

The distribution and status of Critically Endangered archaeophytes in England

Kevin J. Walker & David Pearman

Botanical Society of the British Isles

March 2012



This report was produced by the Botanical Society of the British Isles (BSBI) as part of the 2011/12 Natural England-BSBI Memorandum of Agreement "Putting Plants on the Map: a data services framework in support of plant conservation in England"

The Botanical Society of the British Isles (known as BSBI) is a registered charity in England and Wales (212560) and Scotland (SC038675)
Registered address: Department of Botany Department,
Natural History Museum, Cromwell Road, London, SW7 5BD

www.bsbi.org.uk

Contents

Summary	4
1. Introduction	5
1.1 Objectives	6
2. Method	7
3. Results	7
3.1 Recent records	7
3.1.1 <i>Bupleurum rotundifolium</i> L. Thorow-wax	7
3.1.2 <i>Campanula rapunculus</i> L Rampion Bellflower	8
3.1.3 <i>Carum carvi</i> L. Caraway	9
3.1.4 <i>Centaurea calcitrapa</i> L. Red Star-thistle	10
3.1.5 <i>Chenopodium vulvaria</i> L. Stinking Goosefoot	12
3.1.6 <i>Chenopodium urbicum</i> L. Upright Goosefoot	14
3.1.7 <i>Galium tricornutum</i> Dandy Corn Cleavers	15
3.1.8 <i>Lolium temulentum</i> L. Darnel	16
3.2 <i>Ex situ</i> seed collections	17
4. Conclusions and recommendations	18
5. Acknowledgements	19
6. References	20

Summary

- A small group of archaeophytes are classed as Critically Endangered due to dramatic declines during the last century and are now only recorded, if at all, as presumed-casuals (or following deliberate sowing). These include *Bupleurum rotundifolium* L. (Thorough-wax), *Campanula rapunculus* L. (Rampion Bellflower), *Carum carvi* L. (Caraway), *Centaurea calcitrapa* L. (Red Star-thistle), *Chenopodium vulvaria* L. (Stinking Goosefoot), *Chenopodium urbicum* L. (Upright Goosefoot), *Galium tricornutum* Dandy (Corn Cleavers) and *Lolium temulentum* L. (Darnel).
- Historically all eight species have been associated with areas of low-intensity arable or mixed arable/livestock farming but are now at extremely high risk of extinction in England, despite a continuing trickle of casual records (e.g. as bird-seed or rubbish-tip aliens).
- In this report we assess the distribution and status of all eight species and attempt to: 1) identify all long-established sites in England using available records and correspondence with relevant vice-county recorders; 2) assess the representation of these sites on Sites of Special Scientific Interest; 3) assess whether *ex situ* seed collections have been lodged with Kew's Millennium Seedbank (MSB); 4) provide recommendations for their future conservation.
- *Bupleurum rotundifolium* appears to be extinct as an archaeophyte in GB, whereas *Lolium temulentum* may persist in a single Hertfordshire site, where it was last seen in 2010. *Carum carvi*, *Chenopodium urbicum*, and *Galium tricornutum* all survive on single long-established sites. Long-established populations of *Campanula rapunculus* occur on at least two sites whereas there are roughly 11 and 7 for *Centaurea calcitrapa* and *Chenopodium vulvaria* respectively. The status of both these species seems favourable and there is some evidence that they are increasing their range on some sites.
- To safeguard against national extinction there is an urgent need to establish 'safe-sites' for *Carum carvi*, *Chenopodium urbicum*, *Galium tricornutum* and *Lolium temulentum* and improve site protection for all extant species, especially *C. carvi*, *Campanula rapunculus*, *C. urbicum* and *L. temulentum*. In addition further work is required to assess the distribution of *C. vulvaria* in North Kent and ensure key populations are adequately protected. Finally, the Millennium Seedbank urgently require seed collections for *C. rapunculus*, *C. carvi* and *L. temulentum* as well as additional accessions for *G. tricornutum* and *C. calcitrapa*.

1. Introduction

The GB *Red List* (Cheffings & Farrell 2005) plus recent amendments (Leach 2007, 2010; Leach & Walker 2011) classifies threatened British native and archaeophyte vascular plant species as ‘Critically Endangered’, ‘Endangered’ and ‘Vulnerable’, according to an assessment of each plant’s risk of extinction in the wild against internationally agreed IUCN criteria.¹ Whilst the current distributions of most of our threatened taxa are well known, there are some for which we have a paucity of reliable up-to-date information, including several Critically Endangered UK BAP taxa also listed as species of ‘principal importance’ in England under Section 41 of the Natural Environment and Rural Communities Act (2006).

In this regard, of particular concern is a small group of Critically Endangered archaeophytes that have declined dramatically in the last century and are now only recorded, if at all, as presumed-casuals (or following deliberate sowing). With such species, we suspect that long-established populations may still survive on sites where suitable habitats persist (e.g. low intensity arable), and some casual records – especially from within former stronghold areas – could represent fleeting appearances from a long-buried persistent seed-bank.

The problem is knowing what’s important and what’s not. A good example is *Galium tricornutum* (Corn Cleavers), which has long been known from untreated arable plots at Rothamsted, and in the 1980s was recorded from an arable conservation area at Wytham. Both of these sites are clearly of the utmost importance. But what has become of the Wytham population? And are there other, currently ignored, occurrences meriting attention from a conservation standpoint? On the BSBI Maps Scheme website the map for *G. tricornutum* shows records for 16 hectads in the 1987-99 date class, and one hectad (apparently an error) in the 2000-09 date class. Some of these records may refer to populations that we really ought to be making a high priority for conservation action – but knowing which these are remains a major challenge (Walker & Leach 2010).

