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A REVISION OF GERANIUM IN AFRICA SOUTH OF THE LIMPOPO

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ABSTRACT. *Geranium* in southern Africa is revised, with descriptions of all species and a key to their identification. Twenty-seven native species are recognized, and in addition there are four aliens. One of the natives, *G. arabicum*, is a tropical African species of sect. *Simensia* and has only been recorded once: it has entire stipules. The remainder belong to sect. *Incana* and have divided stipules. Six names published by R. Knuth long ago are shown to represent good species, although none of them has been taken into use hitherto: a further nine new species are described here. Almost all these 15 species have been found in herbaria under the four old names, *G. incanum*, *G. canescens*, *G. caffrum* and *G. ornithopodon*. The headquarters of *Geranium* in southern Africa are in the eastern mountain region and adjoining lands at lower altitude, all with plentiful summer rainfall. Seventeen species are found in the Eastern Cape, 9 in Transkei and 16 in Natal. In contrast only 5 occur in Central, S and SW Cape and only 5 in Transvaal.

W. H. Harvey recognized only five species of *Geranium* in his account for *Flora Capensis* (Harvey, 1860); but the mountainous regions of the eastern Cape and Natal, the heartland of *Geranium* in southern Africa, were barely explored at that time. In the ensuing 50 years four new species were described: *G. pulchrum* N. E. Br., *G. brycei* N. E. Br., *G. multisectum* N. E. Br. and *G. robustum* Kuntze. Then in 1912 R. Knuth published his world-wide account of Geraniaceae in Engler's *Das Pflanzenreich*. Considering that Knuth had no field knowledge of the South African species and saw few specimens, he showed considerable taxonomic insight. He described eight new species, five of which we retain in this revision: subsequently he added *G. knysnaense* (1922), a synonym of *G. ornithopodon*, and *G. wakkerstroomianum* (1938), which is a good and common species. Yet these names have suffered the most astonishing neglect and none has ever been taken into general use. The result has been that the old names, particularly *G. incanum*, *G. canescens*, *G. caffrum* and *G. ornithopodon* have been used in a completely irresponsible fashion, and herbaria have contained almost any of the 27 species now recognized under one or more of these names.

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Failure to note differences in habit has been partly responsible for these misdeterminations. For instance, we have found *G. pulchrum* (a coarse subshrub), *G. amatolicum, G. grandistipulatum, G. brycei, G. discolor* (bushy perennials), *G. baurianum* and *G. contortum* (few- and weak-stemmed perennials), *G. schlechteri, G. wakkerstroomianum, G. sparsiflorum, G. natalense, G. caffrum* (all clump-forming straggling perennials not unlike *G. ornithopodon* in habit), *G. arabicum* (a stoloniferous perennial with undivided stipules), even the European annual *G. dissectum,* all misidentified, often repeatedly, as *G. ornithopodon.* In addition to their distinctive habits, these species show significant differences in leaf-cutting and indumentum.

One unfortunate consequence of the loose use of these names is that the limits of one of them, *G. incanum,* have been even further extended in two recent regional treatments: by Laundon (1963) in *Flora Zambesiaca,* and by Kokwaro (1971) in *Flora of Tropical East Africa.* In fact true *G. incanum* does not extend further north than the Eastern Cape.

The characters of major taxonomic importance are habit, the lobing and cutting of the leaves, and, sometimes, indumentum. Differences in the form of the leaves are sometimes difficult to define precisely, but Figs 1–3 should help in the determinations of specimens. Many of the species have a characteristic indumentum. Caution, however, is necessary: the presence or absence of gland-tipped hairs, particularly on the pedicels, is often not constant within a species; also, in some species both patent and appressed hairs may be found.

There is no doubt that the species may hybridize: this is mentioned under *G. discolor* (no. 5), *G. multisectum* (no. 9), *G. caffrum* (no. 13) and, more tentatively, under *G. magniflorum* (no. 10) and *G. flanaganii* (no. 25).

Knuth (1912) recognized 30 sections in *Geranium* and assigned the southern African species to three of them: sect. *Pyrenaica* Knuth, sect. *Incana* Reiche and sect. *Simensia* Knuth. This arrangement cuts across affinities as we see them. *G. baurianum* is close to *G. contortum*, but Knuth placed the first in sect. *Pyrenaica,* the second in sect. *Incana* as a synonym of *G. ornithopodon.* There is no reason to associate *G. baurianum* with the European *G. pyrenaicum.*

G. schlechteri, G. caffrum and *G. sparsiflorum* are separated from the other South African species and placed in sect. *Simensia*: yet *Simensia* typically has entire stipules while these species have the divided stipules characteristic of sect. *Incana.* Knuth paid little attention to stipule characters but they seem to be important, and divided stipules are relatively uncommon in the genus.

Sect. *Incana* Reiche (1890) was proposed for two S African species (*G. incanum* and *G. canescens*) and none are mentioned under other sections in Reiche's arrangement. Pending a complete revision of the infrageneric classification of *Geranium* it seems best to include in sect. *Incana* all the southern African species with divided stipules (as well as allied tropical species such as *G. exellii* Laundon, *G. ukingense* Knuth, and *G. vagans* Baker), and to keep sect. *Simensia* Knuth for *G. simense* A. Rich. (i.e. *G. arabicum* Forssk.) and allied tropical species in which the stipules are entire. Sect. *Simensia* concerns us here only because of a single record of *G. arabicum* in Transkei (no. 27).

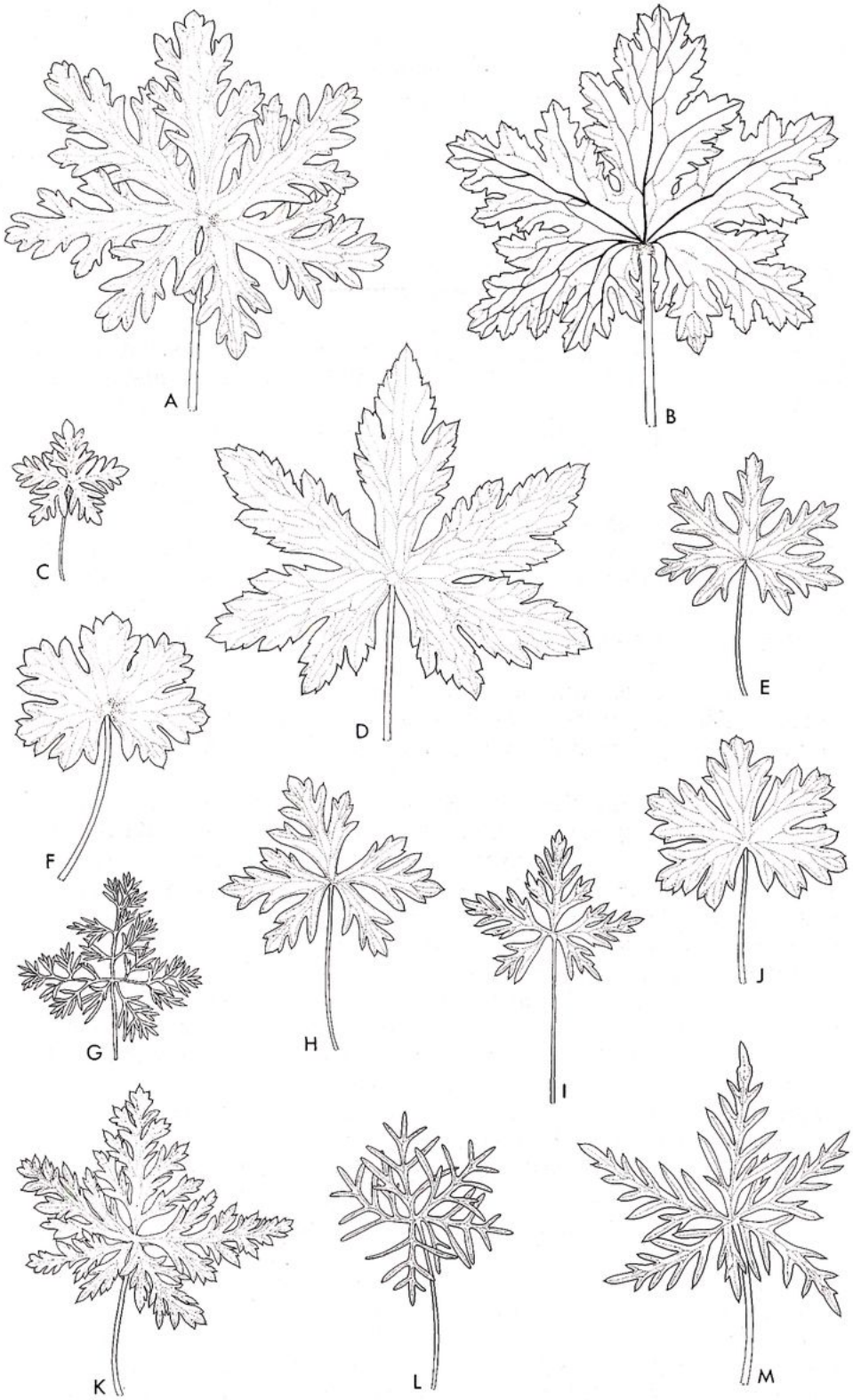

FIG. 1. A, B, *Geranium brycei* ; C, *G. harveyi*; D, *G. pulchrum*; E, *G. canescens*; F, *G. discolor*; G, *G. multisectum*; H, *G. drakensbergense*; I, *G. nyassense*; J, *G. angustipetalum*; K, *G. robustum*; L, *G. magniflorum*; M, *G. incanum*. All $\times\frac{2}{3}$, but there is considerable variation in leaf size.

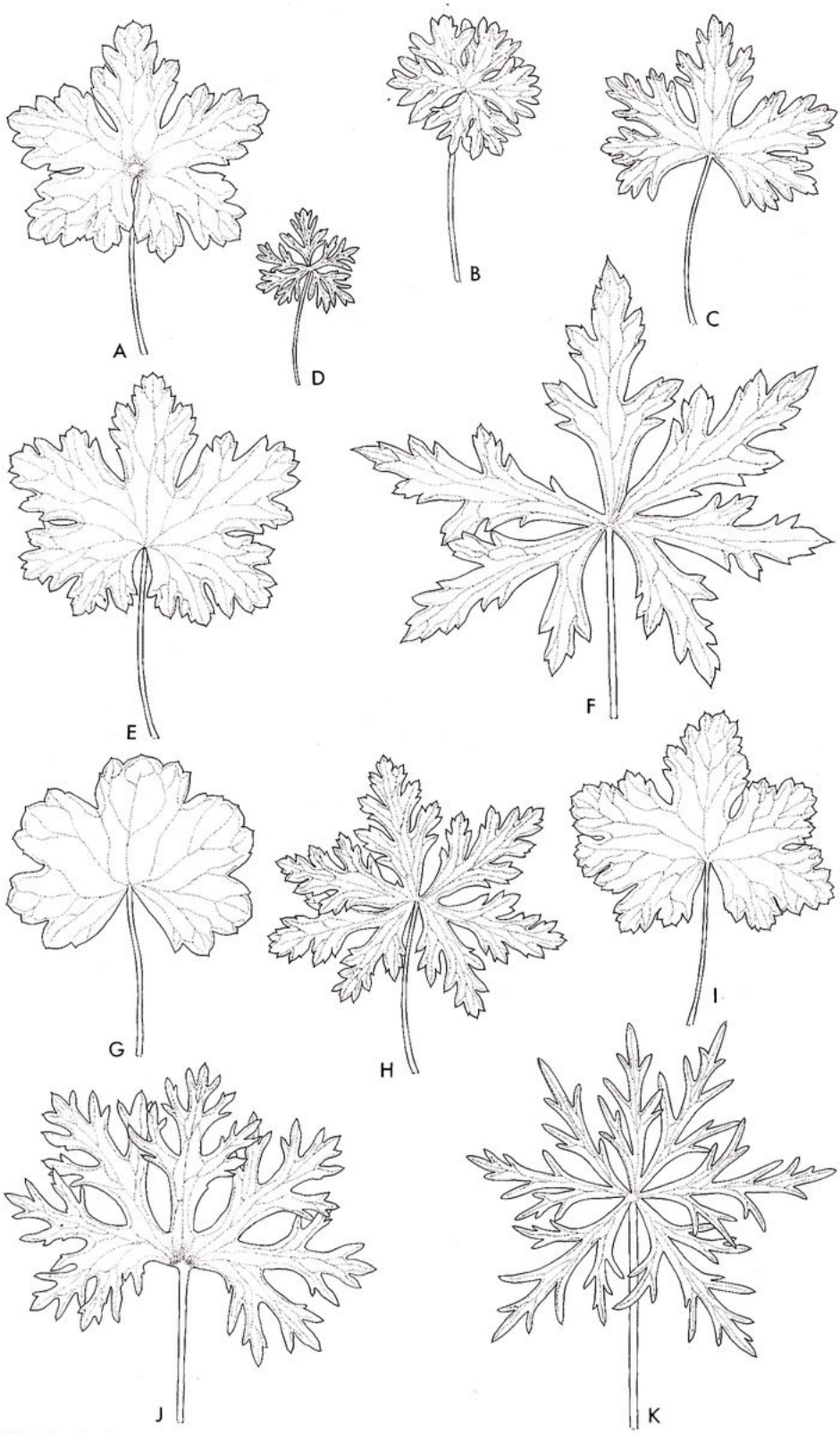

FIG. 2. A, *Geranium wakkerstroomianum*; B, *G. contortum*; C, *G. schlechteri*; D, *G. dregei*; E, *G. amatolicum*; F, *G. subglabrum*; G, *G. baurianum*; H, *G. natalense*; I, *G. grandistipulatum*; J, *G. sparsiflorum*; K, *G. caffrum*. All $\times\frac{2}{3}$, but there is considerable variation in leaf size.

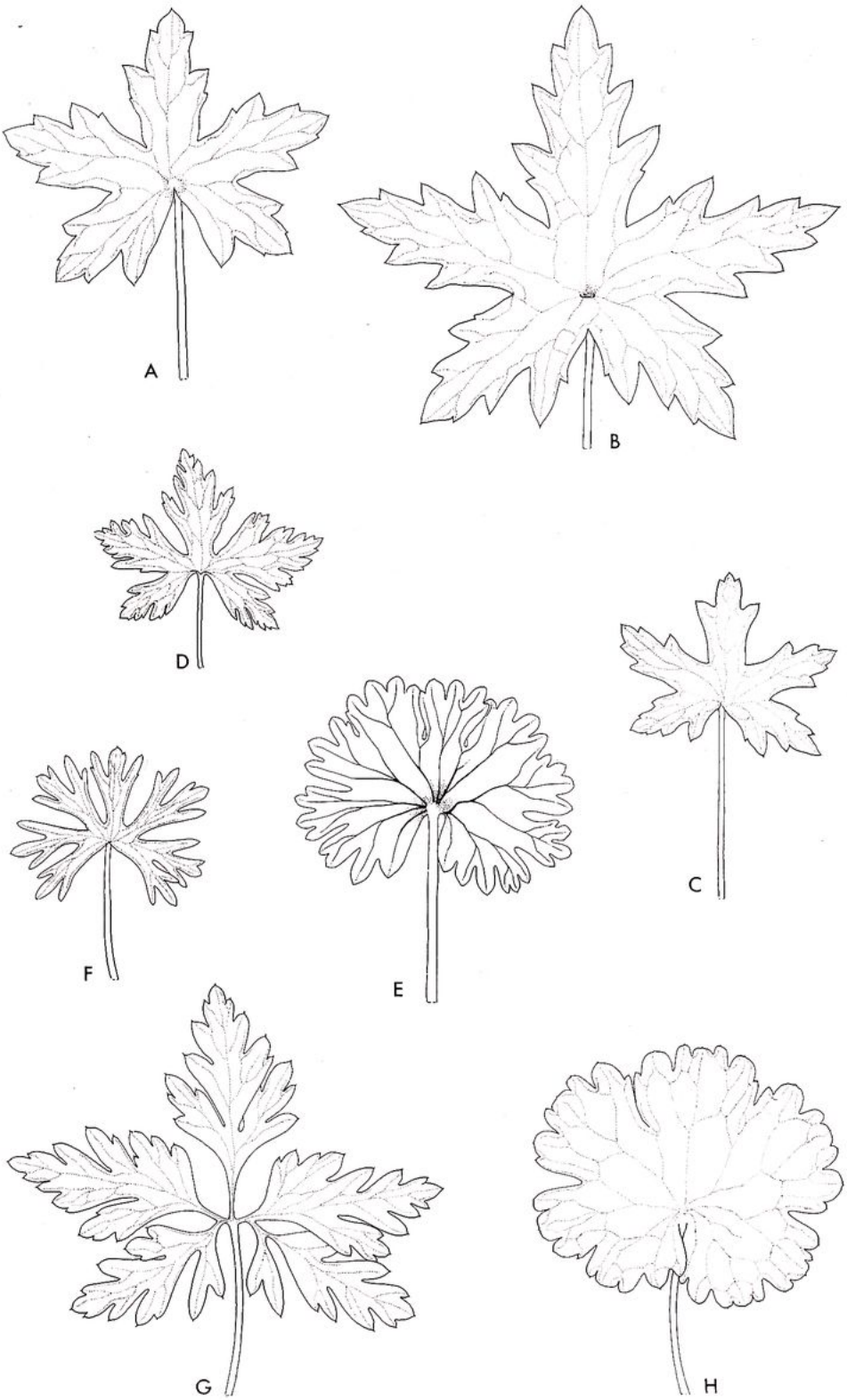

FIG. 3. A, *Geranium flanaganii*; B, *G. ornithopodioides*; C, *G. ornithopodon*; D, *G. arabicum*; E, *G. molle*; F, *G. dissectum*; G, *G. purpureum*; H, *G. rotundifolium*. All $\times\frac{2}{3}$, but there is considerable variation in leaf size.

Dr Peter Yeo has kindly allowed us a preview of his paper on fruit structure and classification in *Geranium,* now in press (Yeo, 1984). Both Reiche (1890) and Knuth (1912) recognized only a series of equivalent sections within the genus. Yeo introduces a more hierarchical arrangement, consisting of 3 subgenera, containing respectively 3, 8 and 2 sections. This classification will clearly present a much more detailed and accurate picture of the diversity within the genus. Subgenus *Geranium* sect. *Geranium* is by far the largest component in terms of species number and Dr Yeo's work within it has only reached the stage of indicating some of the major groupings. The species of sect. *Incana,* and of sect. *Simensia,* fall within this concept of sect. *Geranium.* Thus many of Knuth's sections, when maintained at all, will be downgraded to subsectional rank. Sect. *Incana,* with its constantly divided stipules and a sharply circumscribed geographical range (Congo, Uganda and Kenya south to the Cape Peninsula), will almost certainly merit recognition. Thus it will remain as a coherent entity for further study. In terms of leaf form and habit sect. *Incana* shows very considerable diversity and there is a fascinating line of research ahead in the comparison of this diversity with that shown by other groups of *Geranium,* and by other predominantly Eurasian genera represented in southern Africa. This will be part of the taxonomist's contribution to the multi-disciplinary study of the history of the African flora.

Geranium is essentially a genus of north temperate mesophytic herbs. It is therefore not surprising that its development in southern Africa is centred on the elevated and well-watered eastern part of the summer-rainfall area, and even there species are usually restricted to damp habitats. Thus 16 species are recorded for Natal, 17 for the Eastern Cape, while the intervening Transkei, an ill-collected area, has at least 9. By contrast only 3 species are known from the SW Cape and only 5 from the Transvaal. There are probably about 10 species in the combined areas of the *Flora of Tropical East Africa* and *Flora Zambesiaca*: of these *G. nyassense* Knuth reaches the northernmost Transvaal and there is one record of *G. arabicum* from Transkei; otherwise tropical and southern species are distinct.

It is worth noting that the southern African species of *Geranium* appear to have no close affinity to the Australasian representatives of the genus. According to R. C. Carolin (1965) there are 11 species in Australasia and they show the well-known south temperate link to the species found in South America. Once again, as in so many other groups, southern Africa plays no part in this relationship.

The majority of the species of *Geranium* in southern Africa are strictly herbaceous perennials, new flowering shoots being produced from the stock each year. A few however, notably *G. robustum* and *G. pulchrum,* may be described as shrubs because of the woody stems that persist for more than one season. However, they are not true shrubs in the sense of having long-lived perennial branching stems. Stems arise from the rootstock bearing a tuft of closely packed leaves. As the stem elongates the lower leaves fall, but leave behind the stipules which persist for some time. How long these stems remain in the vegetative condition has not yet been ascertained, perhaps for 1 or 2 years; each stem is monocarpic: it produces a large compound inflorescence, then fruits and dies. Such

plants are herbaceous representatives of the growth pattern recognized as Tomlinson's model in tree architecture (Hallé, Oldeman & Tomlinson, 1978).

In the southern African species of *Geranium* the lower stem leaves are alternate, the upper ones opposite. The change in phyllotaxis does not necessarily coincide with the change from the vegetative to the reproductive regime, the first inflorescences being usually formed in association with the uppermost alternate leaves. The basic unit of the inflorescence in *Geranium* seems to be a terminal 3-flowered dichasium. This, however, is rarely produced; it is usually reduced to 2 flowers, the central one and one lateral. More rarely there is only a single flower. Amongst the Australasian species Carolin (1965) has recognized a group with constantly 1-flowered peduncles, but in southern Africa reduction to a single flower is sporadic on normally 2-flowered plants and is without a systematic basis.

In the straggling species such as *G. schlechteri* the first peduncles are in a superficially leaf-opposed position where the leaves are still alternate. The switch to opposite leaves does not change the pattern: there is still only one axillary shoot, which continues the main axis, and one peduncle that now appears to be axillary, instead of leaf-opposed, but is morphologically terminal. In the more erect species the first peduncles are again associated with the uppermost alternate leaves, but when opposite leaves are produced both leaves subtend axillary shoots: between them is the terminal peduncle, though this may sometimes abort. Further branching is associated with a rapid decrease in the size of the leaf blades, and those of a pair are frequently unequal; above this one leaf is reduced to a stipule-like structure and at a quick glance the leaves appear to be alternate again; finally, laminate leaves disappear altogether and the uppermost nodes of the inflorescence carry only stipular structures. The inequality in the size of the leaves is reflected in the branching pattern. The dichasial branching evident at the first node or two with opposite leaves soon disappears and monochasial branching supervenes, with a 2-flowered peduncle terminating each sympodial segment. In these erect-growing species the early dichasial branching, followed by the monochasial system, results in the build up of a large compound cymose inflorescence. However, the complexity connected with suppression of internodes, as reported by Yeo (1973), does not seem to occur in the southern African species.

KEY TO THE SPECIES

NOTE. *Leaves*: ignore uppermost reduced leaves when measuring depth of lobing.
Sepals: measure before the petals have fallen and ignore mucro.
Hybrids: are known to occur and these are not catered for.

