Flowering Plants of Africa

Volume 67

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Celebrating 100 years: 1921–2021

Flowering Plants of Africa

Since its inception in 1921, this serial, modelled on the former *Curtis's Botanical Magazine*, has published well over 2 000 colour plates of African plants prepared by some 80 artists.

The object of the journal is to convey to the reader the beauty and variety of form of the African flora, to stimulate an interest in the study, conservation and cultivation of African plants, and to advance the science of botany, as well as botanical art.

The illustrations are mostly prepared by artists on the staff of the South African National Biodiversity Institute (SANBI), but we welcome other contributions of suitable artistic and scientific merit. Please see *Guide for authors and artists* on page 214.

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History of this series
(note Afrikaans translation and changes in title)

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Cover illustration: *Adenia repanda* (Plate 2373)

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Barleria rigida var. *rigida* Acanthaceae

Namibia, South Africa

Barleria rigida *Nees* var. **rigida** in DC., Prodromus Systematis Naturalis Regni Vegetabilis 11: 242 (1847); Nees: 92 (1850); Anderson: 28 (1863); Clarke: 48 (1901); Obermeyer: 152 (1933); Darbyshire: 49 (2015); Darbyshire et al.: 17 (2019b). *Barleria stimulans* E.Mey. ex Nees var. *macracantha* Nees: 241 (1847). *Barleria irritans* Nees var. *rigida* C.B.Clarke: 48 (1901), pro parte excl. *Schinz 3*.

The family Acanthaceae was estimated to include almost 4 000 species in 242 genera (The Plant List 2013) and more recently over 5 000 species (POWO 2021), occurs mainly in the tropics and subtropics, and displays a wide range of morphology and habitat tolerances. Members may be herbs, lianas, trees or even mangroves (Schwarzbach & McDade 2002). They may be annual, mass-flowering and monocarpic, or perennial. Flowers may be inconspicuous or spectacular. Bracts may be plain green and small, or large and brightly coloured. Flowers vary from radially symmetrical to highly zygomorphic and may be white, green, yellow, red, lilac to magenta and dark purple, and anything in-between. Pollinators include moths, butterflies, bees, long-tongued flies and birds. The family is also renowned for its diversity in pollen morphology (Scotland & Vollesen 2000). In southern Africa, some groups of the family predominate in the moister eastern areas and have capsules that open upon drying, whereas others dominate in the drier western areas and have capsules that open upon wetting (Balkwill & Welman 2000). The fruit may contain a single seed (very rare), two seeds or two rows of seeds; some members of the family have rough seeds, some smooth and some seeds are covered in hygroscopic hairs (Balkwill & Welman 2000). Some members of the family have a long history of being used as ornamentals, while others appear to be favoured for browsing by some species of antelope (Yazezew et al. 2011). The leaves of members of the type genus are highly architectural and inspired the capitals on columns in Greek Corinthian order and Roman Composite order architecture (Strong 1963).

The genus *Barleria* L. is large with an estimated 335 species globally (Darbyshire et al. 2019b) with at least 60 species occuring in southern Africa. *Barleria* has a mainly palaeotropical distribution with its highest diversity in tropical and southern Africa, and Madagascar (Darbyshire et al. 2019a). Eight centres of endemism have been recognised in Africa including Madagascar (Balkwill & Balkwill 1998; Darbyshire et al. 2019a), with the highest number of endemics now known to occur in Angola, Tanzania and Madagascar (Darbyshire et al. 2019a). It has a wide diversity of morphology, from herbs and creepers to large woody shrubs and even trees (Darbyshire & Luke 2016). Bracts and bracteoles may be leaf-like or spiny. Flowers are usually very noticeable and attractive and may be white, yellow, red or lilac through to purple. One species, *B. ovata* E.Mey. ex Nees, may even have yellow, lilac and dark purple corollas in the same population, which all dry to very dark purple in herbarium specimens. Corollas range from subactinomorphic to very strongly zygomorphic

PLATE 2379.—1, flowering branches, × 0.5; 2, inner calyx lobes, × 2; 3, capsule, × 2; 4, bracteoles, × 2; 5, posticous calyx lobe, × 2; 6, anticous calyx lobe, × 2; 7, bracteoles and calyx, abaxial view, × 2. Voucher specimen: *Condy s.n.* in National Herbarium, Pretoria. Artist: Gillian Condy.

