

## Problems with identification of *Allium paradoxum* – and some new diagnostic characters

When I first found Few-flowered Garlic (*Allium paradoxum*) it was in the early 1990's, before the publication of Stace's first flora (Stace 1991). The taxon did not feature in any of the generally available illustrations (e.g. Stella Ross-Craig, 1972; Clapham, Tutin & Warburg, 1965) and in the text of my "CTW" it had only a minimal small print entry. Partly because it seemed to have too many flowers, but mainly on the always suspect grounds of "what else could it be", I sent in the record as *Allium triquetrum*, a generally much better known alien, but one that I now know struggles to survive in the wild in our region, seldom if ever forming large patches like the ones I reported. The then V.C. recorder gently suggested that it might be *A. paradoxum*, which has since become a very frequent plant in the N. E. part of Norfolk, and especially in the Broads area (Beckett & Bull, 1999; Preston *et al.* 2002).

The first population I found was round the corner from my house, growing typically in shade and in thick leaf mould. There were no associates at all save for *Pentaglottis sempervirens* (Alkanet), another alien which often colonises this otherwise almost empty niche. This population has increased enormously over the last 25 years, producing dozens of dense patches c. 2 - 10 metres long, over a total distance of c. 200 metres of road verge.

Passing them so frequently, I have slowly realised that only about two thirds of the plants have bulbils only, or bulbils plus 1 – 3 (4) flowers, as in the standard descriptions (Clapham, Tutin & Warburg, 1962; Sell & Murrell 1996, Stace, 2010), around a third or so of the plants in long standing and large patches *appearing* to have 5-8 flowers.

### Unconventional reproductive biology

On closer examination these "excess flowers" are found to be not true flowers at all, but what one could call secondary umbels. Whereas the true flowers are bright white with a broadly elliptic outline the flower-like secondary umbels are flask shaped, with a bulbous base rapidly attenuated into a narrow curved neck, the apparent perianth consisting, not of opaque white petals, but of translucent buff coloured bracts much like the bracts subtending the primary umbel, but smaller. The bulbous base of the fused bracts contain only 1 - 3 bulbils, whereas the primary umbels have 3 - 8 (11) bulbils.

Secondary umbels often have long stalks much the same length as those of the flowers, which means that they can be taken at a glance as being flowers. However, they can also be short stalked or completely sessile – in the latter case the one to several bulbils they contain sit among the bulbils of the primary umbel and are only distinguishable as constituting secondary umbels because they have their own flask shaped set of bracts surrounding them.

The illustrations in the BSBI Illustrations of Alien Plants (Clement *et al.* 2005 ) and in the standard German flora (Rothmaler, 2009), both show secondary umbels with long stalks, but these have not, to my knowledge, actually been described before.

Over the last 5 years I have drawn lots of sketches of plants from this population and from several other populations, to define the extremes of variation in floral structure. I have found that the secondary umbel may produce not just bulbils but also 1-2 stalked "tertiary umbels" of 1-3 bulbils, a stalked "secondary flower", or even, occasionally, one of each! Extremely tall plants can produce up to 7 secondary umbels and one flower, or 2 or 3 flowers plus up to 3 sessile secondary umbels.

At the other extreme, small plants which appear to have only an umbel of bulbils frequently have one or more sessile secondary umbels mixed in with the bulbils, as already described. The extremes of floral variation discovered thus far are shown in the illustrations.

The number of bracts surrounding the primary umbel is also very variable and at variance with standard descriptions. Most frequently there are three, very narrowly triangular bracts, with two of them very close together at the base, but very often there are two bracts, one narrow and the other broad and often partially split into two. Occasionally there is only one very broad bract, very occasionally four, all narrow.

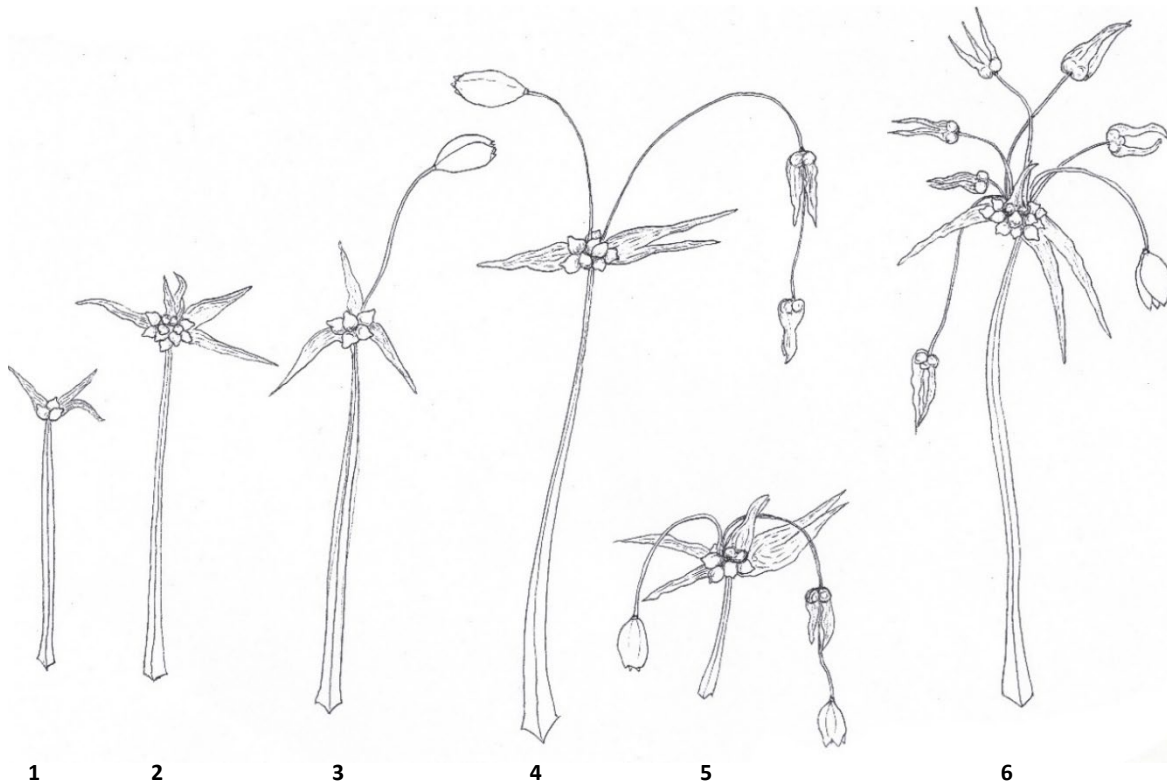
Despite hardly understanding even Mendelian genetics, I feel that this remarkably chaotic pattern of variation must be an example of extreme phenotypic plasticity - that is an unusually varied expression of a single genotype, induced either by

