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Gagea bohemica (Zauschner) J. A. & J. H. Schultes in the British Isles, and a general review of the *G. bohemica* species complex

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ABSTRACT

The discovery of *Gagea bohemica* (Zauschner) J. A. & J. H. Schultes in Britain and details of its habitat are described. The *G. bohemica* species complex in Europe and western Asia is reviewed, and a map showing its distribution is given. The many taxa of the complex which have received specific status in the past are considered to be best treated merely as taxonomically worthless variants of the variable *G. bohemica*.

DISCOVERY IN BRITAIN

In 1968 R. F. O. Kemp (Kemp 1968) recorded the discovery of *Lloydia serotina* (L.) Reichenb. at Stanner Rocks, near Kington, Radnorshire, v.c. 43. One plant had been accidently collected with the moss, *Dicranum scoparium*, in April 1965. In April 1974 R. G. Woods searched the site for this species, and found a single shrivelled flower with white petals amongst many hundreds of non-flowering specimens. Comparison of this flowering specimen with the photograph of Mr Kemp's specimen, which also had faded petals, confirmed that the two were similar, but both plants were hairy, a feature not known in *Lloydia serotina*. Another visit to Stanner rocks by R. G. Woods in mid-January 1975 revealed a single flowering plant, but with bright yellow flowers. A thorough search of the site failed to reveal any other flowers amongst large numbers of non-flowering specimens. This yellow-flowered plant was similar to the shrivelled white-flowered specimen seen the previous year, and a return visit in February confirmed that the yellow petals turn white with age.

Its yellow flowers indicated that the plant belonged to the genus *Gagea*, not to *Lloydia*, though it was clearly not the then only known British species, *Gagea lutea* (L.) Ker-Gawler; later the plant was tentatively identified as *Gagea bohemica* (Zauschner) J. A. & J. H. Schultes. In March 1978 D. McClintock and E. M. Rix met R. G. Woods at Stanner Rocks, and together they found about 25 specimens in full flower among many thousands of non-flowering plants. The identification of the plant as *G. bohemica* was confirmed.

Growing at Stanner Rocks with a range of rare plant species which also show a disjunct distribution, *Gagea bohemica* appears to be a native species previously undetected in the British Isles. Its small leaves, which resemble seedlings of *Allium* species, appear above ground in late August and shrivel in most years by late April. Less than one per cent of the population flowers each year. In mild winters, flower buds open in early January. Some flowers appear to be removed by grazing animals and no fruits have ever been found.

This species is confined to pockets of shallow soil on south and east facing dolorite cliffs which are subjected to summer drought. Commonly associated species include *Allium vineale, Aphanes arvensis, Arabidopsis thaliana, Erophila verna, Jasione montana, Sedum fosteranum* and the mosses *Dicranum scoparium, Hypnum cupressiforme* var. *lacunosum* and *Polytrichum piliferum*.

Other well known rarities on Stanner Rocks also have Continental and West Asiatic affinities, e.g. *Lychnis viscaria, Veronica spicata* and *Scleranthus perennis*.

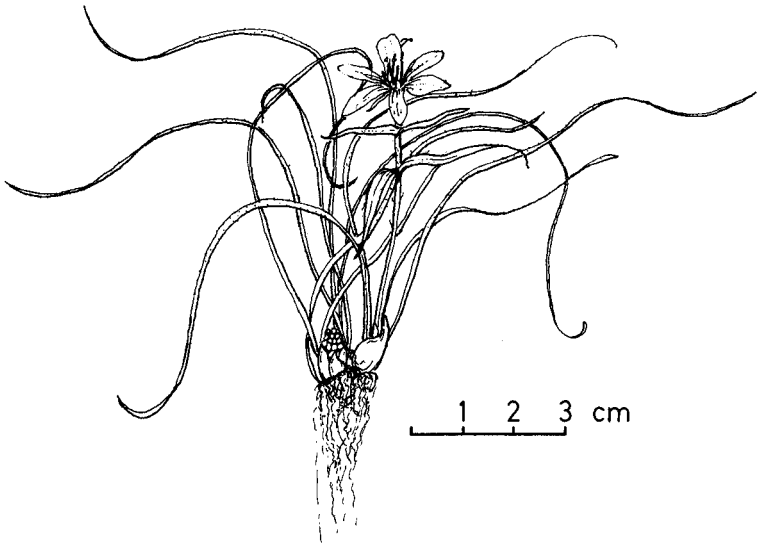

FIGURE 1. *Gagea bohemica*: specimen from Stanner Rocks, Radnorshire, March 1978.

