

## *Orchis militaris* L.

### Military Orchid

*Orchis militaris* is one of four ‘anthropomorphic’ orchids found in England, with the flower structure said to resemble a soldier complete with helmet (converging sepals), arms (labellum lobes) and tunic resplendent with buttons (purple papillae on the labellum). It is a plant of unimproved grassland, scrub edge and woodland glades on free-draining calcareous soils and is restricted to a single site in Suffolk and two locations in Buckinghamshire, although it was formerly much more widely scattered across the Chilterns. The species has been assessed as Vulnerable in Great Britain and England due to the small number of extant locations and restricted population size.



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#### IDENTIFICATION

*Orchis militaris* is the type species of the type genus of the orchid family. It has 3–6 oblong-lanceolate unspotted basal leaves 8–18 cm long and 2–5 cm wide that are shiny yellow green on the upper side, paler beneath and with an obtuse to acute tip. Smaller sheathing leaves (1–4) also surround the lower part of the stem.

The inflorescence, borne on a stem 20–60 cm tall and often violet-tinged, is at first a fairly dense ovoid or cylindrical spike



A private reserve in Buckinghamshire, one of just three extant native locations for *Orchis militaris* in the British Isles. ©Pete Stroh.

up to 14 cm long, becoming more lax as flowering progresses and containing large, faintly scented pinkish-reddish purple flowers (Foley & Clarke, 2005; Stace, 2010). Each flower has five pointed sepals (outer perianth segments, each 10–15 mm) that are a distinctive light ash-grey or pale rose-pink on the outside, whitish with purple lines on the inside. The sepals converge to resemble a helmet. Sometimes called the ‘Soldier’ orchid, its anthropomorphic attributes are completed by a trilobed labellum which has short (up to 8 mm) lateral lobes (‘arms’), a longer bilobed middle lobe (legs) with a short tooth between the lobes, and purple papillae that are said to look like the buttons on a soldier’s tunic, although others see more of a resemblance with baggy pink pyjamas (Brooke & Bone, 1950).

#### SIMILAR SPECIES

*Orchis militaris* is closely related and can readily hybridise with *O. simia* and *O. purpurea* (e.g. Fay *et al.*, 2007). A herbarium sheet bearing a specimen collected from Hartslock Wood near Goring, Oxfordshire in 1831 is thought to be that of the hybrid between *O. militaris* and *O. simia* (*O. × beyrichii*; Bateman *et al.*, 2008). However, *O. militaris* no longer occurs close to its relatives in the Chilterns, thus limiting the chances of hybridisation. For differences between the three species and their hybrids, see Stace (2010), pp. 877–878 and Stace *et al.* (2015), p. 356.

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## HABITATS

In England this is a plant of freely draining calcareous soils with a pH of more than 7.5 (Farrell, 1985). The three native English populations occur in open unimproved chalk grassland, the margins of scrubland and within woodland glades. Frequent associates at the more open grassland communities include *Brachypodium pinnatum* s.l., *Briza media*, *Bromopsis erecta*, *Carex flacca*, *Festuca ovina*, *Lotus corniculatus* and *Poterium sanguisorba*, with Rodwell in Farrell (1985) assigning the community to the NVC type CG2 *Festuca ovina*-*Avenula pratensis* grassland.

Where tree cover and scrub are more prevalent associates include *Brachypodium sylvaticum*, *Fragaria vesca*, *Mercurialis perennis*, *Rubus fruticosus* agg., *Viola riviniana* and the pleurocarpous moss *Rhytidiadelphus triquetrus*. Vegetation at these localities has been equated with the *Geranium robertianum* subcommunity of *Fraxinus excelsior*-*Acer campestre*-*Mercurialis perennis* woodland (NVC W8c). However, the chalk pit habitat in Suffolk supports noticeably different associates to those of Buckinghamshire, and includes *Daphne mezereum*, *Inula conyzae*, *Ligustrum vulgare*, *Mycelis muralis*, *Poa pratensis*, *Torilis japonica* and a bryophyte ground cover with abundant *Pseudoscleropodium purum* (Farrell, 1985). *O. militaris* occurs across a wider edaphic range outside of England; see Farrell (1985) for details.