The Botanical Society of the British Isles (BSBI) is working closely with Natural England to identify priorities for plant conservation in England. One element of this work is to locate key sites for a number of Critically Endangered Section 41 species, to check that they are being protected and/or suitably managed, and, if not, to take action to ensure that they are properly safeguarded in the future. In this report we present the results for eight archaeophytes for which there has been growing concern over the dwindling number of long-established (‘archaeophytic’) sites namely: *Bupleurum rotundifolium* L. (Thorow-wax), *Campanula rapunculus* L. (Rampion Bellflower), *Carum carvi* L. (Caraway), *Centaurea calcitrapa* L. (Red Star-thistle), *Chenopodium vulvaria* L. (Stinking Goosefoot), *Chenopodium urbicum* L. (Upright Goosefoot), *Galium tricornutum* Dandy (Corn Cleavers) and *Lolium temulentum* L. (Darnel) (Fig. 1). Historically all eight species have been associated with areas of low-intensity arable or mixed arable/livestock farming but are now at extremely high risk of extinction in England, despite a continuing trickle of casual records (e.g. as bird-seed or rubbish-tip aliens).

¹ For definitions of these and other Red List categories – ‘Extinct’, ‘Extinct in the Wild’, ‘Data Deficient’, ‘Near Threatened’, ‘Least Concern’, ‘Waiting List’ and ‘Parking List’ – see Cheffings & Farrell (2005).

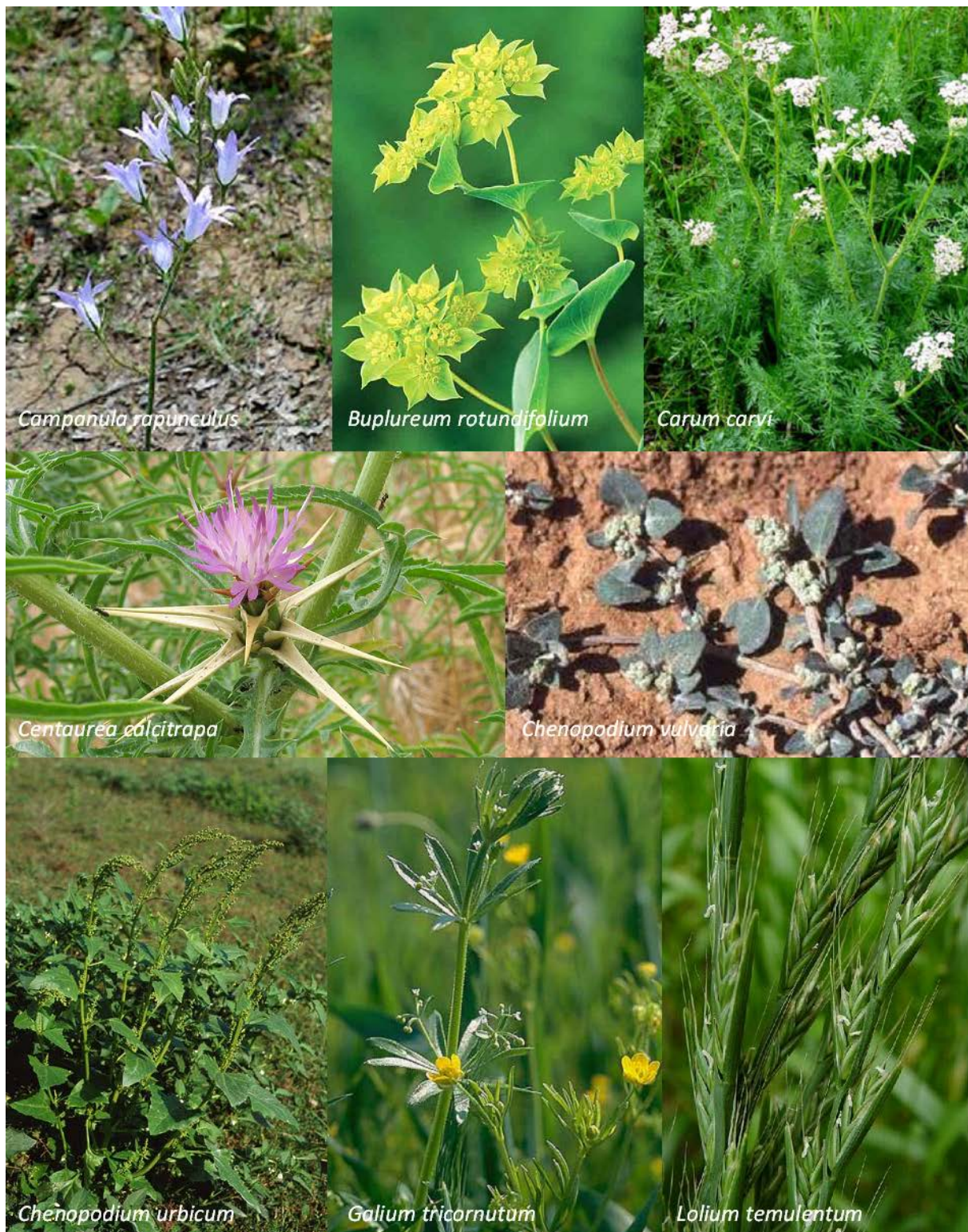


Figure 1 The eight critically endangered archaeophytes included in this study.

1.1 Objectives

The project had four main objectives:

- Identify all extant sites in England for all eight species using available records and correspondence with relevant VCRs;
- Assess the representation of these sites on SSSIs;

- Assess whether *ex situ* seed collections have been lodged with Kew’s Millennium Seedbank (MSB);
- For *Bupleurum rotundifolium*, *Galium tricornutum* and *Lolium temulentum* produce a plan for establishing a ‘wild’ site for possible introduction/re-introduction in 2012, and further sites in 2013-14.

2. Method

Recent records (post 1987) for all eight species were extracted from the BSBI’s Distribution Database (DDb). In addition, relevant vice-county recorders were contacted to provide details of any extant populations, especially those appearing to be ‘long-established’. BSBI members and recorders were also approached directly for the following information via an article in *BSBI News* (Walker & Leach 2010):

- Any records of long-established (possibly ‘archaeophytic’) populations;
- Any recent records (often presumed-casual) occurrences within the former range, where it may have re-emerged from a buried seed-bank, e.g. plants appearing as a result of ground disturbance during road-widening schemes;
- Sites where one of these species is known (or suspected) to have been deliberately (or accidentally) introduced, and where it seems to be persisting under favourable management.

