# *Gentianella campestris* (L) Börner

## Field Gentian

*Gentianella campestris* has bluish-purple flowers and very unequal calyx lobes, with the much larger outer lobes partially enclosing the inner two. It is a species of infertile slightly acid to neutral soils, and is most often found in heavily grazed, species-rich pastures, maritime heath, dune slacks and machair. It is widespread but localised throughout Scotland, north Wales, north and west Ireland and northern England, but is very rare in England south of the Pennines. Substantial losses over the last 50 years have led to an assessment of Vulnerable in Great Britain and Endangered in England and Wales.

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### IDENTIFICATION

*Gentianella campestris* has flowering stems to 30 cm, with 5-15 bluish-purple flowers. The corolla is 15-30 mm long and divided into four (never five) oblong-ovate lobes that are fringed at the throat. British plants are all referable to subsp. *campestris*. Annual forms have been described as subsp. *baltica*, but analyses of herbarium material suggest that this taxon does not occur in the British Isles (Cleal & Rich 2004).

### SIMILAR SPECIES

*G. campestris* is distinguished from other British and Irish gentians by the very unequal calyx lobes, the outer being several times wider than the inner and enclosing them, and from *G. amarella* (and subspecies) by the paler lilac (bluish-purple) rather than dull purple flowers.

The vegetative rosettes of *Gentianella* (and *Gentiana pneumonanthe*) have stomata on the lower surface of the leaf (and scabrid margins); all other *Gentiana* have stomata on both surfaces (Poland & Clements 2009).

Dune slacks at Balnahard, Colonsay, where *Gentianella campestris* occurs with *G. amarella* and *G. uliginosa*. ©Pete Stroh

### HABITATS

*G. campestris* occurs in a variety of open, grazed semi-natural habitats including pastures, hill grassland, grassy heaths, sand dunes, machair and road verges (Porley 2002). It is usually found on infertile slightly acidic to neutral soils. When present on calcareous substrates (e.g. limestone) it is usually indicative of surface leaching or the presence of non-calcareous superficial deposits.

In Britain it occurs in a wide range of NVC communities but is most frequent in open, grazed, species-rich pastures dominated by *Agrostis capillaris* and *Festuca ovina* in the lowlands (CG1, CG2) and uplands (U4, CG10), H7 *Calluna vulgaris-Scilla verna* maritime heath in southwest England and Wales, H10 *Calluna vulgaris-Erica cinerea* heathland and SD8 *Festuca rubra-Galium verum* fixed dune grassland in Scotland.

### BIOGEOGRAPHY

*G. campestris* is endemic to Europe where it has a Continental Boreo-temperate distribution. It is widely distributed across northern Europe (including Iceland), extending southwards to the Alps, Pyrenees, Picos de Europa and Apennines (Smith & Lockwood 2011).

In the British Isles it is widespread but localised throughout Scotland, northern England, north Wales and in north and west Ireland, but it is very rare in England south of the Lake

District and the adjacent Pennines. It is generally a lowland species, but ascends to 915 m in Perthshire.

*G. campestris* has suffered a severe historical decline across its whole range, with some lowland regions having lost the majority of populations in the last 50 years (e.g. Lennartsson & Svensson 1996; Walker 2007).

## ECOLOGY

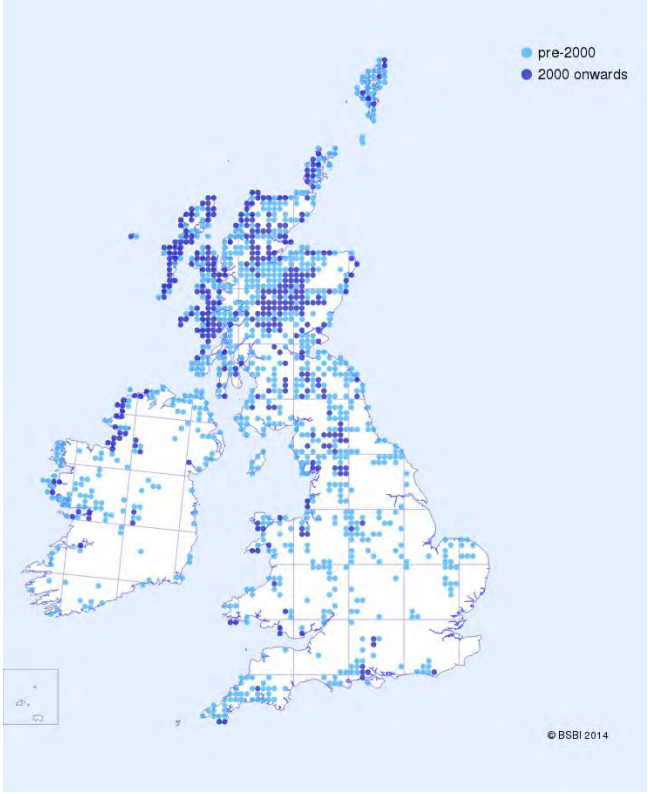
*G. campestris* is a biennial hemicryptophyte that germinates in the spring following a period of cold stratification (Milberg 1994), forms a rosette during the first summer and overwinters as a tap root and a bud (Lennartsson 1997). The 5-15 hermaphrodite flowers are typically bluish-purple, rarely white, pseudo-cleistogamous and markedly protandrous, leading to between 85-95% seed-set in the absence of pollinators (Lennartsson 2002). However, in some populations a proportion of plants have herkogamous flowers i.e. the anthers and the stigma are spatially separated within the flower, which reduces seed set to between 45-60% in the absence of pollinators (Lennartsson 2002).