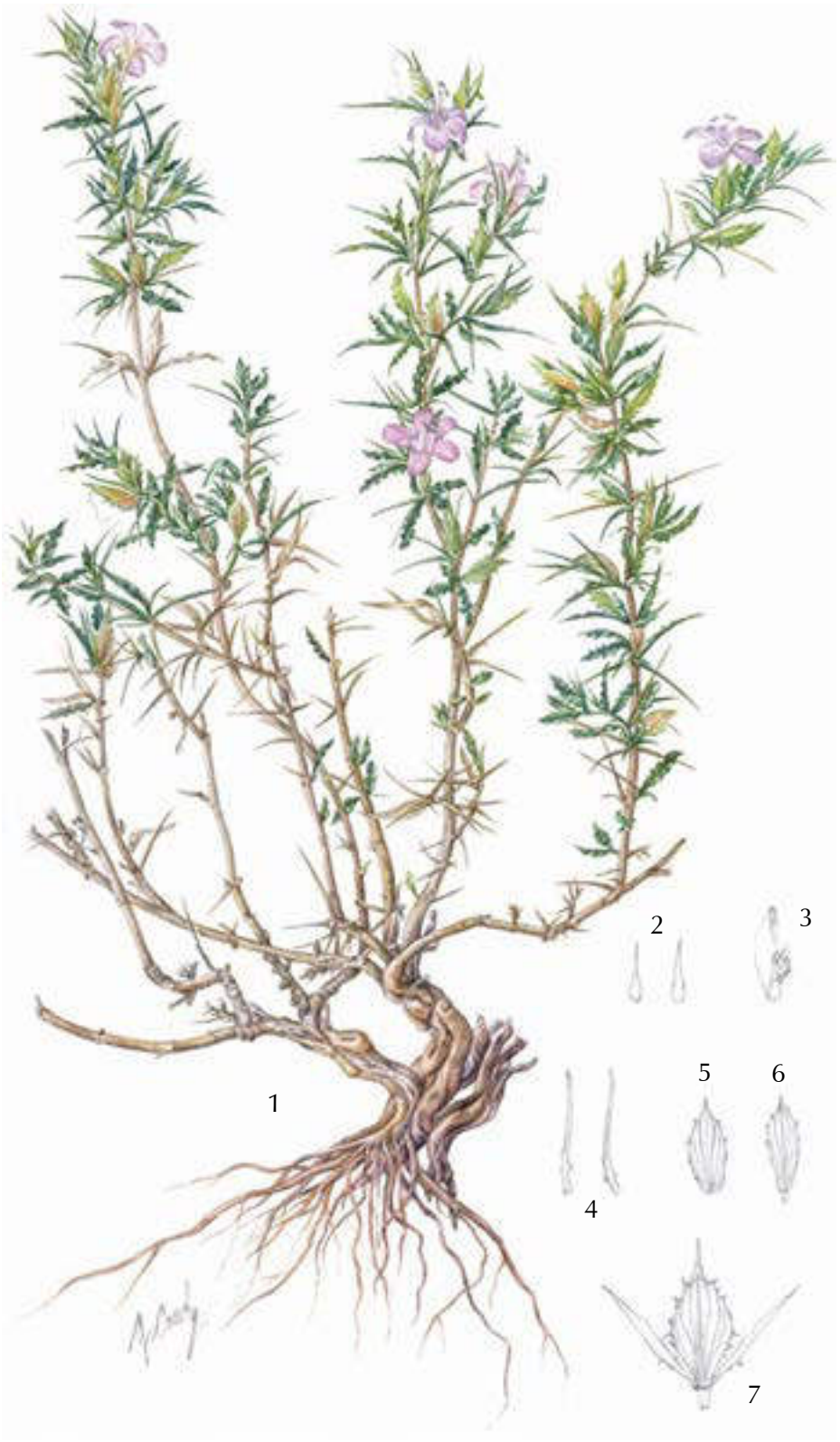

PLATE 2379 *Barleria rigida* var. *rigida*

and the androecium may have from two to four stamens and one staminode, with any combination in-between. Species of *Barleria* occur in a variety of habitats, including on sea-facing dunes, in forests, savanna, grassland or semi-desert. They may have two or four seeds in the beaked or unbeaked capsules and the seeds are covered in hygroscopic hairs, except where they have been secondarily lost in *B. descampsii* Lindau and allies (Darbyshire 2009). The pollen is spherical, deeply reticulate and usually porate (Scotland & Vollesen 2000). *Barleria repens* Nees, *B. obtusa* Nees and what is probably a hybrid between *B. repens* and *B. gueinzii* Sond. are cultivated locally, while *B. cristata* L., the type of the genus, is cultivated internationally.

Barleria has been variously subdivided into subgenera, sections and informal groups and current research by Iain Darbyshire of the Herbarium, Royal Botanic Gardens, Kew, and collaborators are using molecular data to build a complete phylogeny of the genus in order to facilitate understanding of the evolutionary relationships within this very diverse group. The most recent results uphold *Barleria* as monophyletic, support two subgenera and reduce the number of sections from seven to three (Darbyshire et al. 2019a). Further work by Robert Comito and team using RADseq phylogenomics should provide further insight.

In South Africa, *Barleria* was revised for *Flora Capensis* in 1901 (Clarke 1901) and subsequently by Obermeyer (1933). Thereafter, some new taxa have been described and Mandy-Jane Balkwill (= M.-J. Cadman) undertook a study of the subdivision of the genus (Balkwill 1993) and while engaged in that study described some new species, including the spectacular *B. greenii* M.Balkwill & K.Balkwill (Balkwill et al. 1990). Florence C. Nyirenda has undertaken an appraisal of the southern African species of an informal group circumscribed by M.