

Polygala amarella Crantz

Dwarf Milkwort

Polygala amarella is a small, short-lived perennial with a distinct basal rosette of spoon-shaped leaves, smaller and more acute stem leaves, and flowers of various colours (greyish-white, pale mauve, sky-blue, purplish, pink). It is an extreme calcicole confined to open, infertile soils supporting dry to damp calcareous grassland, including tussocks amongst calcareous mires. The species has a very disjunct distribution, found only on the North Downs in Kent, the Craven district in Yorkshire, Orton in Cumbria, and Upper Teesdale. It is assessed as Endangered in England, with declines of greater than 50% detected since 1930.



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IDENTIFICATION

Polygala amarella is a small, ascending to erect milkwort with a distinct basal rosette of obtuse, spoon-shaped leaves. The stem leaves are usually much smaller and more acute. Plants in the north of England have sky-blue, purplish-blue or pink flowers whereas those in Kent are all pale mauve to greyish-white. The veins on the inner sepals rarely reconnect (anastomose), unlike in *P. vulgaris* and *P. serpyllifolia*, and never along the petal margin. Unlike all other British *Polygala* species the leaves have a distinct bitter after-taste. Two geographical races occur in Britain and are probably best treated as subspecies: subsp. *amarella* in northern England and subsp. *austriaca* in Kent (Rumsey 2009).



Great Close Mire near Malham Tarn, Mid-west Yorkshire, one of a small number of locations for *Polygala amarella*. ©Kevin Walker.

SIMILAR SPECIES

Most specimens of *P. amarella* are easily told from *P. vulgaris* and *P. serpyllifolia* by the non-anastomosing veins on the petals and the basal rosette with leaves much larger than those above. In Kent plants can be confused with *P. calcarea* which has anastomosing veins on the petals, larger flowers (>5mm) and sub-aerial rosettes on a short stalk.

HABITATS

P. amarella is an extreme calcicole confined to very open turf overlying calcareous substrates, often on slopes, or vegetation raised above mire surfaces, where the drainage is good. In northern England its main habitats are tussocks in calcareous mires, and short, open turf or mossy cushions on flushed slopes or adjacent to outcrops of unaltered or metamorphosed ('sugar') limestone.

In mires it occurs almost exclusively in NVC M10b *Briza media-Primula farinosa* sub-community of *Carex dioica-Pinguicula vulgaris* mire vegetation (Rodwell 1991) whereas in more closed turf it is associated with sub-communities of CG9 *Sesleria albicans-Galium sternerii* grassland (mainly CG9d; Rodwell 1992). In Yorkshire and on Widdybank Fell it persists amongst semi-closed *Sesleria* grassland and amongst *Calluna vulgaris* and *Empetrum nigrum* (Bradshaw, 1985; K.J. Walker pers. obs.). In Kent it grows in chalk grassland with varied NVC affinities (CG2, CG5, CG7; Rodwell 1992) but always where the vegetation it is kept open by grazing and/or drought.

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BIOGEOGRAPHY

P. amarella is a Boreo-temperate species with a wide distribution in Europe, encompassing disjunct populations in the Pyrenees, northern France, the Alps, central and eastern Europe and Scandinavia.

The species has a very disjunct distribution in England, growing in four main areas: the North Downs in Kent (and formerly Surrey), the Craven district of Yorkshire, Orton in Cumbria, and Upper Teesdale. The Kent populations are all lowland but in northern England it occurs from between c.200 m in Upper Wharfedale to 530 m on Cronkley Fell.

ECOLOGY

P. amarella is a small, often prostrate, herbaceous short-lived polycarpic perennial. Studies in Teesdale established that most plants start flowering in their second and third years, have a half-life of two years and a mean age of six to seven years (Bradshaw & Doody 1978a, b). Some plants have been observed to flower for four consecutive years but this is probably rare.