3. Results

3.1 Recent records

3.1.1 *Bupleurum rotundifolium* L. Thorow-wax

The majority of recent records appear to be either casual records of plants arising from birdseed, usually in gardens or other urban locations. It has also arisen as a contaminant of seed mixtures including on the central reservation of Eastern Road in Brighton and in a strip of cultivated land that had been previously seeded with *Agrostemma githago*, *Anthemis arvensis* and *Centaurea cyanus* at Ferndown Local Nature Reserve in Staffordshire in 2010. It has also been deliberately planted on at least eleven sites as part of ‘arable flora’ conservation schemes. Most of these are located within the grounds of educational sites where it has clearly been introduced (e.g. Butser Ancient Farm, College Lake Wildlife Centre), but in at least one site (Birkdale Farm, Mowthorpe) it has been planted on arable field margins along with a range of other scarce ‘arable weeds’. It seems very likely that *B. rotundifolium* is extinct as a long-established archaeophyte in the UK, although we cannot rule out re-appearance from long-buried seed, and therefore that its status should be changed to ‘extinct as an archaeophyte, all current records neophyte’.

Table 1 Recent records (post-1987) for *Bupleurum rotundifolium* in England.

VC	Locality	Grid ref	Year	Details	SSSI
6	Crickham	ST4349	2005	Garden casual	
8	Marden	SU081583	1988	Garden casual (birdseed)	
9	Churchyard	SU105127	1998	Planted	
11	Hinton Ampner	SU596275	2009	Garden casual	
11	Lovedean, Cowplain	SU681126	1987	Manure heap	
11	Butser Ancient Farm	SU7216	1991	Planted	

12	Four Marks, Winchester Rd	SU6634	1991	Garden casual	
14	Brighton, Eastern Road	TQ319041	2009	Planted, central reservation	
20	Ware, Coltsfoot Road	TL363152	1997	Garden	
24	College Lake Wildlife Centre	SP9314	2000	Planted, arable weed plot	Pitstone Quarry
25	Stowmarket	TM0458	1987	Planted, Rural Life Museum	
25	Redgrave Fen	TM0479	1987	Planted, east plot	Redgrave & Lopham Fens
25	Otley Agricultural College	TM2054	1987	Planted, Otley Agric. Col.	
25	Saxmundham	TM3863	1987	Planted, Park Cottage	
25	Snape Hall	TM3959	1987	Planted, Snape Hall	
25	Southwold	TM5076	1987	Planted, Pier Avenue	Minsmere-Walberswick Heaths & Marshes
27	TG01W	TG01W	2003		
27	Wyndham	TG11040199	2006	Garden escape, road verge	
30	Foster Hill Rd Cemetery CWS	TL05145139	2003	Possibly <i>B. subovatum</i>	
33	VC33 East Gloucestershire	SP02I	1997	SB Flora	
39	Ferndown LNR	SJ85364217	2010	Contaminant in seed mix	
53	Holywell	TF0016	1988	Mound Verge Field	Holywell Banks
62	Mowthorpe, Birkdale Farm	SE677685 SE684688 SE687687	2007	Planted in arable margins	
62	Scarborough	TA028879	2004	Garden casual (bird seed)	

3.1.2 *Campanula rapunculus* L. Rampion Bellflower

Cultivated in Tudor times for its roots, which resemble parsnips, and spinach-like leaves. Now rarely grown in gardens as a curiosity or for ornament (Sanford & Fisk 2010). The Brothers Grimm's tale *Rapunzel* is alleged to have taken its name from this plant. Formerly naturalized in rough grassy places in a few areas, but the majority of recent records are of casual plants. However, there appear to be three persistent populations in rough grassy fields and or rough roadside banks (Table 2), including Nursling Gravel Pit and a road verge near Court Farm in South Hampshire and a roadside bank in Pulborough, West Sussex where it has been known since 1805. It is not known if a second site in West Sussex (Nep Town, 2004) is extant. It may also persist on a railway embankment near Kelvedon in North Essex where it was found in 1990. None of these populations occur on SSSIs although one (Court Farm) is on a 'protected' road verge.

Table 2 Extant sites (post-1987) for *Campanula rapunculus* in England.

VC	Locality	Grid ref	Year	Details	SSSI
11	Nursling Gravel Pit	SU358162	2010		
11	Court Farm, River Avon	SZ149979	2011	Road verge, thriving. Probably just outside the SSSI boundary but on a 'Road Verge of Ecological Importance' so receives some protection	Avon Valley (Bickton-Christchurch)
13	Pulborough	TQ04751861	2001	Bank above wall by side of road. Known in this area since 1805, and known from this site since 1969 (the houses adjacent pre-date	

				1969). Over the years the bank on the wall has become quite overgrown with scrub. Access difficult due to roadside location. Appears in nearby sites in some years	
13	Nep Town, Henfield	TQ21451555	2004	Trackside, history unknown	
19	Kelvedon	TL8518	1990	Railway embankment, possibly persisting	
19	Terling Place	TL71	1970	On private land and no recent records	

Notes: *Campanula rapunculus* in Pulborough has not been seen since 2001 (by Alan Knapp) despite recent searches. The precise details (per Alan Knapp) are: Pulborough, on wall north of Lower Street on a bank at the top of a c.6ft high wall on the north side of the A283 which runs East out of Pulborough. Occasionally a plant or two appears in odd places nearby. Numbers vary a lot from year to year depending on cutting of the bank and some years cannot be seen in flower. The bank is below a hedge forming the southern boundary of a garden.

3.1.3 *Carum carvi* L. Caraway

Probably introduced by the Romans and in cultivation to supply druggists and confectioners by medieval times (Sanford & Fisk 2010). In the 17th and 18th centuries it was certainly being cultivated on a field scale in some areas (e.g. Suffolk, Essex) and became naturalized in variety of habitats including meadows, pastures, roadsides and railway banks (Sanford & Fisk 2010). In some areas this association with 'old grassland' led to the mistaken belief that it was native, for example in meadows ('carvi fields') to the west of Hull and around the Wash in Lincolnshire (e.g. Gibbons 1975; Crackles 1990). In the Northern England and Scotland it was also planted around farmsteads, possibly to produce flavouring for cheese. It clearly declined during the 19th century and by 1900 was only being recorded as a casual in many counties, including East Yorkshire where it was by then confined to docks (Crackles 1990). By the 1950s it had also gone from a series of meadows in Bedfordshire where it had long been established (Boon & Outen 2011). With one exception, all recent records have been of casual plants, presumably arising from fruits imported as flavouring agents (Table 3). The majority of recent records are therefore from ruderal habitats including waste ground, sewage works, field margins, track edges and road verges (Table 3). In comparison there appear to be very few long-established sites in England and no evidence to support contention in Gibbons (1975) that it is 'native around the Wash', and certainly there are no recent records from there. The one possible exception is Marsett above Semer Water in North-west Yorkshire (v.c.65) where it has been known from a 'scruffy' village green (more a farm yard than a green) since at least 1934 and possibly much earlier (Cheetham & Sledge 1941). In Scotland it appears to have gone from its outposts of Banff/Moray and Orkney, but still persistent in reduced numbers in Shetland although is slowly declining (Scott 2011). With the exception of one site, none of the recent records were from SSSIs although the colony at Marsett occurs very close to the boundary of the adjacent Marsett Rigg SSSI.

