

Viola rupestris F.W. Schmidt

Teesdale Violet

Viola rupestris is a diminutive long-lived perennial with pale-blue to violet (sometimes pure white) flowers and a basal rosette of rounded, shovel-shaped leaves. A very fine covering of short hairs is usually visible on the peduncles, petioles, basal lobes, leaves and fruit capsules. It is associated with species-rich *Sesleria albicans* grassland on shallow, nutrient-poor Carboniferous limestone. In Britain, *V. rupestris* is recorded from four main locations across County Durham, mid-west Yorkshire, and Westmorland. The hybrid with *V. riviniana* occurs at three of these locations. It is nationally rare but is assessed as of Least Concern in Britain.



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IDENTIFICATION

Viola rupestris is a diminutive (usually less than 5 cm tall) perennial with pale blue to violet (rarely pure white) flowers 10–15 mm across, acute sepals, and distinctive 'shovel-shaped' leaves with a slightly cordate base. Although variable, British plants usually have an indumentum of very short hairs that extend up the peduncles, the petioles and on to the margins of the basal lobes, but leaving most of the upper lamina essentially glabrous (although note that completely glabrous plants occur in most British populations). Capsules also have a fine covering of short hairs, a character which differentiates *V. rupestris* from all other dog violets in Britain.

SIMILAR SPECIES

Viola rupestris is sometimes difficult to distinguish from *V. riviniana*, especially small-flowered, glabrous forms, but

there are reliable differences between the two species (see Roberts, 1998 and Jonsell *et al.*, 2000 for further details). The leaves of *V. rupestris* are 'shovel-' or 'scoop'-shaped (i.e. the sides of mature leaves are often curled upwards), with a clearly blunt apex, and a less strongly cordate base than in *V. riviniana*. The crenations at the leaf-edges are flat (i.e. within the plane of the leaf), but in *V. riviniana* they are slightly 'crimped', and thus more obvious.

Viola rupestris flowers are a paler blue than in *V. riviniana*, ranging from white to 'delicate pinkish-mauve' (although all become paler with age). Ripe capsules are blunt and not tapered as in *V. riviniana*. The hybrid with *V. riviniana* (*V. x burnattii*) occurs with *V. rupestris* on three sites and is intermediate in most characters (Jonsell *et al.*, 2000). Possibly the best way to differentiate these hybrids is to search for more convincing material of either parent in the vicinity.

HABITATS

Viola rupestris grows in shallow, unimproved turf associated with two NVC sub-communities of CG9 *Sesleria albicans*-*Galium sternerii* grassland: the *Helianthemum canum*-*Asperula cynanchica* sub-community (CG9a) and the *Carex capillaris*-*Kobresia simpliciuscula* sub-community (CG9d).

Populations occur on exposures of Carboniferous limestone, usually in the most open habitats available such as limestone 'clitter', finescreens below low escarpments, drift deposits, and eroding sugar limestone. In the latter habitat, *V. rupestris* appears to be an early colonist with *Festuca ovina* and *Minuartia verna* (Jonsell *et al.*, 2000). The species can persist in more closed *Sesleria* swards, although flowering and fruiting is less vigorous, and only occurs where some disturbance by mammals maintains areas of open soil



Crummack Dale, Mid-west Yorkshire, one of the few sites in Britain for *Viola rupestris*. ©Jeremy Roberts.

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(Bradshaw & Doody, 1978a).

