



EROPHILA

Erophila has been the subject of a number of detailed taxonomic studies which have not tended to clarify the species involved. The earliest studies (Jordan 1852, 1864) resulted in the publication of a large number of new species based on French material. This was followed by a series of experimental investigations by Rosen (1889, 1910, 1911) who showed that uniform F1 families were produced following crosses between different parents and that these segregated in the F2 generation; he also showed that progeny of crosses were variably fertile. Monographic studies culminated in the detailed treatment by Schulz (1927) where species are split into numerous subspecies and forms.

Many of Jordan's names were applied to British specimens after Druce (1914) published a translation of a key to *Erophila* in France by Maranne (1913). The difficulties experienced in identifying *Erophila* in these later years are well illustrated by the diversity of opinions on specimens submitted to and distributed by the Botanical Exchange Club. It is also clear that it was not uncommon for collectors to sort specimens from those collected at one locality according to a preconceived opinion of a species' characteristics. After publication of Schulz' (1927) monograph, Salmon & Baker (1928) and Druce (1930) revised British *Erophila* taxonomy, but without decreasing the problems of identification. Clapham, Tutin and Warburg (1952, 1962) divided British *Erophila* into three species, based on Salmon & Baker's treatment, using ovule numbers and fruit shape as key characters. Walters (1964) has followed the treatment of Markgraf (1962) and has placed all British plants (and the majority of those in Europe) in one species, *E. verna*, with four subspecies; fruit shape and size are key characters in their delimitation. More recently (Walters 1993) the same treatment has been maintained.

Perring (1968) distinguished two subspecies of *E. verna* in Britain, subsp. *verna* and subsp. *spathulata* (Lang) Walters, the latter being characteristic of sand-dunes in the north and west, but also having a scattered inland distribution in southern Britain.

Winge (1940) has published the only cytotoxic investigation, based mainly on NW European plants, but unfortunately he applied new names to the four taxa which he had delimited. Since they have no nomenclatural validity they have not been used subsequently, except by Walters (1964, 1993) who attempted to correlate them with valid names.

We have made a cytotoxic study of populations in Britain, the results of which can be correlated with those of Winge (1940). The treatment given here is based on our study, but with the use of nomenclaturally valid names for the taxa delimited. We have followed Winge (1940) in distinguishing groups of cytotypes at the specific level. The same scheme has also been used by Clapham *et al.* (1987). Since publication in the Plant Crib (1988) this treatment has been adopted in Stace's *New Flora*.

Variation and Biosystematics

Taxonomic confusion has been one of the best known features of *Erophila* for the last century. This has arisen particularly from two features. Firstly, there is a high degree of plasticity in characters such as plant size, number of scapes and numbers of flowers per inflorescence. Secondly, the in-breeding system has resulted in a large number of pure-breeding lines particularly marked by differences in fruit shape and

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size (and often seed number) and pubescence. In addition, study of pubescence characteristics is made difficult because the density of pubescence changes during development. The full leaf pubescence is developed before leaves have reached their mature size, so that young leaves appear more pubescent than mature leaves. Also hairs from both leaves and scapes tend to be lost with age, thus accentuating this effect.

Winge (1940) clearly showed that a range of cytotypes exists in NW Europe with chromosome numbers of $2n=14$ to $2n=64$. He was able to divide his material morphologically into four groups which he distinguished at the specific level. One cytotype with $2n=24$ (*E. semiduplex* Winge) was only recorded from Germany, and has not been subsequently found elsewhere. Plants with $2n=14$ are morphologically distinct (*E. simplex* Winge), while all other plants could be placed in two morphological groups; those with $2n=30-40$ (*E. duplex* Winge) and those with $2n=52-64$ (*E. quadriples* Winge). In Britain these three latter groups are present. The diagnostic characters used to distinguish them appear to have low plasticity. In particular they avoid use of capsule shape and details of hair types, widely employed in previous classifications with confusing results.

The statement of Markgraf (1962) (followed by Walters 1964) that some plants of *Erophila* (*E. verna* subsp. *spathulata*) have the stigmas of the flowers above the level of the anthers is clearly incorrect since these plants are largely automatically self-pollinated immediately after the outer anthers dehisce, when they and the stigma are at the same level and come into contact with one another; the original observations almost certainly refer to older flowers where development and enlargement of the ovary has already taken place.

Names of taxa delimited here have been checked against available lectotypes and other herbarium material collected by the authors quoted (see Filfilan 1984). The names have historically been misapplied in Britain, so old specimens may need to be redetermined.

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| 1 | Leaves densely pubescent, often appearing greyish; petioles not more than half as long as lamina; lower parts of stems densely pubescent, and with at least scattered hairs to the lowest pedicel; seeds 0.3-0.5 mm in length | <i>E. majuscula</i> |
| 1 | Leaves at most with a moderate pubescence, always appearing green; petioles at least half as long as lamina; lower part of stems almost glabrous to moderately pubescent, upper parts always glabrous; seeds 0.5 mm or more in length | 2 |
| 2 | Petals bifid to at least half their length and up to 3/4 their length; stems always with at least scattered hairs on the lower parts; leaves moderately pubescent | <i>E. verna</i> |
| 2 | Petals bifid to a maximum of half their length; stems either with very scattered hairs on the lower parts or glabrous; leaves sparsely pubescent, often only ciliate | <i>E. glabrescens</i> |

Good drawings by E. M. S. Easy are given in Rich (1991). Notes on distribution are given in Rich & Lewis (1999).