1a. Stipules at least bisect, usually multisect..... 2
1b. Stipules entire or very nearly so..... 35

2a. Median primary leaf lobe cut to base of leaf 3
2b. Median primary leaf lobe shallowly to deeply cut, but not to base of leaf 14

3a. Primary leaf lobes once or twice pinnate; pinnae usually linear, sometimes oblong on well-grown plants 4
3b. Primary leaf lobes somewhat irregularly lobed and toothed; ultimate segments oblong or lanceolate 7

4a. Plants loosely branched and straggling, without tufts of radical leaves. SW, S and E Cape 5
4b. Plants clumped, with tufts of radical leaves. Summer rainfall area .. 6

5a. Petals white or faintly tinged pink, veins reddish, 8–11(–15) × 4–7 (–9)mm ..... **11.G. incanum** var. **incanum**
5b. Petals rose, violet or purple (rarely a white sport with purple veins), (11–)12–18 × (5–)8–12mm ..... **11. G. incanum** var. **multifidum**

6a. Leaf lobes once pinnate (the lowermost pair of pinnae on each lobe are sometimes toothed or lobed) ..... **10. G. magniflorum**
6b. Leaf lobes twice pinnate ..... **9. G. multisectum**

7a. Hairs on lower leaf surface confined to veins and margins 8
7b. Hairs on lower leaf surface not confined to veins 10

8a. Petioles with retrorse appressed hairs 9
8b. Petioles with delicate, spreading, gland-tipped hairs **16. G. sparsiflorum**

9a. Ultimate leaf segments oblong ..... **13. G. caffrum**
9b. Ultimate leaf segments lanceolate ..... **15. G. subglabrum**

10a. Leaves silvery, with dense appressed sericeous hairs on both surfaces 11
10b. Leaves thinly clad with appressed hairs above, or if rather densely so the hairs on the lower surface coarse and spreading 12

11a. Shrub; primary leaf lobes irregularly lobed and toothed **1. G. robustum**
11b. Straggling perennial herb; primary leaf lobes pinnately divided, only the lowermost pair of pinnae sometimes toothed ..... **6. G. harveyi**

12a. Sepals c.7–8 × 3–3·5mm ..... **8. G. drakensbergense**
12b. Sepals 4–6 × 1·5–2·5mm 13

13a. Lower leaf surface finely appressed pubescent with coarser hairs over the veins and sometimes longer spreading hairs as well; petals 9–12mm long ..... **12. G. nyassense**
13b. Lower leaf surface with coarse spreading hairs; petals 7–8·5mm long **14. G. dregei**

14a. Petals deeply notched ..... **19. G. wakkerstroomianum**
14b. Petals either entire or shallowly notched 15

15a. Leaves peltate ..... **26. G. ornithopodioides**
15b. Leaves not peltate 16

16a. Hairs on lower leaf surface confined to veins or nearly so 17
16b. Lower leaf surface hairy all over 20

17a. Primary leaf lobes oblong in outline, deeply pinnatifid; segments oblong, usually entire ..... **13. G. caffrum**

17b. Primary leaf lobes elliptic or rhomboid in outline 18

18a. Hairs on petioles scanty, retrorse, appressed..... **15. G. subglabrum**
18b. Hairs on petioles well developed, either long and spreading, or short fine curled, ±retrorse, or mixed 19

19a. Spreading gland-tipped hairs on peduncles mostly at least 1mm long; sepals c.6–9 × 2–3mm ..... **16. G. sparsiflorum**
19b. Spreading gland-tipped hairs on peduncles up to 0·3mm long, or absent; sepals c.4·5–5 × 1·75–2·5mm ..... **17. G. natalense**

20a. Primary leaf lobes cut less than halfway to base of leaf **23. G. baurianum**
20b. Primary leaf lobes cut more than halfway to base of leaf 21

21a. Hairs on petioles retrorse, appressed 22
21b. Hairs on petioles either spreading or if somewhat retrorse then not appressed..... 27

22a. Plant shrubby; primary leaf lobes elliptic in outline, irregularly lobed and toothed ..... **2. G. pulchrum**
22b. Plant herbaceous; primary leaf lobes rhomboid, rhomboid-ovate or oblong in outline, if elliptic then with only 2–3 lobes on each side . 23

23a. Primary leaf lobes elliptic or oblong in outline ..... **25. G. flanaganii**
23b. Primary leaf lobes rhomboid or rhomboid-ovate in outline 24

24a. Petals 8–11·5 × 4–5mm..... **7. G. canescens**
24b. Petals 12–18 × 5–9mm 25

25a. Leaves appressed silvery-silky above and below ..... **6. G. harveyi**
25b. Leaves variously hairy, but not appressed silvery-silky on both surfaces 26

26a. Primary leaf lobes dissected about halfway to midrib; petals c.5–7mm broad ..... **4. G. angustipetalum**
26b. Primary leaf lobes dissected more than halfway to the midrib; petals c.10–12mm broad..... **8. G. drakensbergense**

27a. Primary leaf lobes cut half to two-thirds to the base of the leaf, white-felted below ..... **5. G. discolor**
27b. Primary leaf lobes either cut more than two-thirds to the base of the leaf, or not white below 28

28a. Primary leaf lobes rhomboid, ovate or elliptic in outline; hairs on lower surface either glandular, eglandular or mixed 29
28b. Primary leaf lobes oblong or elliptic-oblong in outline; hairs on lower surface always eglandular..... 34

29a. Lower leaf surface clad in closely matted white hairs between the veins, long coarse spreading hairs over the veins ..... **3. G. brycei**
29b. Lower leaf surface variously hairy, but not with matted white hairs between the veins..... 30

30a. Primary leaf lobes rhomboid in outline, deeply pinnatifid; lower surface silky-silvery..... **7. G. canescens**
30b. Primary leaf lobes either elliptic or ovate in outline, or if rhomboid then scattered coarse hairs on lower surface..... 31

31a. Stipules divided into 2 or 3 broad very acute segments **21. G. grandistipulatum**

31b. Stipules deeply divided into several linear-acuminate segments..... 32

32a. Stem and petioles with short curved eglandular, more or less retrorse hairs, any glandular hairs short (c.0·3mm) ..... **22. G. contortum**

32b. Stem and petioles with long (1mm or more), fine, gland-tipped hairs 33

33a. Stems straggling; flowers not forming a terminal compound inflorescence; petals 9–13mm long ..... **18. G. schlechteri**

33b. Bushy herb with many erect or ascending stems; flowers usually forming a compound inflorescence; petals 14–30mm long **20. G. amatolicum**

34a. Sepals 4–5·5 × 2–3mm; petals 7–10 × 4–6mm..... **24. G. ornithopodon**

34b. Sepals 6–8 × 2·5–4mm; petals 10–16 × 6–11mm ..... **25. G. flanaganii**

35a. Petals entire or nearly so..... 36

35b. Petals deeply notched..... 38

36a. Diffuse perennial herb without radical leaves..... **27. G. arabicum**

36b. Annual herbs with radical leaves..... 37

37a. Primary leaf lobes cut less than halfway to base of leaf; carpels smooth, pilose..... **28. G. rotundifolium**

37b. Primary leaf lobes cut almost or quite to base of leaf; carpels transversely ridged, glabrous..... **31. G. purpureum**

38a. Primary leaf lobes oblong-obovate in outline, deeply trifid; carpels transversely ridged, glabrous..... **29. G. molle**

38b. Primary leaf lobes cuneate in outline, deeply dissected; carpels smooth, pilose..... **30. G. dissectum**

Sect. Incana Reiche

1. Geranium robustum Kuntze, Revis. Gen. Pl. 3(2):32 (1898); Knuth, Pflanzenr. Geran. 166 (1912).

Type: Natal, Charlestown, 1800m, 22 iii 1894, *Kuntze* (K iso.).

Syn.: *G. incanum* var. *pottiae* Burtt Davy, Man. Pl. Transvaal 1:41, 191 (1926). Type: Transvaal, Ermelo distr., farm Goedehoop, Dec. 1915, *Pott* 4971 (PRE holo., BOL iso).

Robust subshrub up to c.1m high, stems one or several from the base, becoming bare and woody there, up to c.8mm diam., silky canescent and leafy above, erect. *Stipules* deeply dissected, segments linear-acuminate. *Leaves* all cauline, all but the uppermost petioles 2–3 times as long as the blade, with white retrorse appressed hairs, blade up to 50 (–100)mm in diam., digitately (3–) 5 (–7)-lobed to the base, each lobe elliptic-lanceolate in outline, twice pinnatifid, the ultimate segments lanceolate, entire or with an occasional tooth, upper surface with silky silvery appressed hairs, lower thickly silvery tomentose, the hairs all of similar length. *Peduncles* terminal and opposite the uppermost, reduced, leaves, forming small almost leafless compound cymes clad in fine retrorse appressed hairs, spreading gland-tipped hairs often present as well; ultimate peduncles mostly 2-flowered. *Pedicels* up to c.60mm long, with fine appressed retrorse hairs as well as few to many spreading gland-tipped ones. *Sepals* (6–) 7–9 × 2.5–3.5 (–4)mm, ± appressed pubescent, often with long spreading gland-tipped hairs as well. *Petals* (13–) 18–20 × 11–12 (–15)mm,

obovate, shallowly notched, light purple. *Rostrum* with short fine spreading pubescence, often with long spreading gland-tipped hairs as well. **Fig. 1K**.

Selected citations:
TRANSVAAL. Wakkerstroom distr., farm Oshoek, 6000–6800ft, 3 xi 1960, *Devenish* 221 (PRE); Wakkerstroom, Honey Moon Kloof, 6200ft, 20 xi 1916, *Beeton* 65 (SAM); near Wakkerstroom, Kastrol Nek, i 1925, *Van Dam* s.n. (PRE). Volksrust distr., Volksrust, i 1912, *Jenkins* s.n. TM 22119 (PRE). Heidelberg distr., 2628 CA, Suikerbosrand, 5500ft, 15 xii 1971, *Bredenkamp* 409 (PRE).
NATAL. Utrecht distr., farm Tweekloof (Altemooi), xii 1926–i 1927, *Thode* A 1150 (PRE).
ORANGE FREE STATE. Witzieshoek, foot of Mopeli's Peak, 6–7000ft, ii 1906, *Thode* s.n. (5682 STE). Bethlehem distr., Golden Gate Highlands Park, c.6100ft, 18 i 1966, *Liebenberg* 7549 (PRE). Ficksburg distr., farm Westbury, 5400–5800ft, 14 x 1934, *Galpin* 13828 (BOL, PRE). Fouriesburg distr., Wyndford, c.5600ft, 22 i 1957, *Gemmell* s.n. (BLFU 7526). Thaba'Nchu distr., 2926 BB Thaba 'Nchu Mountain, 13 xii 1977, *Peters, Gericke & Burelli* 380 (PRE). Ladybrand distr., Ladybrand, 1700m, 16 x 1982, *Richardson* 155 (NU).
LESOTHO. Butha Buthe distr., Mota's Pass, 8500ft, 7 ii 1954, *Jacot Guillarmod* 2131 (PRE); Moteng Pass, 2500m, 6 iv 1977, *Werger* 1620 (BLFU). Leribe distr., Leribe, *Dieterlen* 593 (PRE, SAM); Mamathes, 7 xi 1955, *Marais* 1082 (PRE); Mamalapi, c.8500ft, 19 i 1957, *Marais* 1291 (PRE); ibidem, *Compton* 21362 (NBG, PRE); near Teyateyaneng, 5500ft, 16 xi 1951, *Jacot Guillarmod* 1414 (PRE). Maseru distr., Roma, 2 xi 1974, *Schmitz* 4455 (PRE); Malutsunyane Falls, 7000ft, *Staples* 172 (PRE); 2927 BD, Molimo Nthuse Pass, c.7000ft, 12 i 1979, *Hilliard & Burtt* 12091 (E, NU).
TRANSKEI. Herschel distr., near Sterkspruit, Majuba Nek, i 1916, *Hepburn* 167 (GRA).
CAPE. Barkly East distr., 3027 DB, Ben Mcdhui, bottom of Bell river gorge, 8200ft, 7 ii 1983, *Hilliard & Burtt* 16528A (E, NU); 3028 CC, Rhodes to Naude's Nek, farm 'Dunley', 2285m, 13 ii 1983, *Hilliard & Burtt* 16588/A (E, NU); 3027 DA, c.4 miles S of Lundean's Nek, c.6500ft, 18 i 1970, *Werger* 1068 (PRE); 3027 DA, Witteberg, farm Beddgelert, c.6200ft, 1 xii 1981, *Hilliard & Burtt* 14623 (E, NU); 3027 DC, old Lady Grey road above Kraai River, 5600ft, 30 xi 1981, *Hilliard & Burtt* 14568 (E, NU); 3027 AB, Saalboom valley south of Clifford, c.6500ft, 21 i 1979, *Hilliard & Burtt* 12312 (E, NU). Elliot distr., 3127 BD, Barkly Pass, 5500ft, 29 xi 1981, *Hilliard & Burtt* 14555 (E, NU).

Geranium robustum ranges from around Ermelo and Suikerbosrand in the south-eastern Transvaal through the low Drakensberg and nearby parts of northern Natal to the eastern highlands of the Orange Free State, thence through Lesotho to the Witteberg and the Cape Drakensberg as far south as the Saalboom Valley near Barkly East; *Glass* 505 (SAM) reputedly came from Grahamstown, but that locality is highly improbable.

Geranium robustum favours streamsides and moist, shrub-covered mountain slopes between 1600 and 2590m above sea level. It often forms

dense stands, flowering mainly between November and March. It is a very distinctive plant, yet it is frequently misidentified as either *G. incanum, G. canescens,* or *G. harveyi,* none of which is shrubby, and all differ further from *G. robustum* in other characters. *Geranium robustum* is allied to *G. pulchrum,* which replaces it on the Natal side of the Drakensberg, though *G. pulchrum* possibly demands wetter sites than *G. robustum.*

2. Geranium pulchrum N.E. Br. in Kew Bull. 1895:143 (1895).
Type: Natal, Berg [i.e. Drakensberg], 6–7500ft, Jan. 1895, *Evans* 378 (K holo., NH iso.).
Syn.: *G. lanuginosum* Knuth in Bot. Jahrb. 40:67 (1907) & Pflanzenr. Geran. 164 (1912), non Lam. (1788). Lectotype (chosen here): Natal, Weenen County, South Downs, 4–5000ft, 4 xii 1890, *Wood* 916 (E).

Robust subshrub up to 1.2m high, stems one or several from the base, becoming bare and woody there, up to c.10mm diam., silky canescent and leafy above, erect or decumbent. *Stipules* deeply dissected, segments linear-acuminate. *Leaves* all cauline, petioles long, all but the uppermost much exceeding the blade in length, with silvery retrorse appressed hairs, blade up to c.120mm diam., much smaller in upper leaves, digitately 5 (–7)-lobed nearly to the base (ratio 4·5–10:1 measured on medium lobe), each lobe elliptic in outline, sharply and irregularly lobed and toothed, apex acute, mucronate, upper surface with appressed hairs, lower surface thickly silvery silky tomentose, the hairs all of similar length. *Peduncles* terminal and opposite the uppermost leaves, forming large almost leafless compound cymes clad in coarse ± retrorse white hairs as well as gland-tipped spreading ones, ultimate peduncles mostly 2-flowered. *Pedicels* up to c.60mm long, hairy as the peduncles. *Sepals* 7–9 × 3–5mm, excluding the mucro, with appressed hairs as well as spreading gland-tipped ones. *Petals* 17–22 × 11–19mm, obovate, shallowly notched, light purple or deep pink, sometimes lighter or white at the centre. *Rostrum* with spreading gland-tipped hairs. **Fig. 1D**.
Selected citations:
NATAL. Bergville distr., Sungabala Pass, 6500ft, 29 xi 1961, *Hilliard* 2020 (NU); Royal Natal National Park, 7500ft, i 1964, *Trauseld* 161 (PRE; NU); Cathedral Peak area, 6500ft, vii 1949, *Esterhuysen* 15497 (BOL). Estcourt distr., Kamberg [Mountain], E end, c.5900ft, 2 xi 1974, *Wright* 1887 (E, K, NU); Culvers, 6000ft, xii 1923, *Rogers* 28278 (GRA); Tabamhlope Mountain, 5600ft, 31 iii 1963, *Hilliard* 1483 (NU); ibidem, 29 xi 1939, *West* 1385 (PRE); Giants Castle Game Reserve, 6500ft, 7 xi 1914, *Symons* 114 (PRE, SAM); ibidem, Bushman's River Valley, 19 x 1907, *Wylie* com. Wood 10604 (PRE, SAM). Polela distr., Mawahqua Mt., farm 'Sunset', 5200ft, 3 i 1974, *Rennie* 477 (E, NU). Underberg distr., Sani pass, 6800ft, 26 i 1966, *Killick & Vahrmeijer* 3810 (PRE); 2929 CB, Upper Polela Cave area, 6800–7500ft, 14 ii 1979, *Hilliard & Burtt* 12571 (E, NU); Garden Castle Forest Reserve c.6000ft, 28 i 1975, *Hilliard & Burtt* 7769 (E, K, NU, PRE); Bushman's Nek, near Police Post, 6000ft, 1982, *Stewart & Manning* 2261 (NU). Mount Currie distr., Mount Currie, 5300ft, ii 1884, *Tyson* 1732 (BOL, GRA, PRE, SAM); Cedarville, Mvenyani, 5 ii 1921, *Baudert* 129 (GRA).

The type specimen probably came from the Drakensberg opposite Tabamhlope Mt (Estcourt distr.), where Evans was collecting in January 1895.

Geranium pulchrum is a Drakensberg endemic, which has been recorded along the face of the Berg from Sungabala, just north of Royal Natal National Park in Bergville district, south to Bushman's Nek in Underberg district, as well as on the major Drakensberg outliers: Tabamhlope, Kamberg, Mawahqua, Mount Currie and Mvenyani Mountains, the last two being in East Griqualand. *Geranium pulchrum* seems to be replaced by *G. brycei* somewhere between Mvenyani (near Cedarville) and Ongleluks Nek some 50km to the west on the face of the Drakensberg; the Drakensberg between there and the Natal border is virtually unexplored.

It grows in damp or marshy ground along streams and in drainage lines, flowering mainly between December and March. It is often a conspicuous constituent of scrub at altitudes ranging from about 1500 to 2285m; at higher altitudes it may form almost pure stands tracing the courses of runnels.

Knuth did not see the type of *G. pulchrum*, and re-described the species as *G. lanuginosum*. The specimen that Knuth (1912 p. 157) saw and mistook for *G. pulchrum* is *Baur* 831, from Goshen, on the Windvogelberg near Cathcart, which is *G. brycei*.

Dr Oliver West collected typical *G. pulchrum* on Tabamhlope Mountain in Estcourt district, Natal, (*West* 1385, PRE), but he also collected another specimen (*West* 177, PRE), in which the leaves have the characteristic form of those of *G. pulchrum* but the indumentum is very thin, and not at all typical.

3. Geranium brycei N.E. Br. in Kew Bull. 1901:120 (1901); Knuth, Pflanzenr. Geran. 164 (1912).

Type: Lesotho, Machache Mountain, 2900m, *Bryce* (K holo.).

Syn.: *Geranium thodei* [Schltr. ex] Knuth in Bot. Jahrb. 40:70 (1910) & Pflanzenr. Geran. 164 (1912). Lectotype (chosen here): Lesotho, Mont aux Sources, 2950m, Jan. 1896, *Thode* (BOL; NH, STE, isolecto.).

Perennial herb or subshrub up to c.1m tall, though often much shorter, stems one or several from the base, eventually bare and woody there, up to c.10mm diam., erect or decumbent, upper parts thinly pilose, hairs spreading. *Stipules* deeply dissected, segments linear-acuminate. *Leaves* crowded at the branch tips with more distantly leafy flowering branches arising laterally; petioles 30–300mm long, progressively shorter upwards, uppermost leaves reduced and subsessile, thinly pilose with spreading or slightly retrorse hairs, sometimes a few with delicate gland tips; blade 20–150mm diam., nearly orbicular in outline, digitately 5 (–7)-lobed to at least $\frac{3}{4}$ the depth of the radius, each lobe $\pm$ obtuse, shaggy white spreading hairs above, closely matted white hairs between the veins below, veins raised, brown or pallid, clothed in long spreading hairs. *Peduncles* terminal and opposite the upper leaves, in well grown specimens forming large compound cymes, ultimate peduncles mostly 2-flowered, all pilose, the coarser hairs $\pm$ spreading, many of them gland-tipped, or glands

occasionally few or wanting. *Pedicels* c.15–55mm long, hairy as the peduncles. *Sepals* 6–9·5 × 2–4mm, excluding the mucro, with short fine appressed pubescence as well as long spreading often gland-tipped hairs. *Petals* 14–20 × 10–13mm, obovate, shallowly notched, pale or deep violet, purple-blue, or light magenta-violet, sometimes with a white patch near the base, veins sometimes reddish. *Rostrum* with spreading gland-tipped hairs. **Fig. 1 A, B.**

Selected citations:

LESOTHO – NATAL border, summit of Mont aux Sources, 9500ft, Jan. 1894, *Flanagan* 2017 (BOL, PRE, SAM); ibidem, 10500ft, 22 ii 1926, *Bayer & McClean* 251 (K, NU, PRE).

ORANGE FREE STATE. Witzieshoek, in Gully, 10000ft, 1 iv 1970, *Liebenberg* 8155 (K); between The Sentinel and the chain ladders, 15 i 1982, *Matthews* 757 (NBG).

NATAL. Bergville distr., Cathedral Peak area, Camel, 7300ft, Jan 1944, *Schelpe* 542 (NU). Estcourt distr., Giant's Castle, 9250ft, 17 i 1949, *Bruyns-Haylett* 17 (NU). Underberg distr., 2929 CA, Garden Castle Forest Reserve, Mlambonja valley, path to Mashai Pass, 2255m, 8 i 1982, *Hilliard & Burtt* 15014 (E, NU); 2929 CB, Sani Pass, c.2590m, 17 ii 1982, *Hilliard & Burtt* 15518 (E, NU).

TRANSKEI. Ongeluk's Nek Pass, c.7700ft, 28 iii 1962, *Acocks* 22193 (PRE).

LESOTHO, Butha Buthe distr., Tsehlenyane Oxbow, ii 1970, *Roberts* 5804 (PRE). Mokhotlong distr., Phutha, 9500ft, 28 ii 1949, *Compton* 21619 (NBG, PRE); Mokhotlong, iii 1949, *Jacot Guillarmod* 263 (PRE); south of Sani Pass, c.2990m, 18 i 1976, *Hilliard & Burtt* 8865 (E, K, MO, NU, S, STE). Maseru distr., 2927 BD, Molimo Nthuse Pass, c.2135m, 12 i 1979, *Hilliard & Burtt* 12082 (E, NU), Blue Mountain Pass, c.3000m, 20 i 1981, *Schmitz* 9192 (NU); Bushmen's Pass, 2250m, 15 xi 1977, *Schmitz* 7965 (PRE); Mamalapi, 10000ft, 31 xii 1948, *Compton* 21405 (NBG). Qacha's Nek distr., Sehlabathebe, c.2500m, 7 iv 1976, *Hoener* 1461 (PRE).

CAPE. Lady Grey distr., Witbergen, 5000–6000 Fuss Höhe, *Drège* 7511 (S). Barkly East distr., Doodman's Krans Mountain c.9650m, 9 iii 1904, *Galpin* 6591 (BOL, K, PRE); 3027 DB, Ben Mcdhui, c.2470m, 3 xii 1981, *Hilliard & Burtt* 14702 (E, NU); Naude's Nek, 26 i 1957, *Marais* 1357 (GRA, K, PRE); ibidem, 3028 CA, c.2500m, 13 ii 1983, *Hilliard & Burtt* 16600 (E, NU); 3127 AB, Saalboom Nek, 2100m, 14 x 1980 [sterile], *Hilliard & Burtt* 13123 (E, NU); 3027 BC, Three Drifts stream below farm 'Pitlochrie', c.1770m, 6 xii 1981, *Hilliard & Burtt* 14733 (E, NU). Elliot distr., 3127 BB, Bastervoetpad, c.2165m, 15 ii 1983, *Hilliard & Burtt* 16701 (E, NU). Cathcart distr., Windvogelberg, 'Goshen', 3500ft, Oct., *Baur* 831 (K).

Geranium brycei is widely distributed on the high mountains of Lesotho, along the face of the Natal Drakensberg down to c.2200m, and on the Cape Drakensberg and nearby Witteberg, with an isolated record from the Windvogelberg near Cathcart, due north of the Amatola Mountains in the E Cape. It favours damp and often rocky places, and frequently forms large stands along streambanks and down drainage lines, or, at high altitudes, on open mountain sides. The great variation it exhibits in stature and leaf size is probably controlled partly by

environmental factors; variation in depth of lobing may be genetically controlled, and almost the whole range can occur over a small area (for example, on Mont aux Sources, type locality for *G. thodei,* a synonym of *G. brycei*) or the degree of lobing may be more uniform in any particular area. The main leaf lobes are, however, always blunt (not acute, as in *G. pulchrum*) and the indumentum is distinctive: closely matted white hairs between the veins, with longer coarse spreading hairs over the veins.

The type of *G. brycei* is only a scrap, and we have seen no other material from Machache Mountain. The altitude was given as 9500ft, but this was at a time when Machache was thought to be 11000ft high whereas it is in fact only 9434ft (2886m). Bryce himself (James Bryce, *Impressions of South Africa* p. 329) thought it was no more than 10500ft; he mentions (p. 326) the collection of two species of *Geranium* (later described as *G. brycei* and *G. multisectum*) at a point well below the summit, somewhat above 8500ft by his reckoning, but clearly at least 1000ft lower. We have collected a plant that we equate with *G. brycei* at 7000ft on Molimo Nthuse Pass, which is only some 7·5km SSE of Machache while it has also been collected on Bushman's Pass, at about the same distance SSW of Machache, at 2250m (7400ft), and we are satisfied that *G. brycei* and *G. thodei* are conspecific. Knuth saw no material of *G. brycei*; he relied upon N. E. Brown's description, and in his key to the species in sect. *Incana* he separated his new species *G. thodei* from *G. brycei* on the presence (versus absence) of gland-tipped hairs on the pedicels. Brown makes no mention of glands in his description of *G. brycei,* but the type specimen is in fact glandular and this alleged difference between *G. thodei* and *G. brycei* falls away.

4. Geranium angustipetalum Hilliard & Burtt, **species nova** ex affinitate *G. brycei* N. E. Br., sed habitu effuso (nec foliis caespitosis), pilis petiolorum retrorsus appressis (nec patentibus vel subpatentibus), petalis minoribus praecipue angustioribus (c.12 × 5mm, nec 14–20 × 10–13mm) differt.

Herba perennis; caules ad 45cm longi, 2mm diam., e caudice numerosi, effusi, inferne aut nudi aut stipulis relictis induti, ad apices foliati, tenuiter et retrorsus pilosi, sed stipulis imbricatis fere occulti. *Stipulae* profunde dissectae, segmentis lineari-acuminatis. *Folia* petiolis 50–200mm longis retrorsus et appresse pilosis; lamina 20–55mm diam., ambitu suborbicularis, ad tres partes digitatim 5-lobata; lobi ambitu rhomboideo-obovati, iterum lobulati, apice plus minusve obtusi, supra tenuites appresse pilosi, subtus inter venas pilis albis intertextis supra venas pilis longioribis induti. *Pedunculi* terminales, solitarii 1-vel 2-flori, retrorsus pilosi. *Pedicelli* c.20–50mm longi pilis brevibus plus minusve retrorsis et aliis patentibus glanduloso-capitatis induti. *Sepala* c.6 × 2·5mm mucrone excluso, pilis albis brevibus tenuibus appressis et aliis patentibus saepe glanduloso-apiculatis induta. *Petala* c.12–14 × 5–7mm, obovata, emarginata, rosea, rubro-venosa. *Rostrum* pilis patentibus eglandulosis et insuper aliis paucis longis gracilibus glanduloso-apiculatis praeditum.

