

A new species of *Nivenia* (Iridaceae)

P. GOLDBLATT*

Keywords: Iridaceae, new species, *Nivenia*, South Africa, taxonomy

Nivenia parviflora Goldblatt, sp. nov.

Plantae 0.3–0.5(–0.8) m altae, sempervirentes, caulibus pluribus e caudice lignoso compresso elliptico, foliis distichis ensiformibus ad linearibus usitate 50–70 × 3–4 mm, inflorescentiis ex rhipidiis binatis bifloris 20–60 compositis paniculam corymbosam formantibus, spathis 3–4 mm longis, bracteis siccis papyraceis corrugatis brunneis, floribus pallide caeruleis heterostylis, tubo perianthii ± 5.5 mm longo, tepalis subpatentibus lanceolato-ellipticis 6.3–7 × 2.4–3.0 mm, filamentis ± 6 mm longis (plantis brevistylis) vel ± 2 mm longis (plantis longistylis), antheris ± 1.3 mm longis pallide caeruleis, ovario ± 1.2 mm longo, stylo ± 2 mm (plantis brevistylis) vel 6–8 mm (plantis longistylis) ex tubo exserto, lobis stigmatis ± 0.4 mm longis.

TYPE.—South Africa. Western Cape, Ladismith District, Klein Swartberg Mountains, slopes of Toringberg, ± 800 m, 25 Mar. 1996, Goldblatt 10498 (NBG, holo.; BOL, K, MO, PRE, WAG, iso.).

Description

Shrubs 0.3–0.5(–0.8) m high, evergreen, bearing several branches from base. *Stems* few and irregularly branched, leafy terminal branches compressed, ± 3 mm at widest diameter. *Leaves* forming a distichous fan, narrowly lanceolate to nearly linear, mostly 50–70 × 3–4 mm, veins not evident when alive. *Inflorescence* a corymbose pseudopanicule of 40–120 flowers in 20–60 flower pairs, peduncles exserted from leaves, compressed and 2-winged, 3.0–4.5 mm wide, ultimate branches bearing paired flowers within opposed spathes; *spathes* 3–4 mm long, outer slightly larger than inner, coriaceous, reddish brown, sometimes green near bases, dry and dark brown above; *floral bracts* dry, reddish brown, much wrinkled, ± 5 mm long. *Flowers* hypocrateriform, heterostylous, mostly pale blue, occasionally middle blue (rarely white), white at base of tepals and in tube; *perianth tube* cylindric, ± 5.5 mm long; *tepals* subpatent, held ± 30° above horizontal, lanceolate-elliptic, 6.3–7.0 × ± 2.4–3.0 mm. *Filaments* filiform, suberect, inserted just below top of tube, either ± 6 mm long (thrum morph) or ± 2 mm long (pin morph); *anthers* submedianly fixed, becoming versatile, ± 1.3 mm long, pale blue, pollen whitish. *Ovary* ovoid-turbinate, ± 1.2 mm long; style filiform, either emerging ± 2 mm from tube (thrum morph) or 6–8 mm from tube (pin morph), apically divided into three linear stigma lobes,

each ± 0.4 mm long. *Capsules* ovoid, ± 5 mm long, somewhat pinched near apex, with one seed per locule and usually only one locule fertile. *Seeds* tangentially compressed, blackish with transparent outer coat, surface rugose, 3.0–3.5 mm long. Flowering March to May. Figure 1.

Distribution and habitat

Nivenia parviflora is restricted to the lower southern slopes of the Klein Swartberg Mountains near Ladismith in Western Cape Province, South Africa. Plants grow on rocky sandstone slopes, mostly in rock outcrops, in fynbos vegetation in a community with *Protea repens* L. a dominant species. As in most species of *Nivenia*, flowering occurs in the late summer and autumn, March and April to early May for *N. parviflora*. Its close relative, *N. binata*, is one of only two species of the genus that flowers in the spring, August to October, the other being the taxonomically isolated *N. argentea* Goldblatt.

