

Two new species of *Nemesia* (Scrophulariaceae) from southern Africa

K.E. STEINER*

Keywords: Kamiesberg, Namibia, *Nemesia* Vent., new species, Richtersveld, Scrophulariaceae, seed dimorphism, southern Africa

ABSTRACT

Two new annual species of *Nemesia* Vent. are described from southern Africa. *N. williamsonii* is characterized by bright orange flowers with an inflated yellow palate. It differs from the related *N. maxii* Hiern by having a spur that projects backwards, not downwards, and bracts that are lanceolate with a truncate base, not triangular or cordate. It is unusual for the genus in having dimorphic seeds. *N. williamsonii* occurs almost exclusively in the Richtersveld, but has been collected in a few localities across the Orange River in southern Namibia. *N. hemiptera* is a delicate, wiry-stemmed annual with small white flowers. The flowers are characterized by a tiny nipple-like spur and a seed that is winged on only one side. *N. hemiptera* is endemic to the Kamiesberg from near Garies to Kamieskroon.

INTRODUCTION

Nemesia Vent. is a genus of ± 60 species of annual and perennial herbs endemic to southern Africa (Steiner 1994). It has been over a hundred years since the last revision of the genus (Hiern 1904) and since that time many new species have come to light (Steiner 1989, 1994). A partial revision for species occurring chiefly in KwaZulu-Natal has been published (Hilliard & Burt 1986), but there are many new species that need to be described from the Cape Floral Region and southern Namibia, where $\pm 75\%$ of the species occur. The purpose of this paper is formally to describe two distinctive species, one restricted to Northern Cape and one occurring in the Northern Cape and Namibia.

Nemesia williamsonii K.E.Steiner, sp. nov., *N. maxi* Hiern proxima, sed differt loborum inferiorum aurantiaco nec rubro, palato majoribus calcare corollae inflexo nec deflexo aut recto et bracteis lanceolatis nec cordatis.

TYPE.—Northern Cape, 2816 (Oranjemund): Richtersveld National Park, road to Kouams Camp, 2.3 km SE of turnoff to Pokkiespram, ± 180 m, (–BB), 28 Sept. 2002, Steiner 3954 (NBG, holo.; CAS, K, iso.).

Annual herb up to 280 mm tall; stems angular in cross section with 4 or 5 sides, up to 2.5 mm wide, corners ridged, glandular pubescent. Leaves simple, opposite, mostly sessile, lance-ovate to ovate, 10–43 \times 5–20 mm, sparsely glandular puberulous to nearly glabrous, base rounded to cuneate, apex acute, margins entire to toothed; petioles up to 8 mm long, glandular pilose. Flowers axillary or in lax, terminal racemes, racemes up to 150 mm long; bracts alternate, sessile, lanceolate, lowermost leaf-like, uppermost reduced to $\pm 3.6 \times 1$ mm, base truncate, apex acute, margins entire; pedicels ± 5 –14 mm long, glandular pubescent. Calyx 5-lobed, central upper lobe ± 3.5 –4.1 \times 0.95–1.00 mm, lateral upper lobes ± 3.3 –3.6 \times 0.8–1.1 mm, lower two lobes ± 2.8 –3.3 \times 1.0–1.3 mm, all lobes lanceolate, acute, sparsely glandu-