Type: Natal, Underberg distr., 2929 CC, Bushman's Nek, Thamathu cave, 2285m, 6 ii 1976, *Hilliard & Burtt* 9006 (NU holo.; E, STE iso.).

Perennial herb, stems up to 45cm long, 2mm diam., many from the crown, weak, straggling, either bare below or with the remains of stipules, leafy towards the tips, thinly pilose, hairs retrorse, but surface often almost obscured by the overlapping stipules. *Stipules* deeply dissected, segments linear-acuminate. *Leaves* with petioles 50–200mm long, pilose, hairs retrorse, appressed, blade 20–55mm diam., suborbicular in outline,

digitately 5-lobed to at least $\frac{3}{4}$ the depth of the radius, lobes rhomboid-obovate in outline, themselves lobed, apex ± obtuse, upper surface thinly pilose, hairs appressed, white intermingling hairs between the veins below, longer, coarser spreading hairs over the veins. *Peduncles* terminal, solitary 1- or 2-flowered, pilose, hairs reflexed. *Pedicels* c.20–50 mm long, with short ± reflexed hairs and longer spreading gland-tipped hairs. *Sepals* c.6 × 2·5mm excluding the mucro, with short fine appressed pubescence as well as long spreading often gland-tipped hairs. *Petals* c.12–14 × 5–7mm, obovate, shallowly notched, pink, veined red. *Rostrum* with spreading eglandular hairs and an occasional long gland-tipped hair. **Fig. 1J**.

Geranium angustipetalum is known only from the type collection. It grew at the foot of moist south-facing Cave Sandstone cliffs in the southern Natal Drakensberg and should be sought particularly in the ill-known mountains further south. It is allied to *G. brycei* but is a much less woody plant with lax straggling growth, it lacks radical leaf tufts, and has only one peduncle terminating each branch, not a spreading, branching cyme. The hairs on the petioles are retrorse and appressed, and thus differ from the more or less spreading hairs found in *G. brycei*; however, this character may prove unreliable here as elsewhere in the genus. But the narrow petals are probably a good distinguishing character, as they are in *G. wakkerstroomianum*.

5. Geranium discolor Hilliard & Burtt, **species nova** *G. harveyi* Briq. affinis sed foliis discoloribus (nec concoloribus), laminis ad medium vel ad duas partes lobatis (nec fere ad basin divisis), floribus multo majoribus, petalis 15–20 × 11–16mm (nec 12–15 × 6·5–9mm) distinguenda.

Herba perennis; caules ad 60cm longi, c.3mm diam., debiles, decumbentes vel ascendentes, inferne nudi vel stipulis relictis induti, pilis tenuibus albis retrorsis et saepe aliis longis patentibus praediti. *Stipulae* alte fissae, segmentis lineari-acuminatis. *Folia* petiolata; petioli ad 150mm longi, sursum decrescentes, summi 10–20mm longi, pilis longis tenuibus subpatentibus induti; lamina c.20–50mm diam., ambitu suborbicularis; digitatim ad medium vel ad duas partes 5(–7)-lobata, lobis amibutu obovatis iterum lobatis, coriacea, valde discolor, supra tenuiter appresse pubescens vel subglabra, subtus albo-pannosa. *Pedunculi* terminales vel ad folia superiora oppositi, interdum cymis compositis subefoliatis formantes, sparsim pilis glandulosis patentibus vel subreflexis obtecti, plerumque biflori. *Pedicelli* plerumque 25–65mm longi, ut pedunculi pilosi. *Sepala* 7·5–11 × 3·5mm mucrone excluso, appresse argenteo-pubescentia, pilis aliis longis patentibus raro glanduloso-apiculatis insuper induta. *Petala* 15–20 × 11–16mm, obovata, emarginata, pallide vel fusce purpureo-rosea ad basibus alba, fusco-venosa. *Rostrum* pilis tenuibus subpatentibus rarissime glandulosis pubescens.

Type: E Cape, Stutterheim distr., 3227 CB, Kabusie Forest, 20 x 1980, *Hilliard & Burtt* 13194 (NU holo., E iso.).

Perennial herb, stems up to 60cm long, c.3mm diam., weak, decumbent or ascending, forming loose clumps or mats, bare below or with the remains of stipules, leafy upwards, pilose with fine white retrorse hairs and often long fine spreading ones as well. *Stipules* deeply dissected, segments linear-acuminate. *Leaves* on petioles up to 150mm long, diminishing in length upwards, uppermost petioles c.10–20mm long, pilose with long fine white ± spreading hairs; blade c.20–50mm in diam., suborbicular in outline, digitately 5(–7)-lobed c. $\frac{1}{2}$–$\frac{2}{3}$ the depth of the radius, lobes obovate in outline, themselves lobed, firm-textured,

markedly discolorous, thinly appressed pubescent above or nearly glabrous, white-felted below. *Peduncles* terminal and opposite the upper leaves, sometimes forming almost leafless compound cymes, thinly glandular-pilose, hairs spreading or ± reflexed; ultimate peduncles mostly 2-flowered. *Pedicels* mostly 25–65mm long, hairy as the peduncles. *Sepals* 7·5–11 × 3·5mm excluding the mucro, silvery appressed pubescent, some long fine spreading hairs as well, these rarely gland-tipped. *Petals* 15–20 × 11–16mm, obovate, shallowly notched, pale to dark purplish-pink, veins darker, white towards base. *Rostrum* with fine ± spreading pubescence, hairs very rarely gland-tipped. **Fig. 1F**.

CAPE. 3227 Stutterheim distr., Mt Kemp, c.1400m, 14 xii 1977, *Hilliard & Burtt* 11047 (E, NU). 3227 CA/B, Thomas Mountain, c.1200–1400m, 9 xii 1981, *Hilliard & Burtt* 14787 (E, NU). King William's Town distr., at foot of Pirie, 2000ft, xi 1893, *Flanagan* 2161 (PRE, SAM). 3226 DB, Stockenstrom div., Hogsback Forest Reserve, above Kettlespout Falls, 9 xii 1977, *Hilliard & Burtt* 10950 (E, NU); ibidem, 14 xii 1940, *Barker* 996 (BOL, NBG); Gaika's Kop, 5500ft, 16 ii 1977, *Gibbs Russell* 3505 (PRE). Keiskammahoek distr., Cata Forest Reserve, 5500ft, 12–13 ii 1948, *Story* 3315 (PRE).

Despite being known for a hundred years, this beautiful plant has remained nameless. It was first collected by Flanagan on Mt Pirie near King William's Town, and it is common on the mountains of the E Cape, between Hogsback and Stutterheim. *Geranium discolor* is easily recognized by its firm-textured leaves, glossy green above, white below. It grows in large tangled clumps in moist places on forest margins and among rocks on open mountain slopes.

In Batten & Bokelmann (1966) this is one of the two plants figured (pl. 73, 3) as *G. ornithopodon*, the other being *G. flanaganii* (pl. 74, 7).

A specimen collected on Thomas Mountain, south of Cathcart in the eastern Cape (*Hilliard & Burtt* 14796a, E, NU), appears to be a hybrid between *G. discolor* and *G. amatolicum*, both of which were present (*H & B* 14787 and 14796) at the foot of a rocky scrub-covered slope; *G. baurianum* and *G. contortum* were also nearby, in the short grass of a meadow (*H & B* 14791 and 14797).

6. Geranium harveyi Briq. in Annuaire Conserv. Jard. Bot. Genève 11–12:183 (1908); Knuth, Pflanzenr. Geran. 162, fig. 23 A–E (1912).

Lectotype (chosen here): E Cape, Wildschutsberg, an felsigen Oerten, 5000–6000ft, Dec., *Drège* (K; BM, E, isolecto.).

Syn.: *G. sericeum* Harvey in Harvey & Sonder, Fl. Cap. 1:257 (1860), non Sprengel, Syst. Veg. 3:70 (1826). Type as above.

Many-stemmed, clump-forming perennial herb, stems spreading, decumbent or suberect, slender, becoming woody in lower parts, young parts with silvery retrorse appressed hairs. *Stipules* deeply dissected, segments linear-acuminate. *Leaves* all cauline, petioles long, all but the uppermost much longer than the blade, with silvery retrorse appressed hairs, blade c.5–30mm diam., digitately (3–)5-lobed almost or quite to the base, each lobe rhomboid in outline, deeply pinnatifid, the segments oblong-lanceolate, entire or the largest with an occasional tooth,

appressed silvery-sericeous above, more densely so below. *Peduncles* opposite the uppermost leaves and much exceeding them, with silvery retrorse appressed hairs, 1- or 2-flowered. *Pedicels* seldom exceeding 50mm, hairy as the peduncles, and occasionally with a few spreading gland-tipped hairs below the calyx. *Sepals* 5·5–6 (–8) × 2·5(–3·5)mm excluding mucro, appressed silvery-sericeous, occasionally with a few gland-tipped hairs at the base. *Petals* 12–15 × 6·5–9mm, obovate, shallowly notched, magenta or purple-blue. *Rostrum* with somewhat spreading hairs. **Fig. 1C**.

Selected citations:

TRANSKEI. Cala distr., near Cala, towards Little Bush, 4000ft, 6 xii 1910, *Royffe* 187 (GRA).

CAPE. Wodehouse div., northern border of Stormbergen, Zuurepoort, xi 1830, *Ecklon & Zeyher* (E, K, PRE). Molteno distr., Looperberg, 5182ft, 21 vi 1917, *Mogg* 2524 (PRE). Middelburg distr., Gordonville, c.6500–7200ft, 14 xi 1952, *Acocks* 16578 (K, PRE); 3124 DD, S extreme of Renosterberg above Lootsberg railway halt, c.1800m, farm Blaauwater, 25 xi 1977, *Hilliard & Burtt* 10648 (E, NU); 3124 DD, near Bethesda Road, top of old Wapadsberg Pass, 26 xi 1977, *Hilliard & Burtt* 10648 A (E, NU). 3222 BD, Nieuweveld Mountains, Mountain View Farm, 1676m, 14 ii 1978 [sterile], *Gibbs Russell et al.* 135 (PRE). Graaff Reinet distr., Graaff Reinet, xii 1916, *Page* 14396 (BOL); Tandjiesberg, farm De Nek, ix 1976 [sterile], *Olivier* 1657 (STE-U). Cradock distr., 3225 DA Bankberg, 5900ft, 16 i 1979, *du Toit* 98 (PRE). Tarkastad distr., S of Tarkastad, De Beer's Pass, 1500m, 13 i 1981, *Moffett* 2892 (NU). Queenstown distr., Queenstown, mountainsides, 4000–5500ft, xi 1893, *Galpin* 1631 (K, PRE); Madeira, 20 x 1946, *Thoms* s.n. (NBG). Cathcart distr., 3227 AC, Windvogelberg, 1645m, 8 xii 1981, *Hilliard & Burtt* 14780 (E, NU); ibidem, Goshen, 3500ft, Oct., *Baur* 830 (BOL, GRA, K, PRE). Somerset East distr., 3225 DA, Boschberg, 24 x 1980, *Hilliard & Burtt* 13216 (E, NU); ibidem, 4500ft, *MacOwan* 1952 (GRA).

Geranium harveyi is found on the mountains of the central and eastern Cape, from the Nieuweveld Mountains north of Beaufort West east to the Stormberg and the mountains near Cala in neighbouring Transkei, the mountains around Queenstown and the Windvogelberg at Cathcart, and south to Boschberg at Somerset East. It forms clumps, often very large, in the shelter of outcropping rocks or among bushes on grassy slopes, flowering mainly between October and December.

The species is sometimes confused with *G. canescens,* which has similarly cut leaves, but these are usually more markedly discolorous than those of *G. harveyi,* and the indumentum is thinner (the leaf blade is often visible through the hairs on the lower surface in *G. canescens*; it is completely obscured in *G. harveyi*). Also, *G. canescens* always has gland-tipped hairs on the upper parts (they are very rare in *G. harveyi*, and then confined to the pedicels and lower part of the sepals), and the petals are usually white (rarely flushed pink), not deep pink nor purple, 8–11·5 × 4–5mm, not 12–15 × 6·5–9mm. The two species are allopatric.

See under *G. multisectum* for a possible hybrid with *G. harveyi.*

7. Geranium canescens L'Hérit. in Aiton, Hort. Kew 2:433 (1789) & Geraniologia t. 38 (1792); DC., Prodr. 1:640 (1824); Harvey in Harvey & Sonder, Fl. Cap. 1:257 (1860); Knuth, Pflanzenr. Geran. 162 (1912); Salter in Adamson & Salter, Fl. Cape Penins. 509 (1950).

Type: specimen in G-DC (n.v., IDC microfiche 246).

Syn.: *G. glandulosum* [Lehm. ex] Ecklon & Zeyher, Enum. Pl. Afric. Austral. 58 (1835). Type: Cape, Hottentot's Holland, pago Somerset [Somerset West], Oct., *Ecklon & Zeyher* 447 (S holo., SAM iso.).

Diffuse perennial herb, stems slender, becoming woody, well branched, probably sprawling or suberect, all but the oldest parts with greyish-white retrorse ± appressed hairs, uppermost parts sometimes with spreading gland-tipped hairs as well. *Stipules* deeply dissected, segments linear-acuminate. *Leaves* all cauline (they may initially be tufted at the nodes before the new branch elongates), petioles long, all but the uppermost much exceeding the blade in length, with fine retrorse ± appressed greyish-white hairs, blade up to c.45mm diam., digitately 3–5-lobed at least three quarters of the way to the base, each lobe rhomboid in outline, deeply pinnatifid, the segments oblong-lanceolate, entire or the largest with 1 or 2 coarse teeth, upper surface with fine appressed greyish-white hairs, silky-canescent below, discolorous. *Peduncles* opposite the uppermost leaves and much exceeding them, with fine retrorse ± appressed hairs, sometimes spreading gland-tipped hairs as well, 1- or 2-flowered. *Pedicels* seldom exceeding 50mm long, appressed pubescent, with spreading gland-tipped hairs as well. *Sepals* (5–)6(–8) × (2–)2·5(–3)mm, silvery appressed-pubescent, with spreading gland-tipped hairs as well. *Petals* 8–11·5 × 4–5mm, obovate, entire or shallowly notched, white. *Rostrum* with fine ± appressed hairs as well as spreading gland-tipped ones. **Fig. 1E**.

Selected citations:

CAPE. Malmesbury div., 3318 BD, Bothmaskop, 30 iii 1976 [fruiting], *van der Walt* 524 (STE-U). Tulbagh, 26 x 1977, *van der Walt* 1935 (STE-U); Great Winterhoek, Sneeuwgat, xi 1916, *Phillips* 1708 (SAM). Worcester div., Du Toits Peak, 4 xi 1951, *Esterhuysen* 19219 (BOL, PRE). Stellenbosch div., farm Rustenburg, 6 ix 1946, *Strey* 804 (PRE); Jonkershoek, Biesiesvlei, 1110ft, 11 x 1945, *Rycroft* 1004 (NBG). Cape Town div., Cape Peninsula, Orange Kloof, x 1946, *Power* s.n. (BOL, NBG); ibidem, 16 x 1932, *Salter* 2821 (BM, BOL, K); Vlakkenberg, c.750ft, 18 ix 1952, *Salter* 9075 (BM, BOL, K, NBG, SAM). Caledon div., Palmiet River, 210m, 13 x 1894, *Schlechter* 5419 (BOL, E, PRE). Riversdale div., Mountains above Corente River, 1500ft, xi 1908, *Muir* 34 (PRE); Breede River side of Potteberg, 29 viii 1948, *Blum* (E). Uniondale div., Mannetjiesberg, 6 xi 1941, *Esterhuysen* 6445 (BOL).

Geranium canescens appears to be uncommon, and has been recorded from the mountains of the Peninsula, the Great Winterhoek Mountains near Tulbagh, the mountains around Stellenbosch and Worcester, then a few records eastwards to Uniondale division. Ecological notes are scanty, both dry slopes and streambanks being recorded, with flowers mainly in September and October.

Knuth (1912, p. 162) described *G. canescens* as eglandular, but that is not so: the type specimen in Geneva is glandular, and a letter from B.P.G. Hochreutiner (Director, Conservatoire et Jardin Botaniques) written to T.M. Salter, Bolus Herbarium, on 18 March 1937, confirms this. In any case, Knuth muddled more than one species in his concept of *G. canescens*.

Geranium canescens can be confused with *G. ornithopodon*, which is partly sympatric; the best distinguishing character is the shape of the leaf lobes: rhomboid in *G. canescens* and only very slightly longer than broad; oblong in *G. ornithopodon*, and roughly twice as long as broad (measure the middle leaf lobe).

8. Geranium drakensbergense Hilliard & Burtt, **species nova** *G. magnifloro* Knuth affinis sed foliorum lobis minus dissectis, segmentis oblongo-lanceolatis (nec linearibus), pagina inferiore pilis tenuioribus et paucioribus induta; a *G. harveyi* Briq. habitu caespitoso, segmentis foliorum distincte mucronatis et indumento sparsiore distinguenda.

Herba perennis; caules decumbentes vel suberecti, parce ramosi, parce pubescentes, pilis retrorsis valde appressis paucis aliis glandulosis patentibus sursum numerosioribus intermixtis. *Stipulae* alte dissectae, segmentis lanceolato-acuminatis. *Folia* radicalia dense caespitosa; petioli laminis multo longioribus, parce pilis appressis retrorsis induti; lamina supra pilis tenuibus parcis appressis, subtus dense appresse pilosa, usque ad 35mm diam., fere ad basin in lobos 3–5 digitatim divisa; lobi ambitu rhomboidei, alte pinnatifidi segmentis utrinque 2–3 oblongo-lanceolatis marginibus saepe dentibus grossis 1–2 vix revolutis; folio caulina radicalibus similia sed petiolis sursum decrescentibus summis interdum pilis paucis glanduliferis ornatis. *Pedunculi* foliis superioribus oppositi et ea multo superantes, pilis parcis tenuibus appressis retrorsis aliis patentibus glanduliferis induti, plerumque biflori. *Pedicelli* ad 60mm longi, ut pedunculi pilosi. *Sepala* 7–8 × 3–3·5mm, mucrone excluso, pilis brevibus appressis et aliis longis patentibus glanduliferis instructa. *Petala* 13–18 × 10–12mm, obovata, emarginata, azureo-purpurea. *Rostrum* ut sepala duplo pilosum.

Type: Natal, Underberg distr., 2929 CB, Cobham Forest Reserve, ridge above Upper Polela Cave, c.2285m, 22 xi 1976, *Hilliard & Burtt* 9323 (NU holo.; E, K, MO, S, STE iso.).

Clumped perennial herb, stems decumbent or suberect, herbaceous, sparingly branched, thinly pubescent, hairs retrorse, strongly appressed, a few spreading gland-tipped hairs as well, increasing in frequency upwards. *Stipules* deeply dissected, segments lanceolate-acuminate. *Radical leaves* densely tufted, the stipulate bases of the petioles forming congested oblong masses, petioles much longer than the blades, with sparse retrorse appressed hairs, appressed hairs, blade up to 35mm in diam., digitately cut almost to the base into 3–5 lobes, each lobe rhomboid in outline, deeply pinnatifid, 2–3 segments each side, segments oblong-lanceolate, margins often with 1 or 2 coarse teeth, scarcely revolute, sparse fine appressed hairs above, densely appressed hairy below; cauline leaves similar but petioles progressively shorter upwards, uppermost sometimes with a few spreading gland-tipped hairs. *Peduncles* opposite the uppermost leaves and much exceeding them, with sparse fine retrorse ± appressed hairs as well as spreading gland-tipped ones, mostly 2-flowered. *Pedicels* up to 60mm long, hairy like the peduncles. *Sepals* 7–8 × 3–3·5mm, excluding mucro, with short fine appressed hairs as well as long spreading gland-tipped ones. *Petals* 13–18 × 10–12mm, obovate, shallowly notched,

blue-purple. *Rostrum* with short fine appressed hairs as well as long spreading gland-tipped ones. **Fig. 1H**.

NATAL. Underberg distr., 2929 CC, Bushman's Nek, Thamathu Cave, 2285m, 6 ii 1976, *Hilliard & Burtt* 9007 (E, K, NU, STE); 2929 CA, Garden Castle Forest Reserve, Mlambonja Valley, 2175m, 5 i 1982, *Hilliard & Burtt* 14895 (E, NU); 2929 CB, Cobham Forest Reserve, 'Lakes' cave area, c.2375m, 12 xii 1982, *Manning, Hilliard & Burtt* 15913 (E, NU). Gxalingenwa valley, between Sani Pass and Polela valley, c.2220m, 11 xii 1983, *Hilliard & Burtt* 17191 (E, NU).

Geranium drakensbergense forms thick and extensive clumps in moist and partially shaded places at the foot of S-facing Cave Sandstone and basalt cliffs. Although the leaves of *H & B* 9007 (cited above) are less hairy below and therefore greener than those of the type, the plants are otherwise identical. The two sites are about 25km apart.

This species was collected at 9000ft in the Drakensberg by Sir Peter Watkin Williams and has been cultivated by him in his garden in Devon.

9. Geranium multisectum N.E. Br. in Kew Bull. 1901:120 (1901); Knuth, Pflanzenr. Geran. 166 (1912).

Type: Lesotho, Machache Mountain, *Bryce* s.n. (K holo.).

Syn.: *G. incanum* Burm.f. var. *glabrius* Knuth, Pflanzenr. Geran. 164 (1912). Type: Transvaal, near Heidelberg, *Wilms* 180 (n.v.).

G. incanum Burm.f. var. *grandicalyculatum* Knuth, Pflanzenr. Geran. 164 (1912). Lectotype (chosen here): Transvaal, Pretoria, farm Van Rensburg, Dec. 1883, *Wilms* 179 (K).

G. incanum Burm.f. var. *purpureum* Burtt Davy, Man. Pl. Transvaal 1:41, 191 (1926). Type: Transvaal, Machadodorp, ii, 1909, *Williams* 6314 (K holo, PRE iso.).

[*G. incanum* auct. non Burm.f.; Letty, Wild Fl. Transv. pl. 88, 1 (1962).]

Clumped perennial herb, stock eventually thick (c.15mm diam.) and woody, stems spreading, decumbent or more or less erect, sometimes rooting when in contact with the ground, well-branched, herbaceous, pubescent, hairs appressed or somewhat spreading, sometimes with spreading gland-tipped hairs as well. *Stipules* deeply dissected, segments lanceolate-acuminate. *Radical leaves* tufted, petioles very long (up to c.300mm), much longer than the blade, hairs often retrorse, strongly appressed to more or less spreading, spreading gland-tipped hairs sometimes present as well; blade seldom exceeding 50mm diam., digitately cut to the base into usually 5 lobes, each lobe bipinnatisect, ultimate segments mostly 1–2mm broad, linear, margins revolute, glabrous to sparsely hairy above, more densely so below, not always markedly discolorous, hairs appressed to somewhat spreading, spreading gland-tipped hairs sometimes present as well; cauline leaves similar, but uppermost petioles often short. *Peduncles* opposite the upper leaves and much exceeding them, hairy as the petioles, but often with gland-tipped hairs when the petioles lack them, usually 2-flowered. *Pedicels* seldom exceeding 40mm long, hairy like the peduncles. *Sepals* (6–) 7 (–9) × (2·5–) 3 (–3·5)mm excluding mucro, appressed-pubescent, often with spreading

hairs as well, gland-tipped or not. *Petals* (11–) 15–17 (–19) × (8–) 10–13 (–16)mm, obovate, usually shallowly notched, violet, purple or magenta. *Rostrum* with appressed or spreading hairs, spreading gland-tipped hairs sometimes present as well. **Fig. 1G**.

Selected citations:

TRANSVAAL. Lydenburg distr., Lydenburg–Dullstroom road, Wemmershoek, 5400ft, 4 xi 1907, *Burtt Davy* 7624 (PRE); 2530 AC, Lydenburg to Dullstroom at 38km, 5 iii 1981, *Hilliard & Burtt* 14208 (E, NU). Belfast distr., Dullstroom, 6200ft, 19 xii 1932, *Galpin* 13040 (GRA, PRE); 10 miles NE Machadodorp on road to Lydenburg, 5500ft, 14 xi 1947, *Codd & de Winter* 3359 (PRE); Belfast Commonage, 31 i 1929, *Hutchinson* 2731 (PRE); c.5 miles NW of Belfast, c.5800ft, 12 xii 1955, *Leistner* 523 (PRE). Middelburg distr., 2529 BC, NE of Middelburg, farm Welverdiend, 19 iii 1981, *Hilliard & Burtt* 14412 (E, NU). Bethal distr., Bethal, 14 xii 1910, *Leendertz* TM 9390 (PRE). Johannesburg distr., 2628 CA, Suikerbosrand, 5200ft, 20 xi 1971, *Bredenkamp* 314 (PRE). Carolina distr., Dassiespruit, 5000ft, 22 xii 1907, *Burtt Davy* 7360 (PRE); Carolina, 5500ft, 19 x 1932, *Galpin* 12438 (BOL, PRE). Ermelo distr., Ermelo Spitskop, xii 1915, *Pott* 4970 (BOL, PRE); 'Nooitgedacht', xii 1926, *Henrici* 1371 (PRE); 'The Glen', *Walter* s.n. (PRE). Wakkerstroom distr., near Amersfoort, 'Rolfontein 261', 26 xi 1905, *Burtt Davy* 4085 (PRE); Wakkerstroom, 6200ft, 17 xi 1916, *Beeton* 41 (SAM). Potchefstroom distr., Bank Station, 30 xii 1947, *Louw* 1653 (PRE).

