Watsonia, **19**, 259–263 (1993)

Skunkweed (*Navarretia squarrosa* (Eschsch.) Hook. & Arn.) and other Polemoniaceae in Britain

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ABSTRACT

The discovery of a large population of Skunkweed, *Navarretia squarrosa* (Eschsch.) Hook. & Arn. (Polemoniaceae) in Windsor Great Park, Berks. (v.c. 22) has prompted further investigation into this little known alien, which is described, illustrated and discussed in conjunction with related species. A key is given to separate four relevant genera.

INTRODUCTION

Skunkweed, *Navarretia squarrosa* (Eschsch.) Hook. & Arn. (Polemoniaceae), has a long history of periodic occurrence in Britain but is not treated in recent Floras (Clapham *et al.* 1987; Stace 1991). In early July 1990, M.F.G. was informed that a large population of *N. squarrosa* had been discovered on private land within Windsor Great Park (v.c. 22, Berks.). On investigation it was found that the colony of several thousand plants was thickly scattered on more or less bare sandy ground which had until recently been a rubbish dump. This site had been sown the previous autumn with a grass and wild-flower amenity mixture, the grass seed of which had originated from Oregon. Germination of the sown mixture had been almost non-existent and instead the area was sparsely covered by mainly mosses and several early colonising species such as *Spergularia rubra* (L.) J. & C. Presl and *Gnaphalium uliginosum* L. It was interesting to note that grasses were almost absent. The whole area was almost flat with a few slight hollows which presumably held water during the winter. In June these were covered with the annual White Forget-me-not *Plagiobothrys scouleri* (Hook. & Arn.) I. M. Johnst., a member of the Boraginaceae which is also a native of western North America (Stace 1991).

In 1991 both *N. squarrosa* and *P. scouleri* reappeared in considerable numbers suggesting that seed had been successfully set the previous year. However, long-term persistence is unlikely, as the ground will probably become overgrown again. In mid-June only small seedlings of *N. squarrosa* were present and on walking through these plants their foetid smell, resembling petrol or rotten eggs, was very prominent.

DESCRIPTION OF *NAVARRETIA SQUARROSA*

The genus *Navarretia* (Polemoniaceae) contains 30 annual species of which 29 are native to western N. America and one is native to Chile and Argentina (Mabberley 1987). Many species of *Navarretia* look somewhat similar and the following description defines *N. squarrosa*.

Navarretia squarrosa (Eschsch.) Hook. & Arn., *Bot. Beechey's Voy.* **8**: 368 (1839). Fig. 1.
Synonyms: *Hoitzia squarrosa* Eschsch., *Mém. Acad. Sci. St Pétersb.* **10**: 283 (1826); *Gilia pungens*