## BIOGEOGRAPHY

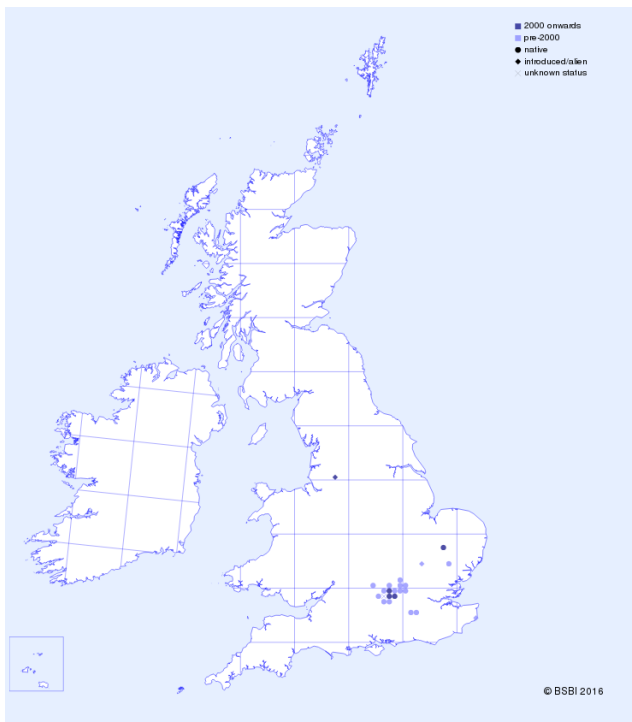
*O. militaris* has a Eurosiberian Temperate floristic element (Continental in Europe; Preston & Hill, 1997), extending from south-eastern Sweden and Russia in the north through central Europe to northern Spain, central Italy, the Balkans and Turkey to the south, and eastwards to Mongolia and Siberia (Kretschmar *et al.*, 2007). It benefits from mild winters and warm springs and summers (Sumpter *et al.*, 2004) but is not tolerant of hot, dry summers and consequently is absent from lowland regions of the Mediterranean. Its altitudinal distribution ranges from sea level in Gotland to ca. 2000 m in the French Alps.

In Britain and Ireland *O. militaris* is on the edge of its global north-western range limit. It was thought to be extinct by the turn of the twentieth century until it was famously refound in 1947 at Homefield Wood in Buckinghamshire (Lousley, 1950). Historically *O. militaris* was present at sites within Berkshire, Hertfordshire, Middlesex, Oxfordshire and Surrey, but it is now restricted to three native locations in England; one at the Rex Graham Reserve in Suffolk, where recent population counts (inclusive of flowering and vegetative rosettes) have been as high as ca. 1,500 but in recent years number ca. 300 (Neal Armour-Chelou, pers. comm.; see also Waite & Farrell, 1998, for a detailed demographic study of this population), and two in the Chilterns in Buckinghamshire, where a combined total of ca. 450 flowering plants have been recently recorded at Homefield Wood (see also Hutchings *et al.* 1998) and a private reserve nearby (Phillip Pratt, pers. comm.). An introduction to a fourth location in the Oxfordshire Chilterns at Warburg Nature Reserve is not thought to have been successful, with a last known record of a single flowering plant in 2005 (Giles Alder, pers. comm.).

## ECOLOGY

*Orchis militaris* is a long-lived tuberous perennial capable of periods of dormancy below ground in common with other temperate orchid species (Waite & Farrell, 1998). The tips of new shoots usually appear above ground by early January. Young plants and seedlings are sensitive to late-winter frosts and mid-spring droughts (Möller, 1989; Sumpter *et al.*, 2004), but mild winters, which are predicted to become more frequent in England based on climate change models, can result in higher numbers of flowering plants (Willems & Bik, 1991).

Slow growth in the winter and early spring means that leaves do not turn green and unfurl until April. There then follows a rapid growth spurt in May when the flower stalk elongates. Flowering generally commences by mid-May with flowers opening from the base of the spike upwards (see photo above). Following pollination, seed capsules are fully ripe by late August or early September (Farrell, 1991). In common with all orchids the seeds of *O. militaris* are minute and are dispersed by wind. Germination is thought to take place soon after dispersal, with the resulting plants capable of reaching flowering size within three years (Farrell, 1985).



Distribution of *Orchis militaris* in Great Britain and Ireland. The triangular symbols near to Manchester and Cambridge represent planted populations in private residences.

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Two underground tubers are present at the time of flowering, the first of which is wrinkled and brown, formed in the previous spring and responsible for the current year's growth. The second - new, fleshy and white - is formed in the current season and is capable of producing new plants the following spring. Vegetative reproduction, thought to be the main mode of regeneration in English populations, occurs when two new tubers are formed in the same season (Farrell, 1985).