lar pilose. Corolla bilabiate, 10.1–16.1 \times 9.6–14.6 mm, upper lip four-lobed, two inner (upper) lobes oblong to obovate, 2.7–5.1 \times 2.8–3.8 mm, base strongly oblique, apex rounded to emarginate, two outer (lateral) lobes oblong, 3.1–5.1 \times 3.2–4.1 mm, base strongly oblique, apex rounded to emarginate; upper lip orange (rarely yellow, see Thompson & Le Roux 364) except for a bright yellow patch (2.8 \times 2.8 mm) just above corolla opening, pale orange reverse, lower lip oblong to obcordate, 4.9–6.7 \times 4.5–5.6 mm, orange (occasionally yellow, see Thompson & Le Roux 364), pale orange reverse, basal portion inflated into a convex projecting palate; palate ± 2.9 –3.2 \times 3.5–4.1 mm, bright yellow, longitudinally grooved, glabrous; hypochile (floor of corolla tube) ± 3.1 –3.3 mm long, sides invaginated to form a narrow channel, base drawn out into a spur, (2.4–)3.1–4.2(–5.3) mm long, \pm straight or curving downward in distal third, orange-white. Stamens four, whitish, lying in a shallow depression in upper surface of corolla tube; filaments of anticous pair (twisted into posticous position) ± 2.5 mm long, \pm straight, except at base and apex, glabrous or with a few glandular trichomes; posticous filaments ± 0.85 mm long, \pm straight except at base, sparsely glandular pubescent; anthers 0.5–0.65 mm long, each pair strongly coherent. Ovary oblong-ovate in outline, 1.2–1.3 \times 1.0–1.1 mm, laterally compressed; style ± 0.75 mm, slightly curved, compressed contrary to the ovary, apex wider than base, lying between anther pairs, stigma a crescent-shaped apical band. Capsules oblong in outline, ± 4.5 –13.1 \times 3.6–6.9 mm, laterally compressed contrary to the septum, apex emarginate to bilobed, lobes rounded to acute. Seeds dimorphic, plants with either winged or wingless seeds; winged seeds widely ovate, ± 1.8 –2.3 \times 1.8–2.4 mm, brown, verruculate, wing membranous with numerous parallel, brownish veins, wingless seeds oblong, ± 1.5 –1.8 \times 0.8–1.0 mm, brown, verrucate. Flowering time: June to September. Figure 1.

Diagnostic features: *Nemesia williamsonii* is easily recognized by its bright orange and yellow flowers. It can be distinguished from the similar and related *N. maxii* by its colour (white vs violet), the difference in orientation of the spur, and the shape of the bracts. In *N. williamsonii*, the spur projects straight backwards or back and then downwards distally, whereas in *N. maxii*, the spur

* Department of Botany, California Academy of Sciences, 875 Howard St, San Francisco, CA 94103, USA.
MS. received: 2005-02-21.

