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Is the enigma a variation? *Sagina boydii* F. B. White (Caryophyllaceae), Boyd's pearlwort

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Sagina boydii F. B. White (Caryophyllaceae), Boyd's pearlwort, is an enigmatic taxon of unknown geographical origin which is only known in cultivation and is of uncertain taxonomic status. Morphological, cytological and geographical evidence suggests that it is most similar to *S. procumbens* L. and *S. saginoides* (L.) H. Karst., but it differs in its compact growth form. Genetically, AFLP analysis shows that it can be included as part of the variation in *S. procumbens*. In cultivation, it will grow true from seed. Other compact growth forms occur in *S. procumbens* but do not grow true from seed. As *S. boydii* is part of the variation in *S. procumbens*, is of uncertain geographical origin, is known only in cultivation, and grows true from seed, it is best treated as a new cultivar, *Sagina procumbens* 'Boydii'. A neotype and standard specimen is designated. © 2005 The Linnean Society of London, *Botanical Journal of the Linnean Society*, 2005, **147**, 203–211.

ADDITIONAL KEYWORDS: AFLP – cultivar – cultivation – neotype – standard specimen.

INTRODUCTION

Sagina boydii F. B. White (Caryophyllaceae), Boyd's pearlwort, has been an enigma from its discovery to the present day. It was first described as a new species by F. B. White in 1887 from living specimens supplied to him by A. H. Evans and by W. B. Boyd. Boyd, the original finder, had written 'The plant was found among a number of other plants brought by me from Braemar in the autumn of 1878. I do not remember gathering the *Sagina*, and did not remember seeing it till planting out the rest of the collections on that occasion after my return home' (White, 1887). After examining it morphologically in some detail, White concluded it was a distinct and apparently undescribed species, and named it to draw attention to it in the hope it might be 'refound in the Glen Callater hills' (grid reference *c.* NO/1.8, south of Braemar, Aberdeenshire, Scotland) where Boyd thought he had found it.

The uncertainty concerning its origin was later set out more pointedly by Druce (1920): 'Supposed to have been found in Braemar in 1878 by Mr W. B. Boyd. He does not remember gathering it, but he found it in his potting shed among other specimens he brought back from Braemar, and his impression is that he gathered it on Ben A'an [now Ben Avon, grid reference *c.* NJ/1.0, north of Braemar]. But he had received about that time living plants from Switzerland for his garden, and there is the chance that it may be of foreign origin. In later years his memory rather crystallized upon Ben A'an; directly after his reporting it he was less certain. The plant is known from nowhere else. It does not perfect seed, but is propagated by cuttings. In order to check my remembrance of the details of its occurrence as given me by Mr Boyd (I had many talks with him about it as I was anxious to refind it), my

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remarks were submitted to Prof. I. B. Balfour, who kindly tells me that Mr Boyd in the early nineties on seeing his plant of *Boydii* at Edinburgh said – "I have no recollection of getting that plant. I believe it is to be a Braemar plant, but when I was arranging for planting my Braemar collections I had also in hand some Swiss plants, and it may have been one of them." As Prof. Balfour says: "There is nothing in it – whether it be a species or otherwise – to forbid its being a British plant; nothing in it to say nay to a continental origin. Re-finding is what is to be aimed at" '. Balfour also noted in correspondence to G. C. Druce held in OXF 'he did not care to have suspicion cast upon it', indicating Boyd was fairly defensive about its Scottish origin.

Boyd himself tried to refind the plant on several occasions without success (Druce, 1919). Boyd travelled and collected widely in Scotland, and no further detailed information on localities visited in the area can be gleaned from data in Boyd's collections or biographies (Druce, 1919; Fair, 1940). No other material referable to *S. boydii* has been seen in herbaria examined in detail (BM, E, K or NMW). There are occasional erroneous literature reports and herbarium specimens of cultivated origin suggesting it originated from Ben Lawers, Perthshire (e.g. Fair, 1940; or specimen in K).

