

A REVISION OF GRUBBIACEAE

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ABSTRACT

The family Grubbiaceae, endemic to Cape Province, is regarded as consisting of a single genus, *Grubbia*, with three species: *G. rosmarinifolia*, *G. rourkei*, and *G. tomentosa*. *Grubbia tomentosa* is a uniform species, widespread on the Table Mountain Sandstone, and is the closest relative of the new species, *G. rourkei*, endemic to Kogelberg. *Grubbia rosmarinifolia* tends to be polymorphic, but from the "typical" populations, *G. rosmarinifolia* subsp. *hirsuta* (mountain ranges from Bainskloof to the Cedarberg) and *G. rosmarinifolia* subsp. *gracilis* (Muizenberg Plateau) can be segregated as morphologically and geographically distinct subspecies. The plants formerly recognized as *G. pinifolia* are considered as variety of *G. rosmarinifolia* subsp. *rosmarinifolia*.

UITTREKSEL

'n HERSIENING VAN GRUBBIACEAE

Die familie Grubbiaceae, endemies in die Kaapprovinsie, word beskou as bestaande uit 'n genus, *Grubbia*, met drie spesies, nl. *G. rosmarinifolia*, *G. rourkei*, en *G. tomentosa*. *Grubbia tomentosa* is 'n uniforme spesies wydversprei op die Kaapse sandsteen en is die naaste verwant aan die nuwe spesies, *G. rourkei*, endemies in die Kogelberg. *Grubbia rosmarinifolia* is geneig tot polimorfisme, en *G. rosmarinifolia* subsp. *hirsuta* (bergreekse vanaf Bainskloof tot die Sederberge) en *G. rosmarinifolia* subsp. *gracilis* (Muizenberg-Plato) kan van die „tipiese” populasies as duidelike morfologiese en geografiese subspesies afgeskei word. Die plante, voorheen as *G. pinifolia* erken, word as 'n variëteit van *G. rosmarinifolia* subsp. *rosmarinifolia* beskou.

INTRODUCTION

In order to present my findings on wood anatomy of Grubbiaceae, a revision of *Grubbia*, the sole genus of Grubbiaceae, was required. Several taxonomic changes, including description of a new species, were needed in order to make available names for the wood studies. Such a revision had been begun some years ago, as annotations of specimens indicate, by Miss M. A. Gutzwiller, who unfortunately could not complete this task. During my field studies in Cape Province in 1973, I collected materials of the three species of *Grubbia* recognized here. However, study of additional specimens from South African herbaria was required. *Grubbia rosmarinifolia* (Figs. 1-5, 18-21) proves to be a polymorphic species from which the species *G. gracilis*, *G. hirsuta*, and *G. pinifolia* have been segregated. As the species names suggest, *G. rosmarinifolia* is a complex in which various populations differ chiefly in foliar characteristics. *Grubbia tomentosa* and a new species described here, *G. rourkei*, are relatively uniform throughout their ranges.

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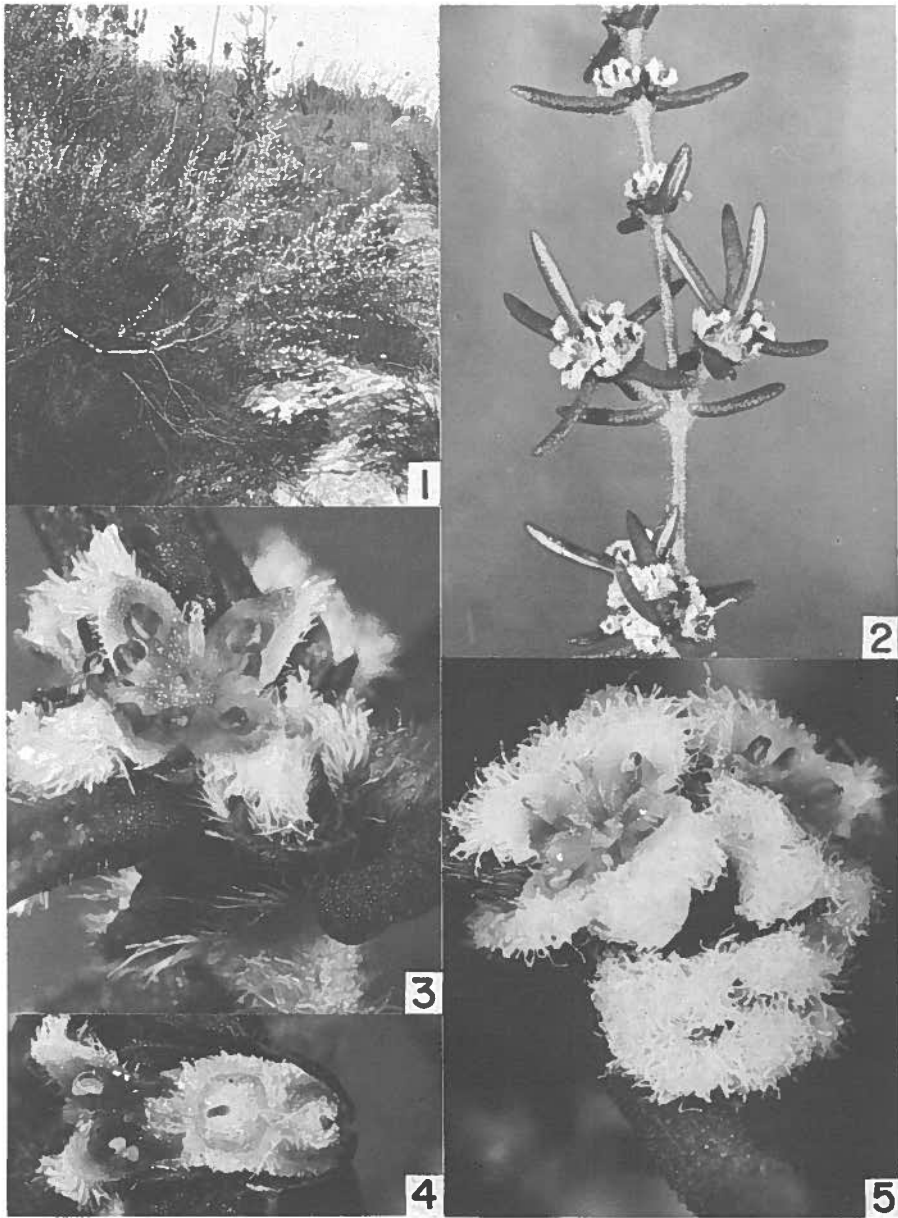


FIG. 1-5.