E. majuscula Jordan (*E. simplex* Winge)

Plants forming rosettes 0.7-3.0 cm in diameter. Leaves spathulate, 0.25-1.6 × 0.1-0.55 cm, 2-6 times as long as broad (including petiole); petioles relatively short, 1/5-1/2 as long as lamina. Leaves entire or with 1 tooth, usually densely pubescent with forked and stellate hairs, the leaves often appearing grey. Rosette bearing 2-10(-14) scapes. Scapes 1.5-9 cm long, densely pubescent towards the base with forked and stellate hairs and with at least scattered hairs on the upper parts. Inflorescence of 2-15 flowers. Pedicels spreading in fruit, glabrous or with a few scattered hairs. Sepals sometimes reddish, with simple

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and forked hairs. Petals 1.5-2.5 mm, bifid to not more than half their length. Fruits oblong to elliptic, 2.5-6 mm, 1.5-4 times as long as broad with 15-60(-70) seeds per capsule. Seeds 0.3-0.5 mm long. $2n=14$. The least common of the three British species described here; scattered through England, Wales and E Scotland; local in Ireland. Present in a range of habitats, very rare on coastal dunes.

E. verna (L.) Chevallier sensu stricto (*Draba verna* L.; *Erophila vulgaris* DC.; *E. boerhavia* (H. C. van Hall) Dumort.; *E. oedocarpa* Drabble; *E. inflata* H. C. Watson; *E. duplex* Winge; *E. spathulata* Láng *pro parte*; *D. praecox* Steven)

Plants forming rosettes 0.6-3.5(-7) cm in diameter. Leaves usually narrowly spathulate with acute apices, 1-2(-3) toothed or entire, $0.3-2.0(-3.5) \times 0.1-0.7$ cm, 1-6.5 times as long as broad (including petiole). Petioles about 0.5-1.7 times the length of the lamina, lamina with scattered to moderate pubescence of mainly branched hairs. Scapes very variable in number, up to 17 in well-grown plants, 1-10(-25) cm long, with a scattered pubescence of simple and branched hairs on the lower parts, upper parts of scapes and pedicels always glabrous. Inflorescence of 1-24 flowers. Sepals with scattered, usually simple hairs. Petals 1.5-3.5 mm, bifid for up to 3/4 of their length and usually not less than 1/2 their length. Fruits very variable, from almost circular to oblanceolate, usually compressed, but occasionally inflated, 1.5-9 mm, 1.5-3 times as long as broad. Seeds 15-50 (mean 20-40 per fruit); Seeds 0.5-0.8 mm. $2n=30, 32, 34, 36, 40, 42, 44$.

Two varieties, based on fruit shape, can be distinguished though Smith (1968) has shown that fruit shape varies more or less continuously.

i) **var. verna:** Fruits oblong to oblanceolate.

Plants with inflated fruits (*E. inflata* H. C. Watson; *E. spathulata* var. *inflata* (H. C. Watson) O. E. Schulz; *E. conferta* Wilmott) are present sporadically in normal populations, and are well known from V.c. 88 (Ben Lawers).

ii) **var. praecox** (Steven) Diklic (*Draba praecox* Steven; *Erophila praecox* (Steven) DC. ; *E. verna* subsp. *praecox* (Steven) Walters; var. *praecox* (Steven) Filfilan & Elkington; *E. spathulata* Láng *pro parte*): Fruits broadly elliptic to orbicular, most typically twice as long as broad or less.

The most widely distributed and common *Erophila* species in Britain and Ireland, probably growing in all the vice-counties from which the genus has been recorded. *E. verna* grows in a wide range of habitats. Var. *praecox* is scattered through Britain and in the north and west is particularly characteristic of sand-dunes; the taxon is mapped as *E. verna* subsp. *spathulata* by Perring (1968). Some sand dunes and other coastal sites have populations of var. *verna*.

E. glabrescens Jordan (*E. quadriplex* Winge)

Plants forming rosettes 0.5-3.0 cm in diameter. Leaves usually narrowly spathulate with acute apices, toothed or entire, $0.25-1.5 \times 0.1-0.5$ cm, 2-6 times as long as broad (including petiole). Petioles 0.5-2.5 times as long as leaf laminae, leaves glabrescent, or with scattered branched and occasionally simple hairs, often \pm ciliate only, the leaves frequently appearing \pm shiny. Scapes 1-15, 1-9 cm long, with a few forked and simple hairs on the lower parts. Often nearly glabrous; upper part of scapes and pedicels always glabrous. Sepals with scattered, usually simple hairs. Petals 2-4 mm long, bifid to not more than half their length. Fruits elliptic to oblanceolate, compressed, 3-6 mm, 1.5-4 times as long as broad. Seeds 20-60 (mean of 30-36 per fruit), fresh seeds 0.7-0.8 mm long, not less than 0.5 mm when young. $2n=48, 52, 54, 56$.

Generally distributed through Britain, although probably not as common as *E. verna*. Local in Ireland. Present in a wide range of habitats, including coastal dunes, and often in urban habitats.

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