Iberis amara L.

Wild Candytuft

Iberis amara has bitter-tasting oblanceolate leaves with lobe-like teeth, sparsely hairy stems and white or lilac flowers that are arranged asymmetrically, the outer two petals being much larger than the inner two. It is an early successional annual of thin calcareous soils, classically colonising the bare chalk of south-facing and steep grassland banks, or the sides of chalk pits, and more rarely cultivated arable headlands. *I. amara* has a strongly aggregated native distribution in Great Britain centered in south-central England and the Chiltern Hills. Declines throughout its range have resulted in an assessment of 'Vulnerable' in Great Britain.

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IDENTIFICATION

Iberis amara has ± hairless oblanceolate leaves, broader near the tip than the base, that are obtuse at the apex, up to 5 or 6 cm long and with two to four lobe-like teeth on each side (Poland & Clement, 2009). They are also very bitter (the Latin *amarus* translates as such) – once tasted, seldom forgotten.

Stems (up to 40 cm tall) are erect, sparsely covered with simple hairs and branched above, bearing a crowded corymbose inflorescence that elongates in fruit (Rich, 1991). The outer flowers are much larger than the inner ones, and each flower is noticeably asymmetrical, having two outer (abaxial) white (sometimes lilac) petals that are much larger than the two inner (adaxial) ones. Busch *et al.* (2014) describe in detail the genetic basis for such monosymmetry in *Iberis*.

The fruits, held on slender pedicels, are circular with a distinct notch at the apex, flattened, narrowly winged, 4-6(-7) x 4-6(-7) mm and with a straight persistent style 0.8-2 mm long (Rich, 1991).

Iberis amara flowering in rabbit scrapes at Church Hill, Therfield Heath, Hertfordshire. © Pete Stroh.

SIMILAR SPECIES

Iberis amara could be confused with two garden escapes found in Britain. The first, *I. umbellata,* differs from *I. amara* in having very contracted racemes and larger fruits (7-10 mm) with acute lobes (Rich, 1991). In addition, nibbling the leaves does not leave a bitter taste in the mouth. The second, *I. sempervirens,* is a glabrous perennial with evergreen leaves and woody stems, found as a garden escape on walls and pavements.

HABITATS

Iberis amara is an early successional annual of bare chalk which remains free of vegetation because of rabbit activity, livestock grazing, cutting, frost shattering in winter and/or cultivation. It is found on warm south or south-west facing steep grassland banks, tracks, disused chalk pits, open areas within storm-damaged woodland and cultivated arable headlands (Showler, 1994; Wilson & King, 2003). As an introduction, casual or garden escape *I. amara* occurs in a wide variety of ruderal habitats including short amenity grassland, quarries, spoil heaps and railway sidings.

Although Showler (1994) states that as a species of bare soils it does not have any true associates, as a native it is often found with other rare, scarce or threatened calcicole species in the near vicinity. For example, in unimproved chalk grassland at Therfield Heath in Hertfordshire (photo opposite) *I. amara*

occurs near to *Pulsatilla vulgaris* and *Tephroseris integrifolia* subsp. *integrifolia,* and in chalk pit habitat it may be present near to uncommon species such as *Filago pyramidata, Centaurium pulchellum, Cerastium pumilum, Gentianella anglica* and *Minuartia hybrida*. Conversely, when *I. amara* occurs as a casual it is often found in the presence of non-native species (e.g. Milne, 1998; Broughton, 2012). It is also occasionally found as a component of 'wildflower' seed mixes sown on the verges of new roads within its native range although in some cases the species in question may in fact be *I. umbellata* (James, 2009; Boon, 2011)