Grubbia rosmarinifolia subsp. *rosmarinifolia* var. *rosmarinifolia*, S. Carlquist 4719. 1. Habit of an old shrub, ca. 1 m high, showing spreading habit. 2. Branchlet in flower. X 2. 3. View of flower, showing anthers unopened. X 15. 4. Inflorescence in which two flowers at right have lost perianth; outer surface of ovary is pilose, ovary tops are papillate. X 15. 5. Flowers showing characteristics of hairs on perianth and scabrid nature of leaf, below. X 15.

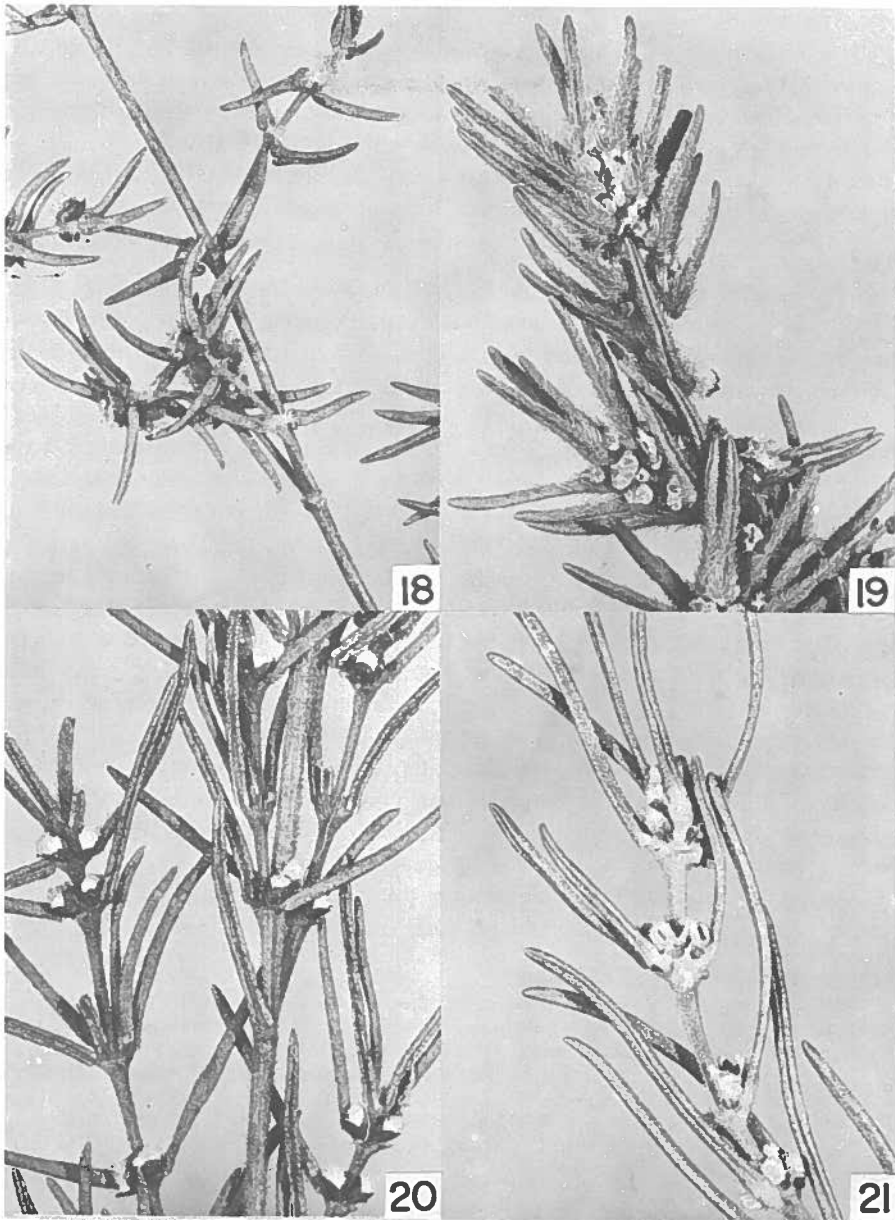


FIG. 18-21.

Photographs of branchlets of *Grubbia rosmarinifolia* herbarium specimens, to show details of leaves and vesture. 18. *G. rosmarinifolia* subsp. *gracilis*, G.J. Lewis 1321 (SAM). 19. *G. rosmarinifolia* subsp. *hirsuta*, R.H. Compton 20986 (NBG). 20. *G. rosmarinifolia* subsp. *rosmarinifolia* var. *pinifolia*, T.P. Stokoe 60060 (SAM). 21. *G. rosmarinifolia* subsp. *rosmarinifolia* var. *rosmarinifolia*, T.P. Stokoe 63133 (SAM). A11, X 2.

The three species of Grubbiaceae can be regarded as relictual mesic elements, as their habitat preferences indicate, within the mediterranean-type flora of Cape Province. However, each of the three species exploits a different mesic habitat. An understanding of these features is essential to any attempt to relate Grubbiaceae to other families. The systematic position of the family, a controversial problem (e.g., Fagerlind, 1947), is discussed in a following paper (Carlquist, 1977).