In this paper we review information about *S. boydii* and its relatives and use a DNA fingerprinting technique to see if any further light can be thrown on the enigma. AFLP (amplified fragment length polymorphism) is a highly reproducible method of obtaining genetic fingerprints from small amounts of DNA consisting of fragments of different sizes, which are then visualized as bands (Vos *et al*., 1995). It has been effectively utilized in studies within and between taxa (e.g. Travis, Maschinski & Keim, 1996; Fay *et al*., 1999, 2002; Krauss, 2000; Hedrén, Fay & Chase, 2001; Fay, Cowan & Simpson, 2003; Richardson *et al*., 2003; Wilkinson *et al*., 2003) and for investigation of hybrid origin of taxa (e.g. Beismann *et al*., 1997; Fay *et al*., 2002, 2003). In hybrids, it is usual to find additivity of fragments from the parental taxa, and more fragments in total in the hybrids than the parental taxa (Fay *et al*., 2003).

MATERIAL AND METHODS

Taxonomy

A review of the literature and herbarium material in BM, K and NMW was undertaken to establish the relationships of *S. boydii* within the genus *Sagina*.

DNA extraction and AFLP

Leaf material from individual plants was collected into silica gel (Chase & Hills, 1991) and stored until needed for extraction or, in one case, collected fresh for use. DNA was extracted from between 0.1 and 0.3 g silica-dried material using a modified 2XCTAB (cetyltrimethyl-ammonium bromide) procedure (Doyle & Doyle, 1987), purified on a Qiagen column and quantified on a spectrophotometer. Table 4 lists the samples used in this study. AFLP fingerprints were performed according to the AFLP Pant Mapping Protocol of Applied Biosystems Inc. For each sample, 0.5 μg DNA dissolved in 5.5 μL pure water was digested with the restriction enzymes *Eco*R1 and *Mse*1, and adaptors with a 5′ tail were ligated to the fragments. A preselective round of PCR was performed using an *Eco*R1 primer complementary to the *Eco*R1 adaptor, and an *Mse*1 primer complementary to the *Mse*1 adaptor but with an additional 3′ base. The product from this PCR was used in a selective round of PCR in which the *Eco*R1 primer had a 5′ fluorescent label and two extra 3′ bases, and the *Mse*1 primer had a further two 3′ bases (three in total). The primer combination used for this was FAM-*Eco*R1 + TG and *Mse*1 + CTT. Amplification reactions were separated on an ABI 3100 DNA analyser using 36 cm capillaries and POP6 polymer. GENESCAN 2.1 and GENOTYPER 2.0 were used to analyse the data, and all fragments 50 and 500 bp in length scored for presence (1) or absence (0) for all samples. This was exported as a binary matrix, which was analysed using the UPGMA (Unweighted Pair-Group Method using Arithmetic Averages) algorithm in the software package PAUP* version 4.0 for Macintosh (Swofford, 1998) and by principal coordinates analysis (PCOA) in the R Package for Multivariate Analysis version 4.0 (Casgrain, 2001), using Jaccard's coefficient (Jaccard, 1908).

Cultivation

Observations on plants in cultivation were made at Kew and Sussex, the latter including observations on its reproductive biology. Consideration was also given to what might be its natural habitat based on its cultivation habits.

RESULTS

Taxonomy

The genus *Sagina* L. is reasonably well defined and is composed of about 30 species, chiefly distributed around the northern hemisphere and in tropical mountain ranges (e.g. Andes, New Guinea). Europe is the primary centre of diversity and eastern Asia a secondary centre (Crow, 1978). Some species such as *S. procumbens* L. are now cosmopolitan weeds.

Sagina boydii is an obvious member of the genus *Sagina* and of section *Sagina* as set out by Crow (1978). At a glance, *S. boydii* is a distinct species char-

acterized by being a densely tufted, dark green, glabrous perennial with very short internodes and crowded linear, shortly mucronate leaves, erect peduncles, small 4- or 5-merous flowers with erect sepals and no petals and a globose capsule shorter than the sepals (White, 1887). Most taxonomists have accepted *S. boydii* as a distinct species, but it has been treated either as a subspecies of *S. saginoides* or as close to *S. procumbens* in the major British and European *Sagina* accounts (Table 1). In other literature it has been suggested to be a form, mutant, sport or hybrid (e.g. Anon, 1892; McClintock, 1966).