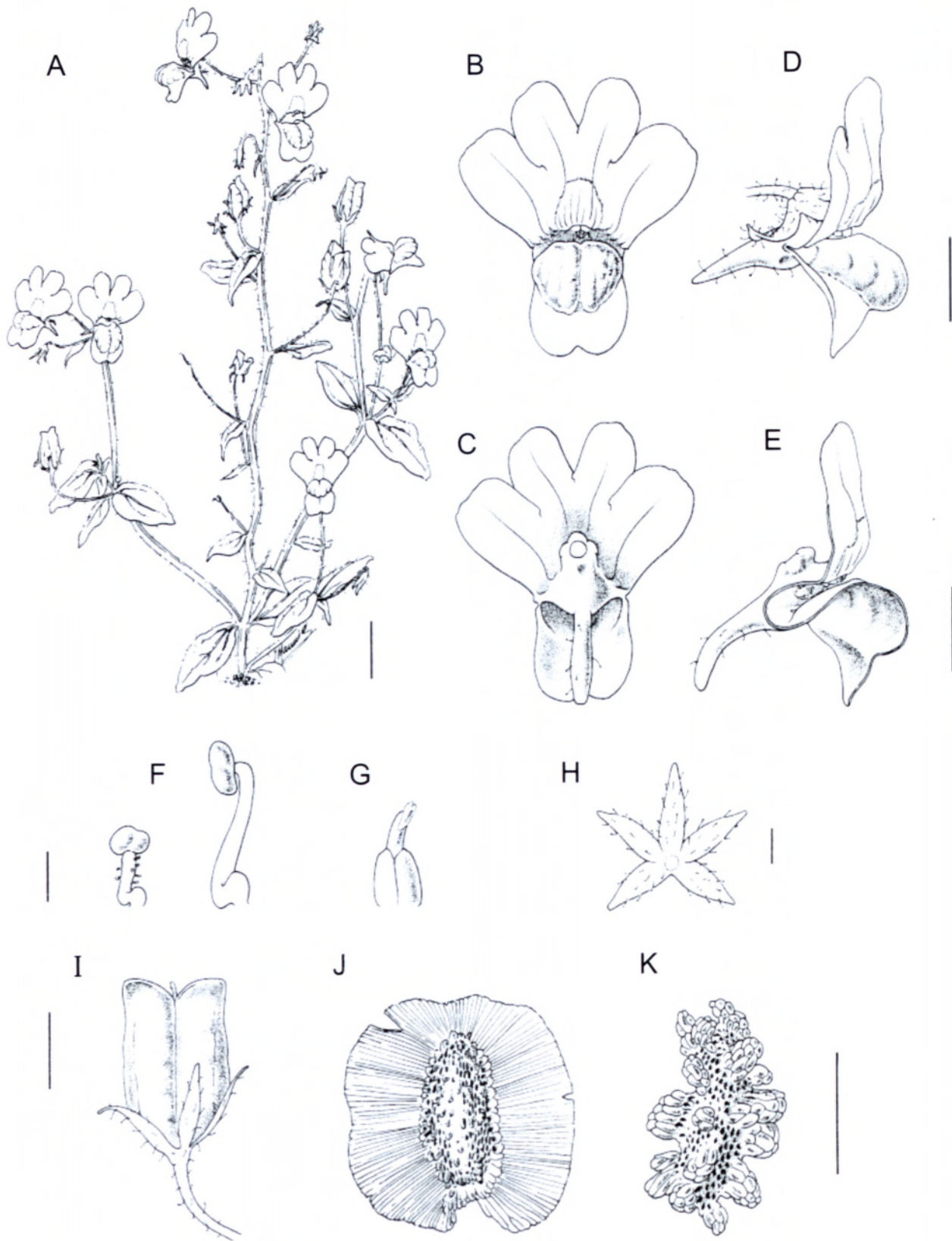


FIGURE 1.—*Nemesia williamsonii*. Steiner 3954 (NBG). A, habit. B–E, flower: B, C, front and rear views; D, E, side views, intact and partially cut away. F, posticus and anticus stamens; G, pistil; H, calyx; I, capsule with calyx; J, K, seed: J, winged type; K, wingless type. Scale bars: A, 10 mm; B–E, 5 mm; F, G, J, K, 1 mm; H, I, 2 mm. Artist: John Manning.

projects straight downwards or down and forwards distally. The bracts of *N. williamsonii* are lanceolate with a truncate base, whereas those of *N. maxii* are triangular or cordate. In some individuals of *N. williamsonii*, flowers turn blue upon pressing, giving a false impression of the

true flower colour. *N. williamsonii* exhibits an interesting seed dimorphism at the plant level, even within a single population. A plant produces either winged or wingless seeds (Figure 1J, K). The wingless seeds, however, are not simply winged seeds that lack the wing. Instead,

there are other morphological features that distinguish the two seed types. The winged seed minus its wing is smaller than a wingless seed. The body of the wingless seed is wider and has much larger and broader verrucae on the seed coat (Figure 1K). A similar dimorphism has been observed in populations of *N. anisocarpa* E.Mey. ex Benth. (W. Metelkamp unpubl.; K.E. Steiner pers. obs.). The proportion of winged to wingless seeds in populations of these species remains unknown.

Etymology: this plant is named in honour of Dr Graham Williamson who first brought this plant to my attention and who has made a major contribution to knowledge of the natural history of the Richtersveld (Williamson 2000).

Distribution and habitat: *Nemesia williamsonii* is a short-lived annual that comes up sporadically after winter or early spring showers. These showers are often localized, making it difficult to predict where the plants will come up. It is known from the northernmost areas of Northern Cape and adjacent areas in southern Namibia (Figure 2). It has been collected most commonly from the

Richtersveld National Park and from the adjacent Fish River Canyon Park in southern Namibia. Together, these areas now form the Ai-Ais/Richtersveld Transfrontier Conservation Area. In the Richtersveld, the author has observed *N. williamsonii* at the base of small, rocky hills or *koppies* in or adjacent to dry streambeds or drainage lines associated with sandy quartzitic soils. Quartzite pebbles and stones were obvious at the type locality. A few plants were also found associated with a lone *Pachypodium namaquanum* on the slopes of a *koppie*. G. Williamson (pers. comm.) has observed *N. williamsonii* associated with *Pachypodium namaquanum* on south-facing slopes near Oena. He also found (NBG5161) that plants are common in black tillite and on brown-yellow dolomite on the west side of the Dreigratberg.

Like many desert annuals, germination and flowering are largely dependent on localized rainfall patterns. Similarly, the ultimate size of individuals depends, to a large extent, on available moisture and nutrients. The largest individual of *N. williamsonii* at the type locality occurred along the roadside in loose sand. It had obviously received additional rainfall in the form of runoff from the road.