Table 3 Recent records (post-1987) for *Carum carvi* in England. Only high resolution records are listed.

VC	Locality	Gridref	Year	Habitat	SSSI
7	Swindon Station, near	SU146852	1989	Footpath edge	
8	Wesley Road, Trowbridge	ST852575	1989	Rough ground	
14	Streat Farm, Jevington	TQ563023	1990	Clover field	

20	Rye Meads	TL387102 & TL391104	1991	Sewage works	Rye Meads
20	Bromley	TL416212	1987	Road spoil	
23	Kirtlington	SP509209	1988	Field margin	
24	Stonepit Field, Great Linford	SP845422	1993	Old limestone quarry	
24	Milton Keynes	SP855388	1998	Car park	
25	Holywells Park & Canal	TM174436	1996	Urban park	
26	Bury St Edmunds	TL831653	1996	Field margin?	
26	Great Barton	TL872652	1991	Roadside verge?	
29	Woodbury Lodge Farm	TL188537	1987	Field margin?	
30	Harlington, M1 Motorway	TL016305	1987	Motorway verge	
54	Tatershall, Coningsby	TF198580	1991	Disused railway line	
61	Old Wife Lane, Cowden	TA222426	2005	Track	
65	Marsett	SD90338621	2009	Village green	

Notes: Crackles (1990) notes that certain fields in the west part of Hull are mentioned in deeds as ‘carvi’ fields. Watson (1847) gives ‘? alien’ but then states that ‘in Lincolnshire and Yorkshire, it would seem to have become perfectly established; if not truly native there. Teesdale wrote “Meadows adjoining the Humber, near Hull, so plentifully the poor people gather the seed to dispose of to the druggists.”’

3.1.4 *Centaurea calcitrapa* L. Red Star-thistle

An archaeophyte probably first introduced by the Romans and known in cultivation in a few Tudor gardens (Sanford & Fisk 2010). Formerly introduced as a seed impurity, particularly with Lucerne and clovers from southern France and Italy (Salisbury 1961) and, more recently, in seed mixtures sown in urban locations for amenity purposes (Table 4). It also occurs as a rare casual on shoddy dumps (e.g. Wilmore 2000) and as a bird seed alien on waste-ground (Hanson & Mason 1985) although it has declined dramatically as a casual in these habitats presumably due to improved seed cleaning and the decline in the use of wool shoddy and esparto (Preston *et al.* 2002). The possibility that coastal populations in Sussex and Kent are native has long been debated (Wigginton 1999). There are recent records from eight sites covering over 30 monads on the border of East and West Sussex where it is thoroughly naturalised and in some areas locally abundant in a variety of disturbed habitats on calcareous soils (Table 4). It has been known from a number of these sites for a very long time (e.g. Cuckmere Haven) and appears to be increasing and colonising new sites nearby. It also occurs at two sites in Gillingham, East Kent, although at Chatham, where it has been known since 1839, it may be extinct due to the cessation of pony grazing. In 2006 it was also found in the middle of a track on Salisbury Plain, North Wiltshire, where it may have been introduced by military vehicles from Europe (Sharon Pilkington, pers. comm.). With the exception of Newtimber Hill and Cuckmere Haven, none of the Sussex or Kent sites are notified as Sites of Special Scientific Interest although a few are local nature reserves where conservation work for *C. calcitrapa* is carried out (e.g. Darland Banks).

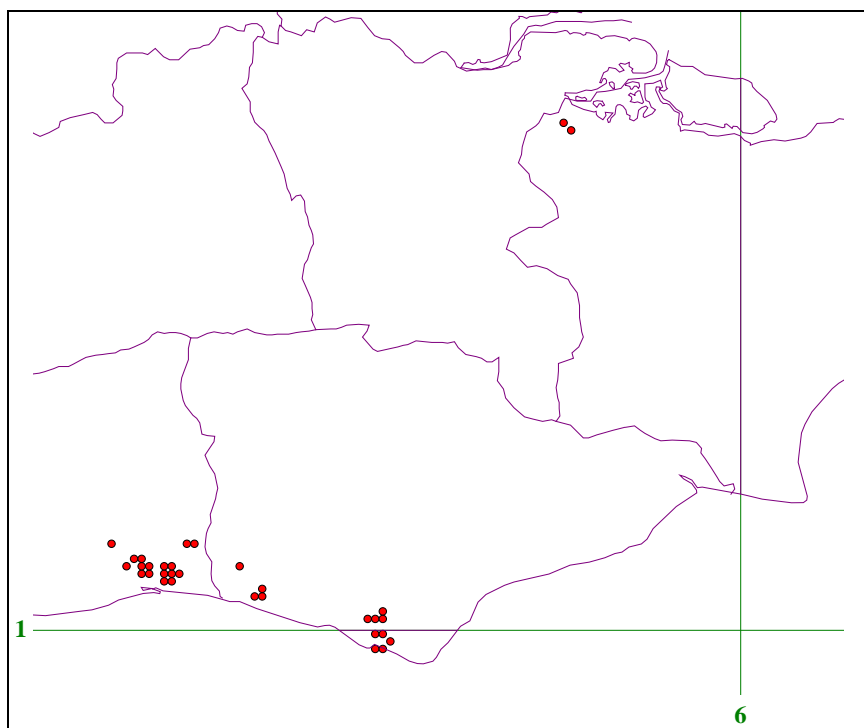


Figure 2 The distribution of *Centaurea calcitrapa* in Sussex and Kent mapped at the monad scale. Only monads with recent (1987+) records are mapped.