Flowering takes place in July and August, with a peak in early August (Lennartsson 1997), but can be variable especially in dry summers when populations tend to be small (Brewis *et al.* 1996; Lennartsson & Oostermeijer 2001; Crawley 2005). Bumblebees (*Bombus* sp.) are the only reported pollinators but the species is highly self-fertile and normally achieves full seed-set without insect pollination (Lennartsson *et al.* 2000).

In Scandinavia, a decrease in populations and increasing fragmentation may have led to a reduction in gene flow between populations and a decrease in cross-pollination within populations (Lennartsson & Oostermeijer 2001).

Plants are monocarpic and regeneration is exclusively by seed. Each fruit contains between 40-120 ovules. The seeds are small (diameter = 0.7 mm; weight = 0.2 mg) and have no specialized structures to aid dispersal. There appears to be no persistent seed bank with few seeds remaining viable for more than two years.

Bitter glycoside substances present in the leaves give some protection from herbivory, although continuous grazing (or damage caused by trampling or mowing) can cause damage to plants, reducing seed production. However, *G. campestris* has been shown to have high capacity for compensatory seed production after damage (Lennartsson & Oostermeijer 2001), and it may even over-compensate for damage caused by mowing (Lennartsson *et al.* 1997) or grazing (Zopfi 1991).




Distribution of *Gentianella campestris* in Great Britain and Ireland.

## THREATS

Today populations of *G. campestris* are still being lost through overgrazing in the uplands and the neglect of pastures in the lowlands, mainly due to a relaxation of grazing and resulting invasion by shrubs and coarse grasses (Lennartsson & Svensson 1996). Cessation of grazing, especially on more fertile mesic sites, can quickly lead to localized extinction. The combination of a transient seed bank and the gradual accumulation of litter and vegetation both reduces the survival of seedlings and juvenile plants and also the number of potential microsites needed for germination.

The extent to which grassland and heathland populations have declined as a result of atmospheric pollution is not known but may account for at least some of these losses, given the declines of similar acid-sensitive species in response to increased nitrogen deposition and lowering of soil pH (e.g. Van Den Berg *et al.* 2005; Dupré *et al.* 2010).

Summer droughts are known to have adversely affected some populations and so it may be susceptible to climate change on drier sites (Lennartsson & Oostermeijer 2001). Lennartsson (2002) has also shown that fragmented populations have both reduced viability and a high probability of localized extinction, suggesting that many surviving populations may have much lower reproductive performance than in the past.

## MANAGEMENT

Numerous studies have shown the importance of grazing for the viability of *G. campestris* populations in a range of species-rich grassland and dune habitats (e.g. Lennartsson *et al.* 2000; Lennartsson 2000, 2002; Lennartsson & Oostermeijer 2001; Virtanen et al. 2002; Smith & Lockwood 2011). In Sweden, optimal management has been shown to involve summer mowing followed by autumn grazing. This favours the establishment of seedlings by creating gaps and removing litter (Lennartsson & Oostermeijer 2001).

Although mowing damages plants before flowering, it nevertheless favours seed production due to a high capacity for compensatory growth (Lennartsson & Oostermeijer 2001) and this has allowed it to persist on heavily mown sites such as roadsides in areas where it has completely disappeared from more intensively managed pastures (Huhta & Rautio 2007).

In many British grasslands where *G. campestris* survives, it is possible that rabbits play a similar role to mowing by keeping the vegetation short whereas sheep grazing prevents litter building-up during the winter months, and both grazers probably also provide sufficient disturbance to encourage seedling establishment (Smith & Lockwood 2011).

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