Breeding systems: *Nemesia williamsonii*, like many *Nemesia* species, is self-incompatible. This is based on the absence of capsule formation in cultivated plants. Fruit set in the type locality was good, but no pollinators were observed. Related species with similar looking flowers are pollinated by anthophorid bees (Steiner unpubl.). The spurs of *N. williamsonii* do not secrete nectar, but pollen may act as an attractive food source for the pollinators.

This plant was brought to my attention by Dr Graham Williamson who first encountered it on one of his many excursions into the Richtersveld (Williamson 2000). He showed it originally to Prof. E.A. Schelpe at the Bolus Herbarium at the University of Cape Town, who recognized it as an undescribed species. However, Prof. Schelpe was unable to describe this species before his death and over the years, Dr Williamson made additional collections in the hope that someday it would be described. Although it was clear from herbarium material that this species was new, the author described it only after seeing living material in the field. The annotation '*Nemesia marlothii* Grant' appears on some specimens of *N. williamsonii* at NBG and in the literature (Range 1935), but this is a *nomen nudum*.

Other specimens examined

NAMIBIA.—2717 (Chamaites): hills E of Dabimub River, ± 400 m, (–CC), 4 Sept. 2000, *P. Bruyns* 8865 (NBG); Ai-Ais Reserve, NW of camp, (–CD), 30 June 1986, *Van Jaarsveld* 8786 (NBG); Ai-Ais area, 400 m, (–DC), 26 July 1989, *Oliver* 9153 (NBG); Karibis, Ai-Ais, 800 m, (–DC), Aug. 1909, *Marloth* 4785 (NBG); 2816 (Oranjemund): West Dreigratberg, N of old Sendelingsdrif police post, (–BB), 5 Aug. 1993, *Williamson* 5161 (NBG); Olienhoutplaas, Karagaskloof, 400 m, (–BB), 3 Sept. 1977, *Thompson & Le Roux* 364 (NBG); 2817 (Violsdrif): ± 15 km E of Visriviermond on Jan Haak road, (–AA), 7 Aug. 1986, *Williamson* 3551 (NBG); near Aussenkehr, 80 km W of Violsdrif, (–AD), 9 Aug. 2000, *Goldblatt & Manning* 11365 (NBG).

NORTHERN CAPE.—2816 (Oranjemund): top of Kodaspiek, (–BB), 20 Sept. 1981, *Van Jaarsveld & Kritzing* 6240 (NBG); 2817 (Violsdrif): Likkewaankloof, Richtersveld National Park, (–AA), 23 Aug. 1993, *Zietsman* 2350 (PRE); Abiekwarivier Mountain, (–AC), 20 Aug. 1987, *Jurgens* 22386 (PRE); Rosyntjieberg, close to base,



FIGURE 2.—Known distribution of *Nemesia williamsonii*, ●, and *N. hemiptera*, ▲, in southern Africa. Border between South Africa and Namibia is indicated by dotted line.

above Goennakouriep River, (-AC), July 1989, *Williamson 4273* (NBG); Zebra Kloof, just NE of Rosyntjieberg, (-AC), 9 Oct. 1991, *Germishuizen 5582* (PRE); E slope of mountain overlooking Koerogab Vlake, 400 m, (-AC), Sept. 1994, *Williamson 5516* (NBG); Tatasberg River mouth, (-AC), 15 Aug. 1982, *Williamson 3074*; northeastern Richtersveld National Park, De Toon, 500 m, (-AD), Sept. 1994, *Williamson 5519* (NBG); Richtersveld, 10 km W of Springbokvlakte on road to Grasdrift, ± 400 m, (-AD), Sept. 1990, *Williamson 4361* (NBG); Richtersveld, Springbokvlakte, (-AD), July 1989, *Williamson 4272* (NBG); Richtersveld, Tatasberg, Giant's Playground, (-AD), 24 Aug. 1986, *Williamson 3594* (NBG); Richtersveld, Tatasberg (-AD), July 1989, *Williamson 4271* (NBG); Richtersveld, in granite gravel in stream bed below Tatasberg, 400 m, (-AD), Sept. 1990, *Williamson 4360* (NBG).

Locality uncertain: Noaisobis, northern Richtersveld, 3 Sept. 1957, *Herre s.n.* (NBG); Ganaquib, Helskloof, 21 Sept. 1933, *Herre 19005* (NBG).

