

Phyteuma spicatum L.



Spiked Rampion, Cynnogyn Pigfain

CAMPANULACEAE

SYN: None

Status:

Nationally Rare

Schedule 8 Wildlife & Countryside Act (1981)

Endangered on GB Red List 2001

UK BAP Priority Species since 2007

Lead partner: Plantlife International

4 10-km squares post 1987

UK Biodiversity Action Plan:

UK BAP signposted priority actions for *Phyteuma spicatum*:

1 - Maintain and restore all known extant or recently extinct populations, through restoration of favourable habitat conditions.

2 - Extend area of traditionally coppiced wet woodland, especially along streams and wet rides and tracks, to link existing populations and to provide opportunities for colonisation.

3 - Surveillance programme: monitor all known populations and survey periodically for new records.

4 - Ensure "delivery plans" for National Forestry Strategies (including Regional Forestry Frameworks where appropriate) include management options to deliver appropriate conditions for this species (e.g. open glades, rides, woodland edges and seasonal grazing to control bramble). Target the uptake of these management options to current and historical sites, and to projects aiming to restore connectivity between woodlands with existing populations.

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1 Morphology, Identification, Taxonomy & Genetics

1.1 MORPHOLOGY & IDENTIFICATION

Spiked Rampion (*Phyteuma spicatum*) is an herbaceous perennial plant. It produces erect flowering shoots 25-95cm long from an enlarged primary root. The plant has a basal rosette of 2-6 ovate and often serrate leaves, with stem leaves alternate and more rounded. Flower hermaphrodite creamy-white sessile, densely packed in bud but becoming more lax on flowering. Usually terminal but occasionally found in leaf junctions.



Figure 1 – Spiked Rampion (*Phyteuma spicatum*) in flower (© Ulf Liedén, www.floracyberia.net)



Figure 2 - Sketch of a *P. spicatum* seedling from Shulkina *et al.* (2003)

1.2 TAXONOMIC CONSIDERATIONS

The closest relatives to this species in the UK are Round-headed Rampion (*Phyteuma orbiculare*), which is a native that is restricted to the chalk grassland downs of the south-east, and Oxford Rampion (*Phyteuma scheuchzeri*), which has been introduced to Oxford and West Sutherland.

All *Phyteuma spicatum* plants found in East Sussex are of the subspecies *spicatum*, which has a white flower (Wheeler & Hutchings, 2002). Most of the garden escapes found in other counties have blue flowers (Stace, 1997). These are considered by Stace (1997) to be of the same species but Damboldt (1976, *cited in* Wheeler & Hutchings, 2002) classifies them as the subspecies *coeruleum* (with the white-flowered form being subsp. *spicatum*).

Shulkina *et al.* (2003) carried out studies on the morphology of species from the Campanulaceae family, including *Phyteuma spicatum*, in an attempt to improve classification of this family. Their investigation led to division of the family into two groups based on seedling morphology, with *P. spicatum* allocated to the group of genera with "rosette seedlings, spiral leaf arrangement and different branching patterns".

Hybrids of this species and its congeners, *P. nigrum* and *P. ovatum*, have been recorded (Wheeler & Hutchings, 2002). Kovanda (1981) suggested that individuals of *P. spicatum* with blue flowers in Czechoslovakia might be hybrids between *P. spicatum* and *P. nigrum*.

1.3 GENETIC IMPLICATIONS

No genetic studies have been carried out on this species.

2 Distribution & Current Status

2.1 WORLD

Phyteuma spicatum is only found in Europe, mainly in Central Europe, where it is common, with local occurrences in parts of Eastern Europe, northern Spain and in Scandinavia.