Diagnosis and relationships

Comprising 10 species, including this new species, *Nivenia* is one of three genera of the Iridaceae that are evergreen shrubs with truly woody stems that produce secondary growth. *Nivenia* and the two other shrubby genera, *Klattia* (three species) and *Witsenia* (one species) are a clade within subfamily Nivenioideae, one of four subfamilies of the Iridaceae, that also includes the African *Aristea*, the Madagascan *Geosiris*, and the Australasian *Patersonia* (Goldblatt 1990, 1993). All three shrubby genera are restricted to the Cape Flora Region of southern Africa. The three shrubby genera form a clade defined not only by their woody and evergreen habit, but by several other specialized features, including leaves with sclerenchyma strands, inflorescence units two- or one-flowered, ovules two per locule, tangentially flattened, shield-shaped seeds, and a transparent testa (Manning & Goldblatt 1991). Within this clade *Nivenia* has the least specialized flowers, always with a blue perianth, the majority of species are distylous, and the floral bracts are dry and papery. Out-group comparison indicates that both distyly and the dry bracts are derived and thus ancestral traits for the genus.

Within *Nivenia* the majority of species have the individual inflorescence units (binate rhipidia) arranged in corymbose pseudopanicles and the rhipidial spathes are short and obtuse. Among these are the new *Nivenia parviflora* which has, in addition, derived dark brown and much wrinkled floral bracts and blue anthers, features shared by two other species of *Nivenia*, *N. binata* Klatt and *N. stenosphon* Goldblatt. It is to these species that *N. parviflora* is evidently most closely related. Both *N. binata* and

* B.A. Krukoff Curator of African Botany, Missouri Botanical Garden, P.O. Box 299, St. Louis, Missouri 63166, U.S.A.

MS received: 1997-02-28.

Artist: F. ANDERSON, 6 Murray Rd, Kenilworth, 7700 Cape Town.

N. stenosphon have larger flowers with tepals 7.5–12.0 mm long, and a longer perianth tube, usually 10–15 mm long in *N. binata* and 32–38 mm long in *N. stenosphon*. *Nivenia parviflora* contrasts with both of these in its unusually small flowers, the tepals 5–6 mm long and the tube ± 5.5 mm long. Because of the smaller flower and relatively short perianth tube of *N. binata* we suggest that *N. parviflora* may be most closely related to that species. Differences between them extend beyond the size and proportions of the floral parts. The rhipidial spathes are 4–5 mm long and the floral bracts 9–10 mm long in *N. binata*, substantially longer than in *N. parviflora* which has spathes 3–4 mm long and floral bracts ± 5 mm long. The differences are presumably directly related to the smaller flowers of the species. Also presumably associated with the small flower size, the filaments and styles of *N. parviflora* are shorter than those of *N. binata*. The filaments are either ± 2 mm or ± 6 mm long (for long- or short-styled morphs) and the styles are either 4 mm longer or shorter than the stamens in *N. parviflora* whereas in *N. binata* the filaments are either 2–3 or 7–9 mm long (for long- or short-style morphs) and the styles either 5–6 mm longer or shorter than the stamens.

Pollination and evolution

The small flower and short perianth tube of *Nivenia parviflora* are related to its pollination ecology. The flowers are visited by and presumably pollinated by the medium-sized bee, *Amegilla* sp. (Anthophoridae), the fly *Prosoeca* sp. (Nemestrinidae), and the butterfly, *Cynthia cardui*. The flowers produce small amounts of nectar in the base of the perianth tube on which the insects feed. Mouthparts of *Amegilla* sp. and *Prosoeca* sp. are 7–8 mm and ± 10 mm long respectively. Thus both these insects are able to remove nectar from the base of the tube of *N. parviflora* which is ± 5 mm long. While foraging for nectar in flowers of *N. parviflora* the bodies of these insects brush against the exerted anthers, and pollen is deposited on their bodies. Pollen of short-styled plants, thus with long stamens, is dusted on an insect's ventral and lateral thorax and abdomen but mainly on the frons in long-styled plants with short stamens. When insects visit flowers with long styles, the terminal stigmas brush against its abdomen and lower thorax thus becoming dusted with pollen from the short-styled morph. Heterostyly thus promotes out-crossing by differential pollen placement on the body of a pollinating insect and this is accompanied by contact with the complimentary stigma type.