SYSTEMATIC TREATMENT

Grubbiaceae Endl., Gen. Pl. 327, 1837. *Grubbia* Berg., Kongl. Vet. Acad. Handl. 28: 34, 1767. Much-branched woody shrub, branched from a single stem and with a taproot, or branched from a lignotuber at the surface of the ground. Leaves decussate, ericoid, or flat, with margins at least somewhat revolute, linear to lanceolate or obcuneate, acuminate, petiolate to nearly sessile. Inflorescences axillary, basically dichasial but congested, subtended by two or more bracts, with two to about 20 flowers. Flowers bisexual, very small. Perianth in a single whorl, tetramerous, calyx-like and hairy on the outer surface, smooth and suffused pink to red on the inner surface, valvate. Stamens eight, free, with a slight tendency for four to be positioned inward of the remaining alternating four. Filaments linear-lanceolate; anthers basifixed, with two adaxial functional anther sacs and a pair of abaxial vestigial sacs each. Anther sacs dehiscent by means of lateral slits. Disc epigynous, papillate to shortly hairy. Ovary inferior, bicarpellate, sometimes bilocular at an early stage and unilocular later. Style filiform, stigma apical, small, with a very short pair of branches or apparently simple. One ovule in each locule, pendent, anatropous, unitegmic, tenuinucellar, with a long micropyle. Fruit indehiscent, with a fleshy exocarp and a sclerenchymatous endocarp, each fruit united with adjacent fruits in an inflorescence, forming a syncarp. Seed with abundant oily endosperm, the endosperm heavily cutinized at its outer surface. Embryo straight, hypocotyl and radicle longer than the two cotyledons. Type species: *G. rosmarinifolia* Berg. Generic synonyms: see below under Sections.

KEY TO THE GENUS *GRUBBIA*

Flowers in a cymose group of 2 or (mostly 3), sessile in axils of leaves; inflorescences subtended by a pair of dark brown scarios broad bracts; fruits small (ca. 1 mm in diameter), forming a syncarp, probably wind-dispersed

-A. *G. rosmarinifolia* (sole species of section I, *Ophira*)
 - Leaves lanceolate to linear, 0,5 to 2,2 cm long, 1-2,5 mm wide (juvenile leaves occasionally wider), hirsute to glabrous above, tomentose below. Bracts of the inflorescence $\frac{1}{3}$ to $\frac{1}{2}$ bilobed. Table Mt., Hottentots Holland Mts., Klein Rivier Mts., Cape Infanta, Langeberg east to mountains in Knysna and Uniondale DivisionsA-1a *G. rosmarinifolia* subsp. *rosmarinifolia*
 - Leaves sagittate at bases, 0,8-1,2 cm long, petioles about 1 mm long. Widespread in Cape ProvinceA-1a, *G. rosmarinifolia* subsp. *rosmarinifolia* var. *rosmarinifolia*
 - Leaves not sagittate at bases, lamina bases in brief rounded lobes or fading into the petioles; lamina glabrous above, linear, 1,2-2,2 cm long, petioles 1-2 mm long. Local in deep valleys on Table Mt. and in the Hottentots Holland Mts.A-1a₂ *G. rosmarinifolia* subsp. *rosmarinifolia* var. *pinifolia*

- Leaves narrowly obcuneate, 3,5–6 mm long, scabrid to glabrescent above, tomentose below. Bracts of the inflorescence $\frac{1}{4}$ bilobed. Subshrub endemic to the Muizenberg Plateau A-1b **G. rosmarinifolia** subsp. **gracilis**
- Leaves lanceolate (the uppermost linear), 0,8–2,7 cm long, densely long-hairy or strigose above, strigose-tomentose below. Bracts of the inflorescence ovate, entire. Cape Province from Bainskloof to the Cedarberg and Kwadousberg A-1c **G. rosmarinifolia** subsp. **hirsuta**
- Inflorescences strobiloid, subsessile in leaf axils, with three smaller and one larger deltoid green lanceolate bracts. Flowers 6–20 (occasionally 4) per inflorescence. Fruit a round or ovoid syncarp, 5 mm or more in length, usually with one large seed per syncarp maturing; syncarp probably bird-dispersed Section II, *Strobilocarpus*.
- Shrub branched from a massive lignotuberous base. Leaves minutely tomentose, 2,4–6,5 cm long, 7 mm broad, margins inconspicuously revolute. Petioles 3–6 mm long. Nodes of stems and sulci between fruits of the syncarp minutely tomentose. Fruits of the syncarp green, turning purple at maturity. Widespread in Cape Province on Table Mountain Sandstone **B. G. tomentosa**.
- Shrub with a single trunk, no lignotuber present. Leaves subsabrid, about 1,5 (1,0–2,0) cm long, 1,4 mm wide, margins strongly revolute. Petioles shorter than 3 mm. Nodes of stems and sulci between fruits of the syncarp hispid. Fruits of the syncarp each reddish with a central yellow spot at style base at maturity. Endemic to Kogelberg, Cape Province **G. rourkei**.

DESCRIPTIONS

I. SECTION **OPHIRA** (J. Burmann) A. DC., Prodr. 14: 618, 1857. *Ophira* J. Burmann (as a genus) ex Linn., Mantissa 2: 150, 1771. *Ophira* Steud., Nom., ed. 2, 2: 220, 1841. *Ophiria* (*sic*) of some authors. Stems round or nearly so in transection. Leaves lanceolate or linear, margins strongly revolute in adult leaves, somewhat less so in juvenile leaves. Flowers in groups of 2 or (mostly) 3, sessile in the axils of leaves; inflorescences subtended by a pair of dark brown scarious broad obtuse bracts. Fruit small, a syncarp composed of the two or three cymosely arranged fused ovaries, apparently wind-dispersed.

A. **Grubbia rosmarinifolia** Berg., Kongl. Vet. Acad. Handl. 28: 34, 1767. (Synonym: *Ophira stricta* Linn., Mantissa 2: 229, 1771, *non* Lam.) Characters of the section *Ophira*, of which it is the sole species.

A-la. **Grubbia rosmarinifolia** subsp. **rosmarinifolia**. Shrub to 1,5 m, branches erect (spreading with age), branchlets pubescent to short-hirsute. Leaves shortly petiolate, petioles 1–2,5 mm long; leaves 0,5–2,2 cm long, 1–2,5 mm wide (juvenile leaves occasionally wider), strongly revolute, variously scabrid to glabrous above, tomentose below. Bracts of the inflorescence $\frac{1}{3}$ to $\frac{1}{2}$ bilobed. Flowering season: August to December.