different conditions of soil or microclimate, or usually just associated with vigour of growth as the plants become older and taller.

The enormous patches of plants produced after a decade or two and consisting of separate, one bulbed plants a few centimetres apart, must be clonal and entirely the result of vegetative reproduction from the bulbils, which fall off and roll only a short distance. If one looks at the patch in late winter by scraping away the leaf mould, all one finds are the bulbils attached tenuously to the ground by their first roots, with no seedlings growing in between. I have never seen any fruits developing from the flowers, which are extremely short lived, disappearing completely along with all the leaves by mid summer.

During flowering around May, it is striking that the oldest and tallest plants in the centre of each patch are the ones with the most floral parts, with up to 11 bulbils, 3 primary flowers and 7 secondary umbels, some of these producing some secondary flowers or tertiary umbels, as described. The youngest and shortest plants at the edge of the patch almost always have only bulbils (usually 2-5), or bulbils with 1-2 sessile secondary umbels, and struggling clonal patches, present some time but with all short plants, the same. These observations would seem to indicate that the unusual variations in number and type of floral parts in this taxon is an expression mainly of vigour of growth.

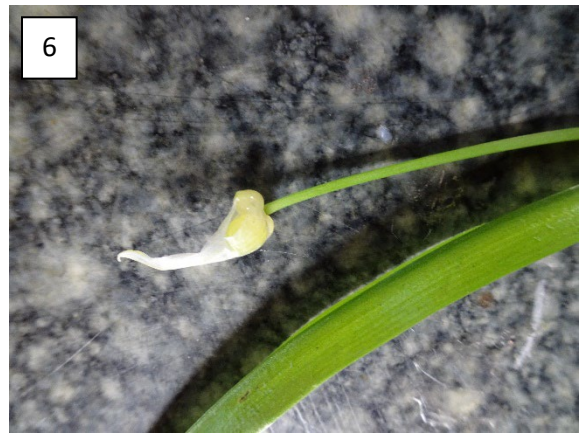
Once one is aware of the existence of secondary umbels, and don't mistake them for flowers, there should be no problem with identification. For such an undisciplined plant there does seem to be a strict limit on the number of true flowers produced, for whether the flowers are produced from the primary or secondary umbel, or both, there "never" seems to be more than 3, which does fit the standard keys and descriptions.



1. Short, young or depauperate plants with a primary umbel of 3 bulbils
2. Short, young or depauperate plants with a primary umbel of 9 bulbils and a sessile secondary umbel of 2 bulbils
3. A taller, older or better-grown plant with a primary umbel of 5 bulbils and 1 primary flower
4. A tall plant with a primary umbel of 8 bulbils and 1 primary flower, and a secondary umbel producing a tertiary umbel
5. A similar tall plant, but with the secondary umbel producing a secondary flower rather than a tertiary umbel
6. A very tall plant with a primary umbel of 11 bulbils, a sessile secondary umbel, 1 flower and 6 stalked secondary umbels

All drawings are taken from specimens found on the road verge of The Avenues, Wroxham





All photos taken from a single roadside verge population, Wroxham, Norfolk (vc27), April 2019

- 1 View of a small part of the population
- 2 Typical patch showing mostly secondary umbels rather than flowers
- 3 Plant with 1 secondary umbel and 1 secondary flower from it
- 4 Plant showing 6 secondary umbels and 1 tertiary umbel
- 5 'Classic' plant with 1 primary flower
- 6 Young or depauperate plant with 1 primary umbel only

## Conclusion

It may be that the 2<sup>o</sup> umbels, 2<sup>o</sup> flowers, and 3<sup>o</sup> umbels are unique to *A. paradoxum*, and, at least in the *Allium* taxa encountered in the British Isles, these features would seem to be diagnostic. Other characters of *A. paradoxum* little remarked upon, and also more or less unique, are the fact that it is one leaved and that the leaves are a very beautiful deep, lustrous green, unlike most of the genus which tend to be rather greyish green in colour. It is also a very nice salad plant with a very pleasant rich taste, a sort of mixture of onion and garlic.

*Allium paradoxum* is a fascinating plant. There can be few taxa exhibiting such enormous variation in flowering structure in a single clonal patch, in vivid contrast to say, the vast clonal patch of a reed bed, where the individual plants of *Phragmites australis* all look more or less alike. The genetics of this extreme phenotypic plasticity could well repay study and could conceivably be of use in crop breeding, giving enhanced ability to respond to nutrient input.

**Bob Leaney**

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