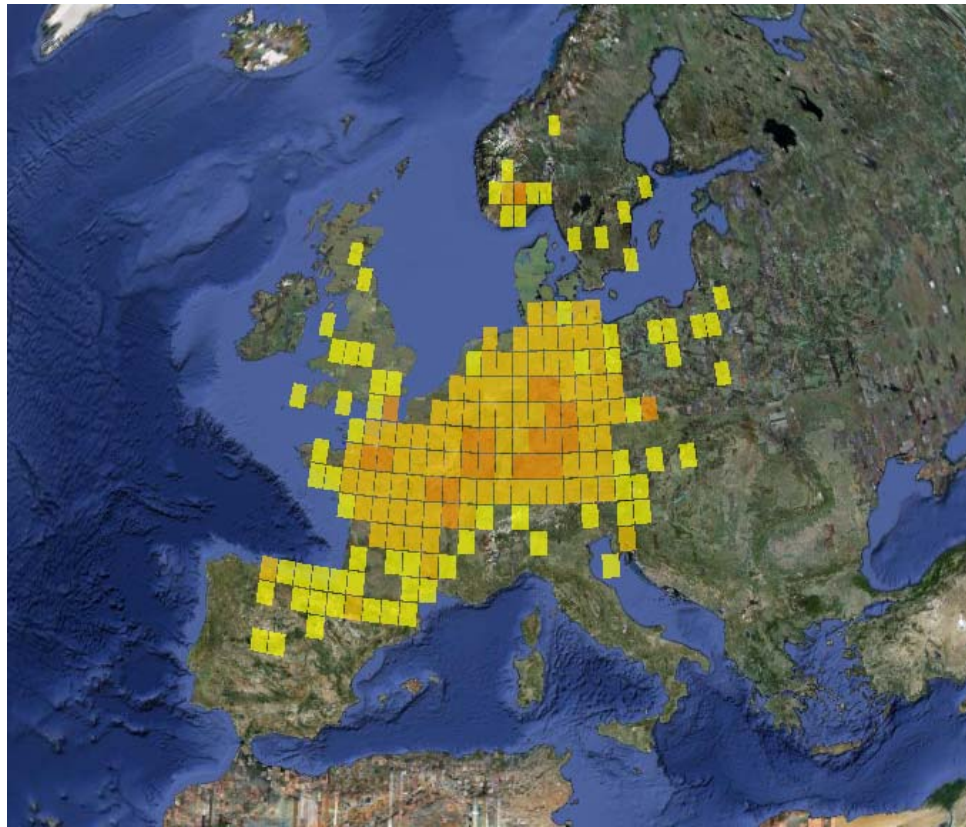


Figure 3 - Global distribution of *Phyteuma spicatum* (GBIF, 2009)

2.2 EUROPE

Phyteuma spicatum is endemic to Europe. In Norway, *P. spicatum* occurs in meadows, forest glades and on disturbed ground (Wheeler & Hutchings, 2002). In the sub-alpine regions of Austria and Switzerland where this species occurs, it is found in woods and meadows. It is also present but less common in lowland areas such as the Netherlands, mainly in open deciduous woodlands (Wheeler & Hutchings, 2002).

Table 1 – Number of occurrences of *Phyteuma spicatum* in countries across Europe (GBIF, 2009).

COUNTRY	NUMBER OF OCCURRENCES	COUNTRY	NUMBER OF OCCURRENCES
Andorra	3	Norway	164
Austria	67	Poland	193
Czech Republic	7	Romania	2
Denmark	19	Slovakia	1
France	3918	Slovenia	43
Germany	2153	Spain	100
Hungary	2	Sweden	58
Italy	2	Switzerland	2
Netherlands	147	United Kingdom	165

2.3 UNITED KINGDOM

OVERVIEW

It is uncertain whether this species is native to the British Isles but it is known to have occurred here since at least 1597 (Wheeler & Hutchings, 2002). While this species is common in many parts of Central Europe, it is extremely rare in the UK. It is only known to have occupied 20 tetrads in England, Scotland and Wales (12 of which as an introduced species), and has not been recorded in Northern Ireland. This species is endemic to the county of East Sussex although it has occurred in several other counties as a garden escape.

Historically, populations of *P. spicatum* in East Sussex appear to have been much larger than they are at present. Wheeler (2008) cites accounts from as recent as 1945 that report the species growing in woodlands in abundance, with woodland floors “carpeted” with Spiked Rampion. It is thought that there are now less than 400 plants of this species remaining in the UK.

