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VOLUME 33 ASTERACEAE

Editor G. Germishuizen

Part 4: Anthemideae

Fascicle 1: Eriocephalus and Lasiospermum

by M.A.N. Müller, P.P.J. Herman and H.H. Kolberg

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FLORA OF SOUTHERN AFRICA

which deals with the territories of

SOUTH AFRICA, LESOTHO, SWAZILAND, NAMIBIA AND BOTSWANA

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INTRODUCTION

This part was compiled in accordance with the Guide for contributors to the *Flora of southern Africa* (compiled by Leistner, Ross & De Winter and available from the Editor, National Botanical Institute, Private Bag X101, Pretoria, 0001 South Africa).

The maps show the distribution of the various taxa in the *FSA* region only.

The numbering of the genera is according to De Dalla Torre & Harms in their *Genera siphonogamarum* (1900–1907), as adapted by Arnold & De Wet (1993, *Plants of southern Africa: names and distribution*).

Background to this Fascicle

M.A.N. Müller completed a revision of the genera *Eriocephalus* L. and *Lasiospermum* Lag. for which a Ph.D. degree was conferred upon him by the University of Stellenbosch in 1988. The results of his thesis had not been published by the time he tragically died in a car accident in April 1997. Permission was granted by the University to publish the taxonomic part of his thesis in the *FSA* format as it was considered to be a valuable contribution to plant taxonomy in southern Africa. P.P.J. Herman extracted and adapted the relevant text from the thesis in co-operation with H.H. Kolberg and translated it into English. However, not all specimens examined by Müller were seen by Herman. The original line drawings by Blythe Loutit and Elna de Bruyn could not be traced. The figures in this publication were scanned from a copy of the thesis.

PREFACE

The genera *Eriocephalus* L. and *Lasiospermum* Lag. belong to the tribe Anthemideae (Asteraceae), which is characterised by an aromatic scent and dissected leaves; the pappus is often absent whereas paleae are often present (Müller 1988, *'n Morfologiese en taksonomiese studie van die genusse* Lasiospermum *Lag. en* Eriocephalus *L. (Asteraceae) in suidelike Afrika*, unpublished Ph.D. thesis; Bremer 1994, *Asteraceae, cladistics and classification*). The tribe is economically important as many of its members are weeds (*Anthemis cotula* L.), cultivated (*Dendranthema* species) or used medicinally (*Artemisia afra* Jacq. ex Willd.).

The last revision of *Eriocephalus* and *Lasiospermum* in southern Africa was done by Harvey (1865, in *Flora capensis* 3). The genus *Eriocephalus* is endemic to southern Africa and its distribution covers the whole *FSA* region except Gauteng and KwaZulu-Natal, with the highest concentration of taxa in the Western Cape. It is an important member of the karoo vegetation and often forms an important fodder plant in these dry areas (Van Breda & Barnard 1991, *100 Veld plants of the winter rainfall region. A guide to the use of veld plants for grazing*; Le Roux, Kotzé, Nel & Glen 1994, *Bossieveld*).

Except for *Lasiospermum brachyglossum* DC. var. *sinaicum* Asch. & O.Hoffm. (this should probably rather be treated as a subspecies), which occurs in the Sinai Desert, the genus *Lasiospermum* is endemic to southern Africa and its distribution covers Namibia, North-West, Gauteng, the Free State, Lesotho and the Northern, Western and Eastern Cape. It is economically important as some members are reported to be poisonous to stock (Walsh 1909, *South African poisonous plants*; Vahrmeijer 1981, *Poisonous plants of southern Africa that cause stock losses*).