Table 4 Extant sites for *Centaurea calcitrapa* in England.

VC	Locality	Grid ref	Year	Details	SSSI
7	Brigmerston Down, Salisbury Plain (Bulford Ranges)	SU20004755	2006	A few plants in the middle of a chalky track; possibly introduced on the wheels of military vehicles?	Salisbury Plain
13	Anchor Bottom/Mill Hill area	TQ1909 TQ2007 TQ2008 TQ2009 TQ2107 TQ2108	2011	Recently established; 100s of plants scattered over wide area along footpaths, field margins, in tractor ruts in field and farmyard	
13	Coombes	TQ187083	1990	164 plants in open chalk grassland. Assumed to be still extant	
13	Newtimber Hill/West Hill area	TQ2611 TQ2711	2011	Known since the 1960s, surviving	Beeding/Newtimber Hill
13	Southwick Hill/Mile Oak area	TQ2306 TQ2307 TQ2308 TQ2406 TQ2407 TQ2408 TQ2507	2011	Known since the 1960s; 1000s of plants scattered over wide area in set-aside, arable field margins, the ruts of tracks and rough grassland (including cemetery)	
13	Steyning Round Hill	TQ16431101	2009	Scrub	
14	Coldean, University of Sussex	TQ337089	1989	No information	
14	Cuckmere Haven including Alfriston, Exceat, Friston Forest, High & Over, Litlington, New Bridge, Tile Barn & Seven Sisters Country	TV5197 TV5199 TV5297 TV5299 TV5398	2011	The classic site, listed in Wolley-Dodd (1937), where it appears to be increasing; 1000s of plants scattered over	Seaford to Beachy Head

	Park	TQ5001 TQ5101 TQ5201 TQ5202		wide area and occurring on riverbanks, paths/tracks, car parks, grassy banks and roadsides	
14	Ovingdean/Woodingdean area	TQ3504 TQ3604 TQ3605	2011	A few scattered plants, known since the 1970s, in a few horse paddocks and along track and arable field margins	
15	Great Lines, Chatham, Gillingham	TQ766675	1992	Known here since 1839. Occurs in rough grassland, but not found in 2011 possibly due to cessation of pony grazing	
15	Darland Banks, Gillingham	TQ77786659	2011	Long established in rough grassland and surviving; in 2011 there were 4 strong patches c. 4 ft across at. 'Augmented' with garden-grown plants from original stock (Kent Wildlife Trust Reserve)	
26	Chadacre Park	TL856521	2005	Sown grassland	
54	Lincoln University	SK97Q	2002	Waste ground	
63	VC63 South-west Yorkshire	SE2924	1974-1993		
63	Kirkhamgate	SE3023	1995	Shoddy dump	
63	Whitwood, Castleford	SE4125	1989		
66	National Glass Centre, Sunderland	NZ404578	2003	In sown grassland with Lucerne	

3.1.5 *Chenopodium vulvaria* L. Stinking Goosefoot

An annual of disturbed, nutrient-rich soil on sandy shingle beaches, strandlines and cliff-tops and formerly inland as a casual of places enriched with animal dung (Pearman 1999; Sanford & Fisk 2010). In the 17th century it was described as 'common almost upon every dunghill' (Culpepper 1653) but during the late 19th century it declined dramatically, perhaps because of the change from horse to tractor power, and the declining use of dung as a fertilizer (Preston *et al.* 2002). By 1930 it was virtually confined to coastal habitats, and even here it has continued to decline for reasons which are unclear. Today it only occurs very rarely as a casual inland. Localities in which it has been recorded since 1987 are listed in Table 5. The best known sites are Landguard Common in Suffolk, where the population is small but well protected (Crewe 1991) and West Bay in Dorset where it was rediscovered in the late 1980s and persist on a clifftop and the bunkers of an adjacent gold course (see photo in Marren 1999). There are also scattered sites along the Thames Estuary in South Essex and North Kent where it is probably over-looked and more common than the records below suggest. Of these it appears to be thriving at East Tilbury, where it has recently colonized newly created habitat inland, and possibly on the Isle of Grain, although survey work is required to establish the extent of the population(s) as well as the status of the outlying population at Sandwich which has restricted access. Half the current sites occur on SSSIs.

Table 5 Extant sites for *Chenopodium vulvaria* in England.

VC	Locality	Grid ref	Year	Details	SSSI
9	West Bay Cliffs	SY46679010	2011	Discovered in 1988 and then plentiful in trampled areas between path and cliff edge and in the bunkers of the adjacent golf course (depending on rigour of management). Has declined dramatically since the 1980s, for reasons that are unclear and very few plants now on cliff edge and path (SSSI). The golf course populations occur outside the boundary of the SSSI	West Dorset Coast
15	Queenborough, Isle of Sheppey	TQ916727	1992	Disused railway line. Seed collected for the Millenium Seed Bank. Current status unknown	
15	Prince's Golf Links, Sandwich Bay	TR354600	?	Known since 1946 from a track on the golf course (according to Joyce Pitt). The current status of this population is not known. There are also records for TR35P and TR36K by Eric Philp (not in Philp 2010), but the golf club do not take kindly to botanising off the public footpaths	?
16	Cliffe Pools	TQ71607670	2011	Plants covered half a square metre in 2011. Formerly on cindery ground scuffed by motorbikes, but discouraged as now an RSPB reserve	South Thames Estuary & Marshes
16	Isle of Grain	TQ8677 TQ8678	1987 +	Found by Eric Philp in two places in this tetrad since 1987; one in TQ8677 (ca TQ867774), on the Grain side of Yantlet Creek, the other in TQ8678 by some old coastal army workings. The current status of these two colonies is unknown	South Thames Estuary & Marshes
18	East Tilbury Beach and Goshems Farm Waste-site	TQ6775 TQ6776	2007	Plants scattered along the strandline of the beach (with Henbane) and from there have colonized the capping of an old landfill site including a new hardcore track. However,	

				the site is under threat from the construction of a long distance sea wall path	
25	Languard Common	TM2831	2006	Possibly the best known site and well-monitored; numbers fluctuate greatly with an average of about 100 plants. The site is temporary fenced to exclude rabbits and rotovated to provide open soil for germination (Sanford & Fisk 2010)	Landguard Common

Notes: Philp (2010) states that in Kent it is: “Long established and looking native on bare or cattle trampled soils by the coast” and gives its occurrence in seven tetrads (TQ57M ,77D , 87P, 87T, 87U, 97B ,96Z). However, it is thought to be under-recorded in coastal sites and further survey work is required to establish its true distribution (Geoffrey Kitchener, in litt.). For example the lack of recent Sandwich records may be largely lack of opportunity to botanise ‘off’ the public footpaths that cross the gold course. Its status in Kent is probably favourable so long as semi-open conditions are maintained by moderate trampling and/or rabbit-disturbance.