Populations of Spiked Rampion have been recorded from a total of 26 tetrads in East Sussex. The populations in 17 of these tetrads are now extinct. There are now only nine tetrads with populations remaining (Wheeler, 2008).



Figure 4 - Distribution of *Phyteuma spicatum* in the UK (Preston, Pearman & Dines, 2002)

2.3.1 ENGLAND

This species is present at 8 sites in England; however, the populations at each of these sites are small. East Sussex is the only vice-county where this species is thought to be native. The sites in this vice-county where *P. spicatum* is thought to still be extant are listed in Table 2.

Table 2 - Sites in East Sussex (VC 14) at which *P. spicatum* is (presumed) native and extant (Wheeler, 2010).

10km	Site name	2010 Population size
TQ50	Abbots Wood	11
TQ51	Newplace Farm	1
	Maynards Green; Bottle Shaw	4
	Dower House Farm; Butlett's Wood	6
	New Sapperton Farm	Not surveyed
	Sapperton Manor Farm	0
	Sapperton Woods	0
TQ52	Riverside road verge(aka Tinkers Lane)	148
	Nursery Lane road verge (aka Malls Bank)	0
	Little England Farm; Homegrove Wood	1
	Browns Lane road verge	0
	Bridgelands Farm road verge	0
TQ61	St Dunstans Farm	5
	Rushlake Green; Millpond Wood & Watermill Farm	22
	Padgham Corner road verge	0
TOTAL [KNOWN] ¹UK POPULATION SIZE		197

The locations of the East Sussex sites are shown in Figure 5.

¹ Native plants in the wild. This figure does not include plants considered to be alien introductions and cultivated plants.



Figure 5 - Sites in East Sussex (excluding Abbots Wood) at which *P. spicatum* is (presumed) native and extant.

ROADSIDE VERGE SITES

The majority of *P. spicatum* plants are at **Riverside**, a roadside verge site in East Sussex that supports over half of the UK population (Wheeler, 2008). Previously, several hundred plants could be found in this metapopulation, which is distributed along approximately 250m of the south verge of Riverside up to Tinkers Lane. Now there are approximately 148 plants at this site. A small population was discovered at **Padgham Corner** verge by Simon Curzon in 1999. However, in the recent 2010 survey, no plants were present. There are two sites along **Nursery Lane** – the **Malls Bank Farm** verge population is recorded as 'rare' and is in decline. It is uncertain whether the grid reference for the other site is correct, but *P. spicatum* was recorded as present here in 2001. There was only one plant recorded at **Brown's Lane** in 1996, although ten years previously over 55 plants were recorded. It was shaded by an overgrown hedge and may now be extinct.

WOODLAND SITES

Abbots Wood is a metapopulation of 11 sub-sites throughout the wood, mainly along paths and rides. Each of these sub-populations is very small so vulnerable to stochastic events. **Newplace Farm** is a relatively new site identified to have this species where the plants are found on the edge of a woodland path. In 1995, there were 20 plants in the **Maynards Green** population, however in the 2010 survey, only 4 were found. The site is situated at the edge of a copse and the main threat to this population is a lack of management, which could lead to over-shading. The last record from the **Sapperton** site is from 1986. This was in a woodland edge habitat with Hornbeam and Hazel trees but, since it has not been surveyed for 20 years, the vegetation composition may have changed and it is not even certain if this population remains extant. An historic site nearby along a stream bank at Sapperton Manor Farm is also a woodland site near a footpath and could be checked for presence of *P. spicatum*. The **Butlett's Wood** population is located at the edge of a coppice and only has five or six plants. The **Little England Farm** population is also growing in a coppice; however this area has become overgrown, which threatens this population. There are small patches of Spiked Rampion at the edge of a wood at **St Dunstan's Farm** but no

further details are known about this site. Only four plants were previously recorded at the **Rushlake Green** site in 2003, situated along a path by the side of a woodland stream. During the 2010 survey, 5 plants were found in this location, plus two sub-sites nearby.

There are several records of *P. spicatum* occurring as a garden escape in the UK but these have been localised cases and have not led to a wider distribution throughout this country. The occurrences of *P. spicatum* as an alien in England are listed in Table 3.