Flowers are visited by a range of generalist pollinators, including Diptera, Lepidoptera, Syrphids and Hymenoptera. In the Netherlands small-bodied bees such as *Andrena*, *Apis*, *Eucera* and *Halictus* have been observed on flowers of *O. militaris* by Claessens & Kleynen (2011). At the Homefield Wood site in Buckinghamshire, Bateman & Rudall (2014) recorded *B. vestalis* and *B. pratorum* inadvertently transporting pollinia whilst foraging for pollen, and speculated that the bees must have pollinated at least some orchids (see also Fay & Salazar, 2001). However, there was also likely to be considerable wastage through pollinia being placed on non-viable parts of the orchid or deposited on other species in the vicinity.

*O. militaris* flowers are non-rewarding (i.e. nectarless) and allogamous and rely on food deceit to guarantee successful pollination. This strategy tends to result in poor fruit-set when compared with nectar-producing orchids. In a global review of reproductive success among nectariferous and nectarless orchids, Neiland & Wilcox (1998) found that there was a significant positive association between orchid rarity and lack of nectar reward, a theory first expounded by Darwin (1862) and later partially quantified by Gill (1989). However, an assessment of orchid populations in the Netherlands and Belgium by Jacquemyn *et al.* (2005) concluded that habitat loss, fragmentation and deterioration were more important determinants of orchid persistence.

*O. militaris* is a mycorrhizal generalist. Jacquemyn *et al.* (2010; 2011), for example, detected multiple and simultaneous fungal associations with *O. militaris*, particularly with the family *Tulasnellaceae*. The authors hypothesise that an ability to associate with multiple partners allow plants to maximise nutrient uptake in stressful conditions and so cope better by having a broad range of ecological options for survival.

In England two varieties have been described, with Suffolk plants conforming to the type var. *militaris* and the Buckinghamshire plants determined by Sell & Murrell (1996) as var. *tenuifrons*, a British endemic. However, Bateman & Rudall (2011) refute a (largely vegetative) diagnostic separation between the two varieties and dismiss var. *tenuifrons* as simply representing typical levels of variation common in many geographically fragmented conspecific orchid populations. Genetically, however, the Suffolk population appears to show some distinction from the Buckinghamshire plants and may therefore represent a separate and more recent dispersal event from Continental Europe (Fay *et al.*, 2004), although Bateman & Rudall (2011)

postulate that such separation is not conclusive based on morphological characters.

### THREATS

Extant populations are well managed by Wildlife Trusts and their dedicated volunteers, but historical losses or reductions in the number of flowering plants have been attributed to habitat loss, either directly by ploughing and development or indirectly via neglect and the encroachment of scrub and trees. *O. militaris* is protected under Schedule 8 of the Wildlife and Countryside Act (1981). Collection was common place in the past and led to the loss of plants as recently as the 1980s, but the three extant sites are now all closely monitored and access is largely restricted to permit holders or organised public open days.

### MANAGEMENT

Management aims to create open conditions via livestock grazing, mowing and raking, the control of encroaching scrub, or the felling of trees and lopping of branches (Hutchings *et al.*, 1998; Waite & Farrell, 1998). Exclosures have been erected at two of the three sites to assist with sheep grazing management and in an attempt to exclude deer and rabbits.

Dense moss cover that had developed following the clearance of perimeter trees at the Suffolk site was removed annually in response to concerns that the moss may smother seedlings and also harbor small mammals that damage orchid tubers Farrell (1991). Clearance activities appeared to be successful, with a substantial increase in numbers of *O. militaris* recorded in subsequent years.

At least one of the three native locations has been fortified with introduced plants. Hand-pollination has been undertaken at some point at all three sites.

### REFERENCES

- Bateman, R.M., Smith, R.J. & Fay, M.F. 2008. Morphometric and population-genetic analyses elucidate the origin, evolutionary significance and conservation implications of *Orchis* × *angusticruris* (*O. purpurea* × *O. simia*), a hybrid orchid new to Britain. *Botanical Journal of the Linnean Society* 157: 687–711.
- Bateman, R.M & Rudall, P.J. 2011. The life and death of a mythical British endemic, *Orchis militaris* var. *tenuifrons* P.D. Sell: why infraspecific taxonomy requires a field-based morphometric approach. *New Journal of Botany* 1: 98–110.
- Bateman, R.M & Rudall, P.J. 2014. Bumblebee-mediated pollination of English populations of the Military Orchid (*Orchis militaris*): its possible relevance to functional morphology, life history and climate change. *New Journal of Botany* 4: 122–133.
- Brooke, J. & Bone, G. 1950. *The Wild Orchids of Britain*. The Bodley Head, London.