-J. Balkwill (Balkwill 1993) in *Barleria* Section *Barleria* (Nyirenda 2012) and in doing so, has provided an understanding of the significance of morphological variation in the *B. rigida* complex (Nyirenda & Balkwill 2018). Iain Darbyshire et al. (2019b) have appraised the complex for Angola and Namibia and have brought further deep insight to understanding the variation in this difficult group.

Barleria rigida has affinities with *B. irritans* and *B. bechuanensis* C.B.Clarke. The leaf margins of the latter have no teeth, whereas those of *B. rigida* are variously toothed. *Barleria rigida* and *B. irritans* are most readily separated based on geography, with *B. irritans* being present in the Eastern Cape and *B. rigida* in the Northern Cape and northwards (Nyirenda 2012). The calyx lobes of *B. irritans* are longer than 20 mm, whereas those of *B. rigida* are up to 18 mm long. The leaves of *B. rigida* var. *rigida* are usually narrowly elliptic and have slightly undulate to markedly undulate leaf margins that are often white and markedly thickened. They sometimes have few teeth or they may have regularly arranged teeth on the margin, with the teeth rarely longer than 1 mm. The leaves of *B. rigida* var. *ilicina* (E.Mey. ex T.Anderson) Oberm. are broadly elliptic and the margins may be flat or irregularly undulate and are often white and slightly thickened. They are always toothed, although there may sometimes be fewer teeth than in var. *rigida*, and at least some teeth are longer than 1.5 mm and on many specimens the teeth may be 3–4 mm long. There are some undescribed species that are similar to *B. rigida* and there are additional varieties within the species that also need description (Nyirenda 2012).