Table 3 – Vice-counties in which *P. spicatum* has occurred as an alien in England (Wheeler, 2008).

V-C No.	VICE-COUNTY	10KM SQUARE
1	West Cornwall	SW72
9	Dorset	ST80
18	South Essex	TQ17
21	Middlesex	TQ59
38	Warwickshire	SP36
39	Staffordshire	SO88
40	Shropshire	SO78
57	Derbyshire	SK24

2.3.2 NORTHERN IRELAND

P. spicatum has never occurred in Northern Ireland.

2.3.3 SCOTLAND

Phyteuma spicatum has previously occurred in three vice-counties in Scotland as a garden escape (Table 3).

Table 4 – Vice-counties in which *P. spicatum* has occurred as a garden escape in Scotland (Wheeler, 2008).

V-C No.	VICE-COUNTY	10KM SQUARE	DATE & PLACE OF LAST RECORD
80	Roxburghshire	NT62	1930 Jedburgh
88	Mid Perthshire	NO01	1918 Methven
89	East Perthshire	NO12	1890 Perth

2.3.4 WALES

Phyteuma spicatum has previously occurred in two vice-counties in Wales as a garden escape (Table 4).

Table 5 – Vice-counties in Wales where *Phyteuma spicatum* has occurred as an alien (Wheeler, 2008).

V-C No.	VICE-COUNTY	10 KM SQUARE
48	Merionethshire	SH71
51	Anglesey	SH57

2.3.5 IRELAND

P. spicatum has not been recorded in Ireland.

2.3.6 CHANNEL ISLANDS

P. spicatum has not been recorded in the Channel Islands.

3 Ecology & Life Cycle

Phyteuma spicatum is a temperate species that grows along the shady edges of paths and rides in woodlands, and in the hedge banks of roadside verges. It also occurs along the sides of ditches and streams. In the wild, *P. spicatum* usually requires three years to reach sexual maturity. It is an early-flowering plant, with flowers developing in April and seed dispersal occurring in late July and August (Wheeler & Hutchings, 2002). This species is self-incompatible so requires several flowering conspecifics nearby for cross-pollination, mainly by bees (Wheeler, 2008).

Kolb (2005) studied the effects of habitat fragmentation on the fitness of 14 German populations of *P. spicatum* with population sizes ranging from 6 to 2095 flowering individuals. She found that plants in smaller populations experienced reduced reproductive success and offspring survival, and that this was probably due to loss of genetic variation and lower pollinator visitation. The main pollinators of *P. spicatum* are bumblebees (genus: *Bombus*) and they are less likely to be attracted to a small quantity of flowering plants than a larger population.

Dispersal of seeds from plants in the genus *Phyteuma* is driven by the wind (Maier *et al.*, 1999). The diaspores are unspecialised (i.e. have no wings or hairs to aid dispersal). Maier *et al.* (1999) carried out wind tunnel experiments to determine the various factors required for efficient seed dispersal of *Phyteuma* species. It was found that the minimum wind speed required for dispersal of *P. spicatum* seeds is 6.0 (+/- 1.6) metres per second (a relatively high speed; Wheeler & Hutchings, 2002). This species also has a high seed production relative to its congeners (an average of 3666 seeds per fructification), which means that it is able to disperse seeds both near the mother plant and is also highly efficient at dispersing seeds over long distances to colonise new areas. It should, however, be noted that although Spiked Rampion has a high seed production, seed predation is also very high (Wheeler, 2008). Bare ground is required for successful seedling recruitment so if this is not available close to the mother plant, it is unlikely that the plant will be able to extend its distribution.

Parts of Spiked Rampion are eaten by several herbivorous organisms (Wheeler & Hutchings, 2002). Many species of mammal show a particular liking for the roots. This species can also be severely damaged in some areas by slugs eating the leaves. It may also be subject to grazing by deer or rabbits. Other recorded insect associations include the larvae of leaf-

mining flies causing damage to the leaves and stems, and a species of weevil, *Miarus campanulae*, which is phytophagous and produces galls (Wheeler & Hutchings, 2002).