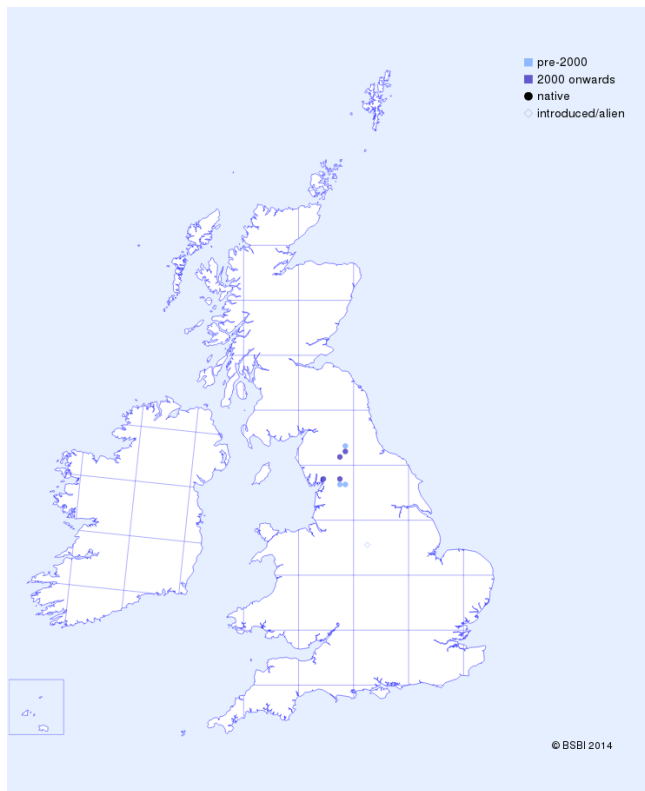
BIOGEOGRAPHY

Viola rupestris is an Eurasiatic species with a wide-temperate distribution, extending from Sakhalin in the Russian Far East to southern, central and northern Europe (Nordal *et al.*, 2005). It is scarce in western Europe and is confined to montane areas in the southern parts of its range.

In Britain, *V. rupestris* has a relict distribution in northern England (Valentine & Harvey, 1961), occurring in four main areas: Widdybank Fell in Teesdale, Long Fell in Cumbria, Arnside Knott in Westmorland, and the southeastern slopes of Ingleborough in mid-west Yorkshire (Roberts, 1977; Taylor, 1999). Its altitudinal range is from 140 m on Arnside Knott to 610 m on Long Fell.

Viola rupestris was first discovered on Widdybank Fell in 1862 by James Backhouse Jnr (Backhouse, 1884). Here, almost the entire population is restricted to the sugar limestone outcrops to the southeast of Red Sike. Plants become more scarce further away from the Whin Sill, and are absent from the Robinson limestone (Bradshaw, 1985). Populations recorded in Widdybank Fell and on Ingleborough have been estimated to each support thousands of individuals (Roberts, 1977; Jonsell *et al.*, 2000).

Two subspecies have been recognized in Europe from isozymes and morphology; subsp. *relicta* is confined to Scandinavia, whereas subsp. *rupestris* occurs throughout the rest of Europe. It is interesting to note that southern French



Distribution of *Viola rupestris* in Great Britain and Ireland.

and English populations are close to subsp. *relicta*, suggesting a western migration route to Scandinavia, but further work is required to confirm which subspecies occurs in the British Isles (Nordal *et al.*, 2005).

ECOLOGY

Viola rupestris is a long-lived, rhizomatous perennial flowering in May and reproducing both vegetatively and by seed. Plants do not flower until they are four years old, but can then do so (but not continuously) or spread vegetatively for many years via lateral, often underground branches (Bradshaw & Doody, 1978b). These branches are non-rooting and do not become independent, but they can have the appearance of discrete plants, thereby making the monitoring of individuals difficult.

Viola rupestris produces flowers that are both outcrossing (chasmogamous) and inbreeding (cleistogamous). Chasmogamous flowers are borne on longer peduncles than self-pollinating plants and tend to be most frequent in the more open habitats (Bradshaw, 1985). They are also larger, scentless, but rarely produce fruits. However, the incidence of flowering and fruiting is generally very low in most or all British populations (<3%; Taylor, 1999), with the majority being cleistogamous.

Fruits which are produced and survive to maturity set abundant seed late in the year. The relatively heavy seeds (1.2 mg) are released explosively from the capsule but then only disperse short distances, mainly via ants attracted by the small elaiosomes. Seeds require chilling for germination and therefore germinate in the spring (Bradshaw & Doody, 1978b).

Seedlings have large cotyledons, and so once established the risk of mortality is no greater than for adult plants (Bradshaw & Doody, 1978a). *V. rupestris* is well adapted to heavy grazing pressure, producing axillary flowering branches as well as basal branches just below the soil surface with a terminal rosette of a few leaves. The production of flowers, fruits and seeds is inversely proportional to the density of the vegetation, and in more closed conditions it is much sparser and shorter-lived (Bradshaw & Doody 1978a).

THREATS

There appear to be few threats to *V. rupestris*, even where the grasslands are hard grazed by sheep, although at Arnside, *V. rupestris* has declined due to increased growth of *Sesleria caerulea* in the absence of sufficient grazing.

Genetic swamping and introgression with other violets has been noted in Scandinavian populations where *V. rupestris* is rare (Nordal & Jonsell, 1998). Observations on Long Fell suggest that unhybridised *V. rupestris* is rare there and hybrids also occur on Widdybank Fell, in a slightly different habitat to *V. rupestris* (Bradshaw, 1985), but are rare on Ingleborough. It is thought that 10% of the Teesdale population was lost during the construction of Cow Green Reservoir (Bradshaw, 1985).

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MANAGEMENT

Livestock grazing that produces a short sward by the end of the growing season will create suitable open conditions for *V. rupestris*. Grazing pressure should be reduced in some years during the spring and early summer months to allow plants to flower and set seed.

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