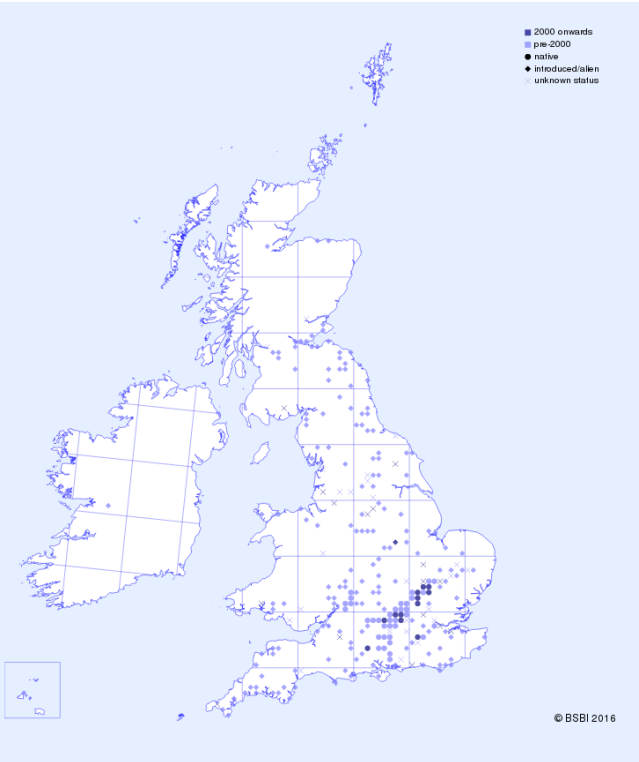
Iberis amara has been recorded as a component of several NVC types, including CG2 *Festuca ovina-Avenula pratensis* grassland, CG3 *Bromopsis erecta* grassland and open areas with affinities to W21 *Crataegus monogyna-Hedera helix* scrub (Rich, 1997).

BIOGEOGRAPHY

Iberis amara is a Suboceanic Southern-temperate species (Preston & Hill, 1997) with a distribution extending across southern and western Europe and North Africa (Showler, 1994).

It has a strongly aggregated native distribution in Britain (Quinn *et al.*, 1994) centered on the chalk of southern central England with core areas across the Chiltern Hills west to Porton Down, Wiltshire (Pilkington, 2007). It has experienced considerable decline within this range since 1970, and may now be extinct in Kent (Geoffrey Kitchener, pers. comm.) and South Hampshire (Martin Rand, pers. comm.).

Iberis amara is also a well-known garden ornamental,



Distribution of *Iberis amara* in Great Britain and Ireland.

occurring as a casual across England, Wales and Scotland (see Preston *et al.*, 2002 and the map below), although the non-native distribution could itself be obscured by misidentification with the two similar *Iberis* species mentioned above.

ECOLOGY

In cultivation *I. amara* can be a polycarpic, short-lived perennial, but in the 'wild' it is found as an annual of disturbed or eroded and well-drained bare chalk soils. The majority of seedlings germinate throughout the autumn months, overwintering as rosettes, although germination may also occur in the winter and spring months depending on climatic conditions. Stems begin to elongate from late spring, with flowering occurring from May to November depending on the time of germination (Rich, 1997).

Iberis amara is largely self-incompatible and requires cross-pollination (Bateman, 1954). It is pollinated by a wide range of insects and is the food plant for two beetles (*Ceutorhynchus atomus* and *C. contractus*) and the white butterflies *Pieris brassicae* and *P. rapae*. In order to deter ovipositing and feeding by *Pieris* adults and their larvae *I. amara* produces chemical barriers (cardenolides and cucurbitacin glycosides) that protect it from such specialists (Huang *et al.*, 1993; Sachdev-Gupta *et al.*, 1993). The production of these toxic compounds almost certainly accounts for the plants survival through to fruiting when it occupies a niche so often created by hungry rabbits. Plants usually set fruit freely, with fruits ripening about six weeks after pollination and plants dying after flowering, although dead stems persist and may be found into the winter (Showler, 1994).

Populations fluctuate from year to year depending on the abundance of open ground. The elliptic or ovate dull dark brown glabrous seeds are small (3.8-4.5 x 1.8-2.4 mm; Bojňanský & Fargašová, 2007) and many accounts in the literature (e.g. Showler, 1994; Rich, 1997; Wilson & King, 2003) assert that they are long-lived in the soil, capable of germinating following disturbance after remaining viable for many years when conditions were unsuitable. However, there are currently no experimental studies investigating seed bank longevity for *I. amara*.

In a study by Thompson *et al.* (1993), small seed size and shape was correlated with long term persistence, and a strong phylogenic effect was also noticed, with families in which the seeds are usually small and compact (e.g. Cruciferae) having generally persistent seed banks. Whilst it is entirely possible that *I. amara* does accumulate a long-lived seed bank, and there are examples of the species appearing in large numbers following large-scale disturbance e.g. woodland clearance in Surrey (Ann Sankey, pers. comm.), communications with a number of BSBI vice-county recorders suggest that populations re-establishing under disturbed conditions and persisting following a prolonged absence are rare.