3.1.6 *Chenopodium urbicum* L. Upright Goosefoot

There are relatively few definite recent records for this species and only a handful with precise locality details that have been determined correctly (Table 5). Most records appear to be of casual plants in ruderal habitats such as rubbish tips, wasteground, gardens or vegetable patches. However there may be one long-established population in Essex (Langdon Hills) where a colony of *Chenopodium urbicum* appeared on an area of cleared secondary woodland that had been recently cleared (Langdon Hills, TQ6787; Rod Cole, pers. comm.). The site is near to a medieval farmstead which is now part of the local country park. The area has since sprouted vigorous scrub re-growth, but it is assumed that the seeds will probably lie dormant there under coppice. The status of the Buckinghamshire populations requires further investigation.

Table 6 Extant sites for *Chenopodium urbicum* in England.

VC	Locality	Grid ref	Year	Details	SSSI
6	Stanton Prior	ST680627	2004	A few plants in farmyard. The specimens have not been checked and so requires confirmation (Helena Crouch, pers. comm.)	
12	Thrupton Race Circuit, S of	SU27574504	2011	Several plants, identity confirmed by Eric Clement	
12	Woolmer Forest	SU7832	1996	Not known	Woolmer Forest
18	Cock Lane Rubbish Tip	TL6302	2006	15+ plants	
18	Little Hyde Lane Rubbish Tip	TL652009	2001	Birdseed casual	
18	Handley Barns, Ingatestone	TL6501	2006		
18	Langdon Hills	TQ6787	2011	A ‘good’ site with many 1000s of plants appearing following the clearance of woodland in 1995 (Rod Cole, pers. comm.).	

				Specimens determined by Mike Mullin (BM). The site is within a country park and close to a medieval farmstead	
19	Martins Farm	TM1117	1995	A few scattered plants on disturbed areas of rubbish tip	
20	Coltsfoot Road, Ware	TL363152	2000	Grown in garden	
24	Turweston	SP603366	1994	Maize field	
24	Tingewick Mill	SP63	1994		Tingewick Meadows
24	Hughenden Manor	SU89	1996		
24	Naphill	SU89N	1992		Naphill Common
38	Grove Street, Leamington Spa	SP314657	2004	Urban street	
39	Willoughbridge	SJ752399	2005		
57	Rodsley	SK205401	2003	Weedy vegetable patch	
68	NU11D tetrad	NU11D	2006	The specimens have not been checked and so require confirmation (Chris Metherell, pers. comm.)	

3.1.7 *Galium tricornutum* Dandy Corn Cleavers

Galium tricornutum has suffered one of the most dramatic plants in the British flora since the 1950s when it was still relatively widespread (Preston *et al.* 2002). Today it only persists as an 'arable' weed on the Broadbalk Field experimental plots at Rothamsted Experimental Station in Hertfordshire where it is confined to one of the plots (Section 9, Plot 10) and is closely monitored. The plot itself has received no artificial fertilisers or herbicides for over 100 years and as a consequence has a interesting assemblage of arable weeds including *Scandix pecten-veneris* and *Torilis arvensis* (James 2009). It appears not to have been seen at the Wytham (Oxford) site since the 1980s despite detailed monitoring (Alison MacDonald, pers. comm.), although the precise location of the record (recorded by Charlie Gibson) is probably now grassland that has been reverting from arable since the 1980s. A small area of the original arable has been preserved ('The Triangle') to preserve a rich assemblage of arable weeds including *Ranunculus parviflorus* and *Kickxia* spp. Material from Rothamsted is being cultivated at College Lake near Tring. Consequently the Rothamsted population is the only remaining naturally occurring locality in Britain. All other recent records appear to be casuals, for example on a road verge in Cambridgeshire (Little Abingdon) in 1996 following disturbance during road-works, or from gardens (e.g. Honingham, Dunstable). The status of the Heacham (VC27) and Holywell (VC53) records requires further investigation.

Table 7 Recent records for *Galium tricornutum* in England.

VC	Locality	GR	Recent	Detail	SSSI
20	Broadbalk Field, Rothamsted	TL123136	2010	Has survived on an untreated, cultivated plot for over 100 years. A good year in 2010, with plants producing lots of spare seed	
24	College Lake Wildlife Centre	SP932143	2011	Cultivated in a rare arable weed plot (seed from	

				Rothamsted)	
23	Upper Seeds, Wytham	SP462080	1980s	Ploughing since 2000 has not produced corn cleavers but it has enabled some 185 species to be recorded, including <i>Vicia parviflora</i> and <i>Anagallis arvensis foemina</i> . Clearly autumn ploughing and harrowing is essential for these species and this should continue.	
25	Otley Agricultural College	TM2054	1987	Planted and now gone	
25	Foxborrow Farm	TM2751	1987	Planted and now gone	
25	Saxmundham	TM3863	1987	Planted and now gone	
27	Hillcrest, Honnngham	TG0912	1997	Grown in garden by Alec Bull from seed from Rothamsted (ex Cambridge Botanic Garden)	
27	Heacham	TF665377	1992	Unknown	
29	Little Abington	TL527497	1996	Roadside casual on a new slip-road	
30	Dunstable, 3 Grove Road	TL025214	1996	For years it occurred in the garden of an old lady in Dunstable who John Dony knew. The houses had been built on arable fields. The lady died c.1998 and, with it, this site disappeared under a modern garden.	
53	Holywell	TF0016	1988	Unknown	
63	Bolton, Bradford	SE1635	1990	Casual	
64	Mid-west Yorkshire	SE1638	1987-99	Casual	