ORANGE FREE STATE. Heilbron distr., $5\frac{1}{2}$ miles SSW of Vereeniging, c.4700ft, 28 xi 1959, *Acocks* 20979 (PRE). Harrismith distr., Platberg, above Zig Zag path, 2165m, 14 xii 1976, *Hilliard & Burtt* 9535 (E, K, MO, NU, STE); 7km from Swinburne, 'Rensburgskop', 1720m, 10 i 1965, *Jacobsz* 384 (PRE); Witzieshoek, ii 1917, *Junod* s.n. (PRE). Bethlehem distr., Bethlehem, *Potgieter* s.n. (PRE); Clarens, xi 1917, *van Hoepen* s.n. (PRE). Ficksburg distr., Strathcona, 3 i 1938, *Fawkes* 247 (NBG). Fouriesburg distr., Dunelm, 9 i 1918, *Potts* s.n. (BLFU 7677). Bloemfontein distr., Glen, xi 1906, *Rogers* s.n. (PRE). Zastron distr., Zastron, x 1926, *Maree* 39 (PRE).

LESOTHO–NATAL border, Mont aux Sources, 2500m, iv 1913, *Dyke* 518 (PRE); ibidem, 9900ft, 19 iii 1946, *Schelpe* 1354 (NU).

LESOTHO. Butha-Buthe distr., Mothae Mountains, Pone Valley, 9750ft, 5 i 1958, *Coetzee* 853 (BLFU, PRE); c.$1\frac{1}{2}$ miles from Oxbow, Khatibe Camp A, 8000ft, 19 i 1962, *Lubke* 229 (PRE). Leribe distr., Pontseng woodlot, 1840m, 29 x 1982, *Richardson* 172 (NU); Leribe, *Dieterlen* 316 (PRE); Thaba Putsoa, 12 ii 1916, *Dieterlen* 1217 (PRE, SAM). Maseru distr., Mamalapi, 9000ft, 25 xii 1948, *Compton* 21271 (NBG, PRE); near St. Michaels, 1760m, 30 xi 1975, *Talukdar* 7426 (PRE); Bushman's Pass, 2250m, 2 xii 1978, *Schmitz* 8509 (PRE); 2927 BD, Blue Mountain Pass, c.2590m, 13 i 1979, *Hilliard & Burtt* 12092 (E, NU); Ntibokho Valley, 28°18′E 29°20′S, 8800ft, 1 i 1947, *Guillarmod* 263 (PRE). Mokhotlong distr., Magapung valley, 10500ft, 18 i 1955, *Coetzee* 567 (PRE); c.1 mile south of Giant's Castle Pass, c.9750ft, 11 xii 1973, *Wright* 1618 (E, K, NU); S of Sani Pass, c.3000m, 18 i 1976, *Hilliard & Burtt* 8866 (E, K, MO, NU, STE). Qacha's Nek distr., Sehlabathebe National Park, c.2425m, 20 ii 1979, *Hoener* 2179 (NU, PRE).

NATAL. Newcastle distr., near Charlestown, valley of Buffalo River, 5000ft, 8 i 1894, *Wood* 5141 (BOL, PRE). Ladysmith distr., Van Reenen, 10 i 1945, *Graham* 65 (NU). Estcourt distr., Giant's Castle, c.6000ft, 6 xi 1897, *Bolus* 6874 (BOL); Kamberg area, farm Game Pass, c.1675m, 7 xi 1982, *Hilliard* 8203 (E, NU). Lion's River distr., Nottingham Road, 4850ft, xi 1963, *Hilliard* 1981 (NU). Mpendhle distr., 2 miles along Runnymead road, 5650ft, 26 ii 1964, *Moll* 656 (NU, PRE); Kamberg area, Storm Heights, c.2100m, 14 xii 1978, *Hilliard & Burtt* 11748 (E, NU); 2929 BC, Highmoor Forest Reserve, ridge SE of Giant's Castle, headwaters of Elandshoek river, c.2440m, 4 i 1983, *Hilliard & Burtt* 16155 (E, NU).
CAPE. Maclear distr., 3028 CA, Naude's Nek, c.2500m, 13 ii 1983, *Hilliard & Burtt* 16591 (E, K, NU). Barkly East distr., Saalboom Nek, 13·4 miles SSE of Clifford P.O., c.7200ft, 15 i 1959, *Acocks* 20181 (PRE); ibidem, 3127 A/B, c.2100m, 21 i 1979, *Hilliard & Burtt* 12307 (E, NU); 3027 DB, Ben Mcdhui, 2560m, 3 ii 1983, *Hilliard & Burtt* 16377 (E, K, MAS, NU, PRE). Molteno distr., near Molteno, Broughton, 6300ft., xii 1892, *Flanagan* 1570 (GRA, NU, PRE, SAM). Murraysburg distr., Koudeveldt Mountains, 6000ft, i 1879, *Tyson* s.n. (BOL). Somerset East distr., Boschberg, 4000ft, i, *MacOwan* 1071 (GRA).
TRANSKEI. Herschel distr., Sterkspruit, Majuba Nek, 22 ii 1918, *Hepburn* 265 (GRA).

Recorded from the Koudeveldberg near Graaff Reinet and Boschberg at Somerset East, then the Stormberg, Cape Drakensberg, Lesotho, Natal Drakensberg and Midlands, eastern Orange Free State and the Transvaal Highveld and eastern highlands, from Potchefstroom in the west to Carolina and Lake Chrissie in the east, and north to Pietersburg, between c.1400 and 3300m above sea level. *G. ukingense* Knuth from the Ukinga Mountains in Tanzania is in the affinity of *G. multisectum,* not of *G. incanum.*

G. multisectum favours open marshy places and may be found in flower between November and January. The original material came from Machache Mountain in west central Lesotho, and the species is particularly common in marshy turf and along streamlines on the high Lesotho plateau. At high altitudes, leaves tend to be small, with short, often incurved lobes; plants at lower altitudes often have larger leaves with longer and more spreading lobes; it is these larger-leaved and often more robust plants that are common in the marshes of the eastern Transvaal.

Geranium multisectum has been much confused with *G. incanum* but is easily distinguished by its tufted habit; moreover, the leaves are seldom as discolorous as those of *G. incanum,* and the hairs are often spreading, not closely appressed; spreading gland-tipped hairs are sometimes present on the leaves, and are often present on the sepals and pedicels; *G. incanum* is always eglandular. See also *G. magniflorum,* below.

A specimen collected by MacOwan on Boschberg at Somerset East warrants special mention (*MacOwan* 1951, GRA). MacOwan collected both *G. multisectum* (*MacOwan* 1071, GRA) and *G. harveyi* (*MacOwan* 1952, GRA) on Boschberg; his no. 1951 appears to be intermediate between these two species and may be of hybrid origin.

10. Geranium magniflorum Knuth in Bot. Jahrb. 40:68 (1907) & Pflanzenr. Geran. 167 (1912), excl. *Schimper* 1898.
Type: Drakensberg, 2700–3000m, Feb., *Thode* 13 (n.v.).

Clumped perennial herb, stock eventually thick and woody, stems decumbent, herbaceous, laxly branched, pubescent, hairs usually retrorse, appressed to somewhat spreading, sometimes with spreading gland-tipped hairs as well near the inflorescence. *Stipules* deeply dissected, segments lanceolate-acuminate. *Radical leaves* densely tufted, the stipulate bases of the petioles congested in obconic masses, petioles several times longer than the blade, hairs often retrorse and strongly appressed, sometimes ± spreading; blade seldom exceeding 50mm diam., digitately cut to the base into usually 5 lobes, each lobe pinnatisect, rarely the lowermost pair of segments further divided, mostly 1–2mm broad, linear, margins revolute, glabrous or sparsely appressed hairy above, densely white appressed hairy below, markedly discolorous; cauline leaves similar, but uppermost petioles often short, sometimes with spreading gland-tipped hairs. *Peduncles* opposite the upper leaves and much exceeding them, usually 2-flowered, with short ± appressed retrorse hairs, usually with spreading gland-tipped hairs as well, or these occasionally sparse or wanting. *Pedicels* rarely exceeding 50mm long, hairy like the peduncles. *Sepals* (6–) 7–8 × (2–) 3–3·5mm excluding mucro, appressed-pubescent, often with long spreading gland-tipped hairs as well, or spreading hairs sometimes sparse or wanting, or glandular tip wanting. *Petals* (11–) 13–17 (–20) × (8–) 9–10 (–14)mm, obovate, notched, pink to blue-purple, or an occasional white sport with coloured veins. *Rostrum* with fine appressed or somewhat spreading hairs, longer spreading gland-tipped hairs also sometimes present. **Fig. 1L.**
Selected citations:
ORANGE FREE STATE. 2828 CB, WSW of Clarens, SE of Drie Susters Peak, c.1850m, farm Dunblane 335, 14 iii 1972, *Scheepers* 1867 (K, PRE); Golden Gate National Park, Generaalskop, 21 i 1965, *Roberts* 3131 (PRE). Witzieshoek, footpath to The Sentinel, c.2590m, 27 xii 1975, *Hilliard & Burtt* 8649 (E, K, MO, NU, PRE, STE).
ORANGE FREE STATE–LESOTHO–NATAL border, Mont aux Sources, 10500ft, 22 ii 1926, *Bayer & McClean* 247 (K, NU, PRE).
NATAL. Bergville distr., Royal Natal National Park, 7500–9000ft, 20 ii 1964, *Trauseld* 196 (NU, PRE); Cathedral Peak area, Cathedral path, 8050ft, ii 1943, *Schelpe* 101 (NU). Estcourt distr., Giant's Castle, c.8500ft, 11 xii 1973, *Wright* 1617 (E, K, MO, NU). Lion's River distr., Kamberg, c.6500ft, 14 xii 1974, *Wright* 2012 (NU). Mpendhle distr., 2929 BC, farm 'Storm Heights', c.2100m, 14 xii 1973, *Hilliard & Burtt* 11743 (E, NU). Underberg distr., 2929 CB, Cobham Forest Reserve, Lakes cave area, c.2300m, 15 xii 1982, *Manning, Hilliard & Burtt* 16065 (E, NU); Sani Pass, c.2865m, 17 i 1976, *Hilliard & Burtt* 8853 (E, K, MO, NU, S, STE). 2929 CB, 5–7 miles NNW of Castle View Farm, headwaters Mlahlangubo river, 2560m, 23 i 1982, *Hilliard & Burtt* 15340 (E, NU).
LESOTHO. Mokhotlong distr., between Indumeni Dome and Castle Buttress, 9700ft, 5 xii 1952, *Killick* 1844 (K, NH, PRE); Temrock Peak [Thabana Ntlenyana?], 11400ft, i 1953, *Liebenberg* 5724 (PRE). Maseru distr., near Likhalaneng, 2500m, iii 1978, *Schmitz* 8280 (PRE); 2928 AD, Ntibokho Valley, 9800ft, 3 i 1947, *Guillarmod* 287 (PRE); Blue Mountain

Pass, 2500m, 24 xii 1980, *Schmitz* 9162 (NU). Qacha's Nek distr., Sehlabathebe National Park, Tsoelikana river, 2477m, *Beverly* 033 (PRE); slopes of Thaba Ntšo, 2650m, 22 ii 1979, *Hoener* 2183 (PRE, S); near Qacha's Nek, Rapase, 5000–6000ft, 10 iii 1936, *Galpin* 14087 (BOL, PRE). CAPE. Lady Grey distr., Witbergen, 7000–8000ft, *Drège* 7510e (S). Barkly East distr., 3027 DB, Ben Mcdhui, 2775–2925m, 5 ii 1983, *Hilliard & Burtt* 16448 (E, K, MAS, NU, S); 3027 BC, farm Beddgelert, lower slopes Avoca, 2285m, 5 xii 1981, *Hilliard & Burtt* 14714 (E, NU); 3027 DC, old Lady Grey road, above Kraai River, 1700m, 29 xi 1981, *Hilliard & Burtt* 14570 (E, NU). Murraysburg distr., Koudeveld Mountains, 6000ft, i 1879, *Tyson* 139 (BOL, SAM); Graaf Reinet distr., Oudeberg, 4500ft, xii 1867, *Bolus* 148 (K).

Geranium magniflorum ranges from the mountains around Graaff Reinet across the high ground to the mountainous parts of Lesotho, the Natal Drakensberg, and the Golden Gate area of the Orange Free State, mainly between 1800 and 3200m, but down to 1375m around Graaff Reinet. It favours damp grass slopes and drainage lines, flowering mainly between December and February.

Geranium magniflorum is very closely allied to *G. multisectum.* being distinguished mainly by its less finely dissected leaves. However, some specimens are difficult to place.

11. Geranium incanum Burm. f., Spec. Bot. Ger. 28 t. 1 no 26 (1759); DC., Prodr. 1:640 (1824); Harvey in Harvey & Sonder, Fl. Cap. 1:257 (1860) excl. var.; Knuth, Pflanzenr. Geran. 162 (1912) p.p., excl. var. *glabrius* and var. *grandicalyculatum*; Salter in Adamson & Salter, Fl. Cape Penins. 509 (1950).
Type: Cape of Good Hope, *Oldenland* (G holo.–fide Kokwaro, 1971).
Syn.: *G. elongatum* Salisb., Prodr. 310 (1796), nom. illegit.

Two varieties are recognized:
var. **incanum**

Diffuse perennial herb with a long thickened tap-root, stems slender, well branched, sprawling, somewhat woody, young parts white appressed-pubescent or rarely hairs spreading. *Stipules* deeply dissected, segments linear-acuminate. *Leaves* all cauline, petioles long, all but the uppermost much longer that the blade, with white appressed retrorse hairs, blade up to 50mm diam., digitately (3–) 5 (–7)-lobed to the base, each lobe pinnatisect or the lowermost bipinnatisect, ultimate segments up to 2mm broad, linear or narrowly oblong, margins ± revolute, glabrous or sparsely appressed-pubescent above, densely white appressed-pubescent below, strongly discolorous. *Peduncles* opposite the upper leaves and exceeding them, with white retrorse appressed hairs, 1- or 2-flowered. *Pedicels* up to 60mm long, often much shorter, hairy like the peduncles. *Sepals* (5–) 6–7 (–8) × (2–) 2·5–3mm excluding mucro, silvery white appressed-pubescent. *Petals* (8–) 10–12 (–15) × (4–) 6–7 (–9)mm, obovate, entire or shallowly notched, usually white with mauve or red veins, rarely pale pink or with a blueish overcast. *Rostrum* with appressed white hairs. **Figs 1M, 4.**

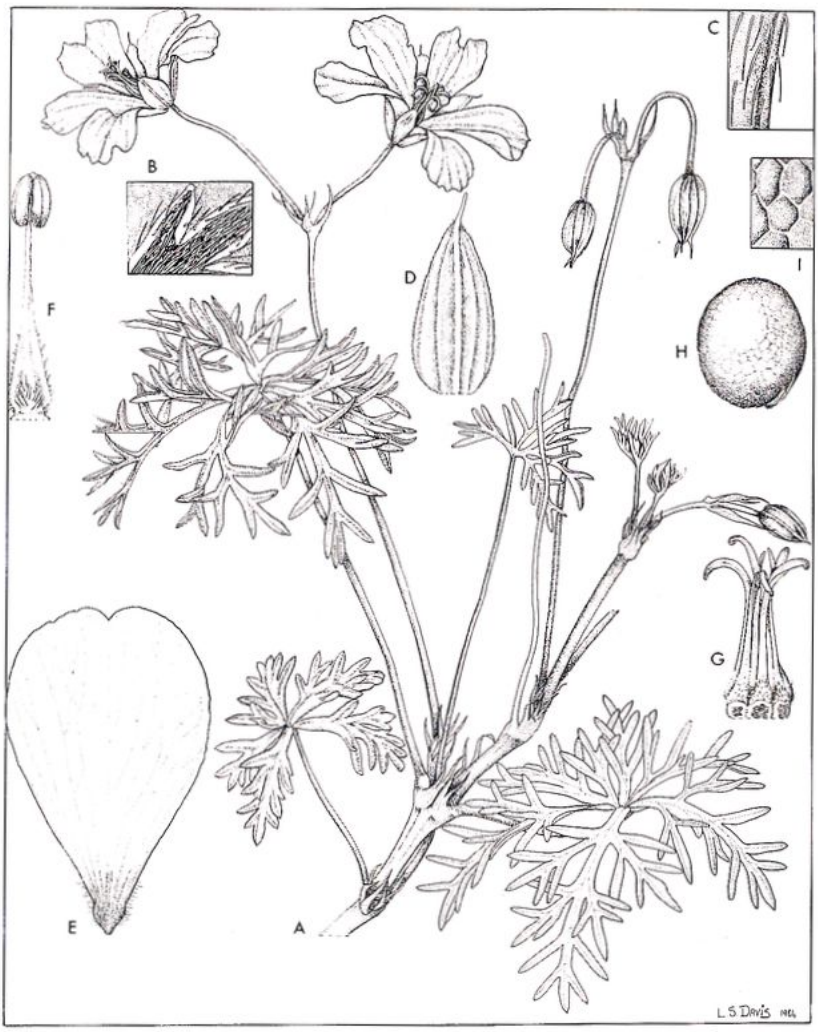

FIG. 4. *Geranium incanum* var. *incanum*. A, flowering branch (×¾); B, appressed hairs on undersurface of leaf (×5); C, appressed retrorse hairs of petiole (×5); D, sepal (×2); E, petal (×2); F, stamen (×5); G, gynoecium (×1½); H, seed (×5); I, detail of reticulate testa.

Selected citations:

CAPE. Cape Town div., 3318 CD, East side of Table Mountain above Kirstenbosch, 28 ix 1980, *Hilliard & Burtt* 13063 (E, NU); Milnerton, 2 viii 1940, *Compton* 8954 (NBG); Strandfontein, 18 ix 1942, *Henderson* 1162 (NBG); Llandudno, 3 x 1975, *van der Walt* 491 (STE-U); Melkbosstrand, 15 miles N of Cape Town, 24 ix 1966, *Dahlstrand* 1059 (PRE); Devil's Peak, 800ft, viii 1880, *Bolus* 32264 (BOL); Groenekloof, *Zeyher* 160 (PRE); Stellenbosch, *Marloth* 9347 (PRE). Simonstown div., Fish Hoek, 21 xii 1927, *Young* 264 (PRE); Simonstown, x 1890, *Marloth* s.n. (PRE, S); 3418 BB, Helderberg Reserve, 9 xi 1975, *van der Walt* 494 (STE-U). Caledon div., 3418 BD, Betty's Bay, 1 x 1980, *Hilliard & Burtt* 13091 (E, NU); Hangklip, 23 x 1949, *Steyn* 685 (BOL, NBG); on the road

between Stanford and Kelders, Gansbaai, 25 ix 1938, *Gillett* 4407 (BOL, K, NBG, PRE); 3419 CB, Kleinbos, c.800ft, 16 xi 1979, *Hugo* 1903 (PRE). Bredasdorp div., beyond Strandkloof, 4 ix 1943, *Wasserfall* 405 (NBG). Riversdale div., Still Bay, xi 1910, *Muir* 418 (PRE); Mountains above Corente River, 1500ft, xi 1908, *Muir* 33 (PRE). Knysna div., George, ix 1880, *Young* s.n. (BOL); Knysna, ii 1921, *Breyer* s.n. (PRE).

Ranges from the Cape Peninsula inland to Stellenbosch and along the coast to George and Knysna, common on both flats and hillslopes, often on the coastal dunes, sometimes sheltered by scrub, or in open places on forested mountain slopes, flowering mainly between August and October.

The name *Geranium incanum* has been wrongly used to cover both *G. multisectum* and *G. magniflorum,* which differ markedly in their densely tufted radical leaves. Both these species frequently have spreading, often gland-tipped, hairs on sepals, pedicels and peduncles, as well as appressed hairs; spreading hairs are always wanting in *G. incanum.* Burtt Davy (*Man. Pl. Transvaal* 1:41 and 191, 1926) described *G. robustum* as a variety of *G. incanum,* but that is a totally different plant. Laundon (in *Fl. Zamb.* 2:134, 1963) confused *G. multisectum* with *G. incanum,* and he also reduced *G. nyassense* Knuth to a subspecies of *G. incanum*; although *G. nyassense* is allied to *G. incanum,* it is better regarded as a distinct species. The status of *G. ukingense* R. Knuth, which was reduced by Laundon to synonymy under his subsp. *nyassense,* needs re-investigation: Knuth described the leaves of *G. ukingense* as mostly radical; it would appear then that *G. ukingense* is more closely allied to *G. multisectum* than to *G. nyassense,* which is a many-stemmed perennial herb without radical leaves.

var. **multifidum** (Sweet) Hilliard & Burtt, **comb. et stat. nov.**

Type: None preserved: grown by Jenkinson from seed sent home from the Cape by Burchell. Iconotype:Sweet, Geran. 3: t.245 (1825).

Syn.: *G. multifidum* Sweet, Geran. t.245 (1825).

G. incanum var. *β* flore rubro, Ecklon & Zeyher, Enum. Pl. Afric. Austral. 58 (1835), citing: Cape, Uitenhage distr., Van Stadensriviersberge, alt. II, October, *Ecklon & Zeyher* (no number cited, but *Zeyher* 370 (BOL, K, PRE, S), so labelled, came from the same locality in the same month).

Distinguished from var. *incanum* by its light violet to magenta pink petals (very rarely white with purple veins), which are often larger, (11–) 12–16 (–20) × (5–) 6–12 (–15)mm.

Selected citations:

CAPE. Bathurst distr., Port Alfred, ix 1895, *Hutton* s.n. (NBG, PRE); ibidem, ix 1916, *Tyson* s.n. (PRE); Kowie, 24 ix 1918, *Britten* 697 (GRA, PRE). Alexandria distr., Olifantshoek, 300ft, 26 iii 1954, *Johnson* 887 (PRE). Port Elizabeth distr., 3325 CD, Sea View, 15 xii 1981, *Hilliard & Burtt* 14831 (E, NU); ibidem, 9 ix 1960, *Acocks* 21443 (PRE); Theescomb, 22 x 1933, *Long* 1112 (GRA, PRE); Bethelsdorp 13 x 1961, *Denman* 269 (GRA). Humansdorp distr., 3424 BB, near St. Francis Bay, 16 xii 1981, *Hilliard & Burtt* 14836 (E, NU); Rietvlei, 2 xi 1941, *Esterhuysen* 6640 (PRE); Hofmansbosch, 9 i 1919, *Britten* 1214 (NBG, PRE); between Gamtoos River and Assegaibosch, 19 ix 1930, *Fries et al.* 1272 (BOL,

PRE); Clarkson, viii 1926, *Thode* A751 (PRE). Uniondale, Mannetjiesberg, 3 xi 1941, *Esterhuysen* 6495 (BOL). Knynsa distr., 12 miles from Knysna on George road, 500ft, 1 ix 1947, *Story* 2866 (GRA, PRE); between Swartvlei and Knysna, 27 ix 1977, *van der Walt* 840 (STE-U); between Knysna and George, Sedgefield, Groenvlei, 6 ix 1982, *Batten* 620 (E, NU). George distr., Goukamma 1 x 1939, *Compton* 7555 (NBG); Wilderness, 25 i 1943, *Compton* 14351 (NBG). Mossel Bay div., Ruytersbosch, 14 i 1951, *van Niekerk* 36 (BOL, PRE); 3422 BA, between Langvlei and Rondevlei, 1 vi 1970, *Taylor* 7814 (PRE). Riversdale div., Still Bay to Blombos road, 7 ix 1957, *Wurts* 1559 (NBG). Caledon div., Oudebosch, 800ft, ix 1920, *Fourcade* 870 (GRA); 3–5 miles E of Die Kelders near Gansbaai, farm Baviaansfontein, c.650ft, 28 ix 1962, *Taylor* 4095 (PRE); south of Hangklip Kloof, 50ft, 17 ix 1969, *Boucher* 671 (PRE). Cape Town div., Cape Peninsula, Hout Bay, 23 x 1937, *Salter* 7024 (BOL).

Both varieties have been recorded from Hout Bay east to George and Knysna, var. *multifidum* ranging thence through the coastal districts to Port Alfred. A specimen collected by MacOwan purportedly at Grahamstown is misleading: his no. 740 in SAM (which is a mixture of *G. incanum* and *G. multisectum*) is localized Grahamstown, but the same number in NH came from the mouth of the Van Staden's River, a likely locality. That there has been some muddle here is borne out by a sheet in GRA (740 + 1071) bearing an annotation by MacOwan drawing attention to muddled labels and localities; this sheet reputedly came from Kasouga, also a likely locality.

12. Geranium nyassense Knuth in Repert. Spec. Nov. Regni Veg. 18:289 (1922); Milne-Redhead in Mem. N. York Bot. Gard. 8(3):231 (1953).

Lectotype (chosen here): Tanzania [Tanganyika], Kyimbila, 1800m, 1912, *Stolz* 1389 (K; NU isolecto).

Syn.: *G. incanum* subsp. *nyassense* (Knuth) Laundon in Bol. Soc. Brot. Sér. 2, 35:63, t. 3 (1961) & in Fl. Zamb. 2:134 (1963); Kokwaro in Fl. Trop. E Afr., Geraniaceae, 4 (1971).

