

Euphrasia pseudokernerii

Pugsley

Chalk Eyebright

A large-flowered eyebright with sharp, minute bristles on the lower floral leaves. It is found in short, herb-rich calcareous grassland and, more rarely, fens, flowering from late July to early September. The bulk of populations in Great Britain are on chalk and limestone in southern and eastern England. It reaches its northern limit in South-west Yorkshire, and its southern limit in south Devon. It is a rare species in Wales, and is confined to the Burren in Ireland. Hybridisation with *E. nemorosa* (Common Eyebright) is widespread, making identification difficult. The species is assessed as Endangered in GB.



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IDENTIFICATION

Euphrasia pseudokernerii is a late flowering eyebright with ±erect and delicate stems (- 30 cm) that are usually much-branched (3-8(10); Stace 2010). The branches are often branched again, giving the plant a bushy appearance. The white (sometimes pale lilac) stalkless flowers sit in the axils of the uppermost leaves, with the lowest flower usually found between nodes 10 and 16, although temperature can influence this character (Yeo 1964).

The corolla (6-) 7-9 (-11) mm is large for an eyebright, and comprises 4 petals that are fused into 2 lips, with the lower lip deflexed (Yeo 1978; Stace 2010). Stem leaves are dark (-pale) green, stalkless, narrow and (usually) glossy with serrated margins and 5(-7) pairs of acute to acuminate teeth (Yeo 1978). Lower floral leaves also have serrated margins, and the

basal pair of leaves have fine bristles at the tips of the teeth (Yeo 1978). The many-seeded fruit capsules are at least twice as long as broad and are much shorter than the calyx (Fitzgerald et al. 2009).

SIMILAR SPECIES

Euphrasia is a critical group and identification often requires careful examination of several specimens in the locality.

E. nemorosa occurs in similar chalk downland habitat, but tends to grow on deeper soils than *E. pseudokernerii* (i.e. further down the slope). It is a more robust looking plant (up to 40 cm) with noticeably smaller (5-7.5(8.5) mm) corollas, capsules that are only slightly shorter than the corolla tube, and a basal pair of floral leaves with acute-acuminate (not bristle-tipped) teeth (Silverside 1994; Poland & Clement 2009; Stace 2010).

The hybrid between *E. pseudokernerii* and *E. nemorosa* is widespread, with hybrid swarms likely where the two species meet (Silverside 1994). Hybrids between *E. pseudokernerii* and *E. confusa* are recorded from a few locations in south Devon and Wiltshire.

In Norfolk, *E. pseudokernerii* forma *elongata* occurs in calcareous fens (Swann 1973), and is described by Pugsley (1930) as 'of lax habit, with stems up to 40 cm high and internodes, except the upper floral, far longer than the leaves'.

HABITATS

E. pseudokernerii is found on chalk and soft limestones (Silverside 1994), with habitats including herb-rich downland and limestone pastures, road verges, cliff tops and more rarely



Magpie Bottom, near Otford, Kent, where *Euphrasia pseudokernerii* grows with *Polygala amarella*. ©Fred Rumsey

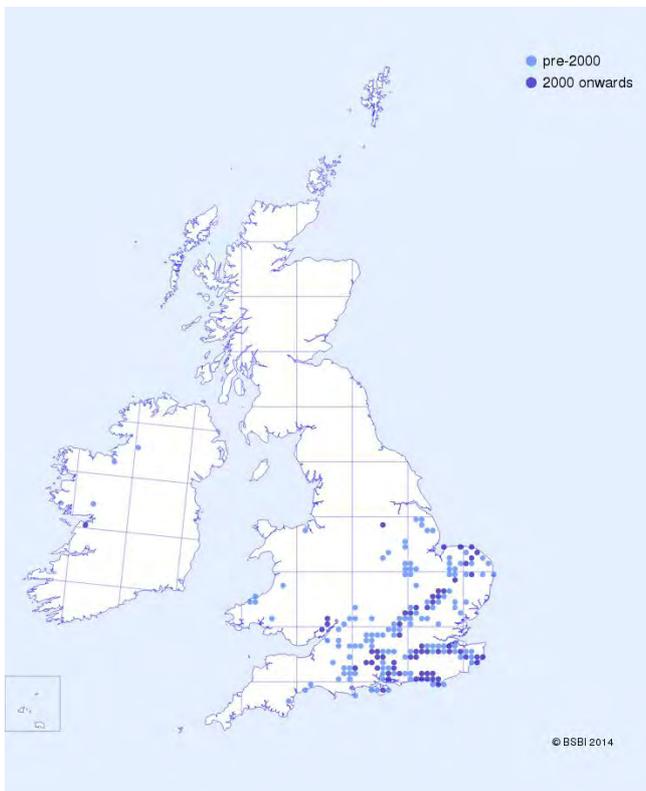
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on calcareous spoil (Chater 2010). It is associated with species-rich NVC CG2a *Festuca ovina-Avenula pratensis* grassland, *Cirsium acuale-Asperula cynanchica* sub-community, and well-grazed CG3a *Bromopsis erecta* grassland. It is also known from calcareous flushes and valley fens, where in Norfolk the tall and slender *E. pseudokernerii* forma *elongata* may replace the type (Silverside 1994). Taxa associated with forma *elongata* are very different from those on chalk and include *Anagallis tenella*, *Angelica sylvestris*, *Epipactis palustris*, *Juncus subnodulosus*, *Pedicularis palustris* and *Succisa pratensis* (Swann 1974).