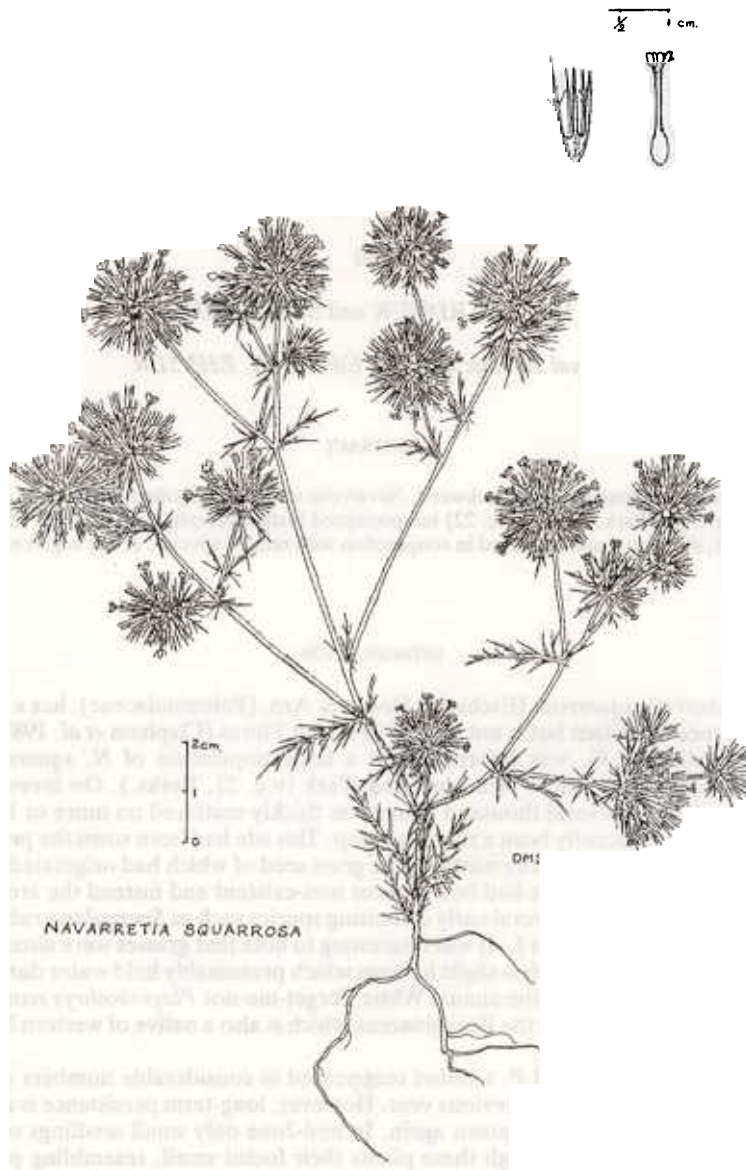

FIGURE 1. *Navarretia squarrosa* (Eschsch.) Hook. & Arn., Skunkweed

Douglas ex Hook., *Bot. Mag.* **57**: t. 2977 (1830); *Gilia squarrosa* (Eschsch.) Hook. & Arn., *Bot. Beechey's Voy.* **4**: 151 (Oct. 1833); *Aegochloa pungens* (Douglas ex Hook.) Benth., *Edward's Bot. Reg.* **19**: sub pl. 1622 (1 Oct. 1833); *Navarretia pungens* (Douglas ex Hook.) Hook., *Fl. Bor. Am.* **2**: 75 (1838).

Erect annual 5–35 cm, with usually one main stem, rather stout and rigid, the lateral branches more or less well developed producing a top-heavy plant narrowing to a slender base; all parts except flowers glandular-viscid, with a strong, unpleasant odour (hence the vernacular name). Leaves alternate, sessile, 1·5–3·5 × 1–2·5 cm, varying from bipinnate to pinnately and palmately dissected,

the linear lobes spinescent. Flowers in capitate, bracteate clusters; calyx tube 7–10 mm, scarious between the ribs, with unequal, subulate, spinescent lobes; corolla 7–13 mm, infundibuliform, blue to whitish, barely exceeding the calyx; stamens 5, slightly unequal, inserted in corolla throat; stigmas 3. Capsule ellipsoid, 3-locular, each loculus with 6–8 or more ovules. Seeds 0·6–0·8 mm, dark brown, irregularly angled-ovoid, rugose. Native to western N. America, from Vancouver Island in the north, south to California (Hitchcock *et al.* 1959).

Cantua pungens Torrey, *Ann. Lyc. Nat. Hist. N. York* **2**: 221 (1828) was described on the basis of a specimen collected by Edwin P. James in 1820, in the valley of the Loup Fork (Nebraska). This is obviously not the same specimen as the type of *Gilia pungens* Douglas ex Hook. (collected by David Douglas on the Multnahomack River, California); because the respective type descriptions of *C. pungens* and *G. pungens* differ in several important points (e.g. *C. pungens*: flowers solitary, axillary; *G. pungens*: flowers in capitate clusters), *C. pungens* is not considered to be synonymous with *Navarretia squarrosa*, although *Index Kewensis* considered it to be so (R. R. Mill, pers. comm.). The type locality of *C. pungens* is also far outside the geographical range of *N. squarrosa.*

Voucher specimens of *Navarretia squarrosa* and *Plagiobothrys scouleri* have been deposited in **RNG, E, herb. E.J.C.** and **herb. M.F.G.** Specimens of *N. squarrosa* were also collected and distributed by the University of Reading through the Société pour l'Échange des Plantes Vasculaires de l'Europe et du Bassin Méditerranéen. It is interesting to note that the oils within the plant are volatile and pressed specimens soon totally lose their foetid odour. *N. squarrosa* seems to be very poorly represented in the literature and in herbaria as a British adventive. For example, there are no specimens held by **BM, CGG** and **K.**

HISTORY OF OCCURRENCE IN BRITAIN

1828–1830

The species was probably first cultivated in Britain in 1829 or 1830, when plants were raised by the Horticultural Society of London from seed collected by David Douglas in North America. He collected seed from plants growing on moist ground in mountain valleys near to the sources of the Multnahomack river, one of the southern branches of the Columbia river in western North America. Plants from this collection were subsequently illustrated in the *Botanical Magazine*, tab. 2977 (Hooker 1830) and although not garden worthy, references to *Navarretia squarrosa* have persisted in horticultural literature to the present day (Huxley 1992).