Barleria rigida was described by Christian Gottfried Daniel Nees von Esenbeck (Nees) in the 1847 Volume 11 of Augustin Pyramus de Candolle's *Prodromus Systematis Naturalis Regni Vegetabilis*. Three specimens are cited in the original description and one has been selected as the lectotype by Darbyshire et al. (2019b). This specimen presents an interesting mystery. Firstly, there is no locality information on the sheet and Nees gave a very vague locality, 'Africa australi extratropical'. Secondly, there is no date of collection on the sheet. Thirdly, the apparent collector, Hoffmannsegg, was a well-known botanist and entomologist, but his name does not appear as a collector or in the index of the two editions of *Botanical Exploration of southern Africa* (Gunn & Codd 1981; Glen & Germishuizen 2010). Knowing that there is an *Acanthopsis hoffmannseggiana* (Nees) C.B.Clarke in South Africa, it was decided to check whether the type of that species provided any clues. It has the same apparent collector and a similarly vague locality (Steyn & Van Wyk 2015), so did not appear to be of much help. However, by looking at the South African distributions of *B. rigida* and *A. hoffmannseggiana*, one finds that the area of overlap is in the Northern Cape, in the broader Orange River valley. If the two species were collected by the same collector, on the same trip, it gives a better idea of where they may have been collected. A search for records of Johannes Centurius von Hoffmannsegg (1766–1849) visiting that area was conducted and a German biography was found (https://saebi.isgv.de/biografie/Johannes_Centurius_von_Hoffmannsegg_(1766-1849)).

Hoffmannsegg was very committed – he sold his inherited estate to his brother-in-law so that he could go on a six-month trip to Portugal. Two years later, he returned to the Iberian Peninsula and stayed for four years. In 1801, he sent Friedrich Wilhelm Sieber to Brazil to collect material to include in his collections. In 1802, his collections were united with those of Johann Christian Ludwig Hellwig. In 1804, he moved to Berlin to coordinate work on his so-called 'Flore Portugaise' and set up a state-of-the-art printing studio to produce it. In 1820, his sister died and he once again inherited the family estate, but it was run down and in debt and he personally was in dire financial straits due to the costs of producing the 'Flore Portugaise'. He then rebuilt the businesses linked to the family estate and then used the proceeds to finish the production of his flora. The biography states that even in his old age, he planned an extended expedition to Africa, but it never came to fruition. There are types from Brazil that bear the name Hoffmannsegg, for example *Salvinia rotundifolia* Willd., but Sieber's name does not appear on the specimen. It seems that Hoffmannsegg's practice must have been to include his name on specimens to indicate that they were in his herbarium, rather than that he had collected them. This, however, does not solve the mystery of how two South African species have types that were apparently collected by Hoffmannsegg.

Another online search revealed that Martin Heinrich Lichtenstein (1780–1857) had sent plant specimens to Willdenow and Hoffmannsegg in Berlin (Gunn & Codd 1981). It seems then that the type of *Barleria rigida* was collected by Lichtenstein. On the accompanying text of the scanned specimen in JSTOR Global Plants, the collector was given as M.H.C. Lichtenstein with the following notes provided: 'The scientific names of the Willdenow Herbarium specimens in B are mainly left without author citation as these names are the historic ones used in the handwritten diagnosis by C.L. v. Willdenow on the species folder. D.FL. v. Schlechtendal, who sorted the Herbarium according to the Linnaean system, brought it to the present state and annotated the mounted specimens with these

names. His enumeration, based on these names, is used in the physical arrangement of the Willdenow Herbarium at B. Schlechtendal's annotations of personal names in the lower right corner of the sheets represent the person from which Willdenow received the material, which is not necessarily the collector. Only some of the specimens are further annotated. Names of collectors, donors, determiners or exchanging herbarium keepers are cited in the annotations field.' This is consistent with our independent conclusion that the specimen must have been collected by Lichtenstein, rather than by Hoffmannsegg. Nees states that the Hoffmannsegg and Lichtenstein specimens were collected in 'Grootriviers Poort', but this locality is outside of the known distribution of the species. The specimen that Nees attributed to Lichtenstein was in the main Berlin collection and was sadly destroyed in World War II, making it impossible to check the locality or for a date on its label.

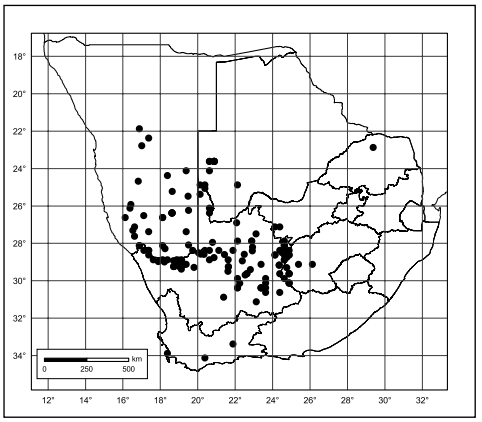

FIGURE 1.—Distribution of *Barleria rigida* var. *rigida* in southern Africa.