Sagina boydii is visually most similar to *S. nivalis* (Lindblad) Fries, *S. procumbens* and *S. saginoides* (L.) H. Karst. in the British Isles, but differs in its compact growth form and/or in lacking petals (Table 2). As Boyd's remarks to Balfour indicated it might have come with some Swiss plants (cf. above), the six Swiss *Sagina* taxa (Clapham & Jardine, 1993) were also considered; *S. glabra* (Willd.) Fenzl is the only species not also present in Britain and again, differs in having conspicuous petals (Table 2).

Given the uncertainty about the geographical origin, *Sagina* taxa worldwide were considered, using a broad approach due to the complex synonymy (Table 2). Of these other taxa, it is most similar to the boreal *S. caespitosa* Lange, but this also has petals.

Table 3 lists the chromosome numbers of European taxa abstracted from the BSBI Database (http://www.bsbi.org.uk) and Crow (1978). *Sagina boydii* has the same chromosome number as *S. procumbens*, *S. saginoides* and their hybrid *S.* × *normaniana* Lagerh., and is in common with part of the ranges cited for *S. maritima* G. Don, *S. nodosa* (L.) Fenzl and *S. subulata* (Swartz) C. Presl. *Sagina caespitosa* and *S. nivalis* have much higher chromosome numbers.

The evidence from morphology, cytology and geography thus indicates that *S. boydii* is most similar to *S. procumbens* and *S. saginoides*, from which it differs in its compact growth form.

AFLP

In total, 219 fragments were scored, of which 211 (96%) were polymorphic. In an initial UPGMA and principal coordinates analysis (not presented), *S. subulata*, *S. nivalis* and *S. apetala* Ard. were increasingly genetically distant from the *S. saginoides*, *S.* × *normaniana*, *S. procumbens* and *S. boydii* samples, and were therefore discarded from the analysis. This left 108 scored bands of which 71 (66%) were polymorphic. There was clear additivity of parental bands in *S.* × *normaniana*, which had 16 bands shared only with the *S. saginoides* sample and 30 bands shared only with *S. procumbens* and *S. boydii*. Each *S.* × *normaniana* sample also had more bands (81, 81, 86) than the *S. saginoides* sample (62), the *S. boydii* samples (both 72) or the *S. procumbens* samples (66–76). Each taxon, except *S. boydii*, had a few unique bands (Table 5). The *S. boydii* samples contained no unique bands, all being shared at least with *S. procumbens*, although both samples contained one band not found in the other sample. These two fragments may be homologous, i.e. alleles of the same locus.

In the UPGMA, and in the pairwise similarity table calculated using Jaccard's coefficient (Table 6), the *S. boydii* samples were closest to the *S. procumbens* samples from Uppsala, Sweden and the Royal Botanic Garden Edinburgh. The first, second and third coordinates accounted for 59, 9 and 7% of the variance, respectively. UPGMA (Fig. 2) and the principal coordinates analysis (Fig. 1) both showed *S. boydii*

Table 1. Treatment of *Sagina boydii* in major British and European *Sagina* accounts

Author	Taxonomy	Status
Bentham & Hooker (1912 and subsequent editions)	Not included	–
Williams (1917)	*S. saginoides* (as *S. linnaei* C. Presl ssp. *boydii* F. N. Williams)	'Aberdeenshire. . . . The plant may possibly be a *lusus*.'
Moss (1920)	*S. boydii*	'Only once found (probably in Braemar . . .)'
Druce (1932)	*S. boydii*	'Supposed to have been found in Scotland . . . but there are great elements of doubt.'
Wright (1938a,b)	*S. boydii*	'puzzle'
Clapham, Tutin & Moore (1987)	*S. boydii*	'Probably native. Presumed to have been collected near Braemar . . .'
Clapham & Jardine (1993)	Grouped with *S. procumbens*, but not numbered separately	'. . . presumed to have been collected near Braemar . . .'
Stace (1997)	*S. boydii*	'Enigmatic; presumed to have been collected in S Aberdeen . . .'