1915–1933

The species was first collected as an alien by Miss I. M. Hayward in August 1915 under Ladhope Bridge, Galashiels, Selkirks., v.c. 79, where it was growing on shingle beside Gala Water and had presumably been introduced with wool shoddy (Druce 1916; Hayward & Druce 1919). It was determined by A. Thellung as *Gilia pungens* Douglas ex Hook. & Arn. Some eight years later it was collected from Sleaford, S. Lincs., v.c. 53, by Miss Landon where it was thought to have been introduced with chicken corn (Druce 1924); again determined by Thellung, this time as *G. squarrosa* Hook. & Arn. (**OXF**). The same year it was also collected from Hythe Quay, Colchester, N. Essex, v.c. 19, where it was thought to have been introduced with malting refuse. Plants were still being recorded from the same locality the following year (Brown 1930, **OXF**). The next recorded occurrence was reported by Miss C. M. Rob from Topcliffe, near Thirsk, N. E. Yorks., v.c. 62, where it came up in a newly made lawn. In this case the plant may have been introduced with sawn wood which originated from California and was used for constructing the doors of the house (Pearsall 1934).

1978–1979

Nearly half a century passed before the species was seen again in Britain, this time as a weed in a rose bed by Mrs M. Baecker at Carr Bank, Milnthorpe, Westmorland, v.c. 69, in 1978 and 1979 (Clement 1979, **herb. E.J.C.**).

OCCURRENCE ELSEWHERE

Navarretia squarrosa has also been recorded as a bird seed alien in the Netherlands (Ooststroom & Reichgelt 1963) and as a ruderal in Denmark (Hansen 1979). Outside Europe it is recorded in the floras of New Zealand and Australia, having first been noted early in the century by Black (Robertson 1957); it persists there to the present day (Toelken 1986; Webb *et al.* 1988).

OTHER POLEMONIACEAE IN BRITAIN

There is only one member of the Polemoniaceae native to Britain and Ireland. Jacob's Ladder, *Polemonium caeruleum* L., occurs in limestone grassland, on screes, on rock ledges and on the borders of woodland in northern England and is reported (Stace 1991) as a sporadic garden escape elsewhere. However, B. Wurzell (pers. comm.) warns that since a number of similar *Polemonium* species, varieties and hybrids are grown in gardens, no wild plant of such provenance should be attributed to *P. caeruleum* without careful verification. Stace (1991) also lists *Phlox paniculata* L., another North American species, as sporadically naturalised on rough and waste ground in England. At the last published tally (Druce 1928), twelve alien Polemoniaceae were listed, the genus *Gilia* contributing most taxa. None of these was included in the two more recent lists of British plants (Dandy 1958; Kent 1992). *Phlox drummondii* Hook. and *P. subulata* L. have been observed as adventives on urban wasteland (B. Wurzell, pers. comm.)

KEY TO THE GENERA OF POLEMONIACEAE OCCURRING IN BRITAIN

The following key may aid the identification of three of the commonest genera most likely to be confused with *Navarretia*:

1. Calyx green and herbaceous throughout ..... 1. *Polemonium*
1. Calyx with prominent scarious or hyaline intervals between the green and more herbaceous costae 2
2. Staminal filaments very unequally inserted; leaves opposite ..... 2. *Phlox*
2. Staminal filaments equally or almost equally inserted; leaves alternate 3
3. Calyx-lobes obviously unequal; leaf segments spine-tipped ..... 3. *Navarretia*
3. Calyx-lobes equal or nearly so; leaf-segments not spine-tipped ..... 4. *Gilia*

ACKNOWLEDGMENTS

The authors are grateful to the following for their assistance in the accumulation of information for this paper: Miss S. Andrews, Mrs M. C. Foster, Dr S. L. Jury, Miss S. K. Marner, Miss A. M. Paul, Mr M. C. Tebbitt and Dr P. F. Yeo. Thanks are also due to Dr J. R. Akeroyd and Dr R. R. Mill for their helpful comments on earlier drafts of the paper and Mr B. Wurzell for providing further useful information on other alien Polemoniaceae. Mrs O. M. Stewart is especially acknowledged for preparing the drawing.

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(*Accepted January 1993*)