A-la₁. **Grubbia rosmarinifolia** subsp. **rosmarinifolia** var. **rosmarinifolia** (Fig. 1–5, 21). (= *G. rosmarinifolia* of most authors). Leaves slightly or markedly sagittate at base, bases rounded; lamina scabrous, hirsute to glabrous above, pubescent beneath, 0,5–1,8 cm long, most frequently 0,8–1,2 cm long. Petiole about 1 mm long. Range: Cape Province, from near Gydo Pass, Ceres Division, southward to the Hottentots Holland Mts. and various parts of Caledon Division, Klein Rivier Mts., Kogelberg; Bredasdorp Division; Riviersonderend Mts. and the

Langeberg from near Swellendam to Garcias Pass; Outeniqua Mts. from Montagu Pass to the Tsitsikama Forest. Streamsides and seeps, mostly on south-facing slopes, from near sea-level (Palmiet River) to about 2 000 m. For a discussion of the type specimen, see Harms (1935).

REPRESENTATIVE SPECIMENS

Cape Peninsula: Table Mt.: *Drège* 20097 (SAM), *H. Bolus* 3943 (NBG), *R.H. Compton* 6691 (SAM); Table Mt. above Echo Valley, *R.H. Compton* 8288 (NBG); Table Mt., top of Kasteelspoort, *E. Cohen* 20-VIII-1938 (NBG).

Ceres Division: Visgat, between Schurfteberg and Gt. Winterhoek Mts., *T.P. Stokoe* 63133 (SAM).

Caledon Division: Nieuwberg, *P. Bond* 485 (NBG), *R.H. Compton* 9211 (NBG); Viljoens Pass, *T.P. Stokoe* 57839 (SAM); between Somerset Sneekop and Dwarsberg, Hottentots Holland Mts., *T.P. Stokoe* 60061 (SAM); Kogelberg, *T.P. Stokoe* 57836 (SAM), *R.H. Compton* 16862 (NBG); Palmiet River, *T.P. Stokoe* 57838 (SAM), *R.H. Compton* 11110 (NBG), *S. Carlquist* 4591 (RSA, NBG); Klein Rivier Mts., upper Fernkloof, *I. Williams* 1533 (NBG), *S. Carlquist* 4508 (A, BOL, CAS, MO, NBG, RSA, US), *S. Carlquist* 4962 (BOL, CAS, MO, NBG, RSA, US); Silverstream, near Villiersdorp, *P. Goldblatt* 1816 (NBG); Rivier Zonder Einde (mts. above Riviersonderend), *Pappe* 20099 (SAM).

Bredasdorp Division: Hagel Kraal, *J.P. Rourke* 615 (NBG); Pottberg Estates, near Cape Infanta, *R.D.A. Bayliss* 6622 (NBG).

Swellendam Division: Clock Peaks, *R.H. Compton* 858 (NBG); One O'Clock Mt., *T.M. Wurts* 290 (NBG); 11:30 O'Clock Peak, *S. Carlquist* 4719 (BOL, NBG, RSA); Strawberry Hill, near Heidelberg, *T.P. Stokoe* 70001 (SAM).

Riversdale Division: Garcias Pass, *C. Thorne* 38854 (SAM); Langeberg near Riversdale, *R. Schlechter* 1833 (NBG).

George Division: Montagu Pass, *R.H. Compton* 8476 (NBG), *J.P. Rourke* 1257 (NBG); Cradock Berg, *R.H. Compton* 14381 (NBG).

Knysna Division: Lottering, *H.C. Taylor* 574 (NBG); Tsitsikama (Tsitsikama), *Pappe* 20098 (SAM).

Uniondale Division: Formosa, *R.H. Compton* 4258 (NBG).

A-la₂. **G. rosmarinifolia** subsp. **rosmarinifolia** var. **pinifolia** (Sond.) S. Carlquist, comb. nov. (*G. pinifolia* Sond., in Harvey and Sonder, Fl. Cap. 2: 326, 1894). Leaves not sagittate at base, lamina glabrous above, densely puberulent below, linear, 1,2–2,2 cm long. Petiole 1–2 mm long. Range: Cape Province, Hottentots Holland Mts. and vicinity; Kogelberg; Table Mt. Along streams, in streams in ravines, at about 1 000 m or higher, chiefly on south-facing slopes.

REPRESENTATIVE SPECIMENS.

Cape Peninsula: Table Mt., *MacOwan* 918 (BOL, SAM).

Caledon Division: Aries Kraal, *R.H. Compton* 16827 (NBG); Nieuwberg, near top of Viljoens Pass, *T.P. Stokoe* 69525 (SAM); S.E. side of Somerset Sneekop,

E. Esterhuysen 3643 (BOL, NBG); between Somerset Sneekop and Dwarsberg, *T.P. Stokoe 60060* (SAM); Landrostkop, *T.P. Stokoe 57840* (SAM); Grietjesgat, between Sir Lowry's Pass and Palmiet River, *Ecklon and Zeyher VII-1833* (SAM); Kogelberg, *H.B. Rycroft 1368* (NBG); Palmiet River, *M.C. Gillett 4253* (BOL). For information regarding the type, see Harvey and Sonder (1894).