DESCRIPTION OF SPECIMENS FROM STANNER ROCKS

A set of specimens for deposition in **BM**, was collected on 4th March, 1978, when the plants were in full flower; the following description is based on these, as is the drawing in Fig. 1:

Bulbs 2, in a pale chestnut-brown papery tunic. Basal leaves 2–4 on a flowering bulb, 40–90mm long, 1mm wide, filiform, D-shaped in section, glabrous or with short crisped hairs. Stems 15–30mm, sparsely woolly on the pedicels above, almost glabrous below, usually 1-flowered, rarely with up to 4 flowers, with 4 cauline leaves, and with 1–2 bracts per flower. Cauline leaves narrowly lanceolate, 15–40mm long, 2–4mm wide, long ciliate. Flowering stems often replaced by a group of *c.*25 bulbils, white at flowering time, later becoming dark brown, each covered with a reticulate tunic. Perianth-segments usually 6, often 7–8, 12–18mm long, 2–4mm wide, narrowly oblong-lanceolate, obtuse, bright yellow and shining inside, greenish outside. Filaments *c.*8mm; anthers *c.*1mm after dehiscence. Style 5–6mm, filiform, glabrous. Ovary obovate; no capsules seen on any plants at Stanner Rocks.

GAGEA BOHEMICA SENSU LATO

The primary cause of the taxonomic difficulties of the genus *Gagea* is the superficial similarity of most of the species. Nearly all are small (up to 10cm) with linear leaves, a branched and usually hairy flowering stem, and yellow flowers with narrow perianth segments. Qualitative characters used to subdivide the genus include bulb type, seed type (both of which are often absent on herbarium specimens), bulbil production, stem indumentum, and cauline leaf number and position.

G. bohemica is easily recognized by the following combination of characters: Basal leaves 2 or more, filiform; stems 5–60cm, the pedicels not greatly elongating in fruit; cauline leaves lanceolate, long acuminate, tapering from below middle; perianth segments 8–18mm, blunt.

The distribution of *G. bohemica* sensu lato is shown in Fig. 2, which is compiled from herbarium specimens in **K**.

Variability in height of stem, flower size and indumentum have led to a proliferation of different names for plants of *G. bohemica* sensu lato. The following list gives in each case an indication of the type and, where appropriate, the basionym.

FIGURE 2. The distribution of *G. bohemica* sensu lato, compiled from herbarium material in **K**. There are also unconfirmed records for Spain and N. Africa, and many probably accurate localities within the general range of territories recorded in the Figure.