3.1.8 *Lolium temulentum* L. Darnel

An annual, formerly 'pestilential' weed of arable land. In the UK it has almost vanished from this habitat, except on the Aran Islands, Western Ireland, where it still occurs as a contaminant of rye crops (*Secale cereale*) grown to produce thatching for houses and barns (Bleasdale 1994). Elsewhere it is now a very rare casual of waste places (e.g. waste ground, tips, garden centres), originating from grain, bird-seed and wool shoddy (Preston *et al.* 2002). In England the only recent 'arable' population was a small population discovered in 2009 in an arable margin in Hertfordshire, north of Burnham Green (c.TL264170) where there were about a dozen plants scattered along a bare field margin, in association with clumps of other arable weed grasses (Table 8). This is the first time it has been reported for Hertfordshire in a very long time, but the site seemed 'natural' rather than just a casual (James 2009). Ian Denholm revisited the site in 2010 and found 2 plants but in 2011 no material from the site could be satisfactorily be determined as *L. temulentum* (T. James, pers. comm.). The owners of the site have been contacted by the Country Management Service and are likely to be willing to conserve it. We have been unable to trace the details of

the North Lincolnshire record although grid reference suggests that it was made on an arable field margin and therefore requires further investigation. The only other arable location was at Mowthorpe in Northeast Yorkshire where seed of *L. temulentum*, collected in Crete, was sown with other arable weeds on field margins as part of an arable weed project, and grown on at the Ryedale Folk Museum, Hutton-le-Hole, but has apparently died out at both sites since (Michael Yates, Vince Jones & Chris Wilson, pers. comm.).

Table 8 Recent records for *Lolium temulentum* in England.

VC	Locality	GR	Year	Details	SSSI
2	Upper Tamar Lake	SS21W	1992	?	
3	Hole's Hole, near Bere Alston	SX4365	1990	?	Tamar-Tavy Est.
8	Seend Head	ST921598	1990	One plant	
14	New Cut, Westfield	TQ8115	1998	Casual?	
20	Burnham Green	TL264170	2009	Arable field margin	
20	Ware, tip	TL344157	1986	Casual	
20	Baldock, Tapp's Garden Centre	TL253337	1995	Casual	
54	Lea Marsh, Gainsborough	SK814869	1992	Arable field margin	
62	Mowthorpe, Birkdale Farm	SE684688	2007	Planted on arable margins	
63	Bolton, Bradford	SE1634	1990	Casual	
64	Armley, Leeds	SE275341	1988	Casual	

3.2 *Ex situ* seed collections

The Millenium Seedbank, Kew, holds collections of seeds of five of the eight species included in this study (Table 9). There are multiple accessions for both *Bupleurum rotundifolium* and *Chenopodium vulvaria*, although the origin of the seed is unknown for the former. In comparison, there are only single accessions for *Centaurea calcitrapa*, *Chenopodium urbicum* and *Galium tricornutum* and none for *Carum carvi*, *Campanula rapunculus* and *Lolium temulentum*.

Table 9 *Ex situ* seed held in Kew's Millenium Seed Bank collection.

Species	Locality	Collect	Harvest	Collectors
<i>Bupleurum rotundifolium</i>	Ex garden, Peterborough, origin unknown	?	?	Unknown
	Ex garden, Sevenoaks, origin unknown	1947	?	McClintock
	Chidden, cult. Cambridge Botanic Garden	?	1978	Reynolds
	Ex garden, Tuddenham, origin unknown	?	1998	
	Cult. RBG Kew, origin unknown	?	1969	Unknown
<i>Centaurea calcitrapa</i>	Cuckmere Haven	2002	2002	Hoyle/Alton
<i>Chenopodium vulvaria</i>	Ex garden, Ware, origin Gosport	1993	1998	Hanson
	Landguard Common, Felixstowe	1982	1982	Crompton
	West Bay, near Bridport, East Cliff	1993	1993	Terry/Parsons
	Queenborough, Isle of Sheppey.	1992	1992	Linington
	Ex garden, origin Burton Bradstock	1974	1977	Southam
	Cult. at MAFF (Harpندن), origin unknown	?	?	Unknown
<i>Chenopodium urbicum</i>	Langdon Hills, Essex	2011	2011	Cole
<i>Galium tricornutum</i>	Rothamsted, cult. Cambridge Botanic Gdn	?	1977	Unknown

4. Conclusions and recommendations

- *Bupleurum rotundifolium* should be declared extinct as an aracheophyte in GB, and further work is required to establish the location and year of the last confirmed sighting. For this species future conservation efforts should be focussed on maintaining *ex situ* stock on ‘museum’ sites and maintaining adequate collections in the MSB;
- *Lolium temulentum* is possibly extinct as an archaeophyte in GB, although the Hertfordshire site, where it was last seen in 2010, should be closely monitored to establish its continued presence and confirm its identity. If still present then the field should be entered into HLS and managed under the relevant scheme option;
- *Carum carvi*, *Chenopodium urbicum*, and *Galium tricornutum* are all Critically Endangered with long-established populations surviving only on single sites. The sole site for *G. tricornutum* is well-protected but further measures are required to ensure the survival of *C. carvi* and *C. urbicum* at Marsett and Langdon Hills respectively.
- One or more ‘safe-sites’ should be established for *Carum carvi*, *Chenopodium urbicum*, *Galium tricornutum* and *Lolium temulentum* to safeguard against extinction on the sole remaining sites;
- Long-established populations of *Campanula rapunculus* are currently known from 2 sites. Both require increased protection either through SSSI designation or local reserve status. Further work is also required to establish its status on two other sites for which there are recent records;
- There are roughly 11 and 7 long-established populations of *Centaurea calcitrapa* and *Chenopodium vulvaria* respectively and there is also evidence that both species are spreading on some sites. Most of the *C. calcitrapa* populations are well known and are adequately protected whereas further work is required to assess the distribution of *C. vulvaria* in North Kent and ensure key populations are adequately protected;
- The MSB has no seed of *Campanula rapunculus*, *Carum carvi* and *Lolium temulentum* and only single accessions for *Galium tricornutum* and *Centaurea calcitrapa*. A single accession of *Chenopodium urbicum* was supplied as a result of this project. Therefore seed collections of *C. rapunculus*, *C. carvi* and *L. temulentum* are urgently needed as well as additional accessions for *G. tricornutum* and *C. calcitrapa* (Table 10);
- More work is required to assess the status of the species on some of the sites covered by this report (Table 10). Inevitably, there will be populations that have been missed during the collation of this report and so the results should be written up for *New Journal of Botany* and/or *BSBI News* to stimulate the submission of new information on the species covered.