I am reluctantly recognizing this taxon as a variety, because it has a geographical unity but is within the range of *G. rosmarinifolia* subsp. *rosmarinifolia* var. *rosmarinifolia*, although it may inhabit deeper valleys rather than open streams. If one viewed specimens only from the Hottentots Holland Mts., such as the one shown in Fig. 20, it could be regarded as a subspecies of *G. rosmarinifolia*. However, exceptions do occur in all of the features. The specimen *Stokoe 63133* (Fig. 21) could be included in var. *pinifolia* if leaf length and shortness of petioles were criteria, but in all other features it fits var. *rosmarinifolia*. The Table Mountain population of var. *pinifolia* is slightly different from the Hottentots Holland—Kogelberg plants. Variation in petiole length of var. *pinifolia*, contrary to description, overlaps that of var. *rosmarinifolia*, and leaf base morphology of the varieties tends to intergrade. Thus, no single character is without exception, and indeed, the annotations of specimens of var. *pinifolia* by Miss M. A. Gutzwiller merely bear the determination "*Grubbia rosmarinifolia* subsp. *rosmarinifolia*." Recognition as a variety seems advisable to highlight one distinctive phase, despite intergradation and variability, of *Grubbia rosmarinifolia* subsp. *rosmarinifolia*.

A-1b. ***Grubbia rosmarinifolia* subsp. *gracilis*** (Salter) S. Carlquist, comb. nov. (*G. gracilis* Salter, *Jl S. Afr. Bot.* 12: 39, 1946). Shrub, often sparsely branched, 20–50 cm high, branches spreading, branchlets pubescent. Leaves narrowly obtuse, margins strongly revolute, sagittate at bases, the lobes obtuse; leaves 3.5–6 mm long, 0.5–2 mm wide, scabrid to glabrescent above, tomentose below. Bracts of the inflorescence keeled, ¼ bilobed. Range: Cape Peninsula, seeps and streams on the Muizenberg Plateau.

REPRESENTATIVE SPECIMENS

Cape Peninsula: Muizenberg Plateau, *Salter 3594* (holotype, BOL; isotypes, BOL, SAM), *R. Schlechter 7-VIII-1892* (BOL), *R.H. Compton 16430* (BOL, NBG), *E. Esterhuysen 24668* (BOL), *Salter 2948* (BOL), *G.J. Lewis 1321* (SAM). The habit and leaves (Fig. 18) of this subspecies are distinctive, as are quantitative features of wood anatomy (Carlquist, 1977). The distinctive geographical range, outside the limits of *G. rosmarinifolia* subsp. *rosmarinifolia*, is a further reinforcement to subspecific status for subsp. *gracilis*. There are no unique morphological features of subsp. *gracilis* that would merit specific status for this population.

A-1c. ***G. rosmarinifolia* subsp. *hirsuta*** (E. Mey. ex A. DC.) S. Carlquist, comb. nov. (*G. hirsuta* E. Mey, ex A. DC., *Prodr.* 14: 618, 1857). Shrub to 1.5 m,

the branches erect. Leaves and branchlets densely long-hairy and strigose. Leaves 0,8–2,7 cm long, lanceolate (the uppermost leaves of adult shoots linear) with sagittate bases, lobes of the bases obtuse. Leaf margins revolute. Petioles about 1 mm long. Bracts of the inflorescence ovate, entire. Range: Cape Province, in montane seeps, or on damp ledges in the north-south ranges of the Cold Bokkeveld, Ceres Division, from Bainskloof to the Cedarberg and Kwadousberg.

REPRESENTATIVE SPECIMENS

Clanwilliam Division: Krom River Kloof, S. Cedarberg, *E. Esterhuysen 17968* (BOL, NBG).

Worcester Division: Kavadoews (Kwadousberg) Mts. near Orchard, *E. Esterhuysen 10908* (BOL, NBG, SAM); Bainskloof, *R.H. Compton 20986* (NBG).

Ceres Division: Tweefontein, Cold Bokkeveld, *R. Schlechter 10125* (BOL, SAM); slopes at E. base of Schurweberg (Schurfteberg), *E. Esterhuysen 12665* (BOL).

The almost hispid vesture, relatively long leaves, and entire inflorescence bracts of this taxon (Fig. 19) distinguish it from *Grubbia rosmarinifolia* subsp. *rosmarinifolia*. With the exception of the specimen *Stokoe 63133*, referred above to subsp. *rosmarinifolia* var. *rosmarinifolia*, the populations of *G. rosmarinifolia* subsp. *hirsuta* are outside the range of other subspecies of *G. rosmarinifolia*. As with *G. rosmarinifolia* subsp. *gracilis*, subsp. *hirsuta* possesses no unique features. Compared with the remainder of *G. rosmarinifolia*, vesture is appreciably more prominent in subsp. *hirsuta*, but of the same basic type as in *G. rosmarinifolia* as a whole.

II. SECTION **STROBILOCARPUS** (Klotsch) A. DC., Prodr. 14: 618, 1857. (Synonyms: *Strobilocarpus* Klotsch, as a genus, *Linnaea* 13: 380, 1839; *Strobilocarpus* Benth and Hook. f., Gen. Pl. 231, 1880; *Ophira* Lam., Encycl. Bot. 4: 565, 1793 et III. in T., non Linn.). Shrubs with branchlets having longer internodes than in section *Ophira*. Stems prominently four-angled (in branches and branchlets) as seen in transection, the angles related to decurrent leaf margins or petiole edges. Leaves lanceolate or linear, petiolate, margins slightly to markedly revolute, 2–6,5 cm long. Inflorescences strobiloid, subsessile in leaf axils, with three smaller and one larger deltoid lanceolate bracts arranged decussately below the flowers. Flowers with soft curved canescent hairs on the outer surfaces of the perianth. Flowers 6–20 (occasionally 4), decussately arranged, sessile on the spike. Fruit a syncarp, 5 mm or more in length, with usually one seed maturing per syncarp. Syncarps probably dispersed by frugivorous birds.

B. *Grubbia tomentosa* (Thunb.) Harms, in Engl. Pflanzenfam., ed. 2, 16b: 51, 1935¹. (Synonyms: *Taxus tomentosa* Thunb., Prodr. 117, 1800; *Ophira stricta* Lam., Encycl. Bot. 4:565, et III, in T., 1793; *Grubbia stricta* (Lam.) A. DC.,

¹ For a discussion of nomenclatural resolution in this species, see Harms (1935).