## *Orchis militaris* L.

- Claessens, J. & Kleynen, J. 2011. *The flower of the European orchid: form and function*. Voerendaal: published by the authors.
- Darwin, C. 1862. *The Various Contrivances by which Orchids are Fertilised by Orchids*. John Murray, London.
- Farrell, L. 1985. *Orchis militaris* L. Biological flora of the British Isles No. 160. *Journal of Ecology* 73: 1041–53.
- Farrell, L. 1991. Population changes and management of *Orchis militaris* at two sites in England. In: T.C.E. Wells and J.H. Willems (eds.) *Population Ecology of Terrestrial Orchids*. pp. 63–8. SPB Publishing, The Hague.
- Fay, M.F. & Salazar, G.A. 2001. Using DNA sequencing to confirm the identity of pollinia - a case study with *Orchis militaris*. Royal Botanic Gardens, Kew.
- Fay, M.F., Qamaruz-Zaman, F., Chase, M.W. & Samuel, R. 2004. Military and monkey orchids: what do we have in England? *Conservation Genetics*. English Nature Research Report 607. Peterborough: English Nature, pp. 33–4.
- Fay, M.F., Smith, R.J., Zuiderduin, K., Hooper, E., Samuel, R., Bateman, R.M. & Chase, M.W. 2007. How does hybridization influence the decision making process in conservation? The genus *Orchis* (Orchidaceae) as a case history. *Lankesteriana* 7: 135–137.
- Foley, M.J.Y. & Clarke, S. 2005. *Orchids of the British Isles*. Griffin Press, Cheltenham.
- Gill, D.E. 1989. Fruiting failure, pollinator inefficiency, and speciation in orchids. In: D. Otte & J.A. Endler (eds.), *Speciation and Its Consequences*. Sinauer, Massachusetts. pp. 458–481.
- Hutchings, M.J., Mendoza, A. & Havers, W. 1998. Demographic properties of an outlier population of *Orchis militaris* L. Orchidaceae in England. *Botanical Journal of the Linnean Society* 126: 95–107.
- Jacquemyn, H., Brys, R., Hermy, M., Willems, J.H. 2005. Does nectar reward affect rarity and extinction probabilities of orchid species? An assessment using historical records from Belgium and the Netherlands. *Biological Conservation* 121: 257–263.
- Jacquemyn, H., Honnay, O., Cammue, B.P.A., Brys, R. & Lievens, B. 2010. Low specificity and nested subset structure characterize mycorrhizal associations in five closely-related species of the genus *Orchis*. *Molecular Ecology* 19: 4086–4095.
- Jacquemyn, H., Brys, R., Bruno, P.A., Cammue, B.P.A., Honnay, O. & Lievens, B. 2011. Mycorrhizal associations and reproductive isolation in three closely related *Orchis* species. *Annals of Botany* 107: 347–356.
- Kretzschmar, H., Eccarius, W. & Dietrich, H. 2007. *The Orchid Genera Anacamptis, Orchis and Neotinea*. EchinoMedia, Bürgel.
- Lousley, J.E. 1950. *Wildflowers of Chalk and Limestone*. Collins New Naturalist Series, No. 16. Collins, London.
- Möller, O. 1989. Die Samenkeimung, das Protocormstadium und der Aufwuchs der *Orchis militaris*. *Orchidee* 40: 29–32.
- Neiland, M.R.M. & Wilcock, C.C. 1998. Fruit set, nectar reward, and rarity in the Orchidaceae. *American Journal of Botany* 85: 1657–1671.
- 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.
- Sell, P.D. & Murrell, G. 1996. *Flora of Great Britain and Ireland* Vol. 5. Cambridge University Press, Cambridge.
- Stace, C.A. 2010. *New Flora of the British Isles*, 3rd ed. Cambridge University Press, Cambridge.
- Sumpter, J.P., D’Ayala, R., Parfitt, A.J., Pratt, P. & Raper, C. 2004. The current status of Military (*Orchis militaris*) and Monkey (*Orchis simia*) Orchids in the Chilterns. *Watsonia* 25: 175–83.
- Waite, S. & Farrell, L. 1998. Population biology of the rare military orchid (*Orchis militaris* L.) at an established site in Suffolk, England. *Botanical Journal of the Linnean Society* 126: 109–21.
- Willems, J.H. & Bik, L. 1991. Long-term dynamics in a population of *Ochis simia* in the Netherlands. In: T.C.E. Wells & J.H. Willems (eds.) *Population ecology of terrestrial orchids*. SPB Academic Publishers, The Hague. pp. 33–45.

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