G. bohemica (Zauschner) J. A. & J. H. Schultes, *Syst. Veg.*, **7**: 549 (1829)
Ornithogalum bohemicum Zauschner
Lectotype: 'Bohemia-Schmidt 336', Herb. Willd. 6590 (**B**), selected by Heyn & Dafni (1977).
G. saxatilis (Mert. & Koch) J. A. & J. H. Schultes, *Syst. Veg.*, **7**: 549 (1829)
Ornithogalum bohemicum var. *saxatile* Mert. & Koch
Type: W. Germany, 'm. Donnersberg, Palat.', Koch (**B**).
G. szovitsii (A. F. Láng) Besser in J. A. & J. H. Schultes, *Syst. Veg.*, **7**: 550 (1829)
Ornithogalum szovitsii A. F. Láng
Type: U.S.S.R., 'circa Odessa, frequens', Szovits (**K**).
G. billardieri Kunth, *Enum. Pl.*, **4**: 242 (1843)
Type: Turkey, 'circa Ephesum', Tournefort.
G. busambarensis (Tineo) Parl., *Fl. Palerm.*, **1**: 379 (1846)
Ornithogalum busambarense Tineo
Type: Sicily, 'Busambra, sotto l'Agughia', Tineo.
G. nebrodensis (Tod. ex Guss.). Nyman, *Syll. Fl. Eur.*, 372 (1855)
Ornithogalum nebrodense Tod. ex Guss.
Type: Sicily, 'Madonie al Pizzo de la Casa' Todaro (**K**).
G. andegavensis F. Schultz in *Flora*, **45**: 460 (1862)
Type: France, near Angers, Maine-et-Loire.
G. corsica Jordan & Fourr., *Brev. Pl. Nov.*, **1**: 58 (1866)
Type: Corsica, monte Ospedale, E. Revelière.
G. saxatilis subsp. *australis* A. Terr. in *Bull. Herb. Boiss.*, sér. 2, **4**: 112 (1906)
Type: Sicily, 'Busambra, solto l'Agughia', Tineo.
G. zauschneri (Pohl) Pascher in *Engler's Bot. Jahrb.*, **39**: 307 (1906)
Ornithogalum zauschneri Pohl
Type: 'Bohemia-Schmidt 336' (**B**).
G. callieri Pascher in *Feddes Repert.*, **2**: 166 (1906)
Type: Crimea, 'Sudak, Callier 206 It. Taur. 1896' (**B,K**).
G. velenovskyana Pascher in *Feddes Repert.*, **2**: 166 (1906)
Type: Bulgaria, 'ad Philippopol. Stribrny' (**LE**).
G. lanosa Pascher in *Feddes Repert.*, **2**: 166 (1906)
Type: Greece, 'prope Athenas, Orph. 119' (**K**).
G. aleppoana Pascher in *Feddes Repert.*, **2**: 166 (1906)
Type: Syria, Aleppo. Hausskn. 937 (1867) (**B,K**).
G. smyrnaea O. Schwarz in *Feddes Repert.*, **36**: 70 (1934)
Type: Turkey, 'Smyrna, Yamanlardag prope cacumen Karacam', Schwarz 369 (**B**).
G. bohemica subsp. *gallica* (Rouy) I. B. K. Richardson in *Bot. J. Linn. Soc.*, **76**: 356 (1978)
G. bohemica var. *gallica* Rouy
Type: France, near Angers. Maine-et-Loire.

FORMER TREATMENTS OF THE GROUP

Previous treatments of the *G. bohemica* group have differed greatly in the status given to the different segregates.

Terraciano (1906), in an account of the oriental species of *Gagea*, gave as a synopsis of his view of the European members of the group:

G. saxatilis
subsp. *saxatilis*
α typica; *β gallica*; *γ helvetica*; *δ hispanica*;
subsp. *australis* Terr.
α sicula; *β corsica*
subsp. *szovitsii* (A. F. Láng) A. Terr.
subsp. *bohemica* (Zauschner) A. Terr.

These subspecies and varieties were defined geographically rather than morphologically.

Pascher (1907) discussed at length the different taxa, and described four species from eastern Europe and the Middle East. He acknowledged the presence of intermediates between these local species and between *G. saxatilis* and *G. bohemica*.

Stroh (1936), in a review of the whole genus, reduced some of Pascher's names to subspecific and some to varietal rank. His treatment can be summarized as follows:

G. nebrodensis
G. bohemica
subsp. *zauschneri* (Pohl) Pascher ex Stroh
var. *lanosa* (Pascher) Stroh; var. *velenovskyana* (Pascher) Stroh
subsp. *aleppoana* (Pascher) Stroh
subsp. *saxatilis* (Mert. & Koch) Pascher ex Stroh
var. *gallica* (Rouy) Stroh; var. *australis* (Terr.) Stroh; forma *corsica* (Jordan & Fourr.) Stroh
G. szovitsii
G. callieri
G. smyrnaea

Heyn & Dafni (1977), in a paper on *Gagea* in Israel, united all the above species, subspecies and varieties, as well as *G. saxatilis* and *G. szovitsii*, under *G. bohemica*. We agree with this possibly rather drastic treatment.

Richardson (1979) recognized within *G. bohemica* sensu lato three species in Europe, but expressed doubt about their status. He retained *G. bohemica* and *G. saxatilis* as separate species, and raised var. *gallica* to subspecific rank under *G. bohemica*. *G. nebrodensis* was also made a subspecies of *G. bohemica*, and *G. callieri* was included in *G. szovitsii*, the third species recognized.