Nemesia hemiptera K.E.Steiner, sp. nov., *N. maxi* Hiern proxima, sed differt florum albo nec rubro, calcarato brevissimum, seminibus testis in alis expansa unilateribus.

TYPE.—Northern Cape, 3018 (Kamiesberg): Kamiesberg, Roodeberg's Kloof, 21.3 km from N7 via Farm Doringkraal, 640 m, (-CA), 27 Sept. 2002, *Steiner 3946* (NBG, holo.; CAS, K, iso.).

Annual herb up to 310 mm tall; stems rectangular in cross section, corners ridged, sides up to 0.9 mm wide, minutely glandular pilose, lateral stems up to 250 mm long. *Leaves* simple, opposite, sessile to shortly petiolate; petioles up to 6 mm long, glandular pilose; lamina ovate to lanceolate, 8–21 \times 2–8 mm, subglabrous to sparsely glandular puberulous, base rounded to cuneate; apex rounded to acute; margins entire to shallowly dentate. *Flowers* axillary or in lax terminal racemes, racemes up to 225 mm long; bracts alternate, sessile, lanceolate, lowermost leaf-like, uppermost linear, reduced to $\pm 2 \times 0.3$ mm, base truncate, apex acute; margin entire, glandular pubescent; pedicels ± 5 –14 mm long, glandular pubescent. *Calyx* 5-lobed, spreading, central upper lobe ± 2.6 –2.8 \times 0.6 mm, lateral upper lobes $\pm 2.6 \times 0.5$ –0.7 mm, lower two lobes $\pm 2.2 \times 0.6$ –0.8 mm, all lobes narrowly lanceolate, acute, glandular pilose. *Corolla* bilabiate, 6.2–9.6 \times 6.7–9.1 mm, upper lip four-lobed, two upper lobes oblong to ovate, 3.2–3.7 \times 1.2–2.5 mm, base \pm perpendicular to margins, apex rounded to emarginate, two lateral lobes oblong to elliptic, 3.3–4.4 \times 3.1–3.3 mm, base strongly oblique, apex rounded to emarginate; lobes white except for a brown rectangular nectar guide, $\pm 0.5 \times 0.7$ mm, below sinus of upper two lobes; lower lip with one lobe, widely obovate and emarginate or obcordate, 3.6–5.7 \times 5.0–5.8 mm, white, tube below lip strongly inflated into a convex palate; palate $\pm 2.1 \times 2.8$ mm, white, with dense patch of capitate, non-glandular trichomes at base of palate near corolla opening, hypochile ± 2.4 mm long with a raised central ridge, densely pubescent with clavate trichomes; trichomes on distal $\frac{2}{3}$ of ridge brown, remainder white, base of hypochile drawn out into a short nib-like spur, 0.5–0.8 mm long, entrance to spur flanked by three brown spots visible on outside of corolla around base of spur; inside of corolla tube white with lilac tinge. *Stamens* 4, whitish, lying in a shallow depression in upper surface of corolla tube; filaments of anticous pair (twisted into posticous position) ± 1.6 mm long, \pm straight except at base, glabrous; posticous filaments ± 0.4 mm long, \pm straight except at base, glandular pubescent; anthers

0.4–0.5 mm long, each pair strongly coherent. *Ovary* widely ovate in outline, 0.6–0.7 \times 0.6–0.7 mm, laterally compressed; style ± 0.3 –0.4 mm, compressed contrary to ovary, apex wider than base, lying between anther pairs, slightly deflexed, stigma a crescent-shaped apical band. *Capsules* ovate to oblong in outline, ± 3.4 –4.6 \times 3.5–4.5 mm, laterally compressed contrary to septum, apex emarginate to bilobed, lobes acute. *Seeds* ovate, ± 1.3 –2.0 \times 0.7–1.0 mm, verruculate, winged on one side only, wing membranous, pale brown with numerous parallel veins. *Flowering time:* (July–) August to September (–December). Figure 3.

Diagnostic features: *Nemesia hemiptera* is easily recognized by its small, white flowers with a tiny spur and its seed that is winged on only one side. It can be distinguished from the related *N. maxii* by its colour (white vs violet), the size of the corolla < 10 mm long, the smaller spur (< 1 mm vs > 3 mm).