Each plant usually produces several flowering branches, with the number of flowers produced being indeterminate and usually curtailed only by drought, poor growing conditions or low temperatures (Margaret Bradshaw pers. comm.). The flowers are hermaphrodite and are thought to be mainly self-fertilising, although no systematic studies have been undertaken to test if this is the case. Flowering usually begins in May and can continue until mid-July, although populations

at lower altitudes (e.g. Orton, Wharfedale) can flower up to a month earlier than those above 500 m in Teesdale (Jeremy Roberts pers. comm.).

Reproduction is solely by seed which germinates freely in the season following flowering. The small seeds have a small oily appendage (elaiosome) which presumably aids dispersal by ants. Livestock probably transport seed over greater distances, leading to sporadic colonisations in areas distant from the main colonies (Bradshaw 1985). The annual production of seed is relatively low and it has a transient soil seed bank with seeds persisting in the soil for less than a year (Thompson *et al.* 1997). The cotyledons are large and persistent, often surviving the winter months, and mortality in the first year is no greater than in older plants (c.30%).

THREATS

In Teesdale the populations were greatly reduced in the 1990s and early 2000s due to high levels of grazing by rabbits (Margaret Bradshaw pers. comm.). Rabbit numbers have since been reduced but any recovery of the populations is now being hampered by the loss of open habitats due to lack of spring-grazing. This, combined with a decline in rabbit numbers, has resulted in increased competition from coarse grasses, in particular *Sesleria caerulea*, and there seems little prospect for recovery unless sheep grazing levels are restored.

In Craven *P. amarella* has been lost from at least two sites since the 1980s due to over-grazing. It declined at another site due to under-grazing when a small flush bordering a stream was fenced and planted with conifers, although grazing was recently restored resulting in an increase in plant numbers.

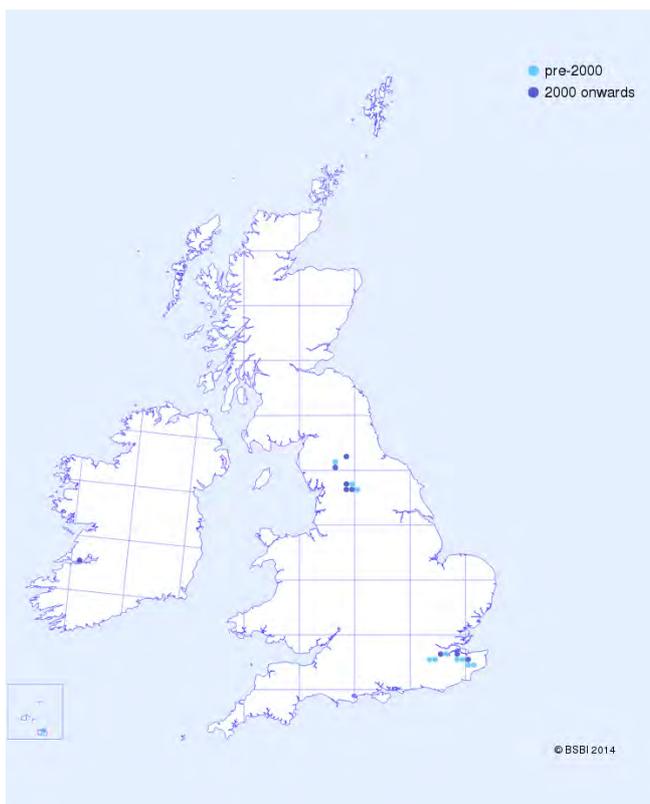
In Kent *P. amarella* has declined to a much greater degree due to urbanisation and under-grazing and now only survives in two locations (Rumsey 2009). As a result of these losses Rumsey (2009) has assessed subspecies *austriaca* (Kent) as Critically Endangered and subspecies *amarella* (northern England) as Endangered.

MANAGEMENT

Population survival is almost entirely dependent on good seed production and successful germination and survival of seedlings to reproductive state (Margaret Bradshaw pers. comm.). In short-turf and mires it benefits from small-scale disturbance caused by grazing animals which reduce the abundance of taller species and create bare microsites for germination and seedling development.

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Distribution of *Polygala amarella* in Great Britain and Ireland.

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AUTHOR VERSION

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SUGGESTED CITATION

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