THREATS

The main reasons for loss are linked to neglect, undergrazing and the spread of myxomatosis which reduced rabbit populations crucial for maintaining small-scale disturbance. Substantial areas of unimproved chalk downland have also been ploughed. Whilst the latter threat is tempered by the protection of many *I. amara* locations within protected sites, the encroachment of rank vegetation and scrub and the subsequent decline of the historically open character of such habitat continue to be a threat at many sites.

MANAGEMENT

The regular and long-term small-scale disturbance of soils and the provision of bare chalk is the key requirement for the retention of *I. amara*.

Many extant locations are grazed by a combination rabbits and livestock, although some sites, especially those on very steep, dry, friable south-facing slopes, will maintain areas of bare chalk without any intervention (Rich, 1997). If scrub is invading then clearance will be necessary, an act which itself could create disturbance and may also act as a stimulus for germination from the seed bank. Where it occurs as an arable weed, annual ploughing in the autumn or spring is recommended (Rich, 1997; Wilson & King, 2003).

REFERENCES

Bateman, A.J. 1954. Self-incompatibility systems in angiosperms. II. *Iberis amara*. *Heredity* 8: 305-322.

Bojňanský, V. & Fargašová, A. 2007. *Atlas of seed and fruits of Central and East-European Flora*. Springer, The Netherlands

Boon, C.R. 2011. *Flora of Bedfordshire*. Bedfordshire Natural History Society, Bedfordshire.

Broughton, D.A. 2012. *Rare Plant Register for Huntingdonshire*. Privately published by the author.

Burmeier, S. & Jensen, K. 2008. Is the endangered *Apium repens* (Jacq.) Lag. rare because of a narrow regeneration niche? *Plant Species Biology* 23: 111–118.

Busch, A., Horn, S. & Zachgo, S. 2014. Differential transcriptome analysis reveals insight into monosymmetric corolla development of the crucifer *Iberis amara*. *BMC Plant Biology* 14: 285-303.

Huang, X.P., Renwick, J.A.A. & Sachdev-Gupta, K. 1993. Oviposition stimulants and deterrents regulating differential acceptance of *Iberis amara* by *Pieris rapae* and *P. napi oleracaea*. *Journal of Chemical Ecology* 19:1645–1663.

James, T.J. 2009. *Flora of Hertfordshire*. Hertfordshire Natural History Society, Hertfordshire.

Milne, R. 1988. Surprising finds on Mickleham Downs. *BSBI News* 48: 28

Pilkington, S.L. 2007. *Wiltshire Rare Plant Register: the rare and threatened vascular plants of North and South Wiltshire*. Privately published by the author.

Poland, J. & Clement, E. 2009. *The Vegetative Key to the British Flora*. Botanical Society of the British Isles (BSBI), London.

Preston, C.D. & Hill, M.O. 1997. The geographical relationships of British and Irish vascular plants. *Botanical Journal of the Linnean Society* 124: 1-120.

Quinn, R.M., Lawton, J.H., Eversham, B.C. & Wood, S.N. 1994. The biogeography of scarce vascular plants in Britain with respect to habitat preference, dispersal ability and reproductive biology. *Biological Conservation* 70: 149-157

Rich, T.C.G. 1991. *Crucifers of Great Britain and Ireland. BSBI Handbook No. 6*. Botanical Society of the British Isles, London.

Rich, T.C.G. 1997. *The management of semi-natural lowland grassland for selected rare and scarce vascular plants: a review*. English Nature Research Reports no. 216.

Sachdev-Gupta, K., Radke, C.D. & Renwick, J.A.A. 1993. Antifeedant activity of cucurbitacins from *Iberis amara* against larvae of *Pieris rapae*. *Phytochemistry* 33:1385–1388.

Showler, A.J. 1994. *Iberis amara* L. Wild Candytuft. In Stewart A., Pearman, D.A. & Preston, C.D. (eds.) *Scarce Plants in Britain*. p.218. Joint Nature Conservation Committee (JNCC), Peterborough.

Stroh, P.A. 2015. *Teesdalia nudicaulis* L.. Shepherd's Cress. Species Account. Botanical Society of Britain and Ireland.

Thompson, K., Band, S.R. & Hodgson, J.G. 1993. Seed size and shape predict persistence in the soil. *Functional Ecology* 7: 236-241.

Wilson, P. & King, M. 2003. *Arable Plants – a field guide*. WILDguides Ltd., Hampshire.

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