Etymology: the name refers to its unique, partially winged, seeds.

Distribution and habitat: *Nemesia hemiptera* is a short-lived, wiry-stemmed annual that comes up after winter or early spring showers. It is endemic to Namaqualand and restricted to the Kamiesberg and adjacent rocky hills (Figure 2). It ranges in elevation from about 560 m to 1 250 m. It occurs in sandy, loam soils in Namaqualand Broken Veld, under and around shrubs at the foot of large granite outcrops. Annual rainfall in this area is probably between 200 and 300 mm, but runoff from the surrounding granite outcrops increases the effective rainfall significantly. The late flowering time for this annual is surprising, since the surrounding plants are mostly drying off when these plants flower. Like many annuals from arid areas, the ultimate size of individuals depends to a large extent on available moisture and nutrients. Flowering is largely dependent on localized rainfall patterns.

Breeding systems: based on cultivated specimens transplanted from the field, *Nemesia hemiptera*, despite its small flowers, is self-incompatible. In the wild, it is probably pollinated by small pollen-collecting bees (e.g. halictids or allodapines). The spurs do not secrete nectar, but pollen may serve to lure pollinators to the flowers.

Nemesia hemiptera was first collected by Rudolf Schlechter near Brakdam, ± 16 km north of Garies, on an expedition to Namaqualand that he made with his brother Max in 1897 (Gunn & Codd 1981). Since that time, it has been collected at least a dozen times, but it has never been described formally.

Other specimens examined

NORTHERN CAPE.—3017 (Hondeklipbaai): Bowedorp, (-BB), Aug. 1929, *L. Bolus 19054* (BOL); summit of Sneekop, (-BB), 11 Dec. 1909, *Pearson & Pillans 5818* (K); slopes of Sneekop, NE of Kamieskroon, ± 1 250 m, (-BB), 12 Sept. 1993, *Goldblatt & Manning 9724* (NBG); 4.8 km E of Kamieskroon, 1 090 m, (-BB), 24 Sept. 1948, *Acocks 22616* (PRE); 6.3 km E of Kamieskroon, 1 070 m, (-BB), 27 Sept. 2002, *Steiner 3953* (CAS, NBG); between Garies and Kamieskroon, (-BD), Aug. 1929, *Pillans 6251* (BOL); Brakdam, north of Garies, ± 560 m, (-BD), 7 Sept. 1897, *Schlechter 11103* (PRE); Brakdam, (-BD), 24 Aug. 1941, *Barker 1939* (NBG); Brakdam, (-BD), 4 Sept. 1945, *Barker 3653* (NBG); Garies, (-DB), 24 July 1941, *Esterhuysen 5428* (BOL). 3018 (Kamiesberg): Studer's Pass, 22 km E of Garies, 625 m, (-AC), 27 Aug. 1967, *Thompson 421* (NBG, PRE).