Table 2. Distribution of *Sagina* taxa and major characters by which they differ from *S. boydii*, compiled from herbarium material, Clapham & Jardine (1993), Crow (1978), Mizushima (1960) and Shteinberg (1970)

Taxon	Major characters differing from *S. boydii*	World distribution
S. abyssinica Hoscht. ex A. Rich.	Large flowers	Africa
S. afroalpina Hedberg	Lax growth form with large leaves	Africa
S. apetala Ard.	Annual	Europe, W. Asia, N. America, introduced to E. Asia
S. belonophylla Mattf.	Many long stems with crowded leaves	New Guinea
S. brachysepala Chiov.	Lax growth form	Ethiopia
S. caespitosa Lange	Conspicuous white flowers	W. Fennoscandia, Iceland, N. Spitsbergen, N. America
S. chilensis Gay	Lax growth form	S. America
S. decumbens Torr. & Gray	Annual, petals present, lax growth form	N. America
S. donatioides F. Muell.	Conspicuous petals	New Guinea
*S. glabra (*Willd.) Fenzl	Lax growth form, conspicuous petals, long pedicels	S. Europe
S. humifusa Fenzl ex Rohrb.	Lax growth form	S. America
S. japonica (Sw. ex Steud.) Ohwi	Annual, petals present	E. Asia, introduced to N. America
S. litoralis Hultén	Long pedicels, glandular and petals	Far East
S. maritima G. Don	Annual	Europe, N. Africa, W. Asia.
S. maxima A. Gray	Larger, petals present	E. Asia, N. America
S. monticola Merr. & L. M. Perry	Erect stems	East Asia
S. nivalis (Lindblad) Fries	Petals present	Arctic and NW Europe, Asia
S. nodosa (L.) Fenzl	Conspicuous white flowers	Europe, N. America, Greenland
S. oxysepala Boiss.	Annual	Caucasus
S. papuana Warb.	Lax growth form	New Guinea
S. pilifera Fenzl	Conspicuous white flowers	Endemic of Corsica and Sardinia
S. procumbens L.	Forming lax patches and rooting at nodes	Europe, W. Asia, N. America, introduced to E. Asia
S. rupestris R. T. A. Schouten ex Kai Larsen	Conspicuous petals	New Guinea
S. sabuletorum Lange	Glandular, procumbent radiating flowering stems	Iberian Peninsular
S. saginoides (L.) H. Karst.	Lax tufts, petals present	Europe, Asia, N. America
S. subulata (Swartz) C. Presl	Conspicuous white flowers	Europe, introduced to N. America
S. truncata Colenso	Procumbent rooting at nodes	New Zealand (possibly not native)
S. valdiviana Phil.	Lax growth form	S. America

clustered with *S. procumbens*, the *S.* × *normaniana* samples clustered together and the *S. saginoides* sample was separate.

CULTIVATION

Since *S. boydii* was first found, it has been maintained in cultivation in botanic gardens (e.g. Kew and Edinburgh, and formerly, Cambridge) and by commercial nurseries. Some horticulturists regard growing it successfully as problematic (Fair, 1940), whilst others regard it as not too difficult, although it may be very slow growing (e.g. Mathew & Starling, 1975). Some horticulturists have even grown it into 'spheres' as a novelty by repeatedly excavating around the base of the dense, tight cushions.

Sagina boydii is a perennial which forms dense cushions, typical of many alpine and snow-bed species. In cultivation in the lowlands it is evergreen. Flowering is erratic. Buds have appeared in late May, and open flowers observed from May to mid-July (Wright, 1938a; S. Heyward & V. Heyward, pers. observ.). The flowers are held close to the rosette. The sepals stay appressed and do not open. The stamens are well formed and the pollen grains are normal, but the stigmas may be ill developed or rudimentary in some flowers (Wright, 1938a).