DISCUSSION

Three main characters have been used to distinguish the taxa in *G. bohemica* sensu lato: stem height, flower size, and the amount and distribution of indumentum. Measurements of these characters were made, mainly using herbarium specimens in **K**. The results (Fig. 3) show an absence of any disjunctions or correlations.

The difficulty of distinguishing taxa on flower size is increased by the fact that the first flower in an inflorescence to open tends to be larger than the others, and that the perianth segments elongate

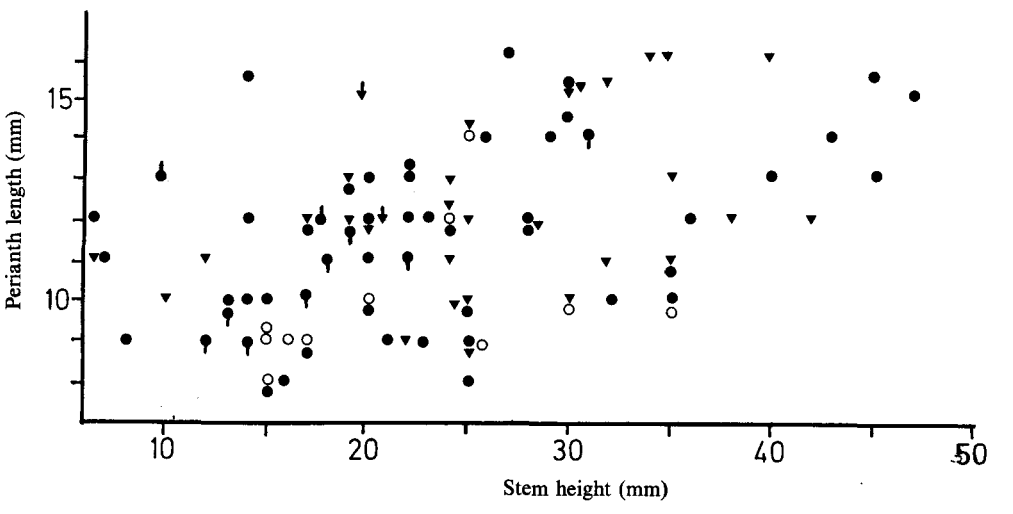

FIGURE 3. Scatter diagram based on herbarium material in **K**, showing relationships between stem height, perianth length and indumentum. Plant glabrous ○; only pedicels hairy ▼; stem hairy throughout ●. Specimens from type locality of *G. saxatilis* ♀; specimens from Stanner Rocks ▼●.

slightly during anthesis. There is also often some shrinkage on drying, especially if pressure has not been heavy. The robustness of the individual plant also affects the size of the flower as well as the height of the stem. For instance, on one sheet from Ankara, Turkey (7 specimens), perianth segment length varied from 11 to 16mm, while stem height varied from 5 to 34mm. Similar variation in perianth length is found in many collections, whereas variation in stem height is usually less than in this instance.

Stem indumentum is also variable within collections, and glabrous individuals were seen from Hungary, Czechoslavakia, Sicily, and Turkey.

Richardson (1979) distinguished *G. saxatilis* from *G. bohemica* and *G. szovitsii* on capsule shape. We were unable to evaluate this character as fruits were not present on the majority of the specimens.

A further character, short crisped hairs on the basal leaves, formed the basis of *G. andevagensis* and *G. bohemica* var. *gallica*. The specimens from western France, especially from near Angers, often have these crisped hairs, but we have not seen more than the occasional hairy specimens among other Continental or Asiatic material. The plants from Stanner Rocks are variable in this character; some have glabrous basal leaves and some have crisped hairs on them, but these hairs are never as dense as those on some of the French specimens. This suggests that the British plants have a closer connection with those from western France than with the largely non-hairy plants from western Germany, south of Mainz, or with those from elsewhere.

In our opinion none of the variation is worth recognizing taxonomically, and all the names listed above are best considered merely as taxonomically worthless variants of *G. bohemica*.

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