BIOGEOGRAPHY

E. pseudokernerii is considered to be 'near endemic' in Great Britain (Cheffings & Farrell 2005), where it is largely restricted to chalk and oolitic regions of southern and eastern England with outlying populations in south and west Wales, reaching the northern limit of its distribution in South-west Yorkshire and its southern range limit in south Devon. The core areas of its distribution are the herb-rich chalk downs of east and west Kent and Sussex where it is currently known from c.20 hectads, and unimproved grasslands across Cambridgeshire, Bedfordshire, Dorset, Hertfordshire, Berkshire, Surrey, south Hampshire and Buckinghamshire.

Outside Britain, it is now perhaps only present in western Ireland at the Burren, County Clare, although Yeo (1978) does mention that populations showing the characters of *E. pseudokernerii* occur on chalk near Rouen, northern France.



Distribution of *Euphrasia pseudokernerii* in Great Britain and Ireland.

ECOLOGY

E. pseudokernerii is a self-pollinating, hemi-parasitic annual herb, flowering from late July or early August into September, although plants growing on hosts may flower and fruit earlier in the season if temperatures are sufficiently high (Yeo 1964).

Demographic studies undertaken by Kelly (1989a) found that *E. pseudokernerii* had virtually no seed bank, and instead depended on germination of seed in the first spring after seed fall. *E. pseudokernerii* seeds require exposure to a period of cold weather to break dormancy, with germination recorded by Yeo (1961) as early as January in controlled conditions, and March in field conditions. Suitable conditions for germination also include a very exacting sward height of between 1-3 cm and relatively stable soil-moisture conditions, with a 50% decrease in soil-moisture shown to substantially and negatively affect plant survival (Kelly 1989b).

In *ex-situ* conditions *E. pseudokernerii* has been found to grow on a number of associates that are typical of chalk grassland habitats, including *Anthyllis vulneraria*, *Carex caryophyllea*, *Bromopsis erecta*, *Festuca ovina*, *Medicago lupulina*, *Pilosella officinalis*, *Plantago coronopus* and *Trifolium repens*, with *E. pseudokernerii* plants seeming to have more vigour if attached to a dicotyledon host (Yeo 1964).

Leguminous hosts in particular appear to have an effect on appearance and vigour, with leaves often having a dark green, glossy appearance (Yeo 1964).

Little is known about *E. pseudokernerii* and its host plants in the wild, but as Swann (1974) noted, this is partly because a *Euphrasia* plant becomes detached from its host quite quickly due to the short-lived nature of the haustoria (the parasitic fungus that draws nutrients from the host). On the sole documented case when a plant (forma *elongata*) had been pulled up with its host still attached, the host plant was found to be *Drosera intermedia*. As Swann noted with some understatement, 'it must be unusual for a semi-parasite to parasitise an insectivorous plant'. *E. pseudokernerii* is capable of flowering without a host, although such plants are slow-growing and relatively small (Yeo 1964).

THREATS

E. pseudokernerii is threatened by continued habitat loss or degradation via agricultural improvement, herbicide drift and/or the cessation of a traditional grazing regime. Hybridisation with *E. nemorosa* may also pose localised threats in some areas, although the relatively clear altitudinal delineation between the two species at many chalk downland locations suggests the impact to existing *E. pseudokernerii* populations would be low.

MANAGEMENT

Germination and establishment requires short turf, and consequently management should follow the traditional extensive grazing systems widely used for the conservation of herb-rich chalk grasslands.

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