.2, Cleeve Common, (X); Prestbury (X) (both Riddelsdell *et al.* 1948); 42/0.0, Barnsley Downs (Riddelsdell *et al.* 1948) (X); Ablington Downs (09.08) last record c. 1948 when it was abundant. Site 'improved' agriculturally with small remnants which may still hold a few plants (PX); 42/0.2, Sevenhampton (Riddelsdell *et al.* 1948) (X); 42/0.3 Snowhill (Riddelsdell *et al.* 1948) (X); 42/1.0, Macaroni Downs (18.07) scattered on both sides of a dry valley, c. 30 plants in 1977, but recently 'improved' (X); Fairford (Riddelsdell *et al.* 1948) (X); 42/1.1, Northleach (Riddelsdell *et al.* 1948) (X); 42/1.2 Kinton Thorns (11.26) ploughed in 1956 (X); Notgrove and Bourton area (Riddelsdell *et al.* 1948) (X); 42/1.3, Hornsleasow Rough S.S.S.I. scattered widely over the site, which is on oolitic limestone at the remains of old quarry workings with *Orchis mascula* and *O. morio*, 300+ plants in 1965 but now much less (S. C. Holland, B. G. Tattersall pers. comms.), 25+ plants in 1988 (C); Bourton Downs (14.31) ploughed and reseeded c. 1948 (X).
- W. Gloucs., v.c. 34: 31/5.7, Durdham Down (Riddelsdell *et al.* 1948) (X); 31/7.7, Wyck Cliffs (Wick Rocks) (Riddelsdell *et al.* 1948) (X); 31/9.9, Poole Keynes, Rodmarton and Culkerton pastures, very abundant in 1924 (Riddelsdell *et al.* 1948) (X,X,X); 32/5.1, Symonds Yat, **herb E.C. Townsend** (X); 32/6.0, near Lydney in 1773 (Riddelsdell *et al.* 1948) (X). 32/8.0, Minchinhampton (Riddelsdell *et al.* 1948) (X).
- Herefs., v.c. 36: 32/5.1, between Rocklands and Coldwell at the foot of Coppett Hill (56.16) in 1849 (X); 32/7.4, Colwall, meadow, prior to 1889 (X).
- Worcs., v.c. 37: 32/7.4, Mathon (74.44 or 74.46) recorded here in the 19th Century (Amphlett & Rea 1909) (X); West Malvern (76.46) (Amphlett & Rea 1909), site lost early this century to building (X); 32/7.6, Abberley Hill (74.64 or 74.66) in the 19th century (Amphlett & Rea 1909) (X); near Witley (Amphlett & Rea 1909), lost in the 19th century (X); 32/9.3 (or 9.4), Bredon Hill, unconfirmed report in the 1920s (X) (J. J. Day pers. comm).
- Staffs., v.c. 39: 32/8.8, Kingswinford, about 1820 (Edees 1972) (X); 43/0.4, Weaver Hills, post-1900 (Edees 1972) (also old specimen in **BON**, pre-1903) (X).
- Salop, v.c. 40: 32/4.7, Downton Gorge (X); 32/5.7, The Lodge, Ludlow (X); 32/5.8, Upper Millichope (X); 32/5.9, Rowley, site drained in 1904 (X); 32/7.8, The Woodland, Bridgnorth (X); 33/5.0, Harley last recorded in the 19th century (X). No records this century (Sinker *et al.*, 1985).
- S. Lincs., v.c. 53: 43/9.2, Easton (X); 43/9.4, Court Leys in 1893 (X); Wilsford (X); Brandon (X); Ancaster Valley, newly discovered site in 1986 (A); 43/9.5, Navenby (X); Wellingore (X); 53/0.1, Bowthorpe in 1836 (X); 53/0.3, Sapperton in 1901 (X); 53/0.5, Temple Bruer (X).
- Leics., v.c. 55: 43/5.0, near Glenfield, not recorded since c. 1795 and subsequently urbanized (X); 43/5.2, Loughborough/Zouch Mill area recorded in c. 1831 (X) (A. L. Primavesi pers. comm.). Some doubt surrounds the above records since they are not on known calcareous soils.
- Rutland, v.c. 55b: 43/9.0, Shacklewell Hollow in c. 1875 (X); Ketton Heath, old record, area subsequently quarried for limestone (X); 43/9.1, Exton Park, possibly 1900–15, but later became an opencast mine site (X) (K. G. Messenger pers. comm.).

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