William John Burchell's specimen, that is a syntype, has the number 1992 and the Kew sheet bears the following locality: 'Kalahari Region, Hay Division, Griqualand West, Plains between Griqua Town and Witte Water' and McKay (1943) indicates that it was collected on 14 February 1812. Therefore, it took 41 years from the first collection and a further 35 years from the second collection until the species was described.

Barleria rigida var. *rigida* is known from many specimens (over 20) with widespread distribution occurring mainly in the Upper Karoo and part of the Gariep Desert and Kalahari Karroid Shrubland (Mucina & Rutherford 2006). This variety of the species occurs in southern Namibia and in the Northern Cape Province of South Africa (Figure 1). It grows in deep or shallow red-yellow sandy soils, or in gravelly, stony or rocky light grey soils with underlying dolerite or calcrete and components of shales and mudstones. The variety occupies altitudes ranging from 400 to 1 500 m above sea level. Plants near the type locality occur in the transitional fragmented Upper Karoo and Dry Highveld Grassland, in the Besemkaree Koppies Shrubland near where the Northern Cape and North West provinces border with the Eastern Cape. The Besemkaree Koppies Shrubland consists of dolerite koppies and soils embedded within Karoo Supergroup sediments (Mucina & Rutherford 2006). Based on it occurring widely in the Northern Cape and being locally common in many of the areas where it occurs, Darbyshire et al. (2019b) have recommended a Red List status of Least Concern.

Specimens have been collected in flower between December and June, with a very strong peak in March. There is no record of attempts to cultivate *Barleria rigida*. It has been found, however, that species of Acanthaceae that occur in dry areas do not easily grow from cuttings and it is difficult to find under which conditions they will flower in cultivation.

Dryland species are also vulnerable to fungal attack when cultivated in mesic conditions, due to more water being available than in their natural habitat. Like many members of the Acanthaceae, *B. rigida* is browsed by livestock and indigenous game species.

The specific epithet, *rigida*, means 'rigid' and no doubt refers to the rigid bracteoles with reduced blades that form sharp rigid spines.

Description.—Perennial woody shrublet. *Stems* arising from a woody rootstock and branching above the ground, up to about 300 mm high or more; old stems glabrescent; young stems may be bifariously hairy or covered in very short hairs. *Leaves* narrowly ovate, 7–30 × 1.5–6.0 mm, usually glabrous; leaf margin undulate, entire or with small teeth; petiole short, 0.5–2.0 mm long. *Inflorescence* usually of solitary flowers but sometimes in clusters of 1–5, borne in alternate axils. *Bracteole* rigid, lanceolate, v-shaped in cross section, 11–24 × 1–4 mm, with a faint vein parallel to the thick midvein, hardened; margin with a few small, scattered teeth up to 1 mm long or occasionally entire; base truncate. *Calyx* outer lobes ovate, glabrous, with or without a purplish tinge on veins and pale sections at the base, membranous, papery, cartilaginous or indurate; margins serrate or weakly spine-toothed; posticous lobe 13–23 × 3–9 mm; anticous lobe 10–21 × 3–9 mm; inner calyx lobe margins entire. *Corolla* white, cream, pink, lilac, mauve, blue or purple, glabrous or shortly pubescent with microscopic hairs. *Stamens* long-exserted, inserted near middle of corolla tube; filaments 16–24 mm long; anthers 1.4–2.6 mm long; lateral staminodes 1.0–2.7 mm long, pubescent basally; antherodes 0.3–0.9 mm long. *Ovary* narrowly ovoid, with white hairs at apex; style exserted; stigma slightly swollen. *Fruit* a capsule, oblong fusiform, 8–13 × 3–5 mm. *Seeds* discoid with dense, matted hygroscopic hairs. *Flowering time*: January to June. Plate 2379.

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