Although Druce (1920) reported that *S. boydii* did not set seed, Heyward & Heyward (1984; T. Hall pers. observ.), after careful observation, found that it did set seed but that as the capsules developed, the pedicel was overgrown by the leaves and the capsule was

Table 3. Chromosome numbers reported for European *Sagina* taxa

Taxon	2*n* chromosome numbers
S. apetala	12
S. boydii	22
S. caespitosa	88, <100
S. decumbens	36
S. glabra	–
S. japonica	42 or 44
S. maritima	22–24, 28
S. maxima	22, 42, 44, 46, 66
S. nivalis (*S. intermedia*)	84, 88
S. nodosa	22–24, 44, 56
S. pilifera	–
S. procumbens	22
S. sabuletorum	–
S. saginoides (*S. linnaei*)	22
S. subulata	18, 22
S. × *normaniana* (*S. procumbens* × *saginoides*)	22

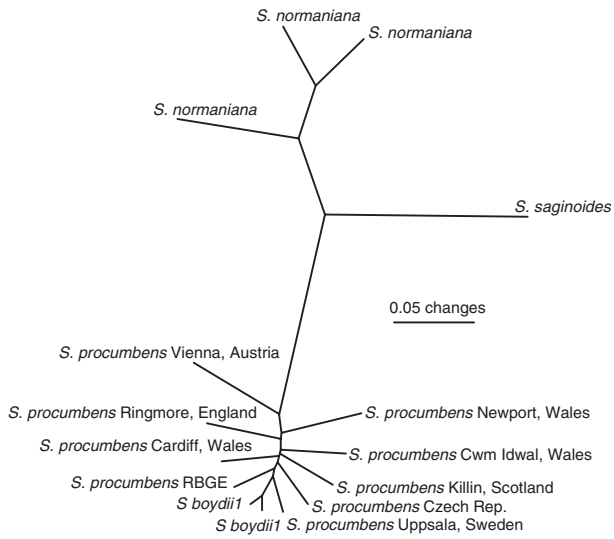

Figure 1. Plot of the first and second axes from the principal coordinates analysis of *Sagina* samples.

Table 4. Sources of *Sagina* DNA samples with National Museum of Wales (NMW) or other voucher accession numbers

Taxon	Source	NMW accession no.
S. apetala	Caroual, France	NMW.V. 2001.24.10
S. apetala	Cardiff, Wales	NMW.V. 2001.25.17
S. boydii	Cultivated at Kew (original T. Ingwersen Ltd)	Kew 1981–28 (living collections)
S. boydii	Potterton & Martin Nursery	NMW.V. 2000.28.1
S. nivalis	Ben Lawers, Scotland	–
S. × *normaniana*	Ben Lawers, Scotland	NMW.V. 2001.34.2
S. × *normaniana*	Beinn Ghlas, Scotland	–
S. × *normaniana*	Ben Lawers, Scotland	NMW.V. 2001.34.3
S. procumbens	Killin, Scotland	NMW.V. 2001.34.4
S. procumbens	Cardiff, Wales	NMW.V. 2001.25.1
S. procumbens	Cwm Idwal, Wales	NMW.V. 2003.1.44
S. procumbens	Ringmore, England	NMW.V. 2003.1.70
S. procumbens	Křivoklát, Czech Republic	NMW.V. 2003.1.71
S. procumbens	Newport, Pembrokeshire, Wales	NMW.V. 2003.1.72
S. procumbens	Uppsala, Sweden	NMW.V. 2003.1.74
S. procumbens	Vienna, Austria	NMW.V. 2003.4.1041
S. procumbens	Royal Botanic Garden Edinburgh	Voucher in E
S. saginoides	Ben Lawers, Scotland	NMW.V. 2001.34.1
S. subulata	Cap Fréhel, France	NMW.V. 2001.24.9

included inside the cushion with the sepals tightly appressed. The capsules open explosively and can throw seeds a short distance, but seed is most likely to be shed inside the cushion. The numbers of seeds per capsule varied widely, a quarter having no seed and the remainder an average of 6.7 seeds per capsule (Table 7). Germination takes about 10–12 days, but growth thereafter may be slow. Seed from 1984 sown in October 1987 flowered in June 1988, and it grew true from seed.