4 Habitat Requirements

4.1 THE LANDSCAPE PERSPECTIVE

The native distribution of Spiked Rampion is limited to the south of England but this is apparently not a climatic limitation as garden escapes have been found to grow in the north of England and in Scotland.

All of the sites at which *P. spicatum* occurs natively (excluding Abbots Wood) are located in the High Weald Natural Area, on the clays of the Ashdown Beds (Wheeler & Hutchings, 2002; Natural England, 2009). These are slow-draining soils that are susceptible to seasonal waterlogging.

4.2 COMMUNITIES & VEGETATION

While this species can be found growing in woodlands, it cannot tolerate full shade, so is usually found at the edges of woodland in the light shade of trees or scrub. The plants also suffer if the canopy is completely opened up because this causes an increased growth of understorey vegetation such as bracken and bramble. Plants found in thick understorey vegetation do not produce flowering spikes and only persist vegetatively for a few years.

When found in woodlands, *P. spicatum* is generally associated with ***Quercus robur-Pteridium aquilinum-Rubus fruticosus* woodland, the W10 NVC community** dominated by oak with a bracken and bramble-dominated understorey (Rodwell, 1991; Wheeler, 2008). This tends to have a low understorey of shrubs and small saplings that can become dense in patches, and often has a history of coppicing (Rodwell, 1991). More specifically, *Phyteuma* is associated with the ***Anemone nemorosa* sub-community (W10b)**, which is characterised by the prominence of Wood Anemone (*Anemone nemorosa*) and Sweet Chestnut (*Castanea sativa*) (Rodwell, 1991).

The roadside verge site of Riverside, is defined as the **W25a sub-community of *Pteridium aquilinum-Rubus fruticosus* underscrub with *Hyacinthoides non-scripta***, which is of very similar vegetation composition to that of the W10 woodland understorey community (Wheeler, 2008). The vegetation at Malls Bank (approx. 1 km down the road from Riverside) has been reported as resembling **MG9b and MG1e mesotrophic grassland communities** (Wheeler, 2008). These habitats are not ideal for *P. spicatum* because it is unable to grow in the dense shade of *Pteridium aquilinum*. Therefore, it is likely that these sites previously had a higher quality vegetation composition, which has declined in quality due to poor management.

In continental Europe, *P. spicatum* is much more varied in the range of habitats that it grows in, from woodland to sub-alpine meadows, although not in mesotrophic grassland (Wheeler, 2008).

4.3 SUMMARY OF HABITAT REQUIREMENTS

A wide range of habitat features is important to *Phyteuma spicatum*, and these have been summarised in Table 6.

Table 6 - Habitat features important to *Phyteuma spicatum* in Britain.

TYPE	
Physical & topographical	A lowland species. Soils on which native populations are located are slow-draining clays that are susceptible to seasonal waterlogging. Sites are partially shaded by trees or scrub.
Vegetation/structural	<i>Phyteuma spicatum</i> occurs at the edges of woodlands, and the majority of current sites are roadside verges. The main vegetation types in which it can now be found include W10b , W25a , MG9b and MG1e , however these are thought to be sub-optimal communities for this species.
Processes	<i>Phyteuma spicatum</i> requires bare ground for seedling establishment. Damage has been caused at some sites by rabbit and deer grazing, and by slugs feeding on the leaves.
Chemical	Wealden Clay and Ashdown Beds of East Sussex have acid soils. Plants in Central Europe have been found to grow on a wide range of pH. Not often found on soils with extremely high or low nitrogen levels.

5 Management Implications

As the Riverside site in East Sussex has the largest population of *P. spicatum* in the UK, it is particularly important that numbers here are maintained and, ideally, increased. Even more threatened are the other extant populations of this species that hold only a few plants and are at risk of imminent extinction if not properly managed.

Decline in number of Sussex populations is mainly due to abandonment of coppice management and a decline in grubbing out of woodland (Wheeler, 2008). Periodical management to create open woodland is required to encourage growth of seedlings. This could be through **removal of trees, creation of glades or creation of paths and rides**. At roadside sites, **scrub and tree cutting** should be carried out to prevent shading.