Table 10 Suggested sites for seed collection for the Millenium Seedbank, Kew

Species	Seed collection for MSB	Establish status
<i>Bupleurum rotundifolium</i>		
<i>Campanula rapunculus</i>	Pulborough; Court Farm	Napp Town; Kelvedon
<i>Carum carvi</i>	Marsett	
<i>Centaurea calcitrapa</i>	Darland Banks; Sussex?	Salisbury Plain; Great Lines
<i>Chenopodium urbicum</i>		Sites in VC24
<i>Chenopodium vulvaria</i>		Sandwich; Isles of Grain/Sheppey

<i>Galium tricornerutum</i>	Rothamsted	Heacham
<i>Lolium temulentum</i>	Aran Islands; Burnham Green	Lea Marsh, Lincs

5. Acknowledgements

We would like to thank the botanists who provided information or answered queries on the species covered by this report most notably Ken Adams, Chris Boon, Rodney Burton, Rod Coles, Helena Crouch, Trevor James, Geoffrey Kitchener, Vince Jones, Chris Metherell, Sharon Pilkington, Martin Rand, Martin Sandford, Michael Yates and Chris Wilson. We are particularly grateful to Rod Coles for taking such an interest in this project and collecting seed of *Chenopodium urbicum* in Essex. We would also like to thank Nancy Reed for information on arable weeds grown at College Lake Wildlife Centre, and to Stephen Moss, Ian Denholm and Philip Wilson for providing information on the *Galium tricornerutum* population at Rothamsted. We also extremely grateful to Alison McDonald, Camilla Lambrick and the other members of the Oxford Rare Plants Group for coordinating the work to reintroduce *G. tricornerutum* at Wytham and to Alison Foster and Tom Price of the Oxford University Botanic Garden for agreeing to grow the material for the trial introduction planned for 2012. Finally we would like to thank Stephanie Miles and Michael Way at the MSB, Kew, for information on the seed collections they hold.

6. References

- Bleasdale, A. (1994). *The Arable Weed Flora of the Rye Crop on the Aran Islands, Co. Galway*. Unpublished report for the National Parks and Wildlife Service of the Office of Public Works.
- Boon, C.R. & Outen, A.R. (2011). *Flora of Bedfordshire*.
- Cheetham, C.A. and Sledge, W.A. (eds) (1941) *A supplement to the Yorkshire floras by the late F. Arnold Lees*. A. Brown and Sons Ltd, London.
- Cheffings, C.M., Farrell, L. (Eds), Dines, T.D., Jones, R.A., Leach, S.J., McKean, D.R., Pearman, D.A., Preston, C.D. Rumsey, F.J. & Taylor, I. (2005). The Vascular Plant Red Data List for Great Britain. *Species Status 7*: 1-116. Joint Nature Conservation Committee, Peterborough.
- Crackles, E. (1990). *Flora of the East Riding of Yorkshire*. Hull University Press, Hull.
- Crewe, M.D. (1991). Stinking Goosefoot at Landguard Point. *Transactions of the Suffolk Naturalists' Society* 27: 30.
- Culpepper, N.G. (1653). *Complete Herbal*.
- Dunn, S.T. (1905). *Alien Flora of Britain*. West, Newman & Co., London.
- Gibbons, J. (1975). *The flora of Lincolnshire*.
- Hanson, C.G. & Mason, J.L. (1985). Bird seed aliens in Britain. *Watsonia* 15: 237-252.
- James, T. (2009). *Flora of Hertfordshire*. Hertfordshire Natural History Society, Welwyn Garden City.
- Leach, S.J. (2007). The vascular plant Red Data List for Great Britain: year 1 amendments. *BSBI News* 104: 19-21.

- Leach, S.J. (2010). The vascular plant Red Data List for Great Britain: year 2 amendments. *BSBI News* 113: 43-44.
- Leach, S.J. & Walker, K.J. (2011). Vascular plant Red Data List for Great Britain: a summary of year 5 amendments, covering years 3, 4 and 5 (2008-2010) of the annual amendment process. *BSBI News* 116: 51-56.
- Marren, P. (1999). *Britain's Rare Flowers*. T. & A.D. Poyser, London.
- Pearman, D.A. (1999). *Chenopodium vulvaria* L. (Chenopodiaceae), in M.J. Wigginton (Ed.) *British Red Data Books. Volume 1. Vascular Plants*. Third edition. Joint Nature Conservation Committee, Peterborough, p.95.
- Philp, E.G. (2010). *A New Atlas of the Kent Flora*. Kent Field Club.
- Preston, C.D., Pearman, D.A. & Dines, T.D. (2002). *New Atlas of the British and Irish flora*. Oxford University Press, Oxford.
- Salisbury, E. (1961). *Weeds and aliens*. Collins, London.
- Sanford, M. & Fisk, R. (2010). *A flora of Suffolk*.
- Scott, W. (2011). *Some Aspects of the Botany of the Shetland Islands*. Privately published.
- Walker, K.J. & Leach, S.J. (2010). Critically Endangered archaeophytes in England – sorting the wheat from the chaff? *BSBI News* 115: 56-57.
- Watson, H.C. (1847). *Cybele Britannica or British Plants and their geographical relations. Volume 1*.
- Wigginton, M.J. (ed.) (1999). *British Red Data Books. Volume 1. Vascular Plants*. Third edition. Joint Nature Conservation Committee, Peterborough.
- Wilmore, G.T.D. (2000). *Alien plants of Yorkshire*. Yorkshire Naturalists' Union, Leeds.
- Wolley-Dod, A.H. (ed.) (1937) *The Flora of Sussex*. (Reprinted 1970).