Although *S. boydii* can be grown from seed, it is usually propagated by cuttings/division. Mathew & Starling (1975) reported that after careful division in spring, it is important to establish a good root system

Table 5. Distribution of fragments among the taxa studied

Taxa fragments found in	Number of fragments
S. × *normaniana* + *S. saginoides* + *S. procumbens* (including *S. boydii*)	43
S. × *normaniana* + *S. saginoides*	16
S. × *normaniana* + *S. procumbens* (including *S. boydii*)	30
S. procumbens (including *S. boydii*) only	13
S. saginoides only	2
S. × *normaniana* only	3
S. boydii only	0

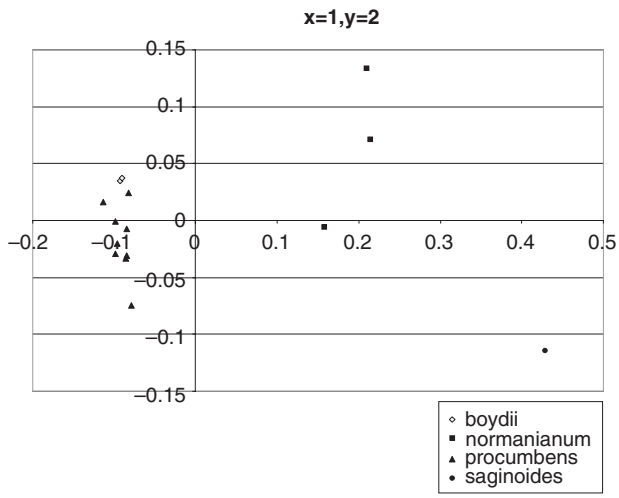

Figure 2. UPGMA dendrogram showing relationships of *Sagina* samples.

on each plantlet in sharp grit before transferring to a rocky crevice or hole in tufa. At Kew, it grows best plunged in a cold frame with glass over the top in winter. When grown in the Arctic refrigerated bench of Kew's Alpine House, the growth form becomes very lax due to poor ventilation and the lack of adequate shading. S. Heyward & V. Heyward (pers. observ.) found that it grew well in clay pots in an alpine house and also in a sand plunge in a raised 'Access' frame, with shading in summer and as much ventilation as possible. Aspland (1990) reported a lack of success when growing it in a cold greenhouse.

Sagina boydii seems susceptible to damage by sharp frost or late snow after being encouraged into early spring growth (S. Heyward & V. Heyward, pers. observ.; Bixley, 1993). In summer, excessive heat and drought are significant threats; red spider mite and aphids also attack and kill it. Under some conditions, plants are susceptible to mildew, and they do not tolerate too much wetness in winter.

DISCUSSION

Although the AFLP study clearly separated the other taxa included in the study, it was not able to separate *S. boydii* from *S. procumbens.* It also confirmed the status of *S.* × *normaniana* as a hybrid (Hepper, 1975) through fragment additivity from the parents, a greater fragment number than the parents and its intermediate clustering position. There was a significant amount of genetic variation in *S. procumbens*, which did not correlate with geography, as might perhaps be expected for a cosmopolitan weed.

The rather uncertain taxonomic position of *S. boydii* is now clear as part of the genetic variation within *S. procumbens*, and the enigma is thus a variation. *Sagina procumbens* is quite variable across its range, differing in colour, size, habit, hairiness, development of a mucro on the leaf apex, number of parts to the flower, presence or absence of petals, number of stamens etc., even with populations. Numerous varieties of *S. procumbens* have been described (Druce, 1928 lists six for Britain alone), but few have been evaluated experimentally. Compact growth forms are commonly found in trampled paths, pavements and lawns, or in other depauperate environmental conditions, showing that it has the potential to develop the growth form seen in *S. boydii*. Compact forms cultivated by J. K. Morton, referred to *S. procumbens* var. *compacta* Lange, grew into normal *S. procumbens* (Crow, 1978) and, similarly, seeds from compact pavement weeds in Cardiff have grown into normal *S. procumbens* when grown in a greenhouse. *Sagina boydii* differs from these compact forms in retaining its growth form from seed.