Bare ground close to established flowering plants is required to provide the preferred substrate condition for seed recruitment. These areas must be kept free of vegetation for at least two years to allow new plants to mature. This has been shown to be successful by Wheeler (1997). **Creation of corridors** between small populations that are separated by long distances will facilitate cross-pollination. It may also be necessary to carry out **cross-pollination by hand** in some cases (Wheeler & Hutchings, 2002).

Very little is known about most of the sites. All of these sites require a **survey** and it would be beneficial to **determine the ownership of private sites** in order to liaise with site managers to develop an appropriate management plan.

6 Threats / Factors leading to loss or decline or limiting recovery

The factors affecting *Phyteuma spicatum* are given in Table 7.

Table 7 - Threats to the survival of *Phyteuma spicatum* in the UK.

TYPE	THREAT
Inappropriate habitat management	Woodland sites – lack of management, e.g. coppicing, leading to canopy closure. Roadside verge sites – lack of management leading to scrub encroachment or development of coarse grassland. Mowing/cutting during flowering period. Extraction damage in managed woodland sites.
Competition	Excessive growth of rank vegetation inhibits seedling recruitment.
Herbivory	Removal of floral spikes by deer, slugs or rabbits. Damage to leaves and stems by slugs.

Wheeler & Hutchings (2002) state poor powers of dispersal of *P. spicatum* seeds as a reason for its decline, however Maier *et al.* (1999) found that this species is highly efficient at dispersing seeds over a long distance when environmental conditions are favourable. This would suggest that, where this species exists in Britain, conditions are not optimum for this species to extend its distribution.

7 Current Conservation Measures

7.1 *IN SITU* MEASURES

OVERVIEW

Only one site at which *Phyteuma spicatum* is present receives statutory protection as a SSSI. This is the St Dunstan's Farm population, which is on the edge of the St Dunstan's Farm Meadows SSSI.

Abbots Wood is the only woodland site that is managed. It is currently owned and managed by the Forestry Commission. The seven other woodland sites are privately owned and, when last surveyed, were reported as being 'overgrown' or 'neglected' (Wheeler, 2008). The roadside verge sites are under the management of East Sussex County Council Highways Department and were included in a Roadside Verges for Wildlife Scheme. However, in recent years, management for this scheme has ceased due to staff losses (Wheeler, 2008).

There are no current plans for a re-introduction of this species anywhere in East Sussex. However, a survey of historic sites would determine whether any sites are suitable for such a re-introduction or whether it is likely that there is still a seedbank present.

CURRENT CONSERVATION SCHEMES

A number of countryside conservation schemes provide assistance to land managers conserving sites. Amongst the most appropriate are:

- **Protected Road Verges** Many district councils run protected road verge schemes. In many cases, these schemes offer little more than freedom from the normal cutting regime, but they can give the opportunity to carry out more constructive management programmes.
- **Woodland Grant Scheme** This is a scheme run by the Forestry Commission. It provides grants to landowners for the stewardship and creation of woodlands. This scheme aims to ensure suitable woodland management is practised, increase the amount of woodland that is accessible to the public, improve the condition of woodland SSSIs, help to deliver Habitat and Species Action Plans, and improve the environment of disadvantaged urban communities.
- **Environmental Stewardship** This is a new agri-environment scheme, which provides funding to farmers and other land managers in England who deliver effective environmental management on their land. The scheme is intended to build on the recognised success of the Environmental Sensitive Areas scheme and the Countryside Stewardship Scheme.

7.2 *EX SITU* MEASURES

The Millennium Seed Bank at Kew has accessions from four of the 13 East Sussex sites for *Phyteuma spicatum*: Tinkers Lane, Malls Bank Farm, Abbots Wood and Waldron Down.

7.3 RESEARCH DATA

An investigation into the ecology and conservation of *P. spicatum* was carried out by Belinda Wheeler in 1997 for her DPhil thesis.

There has been no research into the biochemistry of this species.

Fig 6 Spiked Rampion (copyright Elliot Bignell)



8 References

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9 Contacts

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10 Links

- Herbaria United www.herbariaunited.org
- Global Biodiversity Information Facility www.gbif.org

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