Diffuse perennial herb, stems slender, well-branched, sprawling, somewhat woody, with appressed as well as spreading hairs. *Stipules* deeply dissected, segments linear-acuminate. *Leaves* all cauline, petioles long, all but the uppermost exceeding the blades in length, with sparse fine appressed hairs, long spreading hairs few or many, blade up to c.40mm in diam., digitately (3–) 5 (–7)-lobed to the base, each lobe deeply pinnatifid, the segments oblong-lanceolate, larger ones often coarsely toothed, margins ± revolute, appressed-pubescent above, finely appressed-pubescent below, with coarser hairs over the veins and frequently long spreading hairs as well, slightly discolorous. *Peduncles* opposite the upper leaves and much exceeding them, with appressed as well as few to many spreading hairs, 1- or 2-flowered. *Pedicels* seldom exceeding 30mm long, hairy like the peduncles. *Sepals* 5–6 × 2–2·5mm excluding mucro, with fine appressed pubescence, sometimes coarser spreading hairs as well. *Petals* 9–12 × 3–4mm, obovate, entire or shallowly notched, white or pink. *Rostrum* with fine ascending hairs. **Fig. 1I**.

TRANSVAAL. Sibasa distr., Sibasa, 25 xii 1935, *Smuts & Gillett* 3282 (PRE, STE); 2230 CD, Tshamanyatsha, 1385m, 14 vi 1978, *Netshiungane* 608 (PRE).

Geranium nyassense is found on the mountains in southern Tanzania, Malawi, Zimbabwe and Moçambique, as well as on the Zoutpansberg; it thus crosses both the Zambezi and the Limpopo valleys. The type specimen of *G. nyassense* has glandular pubescence on both sepals and pedicels, and the leaves are whiter below than in specimens from the Transvaal, but neither of these characters is reliable taxonomically; in leaf cutting they are identical, and this is of prime importance in *Geranium*. Transvaal specimens precisely match material from the Inyanga area of eastern Zimbabwe. The plants sprawl in grass near streams and on damp forest margins, flowering between December and June.

Laundon (1961, p. 63) reduced *G. nyassense* to subspecific rank under *G. incanum,* from which, however, it is amply distinct: differences in both leaf cutting and indumentum distinguish them, and their geographical separation is enormous. This is not apparent from Laundon's discussion, because he confused both *G. multisectum* and *G. magniflorum* with *G. incanum*.

13. Geranium caffrum Ecklon & Zeyher, Enum. Pl. Afric. Austral. 58 (1835); Harvey in Harvey & Sonder, Fl. Cap. 1:258 (1860); Baker in Saund., Refug. Bot. tab. 147 (1869); Knuth, Pflanzenr. Geran. 207 (1912), excl. *Flanagan* 1420.

Type: E Cape, Phillipstown, ad flumen Kat River, Oct., *Ecklon & Zeyher* 448 (S (2 sheets) holo., SAM iso. fragment).

Diffuse perennial herb with a long thickened taproot; stems slender, becoming woody at the base, branched, sprawling, rooting, thinly appressed-pubescent. *Stipules* deeply dissected, segments lanceolate-acuminate. *Leaves* loosely tufted initially in young plants and at rooting nodes, but soon all cauline; petioles very long, all but the uppermost much exceeding the blade in length, with fine appressed retrorse hairs, blade up to c.70mm diam. digitately (3–) 5-lobed to the base, each lobe oblong in outline, deeply pinnatifid, these segments rarely more than 2mm wide, oblong, usually entire, rarely the lowermost with 1 or 2 teeth, margins usually slightly revolute, sparsely appressed-pubescent above, appressed hairs over main veins and along margins below, otherwise glabrous. *Peduncles* opposite the uppermost leaves and much exceeding them, with short fine retrorse appressed hairs, 1- or 2-flowered. *Pedicels* seldom exceeding 25mm long, hairy like the peduncles but often with short spreading gland-tipped hairs as well. *Sepals* (4–) 5–6 (–8) × 2–2·25 (–3)mm excluding mucro, with short fine appressed hairs, often short spreading gland-tipped hairs as well. *Petals* (8–) 9–13 (–15) × 4–8 (–10)mm, obovate, entire or shallowly notched, usually white, sometimes pale pink. *Rostrum* with appressed or spreading hairs, often spreading gland-tipped hairs as well. **Fig. 2K**.

Selected citations:

NATAL. Bergville distr., Cathedral Peak Forest Reserve, Mlambonja valley, 5000ft, 25 xi 1952, *Killick* 1780 (K, NU, PRE). Lion's River distr.,

4700ft, 22 i 1956, *Edwards* 1131 (NU, PRE); Balgowan, Glen Arum, 3 iv 1919, *Mogg* 3805 (PRE). Estcourt distr., Cathkin Park, 4200–5000ft, 4 ii 1932, *Galpin* 11722 (BM, BOL, K, PRE); Tabamhlope Research Station, 8 i 1938, *West* 558 (PRE).
CAPE. Aliwal North distr., near Aliwal North, Eland's Hoek, c.4650ft, iv 1903, *F. Bolus* 13 (BOL). Molteno distr., Broughton, 6300ft, 1892, *Flanagan* 1572 (K, PRE, S, SAM). Cathcart, Fairford, xii 1916, *Cotterrell* 177 (GRA). Graaff Reinet distr., 3224 AA, farm Houd Constant, 4500ft, 7 xi 1974, *Oliver* 5262 (PRE); 3124 DD, foot of old Wapadsberg Pass near Bethesda Road, 26 xi 1977, *Hilliard & Burtt* 10681 (E, MO, NU). Queenstown, banks of Komani River, 3500ft, xii 1896, *Galpin* 2247 (PRE). Cradock distr., Mountain Zebra Park, 2 x 1977, *van der Walt* 894 (STE-U). Victoria East, Fort Beaufort, 3226 DB, Juanasberg, 3400ft, 17 xii 1942, *Giffen* 1133 (PRE); 3226 DA, Katberg Pass road, just above Readesdale turnoff, 28 x 1980, *Hilliard & Burtt* 13259 (E, NU). Bedford, 28 xi 1901, *Nicol* 30 (GRA). Ceres div., Koude Bokkeveld Tafelberg, 5500ft, 22 i 1897, *Schlechter* 10099 (BM, BOL, E, K, PRE, S). King William's Town distr., Kei Road, 1000ft, 2 x 1976, *Bayliss* 8002 (GRA, PRE); King William's Town, 1200ft, i 1893, *Sim* 1804 (NU). Stutterheim distr., 3227 CB, Gubu Dam below Kabusie Forest, 11 xii 1981, *Hilliard & Burtt* 14800 (E, NU). Somerset East distr., 3225 DA, Somerset East, Bester's Hoek, 25 x 1980, *Hilliard & Burtt* 13243 (E, NU). Albany distr., Grahamstown Elandskloof, c.2000ft, xi 1888, *Galpin* 379 (GRA, PRE); Riebeeck East, 1500ft, 17 xi 1973, *Bayliss* 686 (K, PRE). Uitenhage distr., Zwartkops River, *Zeyher* 2038 (BOL, PRE, S). Oudtshoorn distr., 3322 AC, Cango Valley, 4 xi 1974, *Moffett* 440 (STE-U). Prince Albert div., near summit Swartberg Pass, 5000ft, xii 1951, *Stokoe* SAM 66685 (SAM). Between Keisiesdoorns and Harmonie [c.3318 DC], x 1922, *Michell* 236 (PRE).

Geranium caffrum is widely distributed in the southern, central and eastern Cape, straggling north eastwards to Natal, where it has been recorded at an altitude of c.1500m in Bergville, Estcourt and Lion's River districts. It favours damp places in rough grassland or low scrub, and may grow around marshes or along streambanks, flowering between September and January. Though much confused with *G. ornithopodon*, it is easily recognized by its differently cut leaves and by its closely appressed pubescence, which, on the lower leaf surface, is strictly confined to the veins and the revolute margins: only the gland-tipped hairs that are sometimes present on the pedicels and sepals are spreading.

It appears to hybridize with *G. flanaganii*: we saw both species growing in the coarse vegetation along the stream below Gubu Dam, at the foot of Kabusie Forest near Stutterheim. This site, which must at one time have been a mosaic of gallery forest, rough grassland, and grass slopes, has been much disturbed, and may well offer the intermediate habitats often necessary for the survival of hybrids. *Geranium caffrum* (*Hilliard & Burtt* 14800) grew along the pathside in short grass, while *G. flanaganii* (*H & B* 14799) straggled through the bushes near the stream; *H & B* 14804 is more or less intermediate between the two species; *H & B* 14801 has leaves similar to those of *G. caffrum* but with some spreading glandular

hairs on the petioles, and large deep pink flowers; the flowers of *G. caffrum* are usually white, and smaller, and the petioles are eglandular. *Geranium amatolicum,* which grew nearby, has glandular petioles and large deep pink flowers.

14. Geranium dregei Hilliard & Burtt, **species nova** *G. caffro* Ecklon & Zeyher affinis sed pilis in caulibus petiolis paginis inferioribus foliorum patentibus (nec valde appressis), floribus plerumque minoribus sepalis 4–4·5mm (nec plerumque 5–6mm) et petalis 7–8·5 × 3–4mm (nec plerumque 9–13 × 4–8mm) distinguenda.

Herba perennis diffusa, caudice crasso lignoso; caules tenues effusi, nodis radicantes et rosulas foliorum et ramos novos emittentes, plus minusve retrorsus patenti-pilosi. *Stipulae* altae dissectae, segmentis lanceolato-acuminatis. *Folia* nodis regenerantibus laxe caespitosa; petiolo longi, summis exceptis lamina multo longiores, pilis plus minusve retrorsis patentibus; lamina ad 35mm diam., digitatim (3–) 5-lobata, saltem lobo medio ad basin laminae inciso, lobis alte pinnatifidis, segmentis ultimis ad 2mm latis oblongis, supra pilis crassis appressis subtus pilis crassis patentibus induta. *Pedunculi* ad folia superiora oppositi et eis multo excedentes, pilis retrorsis subappressis, 1- vel 2-flori. *Pedicelli* ad 20mm longi, sub fructu interdum paulo longiores, uti pedunculi pilosi. *Sepala* 4–4·5 × 1·5–2mm, mucrone excluso, tenuiter appresse pubescentia. *Petala* 7–8·5 × 3–4mm, emarginata, pallide rosea. *Rostrum* pilis tenuibus plus minusve appressis indutum.

Type: Cape, Middelburg distr., farm Compassberg, banks above sluit, 25 xii 1951, *Esterhuysen* 19706 (BOL holo., PRE iso.).

Diffuse perennial herb developing a thick woody stock, stems slender, sprawling, rooting at the nodes and there producing leaf tufts and new branches, with ± retrorse, spreading hairs. *Stipules* deeply dissected, segments lanceolate-acuminate. *Leaves* initially loosely tufted at the regeneration points, petioles long, all but the uppermost much exceeding the blade in length, hairs ± retrorse, spreading, blade up to 35mm in diam., digitately (3–) 5-lobed, at least the middle lobe to the base, each lobe deeply pinnatifid, these segments up to 2mm broad, oblong, upper surface with coarse appressed hairs, lower with coarse spreading hairs. *Peduncles* opposite the uppermost leaves and much exceeding them, with retrorse ± appressed hairs, 1- or 2-flowered. *Pedicels* up to 20mm long, sometimes a little longer in fruit, hairy like the peduncles. *Sepals* 4–4·5 × 1·5–2mm excluding mucro, finely appressed-pubescent. *Petals* 7–8·5 × 3–4mm, shallowly notched, pale pink. *Rostrum* with short fine ± appressed hairs.

CAPE. Middelburg distr., farm Onbekend, 22 i 1935, *Verdoorn* 1564 (PRE). Queenstown distr., near Shiloh, Klipplaat river, 3500ft, 28 xi 1832, *Drège* 7512b (BOL; the specimen in E under this number is *G. caffrum*). Richmond distr., Uitvlugt, 4–5000ft. Dec. Jan., *Drège* 7509 (K).

ORANGE FREE STATE. Trompsburg distr., Trompsburg, 24 i 1925, *Potts* s.n. (BLFU 7911).

Geranium dregei is closely allied to *G. caffrum*, from which it may be distinguished by the spreading hairs on stems, petioles and lower leaf surface, and by its generally smaller flowers.

Although this species was first collected by Drège more than 150 years ago, it remains poorly known because the northern and central Cape is so ill-collected, and what few specimens there are are mostly scrappy or sterile. It seems to be found along streambanks and among Karroo

bushes in the central Cape, and Potts recorded it in the southern Orange Free State in low-lying damp ground; it is reported to be eaten greedily by stock (*Verdoorn* 1564, PRE). A small tuft of leaves collected on the farm Mountain View in the Nieuweveld Mountains (*Gibbs Russell, Robinson & Herman* 4305, PRE) appears to belong to *G. dregei,* and if so extends the known range of the species much to the west. Two specimens from further north may also prove to belong to *G. dregei,* though they have much larger leaves (blade up to 60mm in diam.) and one (*Flanagan* 1420) has spreading gland-tipped hairs on the pedicels and sepals: near Kimberley, 3650ft, Dec. 1892, *Flanagan* 1420 (PRE) and Bloemfontein, Rhenoster Spruit, 25 xi 1917, *Potts* 2821 (BLFU, PRE).

15. Geranium subglabrum Hilliard & Burtt, **species nova** *G. caffro* Ecklon & Zeyher affinis, sed foliorum segmentis ultimis plus minusve deltoideis (nec oblongis), et pedunculis pedicellisque pilis patentibus glanduliferis aliis paucis appressis indutis (nec pilis appressis conspicuis pilis glanduliferis ad pedicellos restrictis) differt.

Herba perennis, multicaulis, caules effusi, decumbentes vel suberecti, tenues, partibus junioribus parce appresse retrorsus pubescentibus. *Stipulae* alte dissectae, segmentis linear-acuminatis. *Folia* petiolis ad 150mm longis sursum decrescentibus pilis appressis retrorsis parce pubescentibus; lamina ad 110mm diam., fere ad basin digitatim 5-lobata; lobi elliptici, lobulati et dentati, segmentis ultimis plus minusve anguste deltoideis, supra parce appresse pubescentes, subtus pilis appressis tantum in venis primariis et marginibus revolutis induti. *Inflorescentia* terminalis, cymam magnam laxe ramosam formans; bracteae parvae, infimae tantum foliaceae subsessiles: pedunculi parcius pilis brevibus crispatis induti et insuper pilis numerosis brevibus (ad 0·5mm) patentibus glanduliferis praediti, plerumque biflori. *Pedicelli* plerumque 20–50mm longi, uti pedunculi pilosi. *Sepala* 4·5–7·5 × 2–2·5mm, mucrone excluso, in nervis pilis patentibus glanduliferis induta. *Petala* 12–15 × 7–11mm, obovata, integra, rosea rubro-venosa. *Rostrum* pilis patentibus glanduliferis praeditum.

Type: Natal, Alfred distr., 3029 DB, farm Rooivaal near Harding, 2 iii 1983, *Hilliard & Burtt* 16748 (NU holo., E iso.).

Many-stemmed, clump-forming perennial herb, stems of indeterminate length, straggling, decumbent or suberect, slender, young parts sparsely appressed pubescent, the hairs retrorse. *Stipules* deeply dissected, segments linear-acuminate. *Leaves* on petioles up to 150mm long, diminishing in length upwards, sparsely pubescent with appressed retrorse hairs; blade up to 110mm in diam., digitately 5-lobed almost to the base, lobes elliptic in outline, lobed and toothed, the ultimate segments ± narrowly deltoid, sparsely appressed pubescent above, hairs below confined to the main veins and revolute margins, appressed. *Inflorescence* a large loosely branched cyme terminating each stem, bracts small, only the lowermost leaflike but subsessile. *Peduncles* with relatively sparse short ± curled hairs as well as many short (up to 0·5mm) spreading gland-tipped ones, mostly 2-flowered. *Pedicels* mostly 20–50mm long, hairy as the peduncles. *Sepals* 4·5–7·5 × 2–2·5mm, excluding mucro, with spreading gland-tipped hairs on nerves. *Petals* 12–15 × 7–11mm, obovate, entire, rich pink with darker veins. *Rostrum* with spreading gland-tipped hairs. **Fig. 2F.**

NATAL. Alfred distr., Rooivaal, 4 i 1957, *Taylor* 5288 (NBG, STE).

TRANSKEI. Engcobo distr., 3128 CB, Baziya Mountain, Mpolompo valley, c.4000ft, 1 ii 1983, *Hilliard & Burtt* 16357 (E, NU); ibidem, foot of Baziya Mountain, 2300ft, March, *Baur* 130 (K, SAM); 2500ft, Oct., *Baur*

775 (K). Tsolo distr., road from Nqadu forest to Bele, c.1100m, 29 xi 1983, *Hutchings* 833 (E, NU, Umtata).

Geranium subglabrum favours streamsides near the margins of forest patches. On Rooivaal, the type locality, it grew in great tangled masses mixed with *G. flanaganii*, which is the commoner species in this area; on Baziya Mountain, it was straggling up through rank vegetation that hid the course of the stream, and again, *G. flanaganii* was present, easily distinguished by its much hairier stems and leaves. *Geranium subglabrum* is similar to *G. caffrum* in leaf indumentum, but the leaf lobing is different (see Fig. 2 F & K) and so is the indumentum on the peduncles (spreading gland-tipped hairs richly developed in *G. subglabrum*, wanting in *G. caffrum*). It can also be confused with *G. sparsiflorum*, but the leaf cutting is different (see Fig. 2 F & J) as is the indumentum.

This species was collected as long ago as 1842 by Wahlberg. His specimen is at Stockholm (S) and bears the locality 'Makkalijberg' [Magaliesberg], but this is unlikely to be correct.

16. Geranium sparsiflorum [Schltr. ex] Knuth in Bot. Jahrb. 40:68 (1907), & Pflanzenr. Geran. 206 (1912).

Type: Natal, Zuurberge [near Weza], 1700m, 1 ii 1895, *Schlechter* 6590 (B† holo.; BM, GRA iso.).

Syn.: *G. alticola* [Schltr. ex] Knuth in Bot. Jahrb. 40:71 (1907), & Pflanzenr. Geran. 166 (1912). Lectotype (chosen here): Natal, Van Reenen [but see comment below], 2300m, 1895, *Schlechter* 6994 (S; GRA isolecto.).

Clumped perennial herb, stems straggling, decumbent, subsimple, herbaceous, clad in both short and long spreading, often gland-tipped, hairs, sometimes underlain by fine eglandular ± appressed hairs. *Stipules* deeply dissected, segments linear-acuminate. *Radical leaves* tufted, the stipulate bases of the petioles congested into a stout woody oblong mass up to c.50 × 10mm, petioles up to c.300mm long, with long spreading hairs, often gland-tipped, blade c.40–90mm diam., digitately 5-lobed more than three quarters of the way to the base, lobes rhomboid in outline, deeply and sharply dissected, the ultimate segments lanceolate, very acute, long, coarse, spreading, rather sparse hairs above, long spreading hairs below more or less confined to the veins, often some gland-tipped; cauline leaves similar, but petioles progressively shorter upwards, uppermost leaves more or less sessile and sometimes lobed nearly to the base. *Peduncles* opposite the uppermost leaves and much exceeding them, with long (many at least 1mm long, sometimes reaching 1·75mm) spreading hairs, gland-tipped or not, 2-flowered. *Pedicels* seldom exceeding 40mm, hairy as the peduncles. *Sepals* 6–9 × 2–3mm, excluding mucro, finely appressed-pubescent, long spreading hairs as well, gland-tipped or not. *Petals* 12–16 × 5–10mm, obovate, entire or shallowly notched, pink. *Rostrum* with or without ± spreading gland-tipped hairs. **Fig. 2J**.

NATAL. Ixopo distr., Ixopo, farm 'Maxwell', 4–5000ft, xi 1893, *Evans* 282 (NH). Mount Currie distr., Kokstad, 5000ft, i 1884, *Tyson* 1661 (GRA, SAM); ibidem, xi 1883, *Tyson* 1241 (SAM).

TRANSKEI. Lusikisiki distr., 3129 BC, Mateku, 27 viii 1969, *Strey* 8967 (NH, PRE); Magwa Falls, 27 x 1962, *Rycroft* 2595 (NBG).

The type specimen of *G. sparsiflorum* came from the Zuurberg, near Weza in southern Natal, and subsequent collections have come from nearby Ixopo and Mount Currie districts, as well as from Magwa Falls and Mateku in Lusikisiki district, Pondoland, that part of the Transkei lying immediately south of Natal. The type of *G. alticola,* which was also collected by Schlechter, reputedly came from Van Reenen, in northern Natal, but the species has never been re-collected there. Schlechter's number, 6994, is not listed in the account of his itinerary in South Africa (Jessop, in *J.S. Afr. Bot.* 30:137, 1964): his 1891–95 tour ends with no. 6992, collected at Van Reenen in March 1895. The isotype of *G. alticola* (*Schlechter* 6994) at the Albany Museum bears a Schlechter printed ticket with the collector's number only written in by Schlechter himself; the locality has been added much later by another hand (the isotype of *G. sparsiflorum, Schlechter* 6590, GRA, has number, locality and date all written in by Schlechter). It seems possible that, at the end of his tour, Schlechter found himself with a few specimens that he numbered but did not localize; the locality 'Van Reenen' was added later, in consequence of no. 6992 having been collected there. The localities of other Schlechter specimens can be questioned (see Jessop, loc. cit.).

It seems then that *G. sparsiflorum* is confined to southern Natal and nearby parts of the Transkei where it grows in damp spots in grassland, flowering mainly between August and December. The deeply and sharply cut leaves with their spreading hairs are distinctive, bearing some resemblance only to those of *G. contortum*, a plant differing from *G. sparsiflorum* in habit among other characters. It can also be confused with *G. subglabrum*: see under that species.

17. Geranium natalense Hilliard & Burtt, **species nova** *G. schlechteri* Knuth affinis, sed foliis altius lobatis et pilis patentibus glanduliferis in pedicellis minus quam 0·3mm longis vel absentibus (nec semper praesentibus saepe minime 1mm longis raro tantum 0·5mm) differt.

Herba perennis, diffusa; caules effusi, laxe ramosi, pubescentes, pilis plerumque brevibus (minus quam 0·3mm) tenuibus subretrorsis vel patentibus, interdum pilis aliis paucis longis acutis vel glanduliferis etiam praesentibus. *Stipulae* alte dissectae, segmentis linearibus acuminatis. *Petioli* ad 80mm longi, sursum decrescentes, foliis summis subsessilibus, pilis brevibus tenuibus subretrorsis crispatis pubescentes, pilis paucis aliis longis glanduliferis vel eglandulosis interdum praesentibus. *Lamina* ad 65mm diam., digitatim 5-lobata ad 2–3mm supra basin; lobi ambitu elliptici, lobati et dentati, supra pilis parcis brevibus appressis, subtus praecipue in venis et marginibus pilis subpatentibus pubescentes. *Pedunculi* foliis superioribus oppositi et eis haud semper excedentes, uniflori vel biflori, pilis retrorsis et interdum aliis brevissimis (ad 0·3mm) patentibus glanduliferis pubescentes. *Pedicelli* ad 25mm longi, uti pedunculi pubescentes. *Sepala* c.4·5–5 × 1·75–2·5mm mucrone excluso, appresse pubescentia pilis paucis patentibus glanduliferis interdum praesentibus. *Petala* c.11 × 7mm, obovata, apice vix emarginata. *Rostrum* pubescens, pilis paucis interdum glanduliferis.

Type: Natal, Lions River distr., Karkloof, farm 'Ehlatini', 4500ft, 15 ii 1947, *Moll* 3467 (PRE holo.; K, NH, NU iso.).

Diffuse perennial herb, stems straggling, of indeterminate length, loosely branched, pubescent, most hairs short (less than 0·3mm), fine, ±

retrorse, or spreading, occasionally some gland-tipped, fewer long acute or gland-tipped hairs also sometimes present. *Stipules* deeply dissected, segments linear-acuminate. *Leaves* with petioles up to 80mm long, diminishing upwards, uppermost leaves subsessile, pubescent with short fine ± retrorse and curled hairs, a few longer glandular or eglandular spreading hairs also sometimes present; blade up to c.65mm in diam., digitately 5-lobed to within 2–3mm of the base, (ratio 8–16:1 measured on the median lobe), lobes elliptic in outline, lobed and toothed, sparse short fine appressed hairs above, pubescent mainly on the veins and margins below, these hairs ± spreading. *Peduncles* opposite the upper leaves and not always exceeding them, 1- or 2-flowered, pubescent with fine ± retrorse hairs and sometimes very short (up to 0·3mm) spreading gland-tipped ones as well. *Pedicels* up to 25mm long, hairy as the peduncles. *Sepals* c.4·5–5 × 1·75–2·5mm, excluding mucro, appressed pubescent, a few longer spreading gland-tipped hairs also sometimes present. *Petals* c.11 × 7mm, obovate, apex scarcely notched, 'mauve' (Moll). *Rostrum* pubescent, a few of the hairs sometimes gland-tipped. **Fig. 2H**.
NATAL. Lion's River distr., Nottingham Road, iii 1939, *McClean* 828 (PRE). Natal, without precise locality, *Cooper* 1191, 2047, 2124 (K).