No further light has been shed on the geographical origin of *S. boydii*, which, from the balance of probabilities, does seem to have been from near Braemar, Scotland as thought by Boyd (Wright, 1938a). Based on T. Hall's long experience of cultivating alpine plants, *S. boydii* would either have been a plant of rock crevices or, less likely, snow patches, with a slight preference for acidic damp soils, all of which conditions occur abundantly in the Braemar area. Botanists such as D. J. Tennant have kept an eye out for it whilst in the area without success (pers. comm., 2001), but we are not aware of any recent systematic specific searches for it. Detailed sampling of *S. procumbens* near Braemar, or in Switzerland, or indeed at Faldonside where Boyd lived, might reveal some more closely related genotypes to provide circumstantial evidence of geographical origin.

As the taxon is part of the variation in *S. procumbens* but is of uncertain geographical origin, is only known in cultivation and grows true from seed,

Table 6. Pairwise similarity table calculated using Jaccard's coefficient

	S. boydii Potterton & Martin	*S. boydii* Kew	*S. normaniana* Bein Ghlas	*S. normaniana* Ben Lawers	*S. normaniana* Ben Lawers	*S. procumbens* Cardiff	*S. procumbens* Killin	*S. procumbens* Ringmore	*S. procumbens* Edinburgh	*S. procumbens* Cwm Idwal	*S. procumbens* Vienna, Austria	*S. procumbens* Newport	*S. procumbens* Uppsala	*S. procumbens* Křivokiát	*S. saginoides*Ben Lawers
S. *boydii* Potterton & Martin	1.000														
S. *boydii* Kew	0.973	1.000													
S. × *normaniana* Beinn Ghlas	0.681	0.681	1.000												
S. × *normaniana* Ben Lawers	0.719	0.719	0.815	1.000											
S. × *normaniana* Ben Lawers	0.700	0.700	0.898	0.820	1.000										
S. *procumbens* Cardiff	0.907	0.907	0.653	0.727	0.689	1.000									
S. *procumbens* Killin	0.878	0.878	0.645	0.741	0.644	0.890	1.000								
S. *procumbens* Ringmore	0.922	0.897	0.636	0.670	0.653	0.861	0.833	1.000							
S. *procumbens* Edinburgh	0.933	0.908	0.692	0.711	0.692	0.870	0.892	0.863	1.000						
S. *procumbens* Cwm Idwal	0.907	0.882	0.635	0.670	0.670	0.868	0.865	0.861	0.895	1.000					
S. *procumbens* Vienna	0.842	0.842	0.638	0.674	0.637	0.782	0.800	0.778	0.855	0.805	1.000				
S. *procumbens* Newport	0.890	0.890	0.634	0.709	0.652	0.827	0.822	0.820	0.853	0.827	0.836	1.000			
S. *procumbens* Uppsala	0.932	0.932	0.649	0.744	0.685	0.918	0.916	0.859	0.919	0.892	0.827	0.875	1.000		
S. *procumbens* Křivoklát	0.918	0.892	0.656	0.713	0.674	0.878	0.875	0.870	0.905	0.878	0.863	0.861	0.903	1.000	
S. *saginoides* Ben Lawers	0.457	0.457	0.663	0.663	0.723	0.466	0.483	0.438	0.467	0.462	0.444	0.455	0.472	0.477	1.000

Table 7. Numbers of seeds in 52 fruiting capsules of *Sagina boydii* harvested on 5 and 19 August 1984

No. seeds per capsule	No. capsules	No. seeds per capsule	No. capsules
0	13	12	2
1	4	13	0
2	5	14	2
3	4	15	1
4	5	16	1
5	3	17	1
6	4	18	0
7	2	19	0
8	0	20	0
9	1	21	0
10	3	22	0
11	0	23	1

we propose that it is best treated as a cultivar, *Sagina procumbens* 'Boydii'. It is clearly described in White (1887), the bulk of whose herbarium is in Perth Museum (PTH) but which does not contain any *S. boydii* (M. Simmons, pers. comm.). Other institutions holding F. B. White exsiccatae or *S. boydii* are ABD, BM, CGE, E, K, MANCH, NMW and OXF, but no material is indicated as having been seen by White prior to 1887. In the absence of herbarium specimens seen by White, *S. boydii* is hereby neotypified as the accurate illustration in Anon (1892: plate 326B), which was drawn from material supplied by W. B. Boyd. This typification also comprises the standard specimen recommended for new cultivars.

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