The closest relatives of *Nivenia parviflora*, *N. binata* and *N. stenosphon* are both restricted to the Swartberg Mountains, and the adjacent Touwsberg in the case of *N. stenosphon*, and both are pollinated by long-tongued flies of the genus *Prosoeca* (Nemestrinidae) (Goldblatt & Bernhardt 1990). The difference in flower size in *N. parviflora* which is correlated with a pollination strategy different

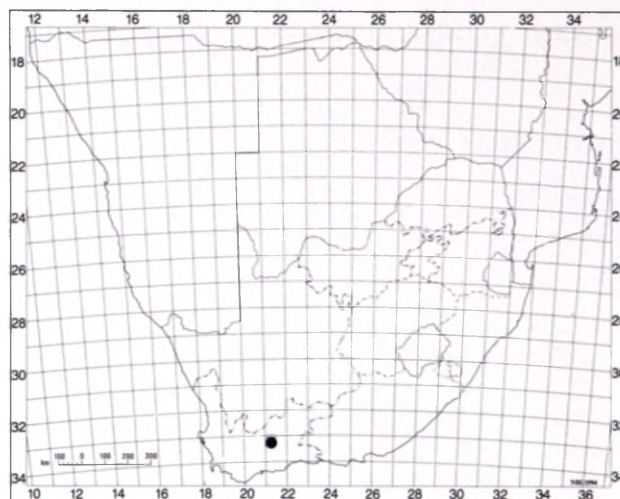


FIGURE 2.—Distribution of *Nivenia parviflora*.

from that of its two relatives, and a difference in flowering time between *N. parviflora* and *N. binata*, presumably sister species, makes it desirable to recognize it as a distinct species. The ranges of the three Swartberg species of *Nivenia* are complimentary, *N. stenosphon* occurring west of Ladismith, *N. parviflora* with a narrow range north of Ladismith, and *N. binata*, with the widest range, extends from Seweweekspoort east of Ladismith to Meiringspoort. It seems clear that both geographic and seasonal components are involved in the radiation and speciation within this clade and in differences in their pollination ecology.

History

Nivenia parviflora was apparently first collected by the botanist and intrepid collector, Elsie Esterhuysen in 1947 in fruiting condition. This collection, and a flowering one made in 1951, were referred to *N. binata* in my monograph of the genus (Goldblatt 1993) because I thought that the specimens represented odd plants flowering out of season and with somewhat smaller flowers than normal. Additional collections show that this assumption was wrong. The plants have a separate geographical range from that of *N. binata* and consistently have smaller flowers that bloom in autumn.

REFERENCES

- GOLDBLATT, P. 1990. Phylogeny and classification of Iridaceae. *Annals of the Missouri Botanical Garden* 77: 607–627.
- GOLDBLATT, P. 1993. *The woody Iridaceae*. Timber Press, Portland, Or., U.S.A.
- GOLDBLATT, P. & BERNHARDT, P. 1990. Pollination biology of *Nivenia* (Iridaceae) and the presence of heterostylous self-incompatibility. *Israel Journal of Botany* 39: 93–111.
- MANNING, J. & GOLDBLATT, P. 1991. Seed coat structure in the shrubby Cape Iridaceae, *Klattia*, *Nivenia*, and *Witsenia*. *Botanical Journal of the Linnean Society* 107: 387–404.

FIGURE 1.—*Nivenia parviflora*, Goldblatt 10498 (BOL, K, MO, NBG, PRE, WAG). 1, flowering stalk of a long-styled plant, $\times 1$; 2, flowering stalk of a short-styled plant, $\times 1$; 3, half flowers showing position of style and stamens in long- and short-styled morphs, $\times 2$; 4, relative lengths of style and stamen of a short-styled flower (left) and a long-styled flower (right), $\times 2$; 5, inflorescence spathes of a single binate rhipidium and floral bracts of two flowers contained therein, $\times 2$. Artist: Fay Anderson.