Geranium natalense is as yet known only from the Natal midlands, where it grows in damp ground bordering marshes and streams, and can probably be found in flower between December and March. It is allied to the widespread *G. schlechteri,* but differs in its more deeply cut leaves (the free part of the midlobe in proportion to the joined part being about 8–16:1, not 2–5:1) (see Fig. 2H & C); it is also markedly less glandular than *G. schlechteri*; and when gland-tipped hairs are present, they are very short (up to c.0·3mm, not mostly 0·5–1·5mm).

18. Geranium schlechteri Knuth, Pflanzenr. Geran. 207 (1912).
Lectotype (chosen here): Natal, [Mt Currie–Alfred districts], Zuurberg, 1400m, 2 ii 1895, *Schlechter* 6567 (BOL; GRA, PRE, isolecto.).
Syn.: *G. ornithopodon* Ecklon & Zeyher var. *lilacinum* Kuntze, Revis. Gen. Pl. 3(2):32 (1898). Type: Van Reenen's Pass, 1800m, 20 iii 1894, *Kuntze* (K iso.).

Diffuse perennial herb, stems straggling, up to c.1m long, loosely branched, with short fine ± retrorse hairs as well as long spreading gland-tipped ones. *Stipules* deeply dissected, segments linear-acuminate. *Leaves* with petioles up to c.180mm long, diminishing upwards, uppermost leaves subsessile, clad in long spreading glandular hairs; blade up to c.60mm in diam., digitately 5-lobed to within c.4–10mm of the base (ratio 2–5:1 measured on the median lobe), lobes elliptic in outline, lobed and sparingly toothed, thinly ± appressed hairy above, long spreading hairs below, often gland-tipped. *Peduncles* opposite the upper leaves and not always exceeding them, usually 2-flowered, with a unilateral band of fine ± retrorse hairs as well as evenly distributed long (often exceeding 1mm) spreading gland-tipped hairs. *Pedicels* 10–40mm long, hairy as the peduncles. *Sepals* 4·5–6 × 2–3mm, pilose with long spreading gland-tipped hairs. *Petals* c.9–12 × 4–7mm, obovate, entire or shallowly notched, white

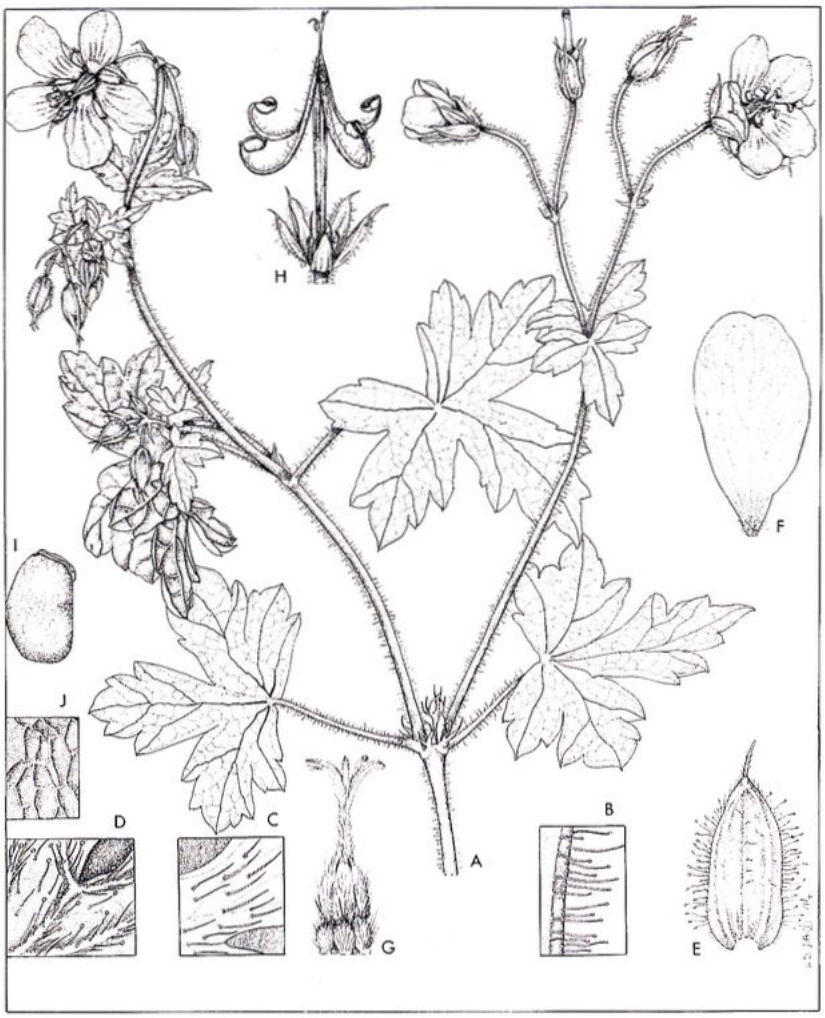

FIG. 5. *Geranium schlechteri*. A, flowering branch (×¾); B, detail of spreading gland-tipped hair on stems and petioles; C, detail of hairs on upper surface of leaf; D, detail of hairs on lower surface of leaf; E, sepal (×3); F, petal (×2); G, gynoecium (×3½); H, fruit (nat. size); I, seed (×4); J, detail of reticulate testa.

fading to pink, or white veined pink, or rosy pink. *Rostrum* pilose with spreading gland-tipped hairs. **Figs 2C, 5.**

Selected citations:

TRANSVAAL. Wakkerstroom distr., farm Oshoek, 6400ft, 28 xii 1960, *Devenish* 397 (PRE).

NATAL. Dundee distr., Helmekaar–Elandskraal road, 23 v 1965, *Shirley* s.n. (NU). Klip River distr., Van Reenen, i 1914, *Bews* 185 (NU); Van Reenen's Pass, 26 xi 1930, *Schweickerdt* 955 (PRE, mixed with *G. wakkerstroomianum*). Bergville distr., Royal Natal National Park, 5000ft, v 1946, *Lewis* 1779 (SAM, mixed with *G. wakkerstroomianum*); ibidem, Tugela Gorge path, c.6000ft, 23 iii 1981, *Hilliard & Burtt* 14452 (E, NU); ibidem, near Basuto Gate, c.7200ft, 2 ii 1982, *Stewart & Manning* 2251

(NU); Cathedral Peak F.R., above Tseketseke river, c.6900ft, 18 i 1983, *Hilliard & Burtt* 16299 (E, NU). Estcourt distr., near Champagne Castle hostel, 6000ft, 9 i 1947, *Codd* 2479 (PRE); Cathkin Park, 4 ii 1932, *Galpin* 11723 (BOL, K, PRE); Kamberg Nature Reserve, Stillerust Vlei, 7 i 1976, *Hilliard & Burtt* 8737 (E, K, NU); Giant's Castle Game Reserve, 6000ft, 5 ii 1964, *McKeown* 29 (BLFU, E, NU). Lion's River distr., Mooi River, Meteor Ridge, 26 x 1918, *Mogg* 3233 (PRE); Kamberg, c.5900ft, 31 xii 1974, *Wright* 2092 (NU); Karkloof, farm Benvie, 18 xi 1980, *Hilliard & Burtt* 13489 (E, NU). Pietermaritzburg distr., Hilton Road, 2800ft, 20 iv 1947, *Randles* 18 (NU). Richmond distr., Indaleni, iv 1948, *Nixon* 26 (NU); Byrne, 4500–5000ft, 25 iii 1932, *Galpin* 12035 (BOL, K, PRE). Mpendhle distr., Runnymead, 5000ft, 23 xii 1964, *Moll* 1473 (NU, PRE); Loteni Nature Reserve, 5000ft, 20 xii 1978, *Phelan* 231 (NU); ibidem, Loteni river valley, c.6000ft, 13 i 1982, *Hilliard & Burtt* 15129 (E, NU); Highmoor Forest Reserve, headwaters of Elandshoek river, 7500ft, 5 i 1983, *Hilliard & Burtt* 16242 (E, NU). Polela distr., Mawahqua, farm Glengariff, 4500ft, 30 x 1977, *Rennie* 851 (E, NU). Underberg distr., Bushman's Nek, Thamathu Pass, 7500ft, 5 ii 1976, *Hilliard & Burtt* 8982 (E, K, NU, S, STE); Umzimkulu river above Drakensberg Garden Hotel, c.5500ft, 27 i 1975, *Hilliard & Burtt* 7740 (E, K, MO, NU, PRE); Garden Castle Forest Reserve, c.6400ft, 11 xi 1980, *Hilliard & Burtt* 13436 (E, NU); Sani Pass, c.8500ft, 17 ii 1982, *Hilliard & Burtt* 15517 (E, NU); 5–7 miles NNW of Castle View Farm, headwaters of Mlahlangubo river, 7000ft, 21 i 1982, *Hilliard & Burtt* 15307 (E, NU). Ixopo distr., farm Lynn Avis, 4350ft, 12 ii 1964, *Crewe* 52 (NU). Mount Currie distr., Franklin, farm Arcadia, 5800ft, iv 1946, *Geldenhuys* 21 (NU); Matatiele, i 1917, *Hilner* 35 (SAM); Cedarville, farm Mvenyani, 23 xi 1920, *Baudert* 100 (GRA); Kokstad, 4700ft, xii 1883, *Tyson* 1992 (E, PRE); St. Bernards, 20 xii 1952, *Barker* 7995 (NBG).

CAPE. 3127 BB, Elliot distr., Bastervoetpad, 6700ft, 15 ii 1983, *Hilliard & Burtt* 16702 (E, NU).

ORANGE FREE STATE. 2829 AC, Harrismith distr., Harrismith, *Smit* 108 (PRE); Kerkenberg, 21 ii 1968, *van der Zeyde* s.n. (NBG); Harrismith Botanic Garden, 1706m, 21 iii 1974, *Jacobsz* 2027 (NBG, PRE). Witzieshoek, ii 1917, *Junod* s.n. TM 17536 (PRE); Witzieshoek, near Rest Camp, 7200ft, 28 xii 1975, *Hilliard & Burtt* 8670 (E, K, MO, NU, STE).

LESOTHO. Maseru distr., Mahlatsa's, 6900ft, i 1948, *Guillarmod* 458 (PRE). Mokhotlong distr., Sehlabathebe National Park, c.2425m, 9 i 1978, *Hoener* 1986 (E, NU, PRE).

Geranium schlechteri is relatively widely distributed from the low Drakensberg on the Transvaal–Natal border, through the north eastern Orange Free State, Natal and Lesotho to the Cape Drakensberg just north of Barkly Pass, at altitudes ranging from c.1370 to 2590m. It favours moist grassland, sometimes in the shelter of rocks, flowering mainly between December and April. It is easily confused with *G. wakkerstroomianum*, and mixed collections are not infrequent, but *G. schlechteri* is very glandular whereas glandular hairs are rarely present in *G. wakkerstroomianum,* which is further distinguished by its deeply notched (not nearly entire) petals. It is also commonly confused with *G.*

ornithopodon and *G. flanaganii,* which have similar petals, but differently cut leaves and mostly different indumentum.

Plants are not uncommon that have larger flowers than the type, and are also more robust. They grow in scrubby places rather than grassland and often form tangles scrambling up through bushes in stream gullies, in *Leucosidea* scrub and on the margins of forest patches. Such specimens have been found along the Drakensberg from Van Reenen's Pass in the north to Thamathu Pass in the south above 1800m; however, numerous intermediate states are found and no taxonomic recognition is justified at present.

19. Geranium wakkerstroomianum Knuth in Repert. Spec. Nov. Regni Veg. 45:62 (1938).

Lectotype (chosen here): Transvaal, Wakkerstroom distr., Stoney Moon [sic=Honeymoon] Kloof, 20 i 1930, *Galpin* 9813 (K; PRE isolecto.).

Syn.: *G. ornithopodon* Ecklon & Zeyher var. *album* Kuntze in Revis. Gen. Pl. 3(2):32 (1898). Type: Natal, Van Reenen's Pass, 1800m, 20 iii 1894, *O. Kuntze* (K iso.).

Diffuse perennial herb, tap-root eventually thick and woody, stems straggling, often forming loose clumps, up to c.1m long, loosely branched pilose with spreading or somewhat retrorse white eglandular hairs, rarely with some gland-tipped hairs as well, very rarely nearly glabrous or with a few ± retrorse hairs. *Stipules* deeply dissected, segments linear-acuminate. *Leaves* with petioles up to c.300mm long, diminishing upwards, uppermost leaves often on very short petioles, clad in spreading hairs, usually eglandular; blade up to c.90mm in diam., often c.25–60mm, digitately 5-lobed about two-thirds of the way to the base, the lobes ± elliptic in outline, shallowly lobed, thinly ± appressed hairy above, sparsely to densely hairy below, these hairs long, ± spreading, eglandular. *Peduncles* opposite the upper leaves, usually 2-flowered, mostly 20–65mm long, usually pilose with long spreading hairs, rarely gland-tipped, rarely hairs sparser, shorter or somewhat retrorse. *Pedicels* c.10–40mm long, hairy as the peduncles. *Sepals* (4–) 6–8 × (1·75–) 2–3mm, pilose with long spreading hairs, very rarely some hairs gland-tipped. *Petals* c.7–17 × 2·5–5·5 (–7)mm, narrowly obovate, deeply notched, usually white veined pink or red, rarely pink. *Rostrum* with short fine spreading hairs, occasionally with some long hairs as well, rarely gland-tipped. **Figs 2A, 6.**

Selected citations:

TRANSVAAL. Louis Trichardt distr., Zoutpansberg, Entabeni, xi 1931, *Obermeyer* TM 31784 (PRE). Pietersburg distr., Woodbush, ix 1909, *Jenkins* 7418 (PRE). Lydenburg distr., farm Zwagershoek, i 1930, *Obermeyer* TM 28011 (PRE); 2530 AB, Lydenburg to Dullstroom road at 37km, 5 iii 1981, *Hilliard & Burtt* 14200 (E, NU). Pilgrim's Rest distr., 2430 DB, Mariepskop, 26 iii 1969, *Vorster* 538 (PRE); Sabie, Mauchsberg, 22 xii 1932, *Smuts & Gillett* 2317 (PRE); Graskop, 3 xii 1937, *Galpin* 14588 (BOL, K, PRE); summit Mount Anderson, 7300ft, 24 xii 1932, *Smuts & Gillett* 2361 (BOL, PRE); 2530 BA, Long Tom Pass at Whisky Spruit, c.6500ft, 15 iii 1981, *Hilliard & Burtt* 14366 (E, NU); 2530 BB, Witklip Forest Station, 8 iii 1981, *Hilliard & Burtt* 14249 (E, NU);

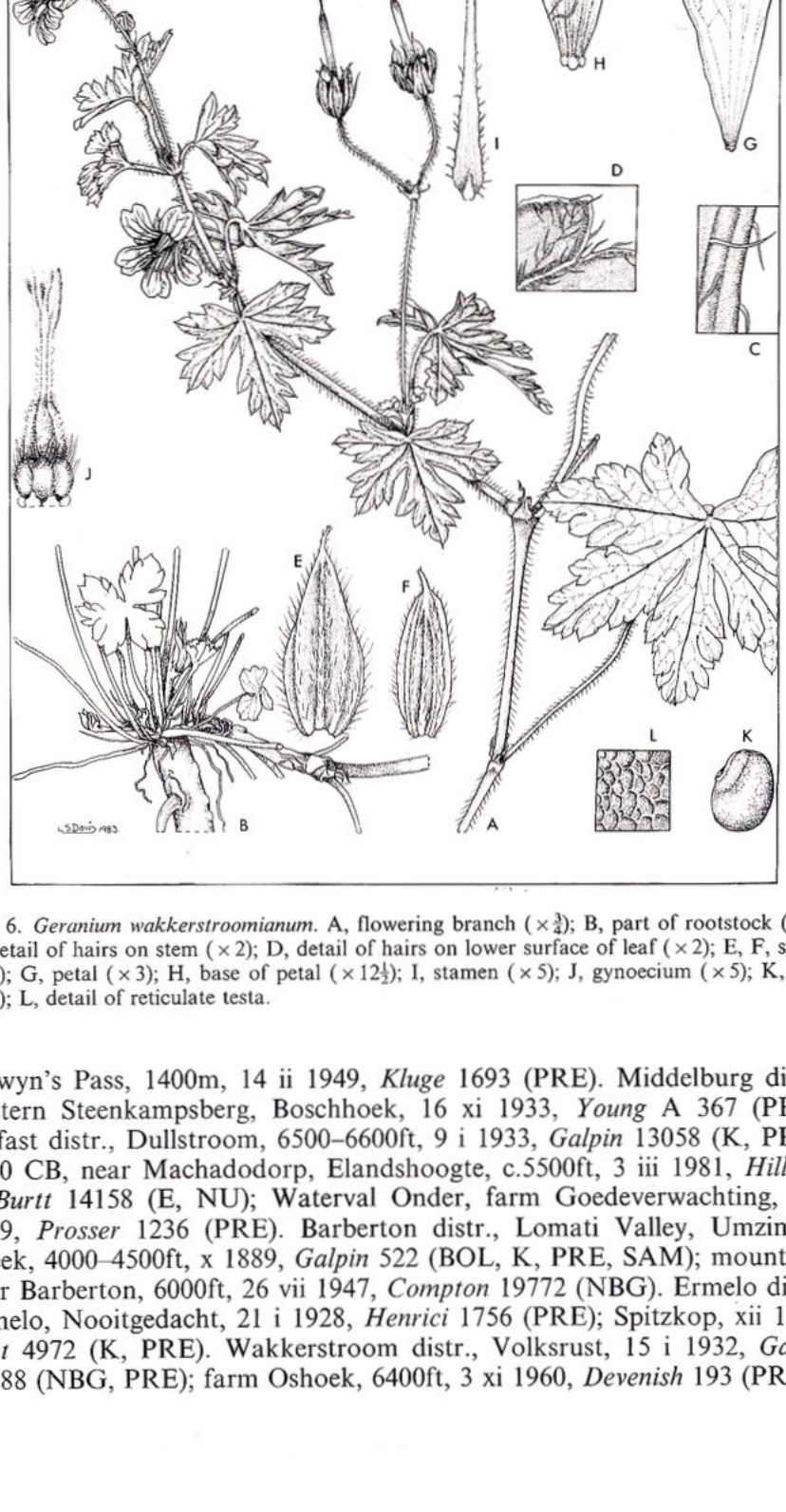

FIG. 6. *Geranium wakkerstroomianum*. A, flowering branch (×¾); B, part of rootstock (×¾); C, detail of hairs on stem (×2); D, detail of hairs on lower surface of leaf (×2); E, F, sepals (×3); G, petal (×3); H, base of petal (×12½); I, stamen (×5); J, gynoecium (×5); K, seed (×5); L, detail of reticulate testa.

Kowyn's Pass, 1400m, 14 ii 1949, *Kluge* 1693 (PRE). Middelburg distr., western Steenkampsberg, Boschhoek, 16 xi 1933, *Young* A 367 (PRE). Belfast distr., Dullstroom, 6500–6600ft, 9 i 1933, *Galpin* 13058 (K, PRE); 2530 CB, near Machadodorp, Elandshoogte, c.5500ft, 3 iii 1981, *Hilliard & Burtt* 14158 (E, NU); Waterval Onder, farm Goedeverwachting, 1 x 1949, *Prosser* 1236 (PRE). Barberton distr., Lomati Valley, Umzimdin Creek, 4000–4500ft, x 1889, *Galpin* 522 (BOL, K, PRE, SAM); mountains near Barberton, 6000ft, 26 vii 1947, *Compton* 19772 (NBG). Ermelo distr., Ermelo, Nooitgedacht, 21 i 1928, *Henrici* 1756 (PRE); Spitzkop, xii 1915, *Pott* 4972 (K, PRE). Wakkerstroom distr., Volksrust, 15 i 1932, *Galpin* 11788 (NBG, PRE); farm Oshoek, 6400ft, 3 xi 1960, *Devenish* 193 (PRE).

SWAZILAND. Forbes Reef distr., Havelock Mine, 4000ft, x 1955, *Miller* 3021 (PRE). Mbabane distr., Mbabane, 20 xii 1952, *Compton* 23768 (NBG); Ngwenya Mts, c.5000ft, 28 ii 1957, *Compton* 26709 (NBG); sine loc. (prob. Hlatikulu), 29 x 1910, *Stewart* TM 8788 (PRE).
ORANGE FREE STATE. Harrismith distr., Bester's vlei, 6200ft, xii 1893, *Bolus* 8133 (BOL); 2829 AC, Kerkenberg, c.5800ft, 4 i 1979, *Hilliard & Burtt* 11943 (E, NU); Swinburne, Rensburg's Kop, 4 iii 1962, *Jacobsz* 27 (PRE); Harrismith Botanic Garden, 1706m, 21 iii 1974, *Jacobsz* 2028 (PRE). Bethlehem distr., Golden Gate, 22 i 1951, *Compton* 22500 (NBG). Ficksburg distr., farm Westbury, 5400ft, 26 x 1934, *Galpin* 13869 (BOL, PRE);
LESOTHO. Butha Buthe distr., Oxbow Camp, 8500ft, i 1960, *Jacot Guillarmod* 4145 (PRE). Maseru distr., Mazenod, 5000ft, 13 iv 1949, *Jacot Guillarmod* 814 (PRE); Leribe, *Dieterlen* SAM 6161 (SAM). Qacha's Nek distr., Sehlabathebe National Park, 2446–2507m, 7 iv 1976, *Hoener* 1459 (PRE).
NATAL. Utrecht distr., 6 miles south of Wakkerstroom, Belelasberg, 1900m, 21 ii 1974, *Davidse* 6784 (PRE); Klipspruit, iii 1917, *Breyer* TM 16943 (PRE). Newcastle distr., Majuba, 13 iii 1905, *Rogers* 94 (BOL, K, PRE). Vryheid distr., Enyati Mt, Leeunek Pass, 19 v 1965, *Shirley* s.n. (NU). Babanango distr., Babanango, v 1932, *King* 286 (PRE). Klip River distr., De Beers Pass, 5–6000ft, 23 iii 1896, *Wood* 5967 (NBG); Cundy Cleugh, 16 v 1965, *Shirley* s.n. (NU); Van Reenen's Pass, farm Nolans Volens, 5000–5500ft, 9 xii 1976, *Hilliard & Burtt* 9443 (E, K, MO, NU, S, STE). Bergville distr., Oliviershoek, 17 i 1970, *Strey* 9510 (K, PRE, both mixed with *G. schlechteri*); Royal Natal National Park, path to Witzieshoek Gate, 6700ft, 28 xii 1975, *Hilliard & Burtt* 8683 (E, K, MO, NU, PRE, S, STE); Cathedral Peak F.R., Ndedema river valley, Schoongezicht cave, 25 x 1973, *Hilliard & Burtt* 6925 (E, K, MO, NU). Estcourt distr., between Champagne Castle Hostel and Cathkin Peak, 5–6000ft, 9 i 1947, *Story* 1750 (PRE); Kamberg, E end, 6000ft, 26 iii 1975, *Wright* 2194 (NU). Lion's River distr., Fort Nottingham Commonage, c.5500ft, 4 v 1977, *Hilliard & Burtt* 10336 (E, NU, STE). Umvoti distr., Greytown, farm Deaseene, 27 i 1939, *Galpin* 14749 (BOL, PRE); Rietvlei, Greenwich Farm, xi–xii 1899, *Fry* 2786 (GRA, PRE). Mpendhle distr., farm Tillietudlem, c.5700ft, 9 xii 1980, *Hilliard & Burtt* 13858 (E, NU); 8 miles from Mpendhle on Underberg road, 5100ft, 25 iii 1963, *Edwards* 3088 (NU, PRE). Polela distr., Mawahqua Mt, Sunset, 6500ft, 31 xii 1973, *Rennie* 466 (E, NU). Underberg distr., Bushman's Nek, Thamathu Pass, 6600ft, 23 xi 1973, *Hilliard & Burtt* 7441 (E, K, NU, PRE, S); Cobham Forest Reserve, Upper Polela Cave, c.7000ft, 21 xi 1976, *Hilliard & Burtt* 9315 (E, K, MO, NU, STE); 2929 CB, 5–7 miles NNW of Castle View Farm, headwaters of Mlahlangubo river, 7000ft, 25 xi 1980, *Hilliard & Burtt* 13671 (E, NU); Upper Umzimouti valley, 6500–6700ft, 27 xi 1976, *Hilliard & Burtt* 9384 (E, K, MO, NU, STE). Mt Currie distr., Mt Currie, 15 xi 1973, *Hilliard & Burtt* 7245 (E, K, MO, NU, PRE, S); Zuurbergen, 4800ft, 1 ii 1895, *Schlechter* 6576 (GRA, PRE). Matatiele distr., 3028 BB, 1km from Ramatseliso's Gate, 2200m, 16 xi 1975, *Boardman* 16 A (PRE).
TRANSKEI. Tembuland, Cala Cutting, 4000ft, 4 iii 1910, *Pegler* 1622

(BOL). 3127 DB, Satana's Nek near Engcobo, 4700–4800ft, 28 xi 1981, *Hilliard & Burtt* 14536 (E, NU). Herschel distr., near Sterkspruit, Majuba Nek, xii 1915, *Hepburn* 95 (GRA).
CAPE. Maclear distr., Ugie, farm Surat, 4300–4500ft, 29 i 1923, *Britten* 4669 (GRA). Queenstown distr., Hangklip Mt, 31 xii 1962, *Roberts* 2062 (PRE). Cathcart distr., 3227 AC, Windvogelberg, c.5400ft, 8 xii 1981, *Hilliard & Burtt* 14781 (E, NU); near Molteno, Broughton, 6300ft, xii 1892, *Flanagan* 1571 (PRE, S, SAM). Stutterheim distr., Dohne, 3000ft, 1897, *Sim* 20118 (PRE). Victoria East distr., Hogsback, *Rattray* 121 (GRA, PRE). Wodehouse distr., Stormberg, Penhoek Pass, c.6000ft, 24 i 1956, *Acocks* 18670 (K, PRE). Zuurepoort, nördliche Grenze der Stormbergen, *Ecklon & Zeyer* s.n. (S). Aliwal North distr., Jamestown, Vogelfontein Farm, 16 xii 1942, *Barker* 2245 (NBG).