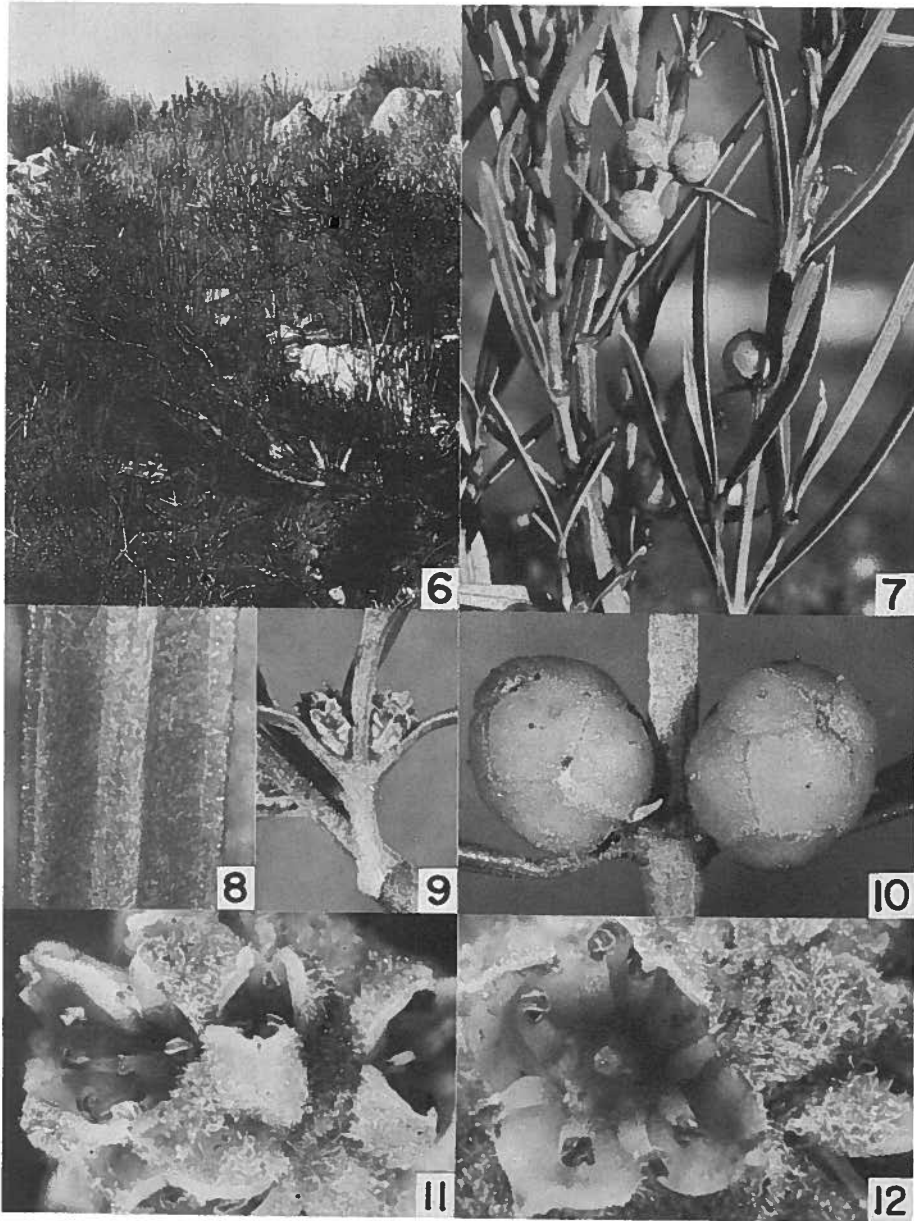


FIG. 6-12.

Grubbia tomentosa, S. Carlquist 5058. 6. Habit of shrub ca. 0,8 m high; lignotuber at lower right. 7. Habit of branchlets in fruit. X 0,7. 8. Lower surface of leaf. X 4. 9. Pair of inflorescences in leaf axils. X 6. 10. Pair of fruits, prior to turning purple. X 3. 11. Oblique view of flower at anthesis. X 20. 12. Face view of flower at anthesis. X 20.

Prod. 14:618, 1857; *Strobilocarpus diversifolius*, Linnaea 13:380, 1839; *Grubbia latifolia* Schnizlein, Icon. 2:108, 1856–1865).

Shrub to 1,5 m high, branched from a massive lignotuberous base (Fig. 6) Leaves lanceolate-elliptic (Fig. 7), acuminate, tapering below to a petiole; lamina 2,5–6,5 cm long, 2–7 mm broad. Petiole 3–6 mm long. Leaves glabrous and smooth to minutely tuberculate above, tomentose below (Fig. 8), margins inconspicuously revolute. Stems and nodes finely tomentose. Flowers 15–20, in sessile cone-like groups 5–6 mm long (Fig. 9). Perianth segments ovate, acute (Fig. 11, 12), pale rose within. Bracts of the inflorescence green, deltoid, 1–2 mm long (Fig. 9, 10). Fruit an ovoid syncarp 6–10 mm long, green turning evenly red-purple at maturity, glabrous, margins of each fruit in the syncarp outlined by barely perceptible grooves, not hairy. Exocarp of fruit fleshy, endocarp very thick and woody. Flowering season: December through January according to my observations; I failed to find any individuals in flower from July through November, despite the statement by Salter (in Adamson and Salter, 1950) that *G. tomentosa* flowers throughout the year. Range: Cape Province, chiefly on south-facing slopes below or among large boulders of Table Mountain Sandstone, tending to be at lower elevations from near sea-level (Cape Peninsula) to about 600 m. Hills and mountains from Elandskloof (Ceres Division) southward to the Cape Peninsula and to Sir Lowry's Pass; southern coastal ranges, including the Riviersonderend range behind Genadendal, the Klein Rivier Mts., and the Langeberg from Swellendam to Garcias Pass and to Cradock Berg, George Division, according to Harvey and Sonder (1894). For a discussion of typification of this species, see Harms (1935).