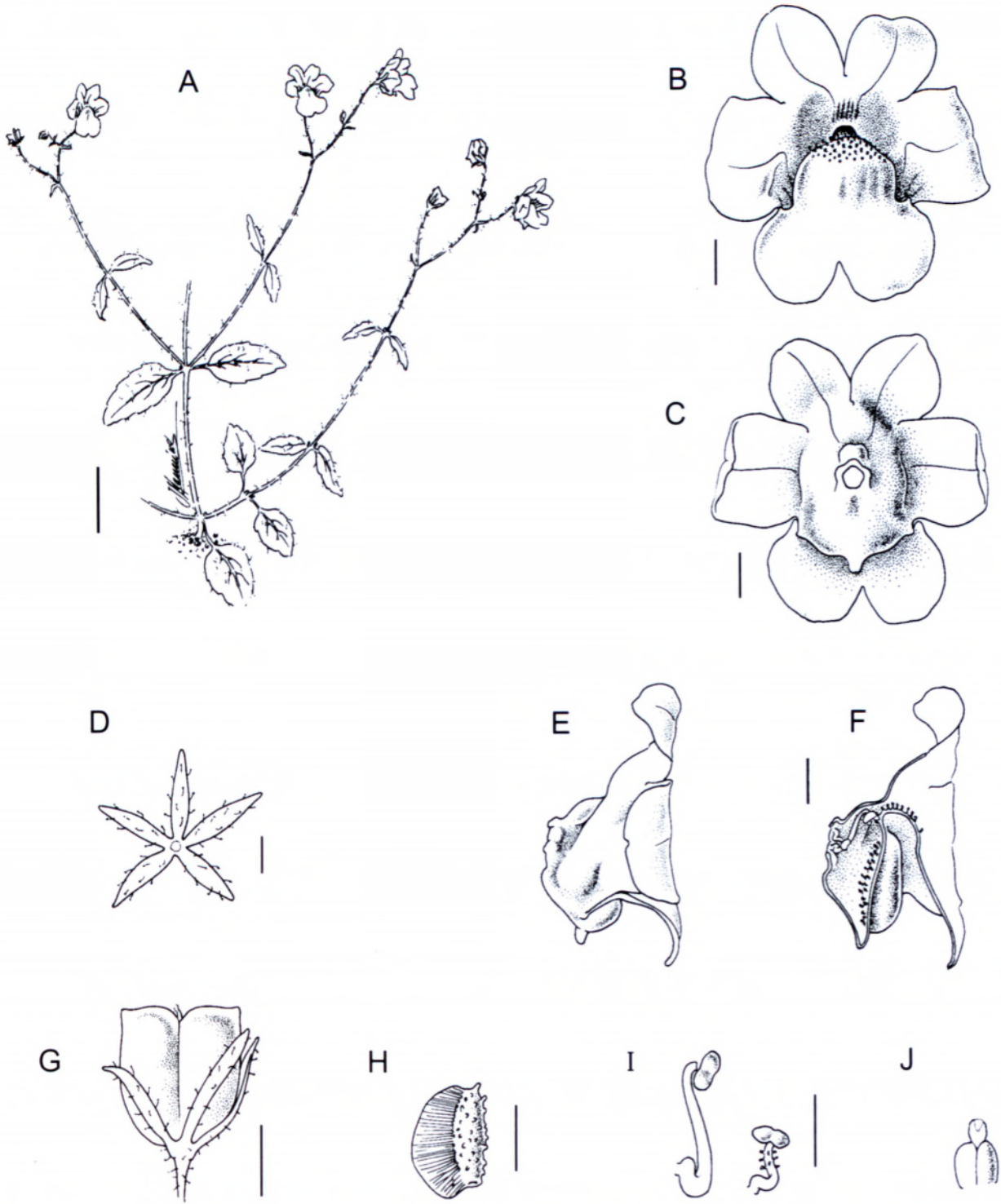


FIGURE 3.—*Nemesia hemiptera*, Steiner 3946. A, habit; B, C, flowers, front and rear views; D, calyx; E, F, flowers, side view, intact and partially cut away; G, capsule with calyx; H, seed; I, posticous and anticous stamens; J, pistil. Scale bars: A, 10 mm; B–F, H–J, 1 mm; G, 2 mm. Artist: John Manning.

ACKNOWLEDGEMENTS

I thank Northern Cape Nature Conservation and the Richtersveld National Park for permission to work in their respective areas, Graham Williamson for collecting *N. williamsonii* on numerous occasions over the years, and John Manning for his excellent illustrations. I also thank the Compton Herbarium for the use of their facilities and NBG and PRE for the loan of *Nemesia* specimens.

REFERENCES

- GUNN, M. & CODD, L.E. 1981. *Botanical exploration of southern Africa*. Balkema, Cape Town.
- HIERN, W.P. 1904. Scrophulariaceae. In W.T. Thiselton-Dyer, *Flora capensis* 4,2: 121–420. Reeve, London.
- HILLIARD, O.M. & BURTT, B.L. 1986. Notes on some plants of southern Africa chiefly from Natal: XIII. *Notes from the Royal Botanic Garden Edinburgh* 43: 345–405.
- RANGE, P. 1935. Die Flora des Namalandes. VIII. *Feddes Repertorium* 38: 263.

- STEINER, K.E. 1989. A new perennial *Nemesia* (Scrophulariaceae) from the western Cape. *South African Journal of Botany* 55: 405–408.
- STEINER, K.E. 1994. A new *Nemesia* (Scrophulariaceae) from the interior of the southern Cape, South Africa. *South African Journal of Botany* 60: 211–213.
- WILLIAMSON, G. 2000. *Richtersveld, the enchanted wilderness: an account of the Richtersveld*. Umdaus Press, Hatfield, Pretoria.