Geranium wakkerstroomianum is even more widely distributed than its close ally, *G. schlechteri* ranging as it does from the Zoutpansberg in the northern Transvaal across the mountains and high ground in the east to western Swaziland, the eastern and north-eastern Orange Free State, Natal, Transkei and the eastern and north-eastern Cape as far west as the Stormberg and the Amatola Mountains. It is essentially a montane plant growing between 1200 and 2500m above sea level, where it can be found in damp sheltered places around rocks and on the margins of forest patches, or in marshy grassy places. Although it was described forty-five years ago, the name has never been taken up, and the species will be found in herbaria commonly misidentified as *G. ornithopodon,* sometimes as *G. canescens*. It is at once distinguished from both these species, as well as from *G. schlechteri,* by its narrow deeply notched petals (they are entire or shallowly notched in the other three species).

The hairs on *G. wakkerstroomianum* are usually eglandular; however, throughout its range, occasional specimens, even in a single collection, may have some gland-tipped hairs particularly on the pedicels, peduncles and upper parts of the stems. There is also some variation in degree of development of hairs: plants are generally well clothed in spreading hairs, but when the pubescence is more scanty, the hairs may be shorter and retrorse.

20. Geranium amatolicum Hilliard & Burtt, **species nova** *G. schlechteri* Knuth affinis sed pedunculis inflorescentiam terminalem compositam formantibus (nec contra folia superiora solitaria), et floribus majoribus petalis 15–20mm (nec 9–14mm) longis distinguenda.

Herba perennis ramosa ad 75cm alta; caules ad 3mm diam., multi, ascendentes vel erecti, inferne nudi, in ramulis numerosis foliati, pilis glanduliferis longis et brevibus instructi. *Stipulae* alte dissectae, segmentis lineari-acuminatis. *Petioli* c.25–150mm longi, patenter glanduloso-pilosi. *Lamina* plerumque 20–110mm diam., ambitu suborbicularis, digitatim ad duas partes 5(–7)-lobata lobis ambitu ovatis iterum lobatis, supra pilis parcis longis glanduliferis aliis eglandulosis interdum intermixtis, subtus pilis longis patentibus interdum glanduliferis praedita. *Pedunculi* plerumque biflori, pilis longis brevibusque patentibus glanduloso-pilosi, linea unilaterali pilorum crisporum etiam praediti, foliis superioribus oppositi et terminales inflorescentiam cymoso-corymbosam formantes. *Pedicelli* c.10–70mm longi, uti pedunculi pilosi. *Sepala* c.7–11 × 2·5–4mm mucrone longo excluso, glanduloso-pilosa. *Petala* c.15–20 × 9–13mm, obovata, integra vel emarginata, vivide rosea, venis rubris vel petali basi albo albis. *Rostrum* patenter glanduloso-pilosum.

Type: E Cape, Stutterheim distr., 3227 CA/B, Thomas Mountain, c.4–4600ft, 9 xii 1981, *Hilliard & Burtt* 14788 (NU holo.; E, K, PRE, S, STE iso.).

Bushy perennial herb up to c.75cm high, stems up to c.3mm diam., many, ascending or erect, bare below, leafy on the many branchlets, glandular-pilose with long and short glandular hairs. *Stipules* deeply dissected, segments linear-acuminate. *Leaves* with petioles c.25–150mm long, glandular-pilose, hairs patent, blade mostly 20–110mm diam., suborbicular in outline, digitately 5(–7)-lobed at least $\frac{2}{3}$ of the way to the base (ratio 2–3·5:1 measured on the median lobe), lobes ovate in outline, themselves lobed, scattered long gland-tipped hairs above, sometimes mixed with eglandular hairs, hairs below long and spreading, some gland-tipped. *Peduncles* terminal and opposite uppermost leaves eventually forming small cymes, mostly 2-flowered, glandular pilose with long and short patent hairs, unilateral band of fine curly hairs as well. *Pedicels* c.10–70mm long, hairy as the peduncles. *Sepals* c.7–11 × 2·5–4mm, excluding the long mucro, glandular-pilose. *Petals* c.15–20 × 9–13mm, obovate, entire or shallowly notched, bright pink, veins reddish, or white if base of petals white. *Rostrum* glandular-pilose, hairs patent. **Fig. 2E**.

CAPE. 3227 AC, Cathcart, Windvogelberg, c.5400ft, 8 xii 1981, *Hilliard & Burtt* 14750 (E, NU). Stutterheim distr., W end of Kabaku Hills, c.3400ft, 10 x 1942, *Acocks* 9173 (PRE); Evelyn Valley, 13 i 1947, *Compton* 19144 (NBG). Queenstown distr., Elandsberg, 1860, *Cooper* 432 (BM, E, K, NH, PRE) [this is probably the range between the Great Winterberg and the Amatola Mountains]; without precise locality, 5000ft, i 1921, *Schönland* 4286 (PRE). Stockenstrom div., Lushington Mountain, 3500ft, xi 1884, *Scully* 125 (GRA, SAM); ibidem, xi 1884, *Scott Elliot* s.n. (E). 3226 BC, Katberg Pass, c.5000ft, 24 i 1979, *Hilliard & Burtt* 12352 (E, NU); ibidem, 28 x 1980, *Hilliard & Burtt* 13260 (E, NU); Katberg, 4000–5000ft, xi, *Drège* (PRE); ibidem, 4000ft, May 1869, *Shaw* s.n. (K); ibidem 4000–5000ft, x 1893, *Galpin* 1739 (GRA, PRE); below Katberg Pass, 26 x 1946, *Esterhuysen* 13228 (BOL); Katberg, x 1963, *Sidey* 3790 (PRE); ibidem, 12 i 1950, *Martin* 184 (NBG). Stutterheim distr., 3227 CA/B, Thomas Mountain, 4–4600ft, 9 xii 1981, *Hilliard & Burtt* 14796 (E, NU); 3227 CB, Gubu Dam, 11 xii 1981, *Hilliard & Burtt* 14802 (E, NU).

Geranium amatolicum has been known for about 150 years, but it has always been confused with *G. ornithopodon,* which can be distinguished immediately by its leaves being differently cut and never glandular below. It appears to be endemic to the mountains of the eastern Cape, between Katberg, Cathcart and Stutterheim. On Katberg, we found it in straggling masses along a streamlet on the edge of the road through the forest, but beyond the summit of the pass it formed big clumps down a streamline; on Thomas Mountain it grew among rocks beside a stream in a deep narrow valley as well as among rocks on the moist face of a steep slope, partly sheltered by trees and bushes. On the Windvogelberg it is common on the S-facing slope near the summit beacon, among rocks and big tufts of *Merxmuellera*; here the plants were very bushy, not as lax as specimens from wetter sites, nor with such big leaves.

What may be no more than a local form of the species is common at

Hogsback in the Amatola Mountains. It is distinctive by virtue of its very short fine glandular pubescence with only occasional long spreading hairs: it may differ further in habit: where we found it, near Kettlespout Falls, the plants straggled over marshy ground, spreading by means of overground runners (*Hilliard & Burtt* 10946, E, NU), and this habit is displayed by six of the seven other specimens we have seen. The seventh specimen, however, (*Stirton* 6258, PRE) seems to have been a bushier, more robust, plant. Clearly more field observations are necessary at Hogsback.

The possibility of hybridization between *G. amatolicum* and *G. caffrum* and *G. discolor* is mentioned under the last two species.

21. Geranium grandistipulatum Hilliard & Burtt, **species nova** *G. amatolico* Hilliard & Burtt affinis sed stipulis minus divisis segmentis acutis (nec longe acuminatis) differt.

Herba fruticosa (statura ignota); caulium partes superiores usque ad 4mm diam., pilis patentibus glanduliferis villosi et linea unilaterali pilis crispatis instructi, praecipue ad apices ramulorum foliati. *Stipulae* c.9 × 6mm, in segmenta lata acuta divisae. *Petioli* partibus superioribus caulium c.30–100mm longi, sursum celeriter breviores, pilis glanduliferis patentibus villosi. *Lamina* plerumque 30–60mm diam., ambitu suborbicularis, ad duas partes 5–7-lobata, lobis ambitu ovatis iterum acute lobatis et dentatis, supra tenuiter subtus densius pilis glanduliferis et eglandulosis praedita. *Pedunculi* ad folia summa oppositi, biflori, 20–70mm longi, pilis glandulosis patentibus et aliis brevibus crispatis induti. *Pedicelli* 10–45mm longi, uti pedunculi pilosi. *Sepala* c.9–11 × 3·75–4·5mm, mucrone longo excluso, glanduloso-pilosa. *Petala* c.15–19 × 12–14mm, obovata, integra vel emarginata, rosea. *Rostrum* patenter glanduloso-pilosum.

Type: E Cape, Stutterheim distr., W end of Kabaku Hills, 19 ix 1942, *Acocks* 9089 (PRE holo.)

Coarse bushy herb of unknown stature, upper parts of stems up to 4mm diam., villous with spreading gland-tipped hairs underlain by a unilateral band of fine curly hairs, leafy particularly towards the ends of the branches. *Stipules* c.1·9 × 6mm, divided into a few broad very acute segments. *Leaves* with petioles c.30–100mm long (only upper part of stems present), rapidly shorter upwards, villous with spreading gland-tipped hairs, blades mostly 30–60mm in diam., suborbicular in outline, 5–7-lobed roughly two thirds of the distance to the base, lobes ovate in outline, sharply lobed and toothed, upper surface thinly pilose with glandular and eglandular hairs, lower surface more densely so. *Peduncles* opposite the uppermost leaves, 2-flowered, 20–70mm long, villous with spreading glandular hairs underlain by fine curly hairs. *Pedicels* 10–45mm long, hairy as the peduncles. *Sepals* c.9–11 × 3·75–4·5mm, excluding the long mucro, glandular-pilose. *Petals* c.15–19 × 12–14mm, obovate, entire or shallowly notched, rose pink. *Rostrum* glandular-pilose, hairs patent. **Fig. 2I**.

CAPE. Stutterheim distr., W end of Kabaku Hills, 10 x 1942, *Acocks* 9089 A (PRE). Stockenstrom div., Old Katberg, xii 1884, *Scully* 160 (SAM).

Geranium grandistipulatum is unusual among South African species in that the stipules are not much divided. This character at once sets it apart from its close ally, *G. amatolicum,* from which it probably differs further in more robust and more erect habit. Acocks collected both species at the western end of the Kabuka Hills (3227 CB, not far from Dohne), in forest

clearings, where he recorded *G. amatolicum* as growing along streams in matted masses, and common, while *G. grandistipulatum* was 'occasional', but there is no further information. At this locality, *G. grandistipulatum* is clearly a much more robust plant than *G. amatolicum*, with larger and more densely hairy leaves. W. C. Scully found it 'among stones' at Old Katberg, west of the Kabaku Hills. It is doubtless elsewhere in the mountains between the Great Winterberg and Stutterheim, which are ill explored botanically but are clearly rich in species of *Geranium*.

22. Geranium contortum Ecklon & Zeyher, Enum. Pl. Afric. Austral. 59 (1835).
Type: E Cape, Winterberg, Dec., *Ecklon & Zeyher* 450 (S holo., SAM iso.).

Perennial herb, with a long thin (c.2mm diam.) subterranean creeping stock, stems few from the crown, up to c.45cm long, decumbent or ascending, simple or sparingly branched, nude below, leafy above, glandular puberulous or glandular pubescent, with long and short eglandular spreading hairs as well, sometimes short fine curled or retrorse hairs, which may be arranged unilaterally. *Stipules* deeply dissected, segments linear-lanceolate. *Leaves* crowded on the crown, becoming distant upwards, petioles c.20–130mm long, decreasing rapidly in length upwards, with short and long spreading eglandular hairs, often gland-tipped hairs as well; blade mostly 20–50mm in diam., orbicular in outline, deeply 5–7-lobed to within c.3–7mm of the base, these lobes rhomboid or ovate in outline, deeply and sharply cut, scattered coarse hairs on both surfaces, often short fine gland-tipped hairs as well on lower surface. *Peduncles* opposite the upper leaves, often few, forming a small cyme in well-grown specimens, mostly 30–65mm long, usually 2-flowered, glandular-puberulous or glandular-pubescent with long and short spreading eglandular hairs as well, and occasionally short curled retrorse hairs. *Pedicels* mostly 10–40mm long, hairy as the peduncles. *Sepals* 7–10 × 2·75–4mm, clad in short and long spreading eglandular hairs, often with gland-tipped hairs as well. *Petals* 14–20 × 10–16mm, obovate, entire or shallowly notched, blue-pink. *Rostrum* with spreading glandular and eglandular hairs, or wholly eglandular. **Fig. 2B**.

CAPE. Stutterheim distr., Fort Cunynghame, 3000ft, i 1924, *Schonland* 84a (PRE); 3227 A/B, Thomas Mountain, 4–4600ft, 9 xii 1981, *Hilliard & Burtt* 14797 (E, NU); ibidem, 3000ft, i 1894, *Sim* 1807 (NU, SAM). Cathcart distr., farm Fairford, xi 1916, *Cotterrell* 87 (GRA); 3227 AC, Windvogelberg, c.5400ft, 8 xii 1981, *Hilliard & Burtt* 14782 (E, NU); Happy Valley, 2 i 1942, *Barker* 1397 (NBG). Victoria East distr., Katberg Range, 5000–5800ft, 25 xii 1911, *Galpin* 8341 (PRE); ibidem, Feb., *Baur* s.n. (K); Hogsback, 14 xii 1940, *Barker* 934 (BOL, NBG); ibidem, c.800m, 25 xi 1969, *Dahlstrand* 1804 (PRE). King William's Town distr., foot of Pirie, 2000ft, xi 1893, *Flanagan* 2162 (PRE, SAM). Bedford distr., Great Winterberg, 1800m, i 1906, *Ford* in herb. Marloth 11402 (PRE, mixed with *G. baurianum*). Not precisely localized, Mount Hope, 7000ft, iii 1900, *Galpin* 2638 (GRA); without locality, 5800ft, xii 1917, *Rattray* 47 (PRE).

Geranium contortum is probably endemic to the mountains of the

eastern Cape, from the Great Winterberg to Katberg and Pirie Mountain near King William's Town, at altitudes ranging from c.600 to 2100m. It grows scattered in moist grassland, and Dr Rattray recorded it as 'very abundant, and forms large colour patches'. The plants are not large, but the flowers are, and richly coloured, appearing between November and January.

The name has never been taken into use because Harvey (1860, p. 258) reduced it to synonymy under *G. ornithopodon* and Knuth (1912, p. 165) followed him. But the species is easily distinguished from *G. ornithopodon* by its different habit and differently cut leaves; Harvey saw only the Ecklon & Zeyher collection, which is badly wilted (and must thus have prompted the choice of epithet), so his usually discerning eye failed him.

The relationship of *G. contortum* lies with *G. baurianum*: they are alike in habit, but differ in leaf cutting. Also, where we saw them growing together on Thomas Mountain, the flowers of *G. contortum* were noticeably larger and bluer; the difference in flower size is consistent at least over the range of material that we have seen. (See also under *G. baurianum*).

23. Geranium baurianum Knuth, Pflanzenr. Geran. 156 (1912).
Type: Transkei, Baziya, 1000ft, May, *Baur* 182 (n.v.)
Syn.: [*G. flexuosum* E. Mey., nomen; Harvey in Harvey & Sonder, Fl. Cap. 1:258 (1860) pro. syn. sub *G. ornithopodon*.]

Perennial herb, tap-root eventually woody and carrot-like, surrounded by woody fusiform root-tubers, stems one or few from the crown, up to c.600mm long, decumbent or prostrate, distantly leafy, clad in long and short spreading hairs. *Stipules* deeply dissected, segments linear-lanceolate. *Radical leaves* crowded on the crown, though sometimes few, petioles mostly 30–170mm long, clad in long and short spreading hairs; blade mostly 20–55mm diam., orbicular in outline, shallowly 5–7-lobed (less than halfway to the base), these lobes hemispherical in outline with a few coarse teeth, glabrous to thinly pilose above with coarse spreading hairs, coarse spreading hairs on veins below, these rarely wanting, thinly to thickly pubescent with short fine hairs between the veins; cauline leaves similar, but petioles rapidly decreasing in length upwards, uppermost leaves reduced and subsessile. *Peduncles* opposite the upper leaves and terminal, forming a small cyme, 10–55mm long, usually 2-flowered, clad in long and short spreading hairs. *Pedicels* mostly 12–30mm long, hairy as the peduncles. *Sepals* 6–9 × 2·5–3·75mm, clad in long spreading hairs. *Petals* 13–18 × 6·5–10mm, obovate in outline, entire or shallowly notched, mostly deep bright pink, but ranging from pale pink to light purple. *Rostrum* with short fine spreading pubescence, some coarse hairs as well, very rarely some gland-tipped. **Fig. 2G**.

NATAL. 3029 DA, Alfred distr., Zuurberg, 4600–4700ft, 29 xi 1973, *Hilliard & Burtt* 7517 (E, NU); ibidem, 5000ft, 20 xi 1977, *Hilliard & Burtt* 10543 (E, NU).

TRANSKEI. Faku's territory, 4500–7200ft, *Sutherland* s.n. (K). Tabankulu distr., Tabankulu Mountain, 16 xi 1973, *Hilliard & Burtt* 7268 (E, NU). 3128 CB, Umtata distr., NW of Umtata, hill above Mhlanfane Forest

Station, c.5000ft, 31 i 1983, *Hilliard & Burtt* 16347 (E, NU); Baziya Mountain, c.4700ft, 10 ii 1981, *Hilliard & Burtt* 13907 (E, NU). 3127 DB, Satanna's Nek, 4700–4800ft, 28 xi 1981, *Hilliard & Burtt* 14537 (E, NU).
CAPE. 3127 BB, Elliot–Maclear distr. boundary, Bastervoetpad, c.7200ft, 15 ii 1983, *Hilliard & Burtt* 16697 (E, K, NU, PRE, S). Stutterheim distr., 3227 CB, Kabusie Forest, 20 x 1980, *Hilliard & Burtt* 13192 (E, NU); Evelyn Valley, 13 i 1947, *Leighton* 2664 (K, BOL); Dohne Hill, 2000ft, iii 1893, *Sim* 1808 (NU); 3227 CA/B, Thomas Mountain, 4–4600ft, 9 xii 1981, *Hilliard & Burtt* 14791 (E, NU). King William's Town distr., Keiskama Hoek near Ghulu Kop, 4000ft, xii 1925, *Dyer* 310 (GRA, PRE); 3227 CA, Keiskamahoek, Gxulu Location, 4500ft, 13 xii 1976, *Gibbs Russell* 3426 (PRE). Victoria East distr., Hogsback, 4000ft, *Bokelmann* 1 (NBG); ibidem, i 1953, *Peacock* s.n. (SAM 66684); ibidem, 30 iv 1955, *Lewis* 4362 (SAM); ibidem, 4800ft, 13 ix 1955, *Johnson* 1183 (PRE); 3226 DA, Katberg Pass, 5800ft, 26 i 1979, *Hilliard & Burtt* 12389 (E, NU); ibidem, 28 x 1980, *Hilliard & Burtt* 13272 (E, NU); Bedford distr., Great Winterberg, 1800m, i 1906, *Marloth* 11416 (PRE, mixed with *G. contortum*). Queenstown distr., Los Tafelberg, 6000–7000ft, xii 1830, *Drège* (K, PRE). Somerset East distr., Boschberg, 4000ft, xi, *MacOwan* 1641 (K, GRA).

Geranium baurianum ranges from southernmost Natal through the Transkei to Boschberg at Somerset East in the eastern Cape, between c.900 and 2100m above sea level. It is a plant of moist grassy mountain slopes and tops, often locally common but scattered. It was first collected by Drège (distributed as 7513b) on Los Tafelberg, between Queenstown and Tarkastad, over a hundred and fifty years ago, but Meyer's manuscript name was not taken up by Harvey and the species passed unrecognized, dumped under the much misused name *ornithopodon*, until the Rev. Baur's specimen from Baziya Mountain came into the hands of Knuth, who, in 1912, named it in honour of Baur. But Knuth's name too has been neglected. In his revision of *Geranium* he placed his new species next to *G. brycei,* which he mistakenly called *G. pulchrum*. However, the relationship of *G. baurianum* lies with *G. contortum*; they may grow together and they are much alike in habit, but the leaves of *G. baurianum* are less deeply cut than those of *G. conortum*, the whole plant is usually eglandular (a few glandular hairs may occur on the rostrum), the petals are narrower, and they are possibly never as blue as those of *G. contortum*, and *G. contortum* does not develop the root tubers that are characteristic of *G. baurianum*.

We have not traced an isotype of *G. baurianum,* the holotype of which was destroyed in the Berlin fire. But we have re-collected the plant on Baziya Mountain, and its identity is confirmed by Knuth's description.

24. Geranium ornithopodon Ecklon & Zeyher, Enum. Pl. Afric. Austral. 1:59 (1835); Harvey in Harvey & Sonder, Fl. Cap. 1:258 (1860) excl. syn.; Knuth, Pflanzenr. Geran. 165 (1912) p.p. excl. syn.
Type: Cape, Kaffraria, Nieuwe Post, June, *Ecklon & Zeyher* 443 (S, SAM, isotypes).
Syn.: *G. knysnaense* Knuth in Repert. Spec. Nov. Regni Veg. 18:292

(1922). Lectotype (chosen here): Cape, [near George] Blanco, 400ft, 1 xi 1894, *Schlechter* 5769 (BOL; GRA, PRE, isolecto.).

Many-stemmed, clump-forming perennial herb, rootstock eventually thick and woody but not tuberous, stems of indeterminate length, straggling, decumbent or suberect, pilose with spreading or somewhat retrorse rather coarse eglandular hairs up to 1·25mm long. *Stipules* deeply dissected, the segments linear-acuminate. *Leaves* with petioles mostly 25–100 (–150)mm long, pilose with spreading eglandular hairs; blade up to 80mm in diam., digitately 5-lobed more than halfway to the base (ratio 2·5–4:1), lobes oblong-elliptic in outline, with usually 2 coarse teeth each side in upper half, thinly pilose above with coarse spreading hairs, more densely so below with long spreading hairs over the veins. *Peduncles* opposite the upper leaves and terminal, forming spreading cymes, usually 2-flowered, 10–80mm long, pilose with long spreading hairs, all or some gland-tipped, underlain by a unilateral band of fine curly hairs. *Pedicels* c.10–45mm long, hairy as the peduncles. *Sepals* 4–5·5 × 2–3mm, glandular-pilose, these hairs underlain by shorter, fine, eglandular ones. *Petals* 7–8 (–10) × 4–6mm, obovate, entire, pale pink with darker veins, or white. *Rostrum* pilose with fine eglandular hairs, long spreading gland-tipped ones as well. **Fig. 3C**.

Selected citations:

CAPE. King William's Town distr., Pirie, 2000ft, ii 1893, *Sim* 1806 (NU, mixed with *G. schlechteri*). Stutterheim distr., 3227 CB, Kabusie Forest, 20 x 1980, *Hilliard & Burtt* 13191 (E, NU). Queenstown distr., 1860, *Cooper* 434 (BOL, E, K, NH, PRE). Victoria East distr., 3226 DB, Hogsback Forest Reserve above Kettlespout Falls, 9 xii 1977, *Hilliard & Burtt* 10947 (E, MO, NU). Stockenstrom dist., Katberg, 8 xii 1902, *Sole* 403 (GRA, PRE). East London distr., East London, ii 1908, *Rattray* 203 (GRA). Bathurst distr., Dixon's Bush, c.2500ft, x 1891, *Bennie* 162 (GRA). Albany distr., Grahamstown, ix, *MacOwan* 105 (GRA). Port Elizabeth distr., Zuurberg Pass 22km from Ann's Villa, 1 xi 1977, *van der Walt* 888 (STE-U). George distr., near George, 25 ix 1814, *Burchell* 6037 (K, PRE). Knysna distr., Touws River, 13 xi 1953, *Taylor* 4100 (NBG). Caledon distr., 3418 BD, Betty's Bay, 1 x 1980, *Hilliard & Burtt* 13092 (E, NU); near Hermanus, Mossel River, 2 x 1950, *Martin* 550 (NBG). Cape Town distr., Hout Bay, 23 x 1937, *Salter* 7026 (BOL, SAM).