REPRESENTATIVE SPECIMENS

Caledon Division: Klein Rivier Mts., upper Fernkloof, *S. Carlquist 4515* (BOL, CAS, K, MO, NBG, PERTH, US); upper slopes of Vogelgat Reserve (near Hermanus), *S. Carlquist 5010* (BOL, MO, NBG, RSA).

Bredasdorp Division: Slopes above Bredasdorp, *S. Carlquist 5010* (A, BOL, CAS, MO, NBG, PERTH, US).

Swellendam Division: Lower slopes of 11:30 Peak, Langeberg, *S. Carlquist 4559* (BOL, CAS, MO, NBG, RSA).

C. *Grubbia rourkei*, sp. nov. (Synonym: *G. linearifolia* M.-A. Gutzwiller ined., in herb.). Frutex ad 2 m altus, rami laxi. Caulis ramosus supra, simplex et nontuberosus infra. Ramuli nodosi, piloso-glabrescenti, flavidi. Nodi insigne pilosi. Folia ca. 15 (10–20) mm longa, 1,5 mm lata, petiolata, ericoidea, linearia, sordido-cineraria, integerrima, dense et breve pilosa (subscabrida supra), ad apice submucronata, margine revoluta, carinae dense pilosae, flavescentes. Petiolae ad basi connatae. Ramuli floride ad capitulum parvum globosum 5 mm longum

strobiliformum in axillis foliorum subsessile reducti et post anthesin fructi in syncarpium globosum connati. Flores 4–10. Internodi ramulorum saepe breves (fertiles) vel longiores, syncarpium subverticillati. Perianthium roseum, pilis perianthiorum brevis, sordidis. Segmenti perianthiorum arcuati. Fructi syncarpiorum rosei sed ad apice flavo-maculati, pubescenti. Sulci syncarpiorum pilosi. Semen globosum; embryo in centro albuminis linearis, subteres, viridis.

Erect shrub to 2 m tall (Fig. 13), branches spreading. Trunk branched above, but simple below, non-tuberous (unlike *G. tomentosa*, which has at ground level a lignotuber from which branches depart). Branches nodose, pilose when young and glabrescent with age (Fig. 14–16), yellowish to yellowish-green. Nodes conspicuously pilose; petioles of leaf pairs connate at nodes. Leaves about 15 (10–20) mm long, 1.4 mm wide, shortly petiolate, linear, narrow, ashy or pallid drying yellowish-green, entire, glabrous or subscabrid, submucronate at the apex, margin conspicuously revolute, the grooves on the lower surface densely pilose and becoming yellowish (Fig. 14). Flower-bearing shoots reduced to small strobiloid capitula 5 mm in diameter, subsessile in axils of leaves, flowers after anthesis connate into syncarps. Flowers 4–10 per syncarp. Internodes short where axils bear flowers and fruits, which therefore appear to be in subverticillate groups; internodes longer between leaf pairs on shoots where flowers are absent. Perianth rosy within, hairs on outer surface of perianth short, brownish-white. Perianth lobes (as observed in living specimens) arcuate, tips tending to touch at anthesis and the flower therefore tending to open with slits between the lobes (Fig. 17). Fruits of the syncarp pubescent, each fruit red with a central yellowish-green spot (Fig. 14). Sulci between fruits of the syncarp pilose, so that the syncarp does not appear grooved but instead ridged (Fig. 15). Seed globose; embryo in the centre of the endosperm, linear, subterete, green. Flowering season: evidently extended over a large portion of the year, for both flowers and fruits can be seen on specimens collected at various times of the year. Range: endemic to Kogelberg, where it grows on open but moist south-facing slopes with restiads.

Type: Northwest slopes of Five Beacon Ridge, Kogelberg, *J. P. Rourke 1472* (holotype, RSA; isotype, NBG).

REPRESENTATIVE SPECIMENS

Caledon Division: Sanctuary Peak, near Kogelbaai, *S. MacPherson 22–VII–1956* (NBG); eastern foothills of Kogelberg above Steenbras Dam, N.W. side, *J. P. Rourke 1374* (NBG), *S. Carlquist 5115* (A, BOL, CAS, K, MO, NBG, PERTH); Kogelberg without specific locality, *T. P. Stokoe 6451* (BOL), *7139* (BOL), *17408* (BOL), *23823* (SAM), *G. J. Lewis 1220* (SAM), *R. H. Compton 7728* (NBG).

I take pleasure in naming this species for Dr. John P. Rourke, Curator of the Compton Herbarium, Kirstenbosch Botanic Garden. Dr. Rourke has explored

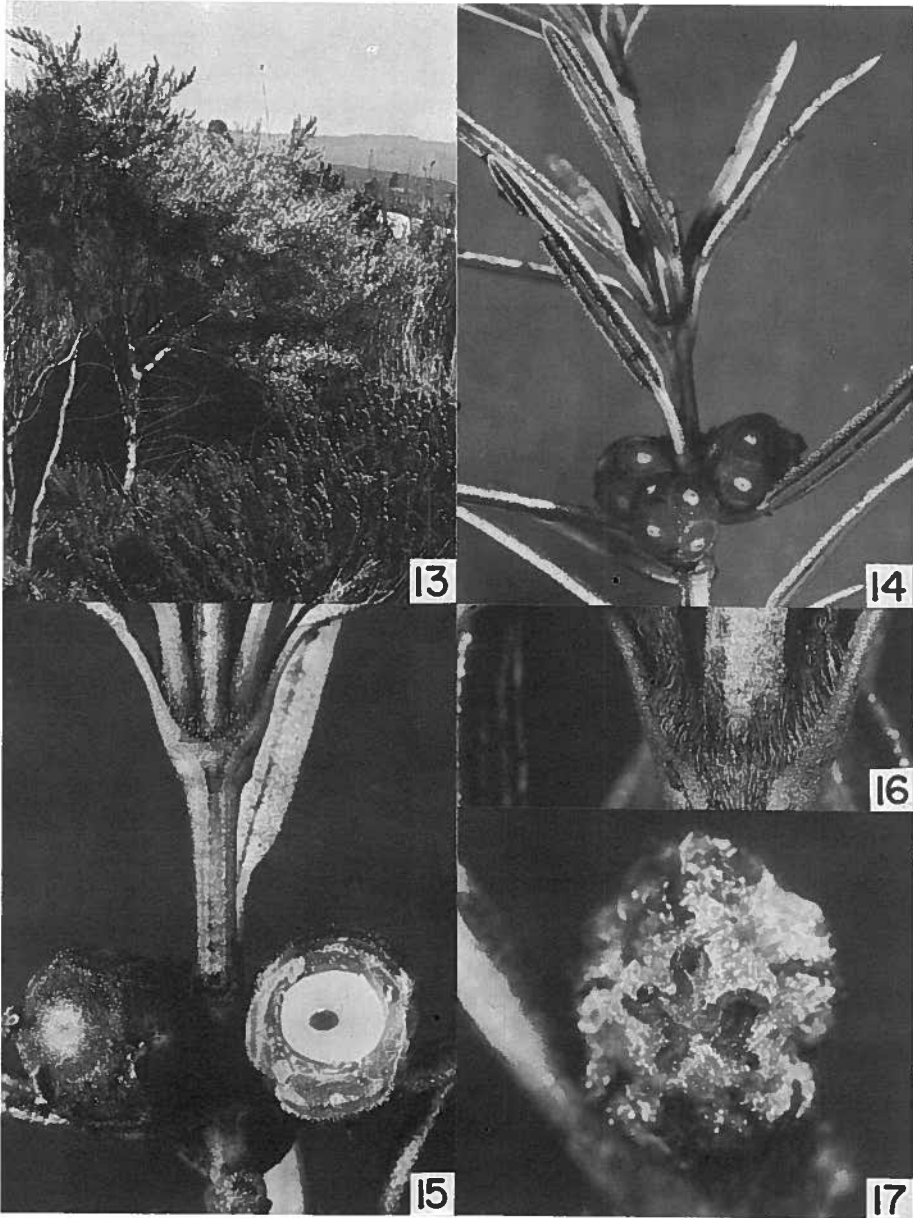


FIG. 13-17.

Grubbia rourkei, S. Carlquist 5115. 13. Habit of shrub 1,3 m high. 14. Branchlet with fruits. X 1,2. 15. Branchlet showing two fruits, one sliced to show the single fertile seed with an embryo in the centre of the white endosperm. X 3. 16. Node, showing long dense hairs. X 15. 17. Inflorescence, with flower apparently at anthesis, pores between overlapping perianth segments. X 20.

Kogelberg in search of colonies of this species and has contributed to knowledge of its range. He kindly showed me a colony of this species, from which my collection and anatomical studies are derived. *Grubbia rourkei* obviously belongs in section *Strobilocarpus*, but is amply distinct from *G. tomentosa*. *Grubbia rourkei* lacks a lignotuber, is branched above the base, with branches spreading in a somewhat horizontal fashion (Fig. 13). The narrowly linear nature of the leaves (Fig. 14) and the densely pilose nodes and petiole bases (Fig. 17) are distinctive. Flowers are deep rose, and apparently do not open in a typical fashion (Fig. 17) if my material is representative. The number of flowers per head is fewer than in *G. tomentosa*, and the syncarp accordingly sphaeroidal (Fig. 14) rather than ovoid, with each fruit demarcated by a pilose groove (Fig. 15), giving a polyhedral rather than smooth oval appearance to the syncarp; the surface of each fruit of the syncarp is red, with a yellowish-green spot in the centre, and pubescent, unlike the glabrous fruits, red-purple at maturity, in *G. tomentosa*. In *G. tomentosa*, the endocarp is evidently thicker.

In lack of a lignotuber, in having fewer flowers per inflorescence than *G. tomentosa*, and in some details of wood anatomy (Carlquist, 1977), *G. rourkei* shows some approach to *G. rosmarinifolia*, despite its obvious affinity to *G. tomentosa*. Division of *Grubbia* into two genera certainly does not seem warranted and indeed, few authors have ever advocated this.

Grubbia rourkei may represent a relict of the stock from which *G. tomentosa*, adapted to drier slopes than the other two species, has developed. Both *G. tomentosa* and *G. rourkei* are relatively uniform morphologically, whereas *G. rosmarinifolia*, despite its ecological restriction to seeps and streams, exhibits diversification among populations, diversification that appears to have been relatively recent. One reason for the diversity in *G. rosmarinifolia* may be the fact that its requirement for summer-wet seeps or streams results in an "insular" distribution. On the other hand, *G. tomentosa* forms large, if sparse, populations on slopes subject to fire and greater drought, to both of which factors the lignotuber is doubtless an adaptation. The continuous nature of populations of *G. tomentosa* would, theoretically, result in greater gene-flow and therefore greater uniformity than in a species with "insular-type" distribution of populations.

Grubbia tomentosa does grow beneath or among sandstone boulders that would tend to attenuate water availability somewhat, but the capability to form numerous branches from the base permits this species to bear a leafy crown proportionate to its moisture-gathering capacity and moisture availability during particular months. Plants restricted to streams and seeps, such as *G. rosmarinifolia*, are less frequently burned and minimally subject to drought. The scarcity of *G. rourkei* may be related to the fact that although plants occupy moist slopes, these slopes are open, and do dry out and burn during the hottest portions of the year.

One could cite other genera in the Cape flora that show these patterns. For example, *Staavia radiata* (Bruniaceae), like *Grubbia tomentosa*, is a lignotuber-

bearing species characteristic of *fynbos* areas subject to drought and fire; it is a relatively widespread species, whereas *Staavia*s that lack lignotubers, such as *S. glutinosa* (Table Mountain) and *S. dodii* (Cape Reserve) are geographically restricted, small in numbers, and may, according to frequency of fires, be very scarce in particular years. Within the open *fynbos* of the Table Mountain Sandstone, resistance to fire by means of lignotubers would seem to be a better long-term strategy for survival than resistance in the form of fire-resistant seeds. This is certain to be true if the increased frequency of fires since human occupation continues.

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