The epithet of this species has been almost universally written as *'ornithopodum'*, but Ecklon & Zeyher gave it in the Greek form *'ornithopodon'*, and there is no justification for any change. The word means bird's foot, and was obviously suggested by the leaves, that are cut into 5 spreading lobes: this is, of course, a common feature in the genus. In *G. ornithopodon* the lobes are characteristically oblong and the median one usually bears only 2 coarse teeth on each side. Typical *G. ornithopodon* is also characterized by having spreading hairs on all parts and relatively small flowers. The types of both *G. ornithopodon* and *G. knysnaense* (here reduced to synonymy) displayed these features. The sheet of *Ecklon & Zeyher* 443 at Stockholm (Ecklon's own herbarium) is sterile, and the original description refers only to leaf characters; but the isotype at Kirstenbosch (SAM) bears several peduncles on which the sepals can

be measured (4·5 × 2·25mm), confirming that true *G. ornithopodon* is a small-flowered plant.

This redefinition of the species reduces its range considerably: this runs from the Cape Peninsula to the eastern Cape, where it reaches the mountains around Stutterheim as well as the coast at East London, growing in damp ground, often in scrub or in forest margins. The large-flowered plants hitherto included here are now placed under the next species, *G. flanaganii,* where the problem of species-separation is further discussed.

25. Geranium flanaganii [Schltr. ex] Knuth in Bot. Jahrb. 40:69 (1907), & Pflanzenr. Geran. 165 (1912).

Lectotype (chosen here): E Cape, Komgha, i 1895, *Schlechter* 6182 (GRA).

Syn.: [*G. ornithopodon* auct.; Batten & Bokelmann, Wild Fl. E Cape Prov. 88, pl. 74, 7 (1966); Ross, Fl. Natal 210 (1972)].

Many-stemmed clump-forming perennial herb, rootstock eventually thick and woody but not tuberous, stems of indeterminate length, straggling, decumbent or suberect, thinly to thickly pilose, hairs reflexed and appressed to spreading, up to 1·25mm long, eglandular. *Stipules* deeply dissected, the segments linear-acuminate. *Leaves* with petioles mostly 35–150mm long, pilose as the stem; blade up to 90mm in diam., digitately 5-lobed more than halfway to the base (ratio 2–4:1), lobes oblong-elliptic in outline, mostly with two coarse teeth each side, the lower tooth itself often toothed (and see discussion below), short appressed hairs above, variable below, ranging from subtomentose with short fine appressed hairs to short fine appressed hairs confined to veins and margins to short or long spreading hairs all over or nearly confined to veins and margins. *Peduncles* opposite to upper leaves and terminal, forming spreading cymes, usually 2-flowered, c.20–80mm long, indumentum very variable even in a single collection, ranging from reflexed appressed eglandular hairs, or mixed with spreading gland-tipped hairs, to spreading gland-tipped hairs underlain by fine curled hairs, or sometimes glabrous. *Pedicels* c.10–50mm long, hairy as the peduncles. *Sepals* (5–)6–8 × 2·5–3·5(–4)mm, indumentum variable, hairs sometimes all appressed and eglandular, or some spreading gland-tipped hairs as well, or all the hairs spreading. *Petals* (9–)11–16 × (5·5–)7–11mm, obovate, entire, light to dark pink with darker veins. *Rostrum* with short appressed eglandular hairs or hairs ± spreading, spreading gland-tipped hairs often present as well. **Fig. 3A.**

Selected citations:

TRANSKEL. Umzimkulu distr., Clydesdale, 3000ft, xii 1884, *Tyson* 2554 (BOL, SAM). Bizana distr., 5 miles from Bizana on Kokstad road, 2500ft, 22 xi 1945, *Story* 619 (PRE). Tabankulu distr., Tabankulu Mountain, 16 xi 1973, *Hilliard & Burtt* 7264 (E, K, MO, NU, PRE, S). Port St Johns distr., between Second and Third Beach, c.70ft, 15 x 1951, *Bruce* 454 (PRE). Lusikisiki distr., Wild coast near Lusikisiki, vi 1951, *Kelly* 6 (NBG). Libode distr., Misty Mount, 22 xii 1982, *Hutchings* 69 (NU). Umtata distr., 3128 CB, Baziya Mountain, c.3400ft, 12 ii 1981, *Hilliard &*

Burtt 13953 (E, NU). Idutywa distr., 11 miles S of Idutywa, 2000ft, 10 iii 1955, *Codd* 9259 (PRE). Elliotdale distr., The Haven [mouth of the Bashee river], 11 ix 1966, *J. Gordon-Gray* 670 (NU).
CAPE. Komgha distr., near Kei Mouth, 25 xi 1945, *Compton* 17643 (NBG); 3227 DA/B, road W of Komgha, 15 xii 1977, *Hilliard & Burtt* 11100 (E, NU); near Komgha, 2000ft, xi 1891, *Flanagan* 23 (PRE). East London distr., 3228 CC, Gonubie Mouth, 18 x 1980, *Hilliard & Burtt* 13169 (E, NU); 3227 DD, road to Qenera river mouth, 14 xii 1981, *Hilliard & Burtt* 14829 (E, NU). King William's Town distr., Pirie, 4000ft, ii 1893, *Sim* 1805 (NU). Stutterheim distr., Fort Cunynghame, 7 xi 1953, *Taylor* 4247 (NBG); 3227 CB, Kabusie Forest, 20 x 1980, *Hilliard & Burtt* 13195 (E, NU); Gubu Dam below Kabusie Forest, 14 xii 1977, *Hilliard & Burtt* 11050 (E, NU); E end of Kabaku Hills, c.3100ft, 15 xi 1942, *Acocks* 9323 (PRE).

Specimens showing some deviation from *G. flanaganii s.str.* (either indumentum not strongly appressed or, if appressed, sparser, or leaf lobes ± oblong, not elliptic-oblong):
SWAZILAND. 2 miles E of Goedgegun, 3500ft, 24 xii 1967, *Ross* 1747 (NU, PRE).
NATAL. Hlabisa distr., Dukuduku Forest, 21 xi 1978, *Pooley* 2196 (E, NU); Hluhluwe Game Reserve, c.1000ft, 31 x 1961, *Hitchins* 115 (NU, PRE). Mtunzini distr., Umlalazi Nature Reserve, c.10ft, 30 viii 1962, *Ward* 4288 (NU, PRE); Mtunzini, 50–100ft, 25 viii 1913, *Wood* 12382 (NU, PRE). Lion's River distr., Mount Ashley, 3500ft, 23 x 1964, *Moll* 1307 (NU, PRE); 2930 AB, Karkloof range, farm 'Benvie', 18 xi 1980, *Hilliard & Burtt* 13485 (E, NU). Durban distr., Amanzimtoti, 50ft, 29 ix 1898, *Wood* 7350 (PRE, SAM); Isipingo, 10–15ft, 9 ix 1966, *Ward* 5858 (K, NU, PRE). Pinetown distr., Everton, Molweni Kloof, 12 x 1973, *Hilliard & Burtt* 6835 (E, K, MO, NU). Camperdown distr., Inchanga, 12 x 1973, *Hilliard & Burtt* 6833 (E, K, MO, NU, PRE, S). Richmond distr., Byrne Valley, c.5000ft, 13 xi 1975, *Hilliard* 5587 (E, NU). Ixopo distr., near Lufafa Road, 28 xi 1977, *Shirley* s.n. (NU). Polela distr., farm 'Sunset', 5200ft, i 1978, *Rennie* 906 (NU); 2929 D east of Hlabeni on Creighton–Donnybrook road, 16 i 1978, *Hilliard & Burtt* 11218 (E, NU). Alfred distr., 3029 DB, Harding, farm 'Bedford', 2500–3000ft, 1 iii 1983, *Hilliard & Burtt* 16724 (E, NU); 3029 DA, Zuurberg, c.5000ft, 20 xi 1971, *Hilliard & Burtt* 10544 (E, NU). Port Shepstone distr., between Port Shepstone and Margate, 5 xi 1938, *Hafström & Acocks* 733 (BOL, PRE, S); 3030 CC, Umtamvuna Nature Reserve, *Balkwill & Manning* 439 (NU).

The relationship between *G. flanaganii* and *G. ornithopodon* is a very intimate one, and their retention as independent species is debatable. However, the situation would not be met by a facile reduction of *G. flanaganii* to synonymy, nor does its establishment as a subspecies of *G. ornithopodon* (which was the solution we at one time favoured) adequately clarify the problem. The point to be brought out is that *G. ornithopodon* is a small-flowered species with a southern distribution. *G. flanaganii* is a coarser, larger-flowered plant with a more northerly range, though there is a big area of overlap in the eastern Cape. It is from this area that both *G. ornithopodon* and *G. flanaganii* were originally described.

Knuth (1912, p. 161) relied on differences in indumentum to separate these two species, and as far as the type specimens go this is clear enough: *G. ornithopodon* has spreading, relatively coarse, hairs; *G. flanaganii* has a denser softer indumentum of appressed, and on the petiole retrorse, subsericeous hairs. *G. flanaganii* is, however, also distinguished by its larger flowers, and we are inclined to pay greater attention to this character because indumentum has proved to be variable in other species. Some of the material from the eastern Cape with the indumentum of *G. flanaganii,* and its larger flowers, also has leaves with the lobes elliptic rather than oblong in outline and the median lobe with 3–4 teeth on each side. Further north, especially in Natal, indumentum becomes very variable and the close subsericeous type almost disappears; but though the hairs may recall *G. ornithopodon,* these plants all have the larger flower size of *G. flanaganii* and, sometimes, more than two teeth on each side of the median leaf-lobe. We have therefore extended the variation range of *G. flanaganii* to include this material. The arrangement we offer is not a solution to the problems involved: it is rather the simplest outline from which we think a critical study should be launched.

The possibility that some of the variation is due to hybridization must certainly not be ignored, and it could be that the type of *G. flanaganii* is itself a specimen 'contaminated' by *G. ornithopodon* (witness the rather small *ornithopodon*-like leaves). But even near Komgha, the type locality, we have collected plants agreeing with Natal specimens in leaf size and form, but with the appressed sericeous indumentum of typical *G. flanaganii.*

Where hybridization seems very likely to play a part is in the variability found in the south-western part of the overlap range. Between Humansdorp and Knysna, within the area of *G. ornithopodon,* specimens have been collected with the typical leaf form of *G. ornithopodon* but the indumentum is strongly appressed and the flowers larger, as in *G. flanaganii* (e.g. *Acocks* 21471, K, PRE; *Fourcade* 344, BOL, GRA; *van der Walt* 862, STE-U; *Keet* 827, GRA, PRE). One specimen (3424 AA, Eerste River, *Fourcade* 3006, K, PRE) has the spreading pubescence of *G. ornithopodon* but the large flowers of *G. flanaganii.* As hybridization appears to be not uncommon in *Geranium* (and there is evidence of hydridization between *G. flanaganii* and *G. caffrum*; see under that species) it is tempting to suggest that over this whole area some crossing has taken place.

Geranium flanaganii in the broad sense ranges from southernmost Swaziland through Natal and Transkei to East London and Stutterheim in the eastern Cape, at altitudes ranging from sea level to about 1600m. Like *G. ornithopodon,* it may be found scrambling through other vegetation on damp forest margins (we have ourselves collected both plants at Kabusie Forest near Stutterheim) or it may grow in tangled masses in damp or even marshy places in more open situations.

26. Geranium ornithopodioides Hilliard & Burtt, **species nova** *G. flanaganii* Knuth affinis, sed foliis peltatis et pilis caulium ad 3·25mm longis (nec 1·25mm tantum) facile distinguitur.

Herba perennis, multicaulis; caules caespitosi vel effusi, pilis longis (ad 3·25mm) tenuibus patentibus interdum glandulosis induti. *Stipulae* alte dissectae, segmentis lineari-acuminatis. *Folia* petiolis plerumque 50–270mm longis ut caulibus pilosis; lamina ad 11cm diam., peltata, alte quinqueloba; lobi oblongo-elliptici, plerumque dentibus 2–3 grossis utrinque praediti, supra tenuiter pilis validis appressis infra densius pilis longis patentibus induti. *Pedunculi* foliis superioribus oppositi vel terminales, inflorescentiam patentem formantes, plerumque biflori, 27–100mm longi, pilis patentibus glandulosis et eglandulosis aliis brevibus crispatis additis dense induti. *Pedicelli* c.7–18mm longi, uti pedunculi pilosi. *Sepala* c.6–7 × 3·5mm, glanduloso-pilosa pilis aliis brevissimis appressis additis. *Petala* c.10–13 × 7·5–8mm, obovata, integra, rosea. *Rostrum* pilis patentibus glandulosis ornatum.

Type: Natal, Pinetown distr., 2930 DD, Molweni kloof, c.600m, 12 x 1973, *Hilliard & Burtt* 6834 (NU holo., E iso.).

Many-stemmed perennial herb, stems of indeterminate length, either clumped or straggling up through other vegetation, pilose with long (up to 3·25mm) delicate spreading hairs, a few of them gland-tipped. *Stipules* deeply dissected, the segments linear-acuminate. *Leaves* with petioles mostly 50–270mm long, pilose as the stem; blade up to 110mm in diam., peltate, deeply divided into 5 lobes (ratio 3–4·3:1 measured on the centre lobe), lobes oblong-elliptic in outline with usually 3 coarse sharp teeth on either side, thinly pilose above with coarse appressed hairs, more densely so below with long spreading hairs. *Peduncles* opposite the upper leaves and terminal, forming spreading cymes, usually 2-flowered, c.27–100mm long, densely pilose with spreading glandular and eglandular hairs underlain by fine short curly ones. *Pedicels* c.7–18mm long, hairy as the peduncles. *Sepals* c.6–7 × 3·5mm, glandular-pilose underlain by very short fine appressed hairs. *Petals* c.10–13 × 7·5–8mm, obovate, pink. *Rostrum* with spreading gland-tipped hairs. **Fig. 3B.**

NATAL. Pinetown distr., Krantzkloof, x 1921, *Haygarth* sub TM 22749 (K, PRE, STE); Forest Hills, Elizabeth Drive, 27 x 1958, *Johnson* 1394 (PRE). Umzinto distr., 3030 AD, farm Ellesmere B, c.2400ft, 27 iv 1981 [sterile], *Hilliard & Burtt* 14524 (NU).

Geranium ornithopodioides is known from the gorge of the Molweni river not far from Durban, and from similar terrain further south in Natal, where it scrambles up through other vegetation on forest margins or forms tangles along streams. The most striking feature of the plant is its peltate leaves, which are unknown elsewhere in the genus in southern Africa. The leaves alone serve to distinguish it from its ally, *G. flanaganii*, but where we saw them growing together near the Molweni river, we were at once struck by the differences in indumentum between the two species, the delicate spreading hairs on the stems and petioles of *G. ornithopodioides* often reaching 3 mm in length, more than twice the length of those in *G. flanaganii*.

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27. Geranium arabicum Forssk., Fl. Aegypt. Arab. 124 (1775); Laundon in Bol. Soc. Brot. Sér. 2, 35:59, t. 1 (1961) and in Fl. Zamb. 2:133, tab. 20 fig. F (1963), which see for full synonymy.

Lectotype: Arabia, Yemen, Kurma, *Forskål* (sheet 735 in C, n.v.; Laundon 1961, pl. 1).

Syn.: *G. simense* [Hochst. ex] A. Rich., Tent. Fl. Abyss. 1:116 (1847); Oliver, Fl. Trop. Afr. 1:291 (1868); Knuth, Pflanzenr. Geran. 203, t. 26 fig. A–B (1912). Type: Ethiopia, Simien, Mt Selki, *Schimper* II 670 (K iso.).

Diffuse perennial herb, stems stoloniferous, rooting at some of the nodes, thinly pilose with spreading eglandular hairs. *Stipules* ovate, acute to acuminate. *Leaves* with petioles c.10–150mm long, pilose with spreading eglandular hairs, towards the tips underlain by shorter retrorse hairs; blade up to c.50mm in diam., divided at least $\frac{3}{4}$ of the way to the base into 5 lobes, lobes elliptic in outline, further lobed and toothed, thinly pilose on both surfaces. *Peduncles* in the axils of the leaves, c.30–70mm long, usually 2-flowered, sometimes compounded, thinly pilose with long spreading eglandular hairs underlain by shorter retrorse ones. *Pedicels* c.10–30mm long, pilose with retrorse hairs. *Sepals* c.6 × 2·5mm, pilose with spreading hairs. *Petals* 5 × 2·5mm in the local specimen, c.10 × 5–7mm fide Laundon (op. cit.), obovate, entire or very shallowly notched, white or pink. *Rostrum* pubescent. **Fig. 3D.**

TRANSKEI. Port St Johns, i 1929, *Wager* s.n. (PRE).

Geranium arabicum is widespread from Yemen to Eritrea, Sudan, Ethiopia, the mountains of tropical Africa, south to Zimbabwe, and west to West Africa; it is also in Madagascar. This solitary record from southern Africa, on the Transkeian coast at Port St Johns, is remarkable and needs confirmation. Over its main distribution area, the plant is recorded as growing in damp shady habitats, especially in woodland, and at Port St Johns it was found 'in grass at edge of bush'.

SPECIES INTRODUCED FROM EUROPE

28. Geranium rotundifolium L., Sp. Pl. 683 (1753); Adamson & Salter, Fl. Cape Penins. 510 (1950); Ross-Craig, Drawings of British Plants 6:pl. 36 (1952); Heywood et al. (eds.), Fl. Europ. 2:198 (1968).

Annual herb, stems up to c.50cm, erect or ascending, pilose with spreading glandular and eglandular hairs. *Stipules* ovate, acuminate. *Radical leaves* tufted, petioles up to c.250mm long, pilose as the stem; blade up to c.65mm in diam., divided less than halfway to the centre into 5–7 lobes, lobes cuneate in outline, deeply crenate, both surfaces thinly pilose; cauline leaves similar, but petioles progressively shorter and blade reduced. *Peduncles* opposite the upper leaves and shorter than they, eventually forming compound cymes, usually 2-flowered, pilose with spreading hairs mostly gland-tipped. *Pedicels* similar to peduncles. *Sepals* c.4·5 × 1·5mm, pilose. *Petals* c.7·5 × 2·5mm, oblong, tips rounded or slightly notched, pink. *Rostrum* pilose with spreading glandular and eglandular hairs. *Carpels* smooth, pilose. **Fig. 3H.**

CAPE. Peninsula, Table Mountain, xi, *Zeyher* 451 (SAM, mixed with *G. dissectum*); below Newlands Reservoir, 27 ix 1937, *Salter* 6981 (BOL, SAM).

A native of Europe naturalized on the Cape Peninsula since early in the last century, but possibly not common. Its entire petals and smooth hairy carpels will distinguish it from *G. molle,* which has rather similar foliage.

29. Geranium molle L., Sp. Pl. 682 (1753); Adamson & Salter, Fl. Cape Penins. 509 (1950); Ross-Craig, Drawings of British Plants 6: pl. 34 (1952); Heywood et al., (eds.), Fl. Europ. 2:198 (1968).

Annual herb, stems up to c.45cm long, decumbent or ascending, pilose with glandular and eglandular hairs. *Stipules* ovate, acute. *Radical leaves* tufted, petioles up to 250mm long, pilose as the stem; blade up to 60mm in diam., divided halfway or more to the centre into 5–9 lobes, lobes oblong-obovate, deeply 3-fid, both surfaces thinly pilose; cauline leaves similar but petioles progressively shorter and blade reduced. *Peduncles* opposite the upper reduced leaves eventually forming large compound cymes, usually 2-flowered, pilose with spreading hairs often gland-tipped. *Pedicels* similar to peduncles. *Sepals* c.2·5–4 × 1·5–2·5mm, pilose. *Petals* c.3–7 × 2–3mm, deeply notched, purplish-pink. *Rostrum* glandular-pubescent. *Carpels* transversely ridged, glabrous. **Fig. 3E.**

CAPE. Port Elizabeth distr., Baakens Valley, Fern Glen, 7 vi 1976 [sterile] *van der Walt* 568 (STE-U). Knysna distr., Plettenberg Bay, ii xi 1978, *Botha* 2253 (PRE). Oudtshoorn distr., 3–8 miles SW of De Rust, Nels River Valley, c.1450ft, 22 x 1959, *Acocks* 20786 (PRE); Cango Valley, Boomplaas, 26 vi 1974, *Moffett* 187 (STE-U). Mossel Bay distr., near Brandwag P.O., c.200ft, 17 ix 1960, *Acocks* 21549 (PRE). Caledon distr., Vogelgat, 100ft, 15 ix 1978, *Williams* 2587 (NBG, PRE). Stellenbosch distr., W end of Bottelary Hills, NE of Kanonkop, 300m, 29 viii 1979, *Boucher* 4497 (PRE); Jonkershoek, 6 x 1952, *Parker* 4802 (BOL, NBG); Somerset West, 15 viii 1953, *Parker* 4891 (BOL, NBG, SAM). Cape Peninsula, Claremont, 23 viii 1937, *Salter* 6855 (BOL); Kirstenbosch, NW of Window Stream, xi 1935, *Esterhuysen* 500 (BOL); Tygerberg Nature Reserve, 200–400m, 22 ix 1975, *Loubser* 3402 (NBG); Mowbray, 27 xii 1952, *Garside* s.n. (BOL).

A native of Europe, now well established in the SW and S Cape, from Port Elizabeth to the Peninsula, in damp and partially shaded places. Easily recognized by its glabrous, transversely ridged carpels and deeply notched petals.

30. Geranium dissectum L., Cent. Pl. 1:21 (1755); Adamson & Salter, Fl. Cape Penins. 509 (1950); Ross-Craig, Drawings of British Plants 6:pl. 37 (1952); Heywood et al., (eds.), Fl. Europ. 2:198 (1968).

Annual herb, stems up to c.60cm long, erect or ascending, thinly pilose with retrorse eglandular hairs. *Stipules* ovate, acuminate. *Radical leaves* tufted, petioles up to c.150mm long, pilose as the stems; blade up to c.50mm in diam., deeply 5–7-lobed, each lobe cuneate in outline, deeply dissected, glabrous or sparsely hairy above, more densely so below particularly on the veins; cauline leaves similar but petioles rapidly shorter. *Peduncles* opposite the leaves and shorter than they, usually 2-flowered, pilose with spreading or somewhat retrorse hairs. *Pedicels* pilose with spreading hairs, some gland-tipped. *Sepals* c.4 × 2mm, glandular-pilose. *Petals* c.5 × 2mm, obovate, notched, purplish-pink. *Rostrum* glandular-pilose. *Carpels* smooth, hairy. **Fig. 3F.**

Selected citations:

CAPE. Port Elizabeth distr., Springfields, xi 1915, *Paterson* 3288 (BOL,

GRA). Swellendam distr., Buffelsjagt Dam, x 1975, *van der Merwe* 2721 (PRE). Worcester distr., Worcester Veld Reserve, *van Breda* 474 (PRE). Stellenbosch distr., Somerset West, 25 ix 1945, *Parker* 3988 (BOL, NBG, SAM). Cape Peninsula, Table Mountain, Nov., *Zeyher* 451 (SAM, mixed with *G. rotundifolium*); Constantia, Bergvliet Farm, 19 x 1916, *Purcell* 235 (SAM); Kenilworth, x 1892, *Bolus* s.n. (BOL 32251).

A native of Europe, long established on the Cape Pensinula, and recorded as far east as Port Elizabeth. Easily recognized by its deeply dissected leaves and smooth hairy carpels.

31. Geranium purpureum Vill. in L., Syst. Pl. Europ. 1, Fl. Delph. 72 (1785); Adamson & Salter, Fl. Cape Penins. 509 (1950); Ross-Craig, Drawings of British Plants 6:pl. 41 (1952); Heywood et al., (eds.), Fl. Europ. 2:198 (1968).

Annual herb, stems up to 60cm long, erect or ascending, pilose with spreading gland-tipped hairs. *Stipules* ovate, acute. *Radical leaves* several, petioles up to c.100mm long, hairy as the stems; blade up to 80mm in diam., divided to the base into 3–5 lobes, each lobe ovate in outline, base cuneate tapering to a petiole-like part (the leaf looks compound), bipinnatisect, with a few long coarse hairs above and below, or almost glabrous; cauline leaves similar but petioles rapidly shorter. *Peduncles* opposite the leaves and terminal, forming compound cymes, mostly 2-flowered, pilose with spreading glandular hairs and shorter, curled eglandular ones. *Pedicels* similar to peduncles. *Sepals* c.5–6 × 2·5mm, ovate, glandular-pilose. *Petals* c.9 × 2·5mm, elliptic-oblong, entire, narrowed to a claw, purplish-pink. *Rostrum* glabrous. *Carpels* transversely ridged, glabrous. **Fig. 3G.**

Citations:

CAPE. Cape distr., Cape Flats, Stikland, 30 viii 1979, *Boucher* 4499 (PRE); Cape Flats, Swartklip, 22 ix 1972, *Taylor* 8205 (PRE); between Wynberg and Faure, 26 viii 1953, *Parker* 4903 (NBG, SAM); Tygerberg Nature Reserve, 30 viii 1975, *Loubser* 3372 (NBG); Blaauwberg, x 1951, *Stokoe* s.n. (SAM 65578); Zeekoe Vlei, 28 xi 1954, *Leighton* 3285 (BOL, PRE); Isoetes Vlei Nature Reserve, 27 ix 1978, *Bond* 1705 (NBG). 3318 CD, Robben Island, 6 x 1978, *Buys* s.n. (PRE, STE).

A native of Europe, naturalized in the SW Cape on the sandy flats between Blaauwberg, Tygerberg and Wynberg, and locally common. Easily recognized by its deeply dissected leaves and transversely ridged, glabrous carpels.

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