Members of *Eriocephalus* display anomalous secondary growth, which leads to the splitting of older plants resulting in independent daughter plants (Müller 1988). The branches can be divided into long, 'normal' branches (dolichoblasts), with leaves either opposite or alternate, and dwarf shoots (brachyblasts) containing leaf tufts. The most important characters used in the delimitation of species are: paleae of marginal female florets free or connate, capitula radiate or disciform, the indumentum of the leaves felty or sericeous and leaves opposite or alternate. Until now it was believed that the involucre consisted of two rows of involucral bracts (De Candolle 1838, *Prodromus systematis naturalis regni vegetabilis* 6; Harvey 1865; Bentham 1873, in *Genera plantarum* 2; Phillips 1926, *The genera of South African flowering plants*; Merxmüller 1967, in *Prodromus einer Flora von Südwestafrika* 139; Bremer & Humphries 1993, in *Bulletin of the Natural History Museum, London (Botany series)* 23,2; Bremer 1994). Müller (1988) conducted an intensive ontogenetic and anatomical investigation of the capitula and came to the conclusion that the involucre consists of only one row of involucral bracts and that the inner row represents the paleae of the marginal female florets. These paleae can be either free or connate.

Herman (2001, in *South African Journal of Botany* 67: 66) described septate hairs on the paleae of most of the *Eriocephalus* species and on the cypselas of two of the four *Lasiospermum* species and it seems possible that these hairs could be a generic character of both *Eriocephalus* and *Lasiospermum*.

9320000 **1. ERIOCEPHALUS**

by M.A.N. MÜLLER†, P.P.J. HERMAN* & H.H. KOLBERG**
(Literature references on p. 61)

Eriocephalus *L.*, Species plantarum, edn 1: 1310 (1753); Murray: 795 (1784); Lam.: 387 (1786); Juss.: 186 (1789); Gaertn.: 428 (1791); Moench: 590 (1794); Thunb.: 168 (1800); Curtis: t. 833 (1805); Pers.: 497 (1807); Thunb.: 724 (1823); Spreng.: 621 (1826); Cass.: 491 (1827); Spreng.: 642 (1831); Less.: 268, 269 (1832); DC.: 145 (1838); Endl.: 441 (1838); Harv.: 185 (1838); Harv.: 199, 200 (1865); Benth.: 416 (1873); E.Phillips: 660, 661 (1926); Levyns: 261 (1929); Marloth: 261 (1932); Adamson & T.M.Salter: 800 (1950); Merxm.: 58, 59 (1967); R.A.Dyer: 701, 702 (1975); M.A.N.Müller: 155 (1988); K.Bremer & Humphries: 160 (1993); K.Bremer: 473 (1994); P.P.J.Herman, Retief, M.Koekemoer & W.G.Welman: 136 (2000). Type species: *E. africanus* L.

Many-stemmed, sparsely to much-branched, erect to spreading, sometimes spinescent shrubs, rarely suffrutices, 0.25–2.0 m high and in diameter, often aromatic. *Old stems* mostly displaying anomalous secondary growth; young branches sericeous to felty, often glabrescent; sometimes with short-lived brachyblasts in leaf axils. *Leaves* mostly opposite, but sometimes alternate, densely imbricate on brachyblasts, ericoid, linear or acicular, entire or pinnatisect with 1–7 linear lobes. *Capitula* solitary on brachyblasts or in terminal umbellate racemes at ends of young shoots or brachyblasts or in racemes or spikes; heterogamous radiate or disciform, with 2–60 florets: 1–8 ray or marginal female and 1–60 functionally male disc florets. *Involucre* semiglobose, of 4–6 involucral bracts in 1 row; bracts oblong, ovate, lanceolate to obovate, slightly keeled to flattened, often with broad transparent membranous margin, pubescent or glabrous. *Receptacle* flattened, paleate. *Paleae* as long as florets or shorter, those of marginal florets totally or partially connate or entirely free from each other, hard and thick or membranous and transparent; free paleae ovate to lanceolate to linear, margins fringed, abaxially long-lanate, hairs septate. *Marginal female florets* with or without strap-shaped lamina, shorter than, as long as, or longer than furcation of style, or distinctly longer than style branches, strap-shaped to cuneate, to broadly cuneate, apex 2–4-dentate or -lobed; corolla white, cream-coloured, pink or purple, rarely golden yellow. *Style* cylindrical, furcate with 2 flattened, linear, acute branches. *Ovary* (and cypsela) oblong-linear to narrowly obovoid, slightly flattened, sometimes slightly angular, lanate or pilose. *Seed* dark brown, smooth, glabrous, oblong-ovoid, slightly flattened. *Pappus* absent. *Paleae*: those of disc florets ovate to lanceolate to linear, flattened, membranous, margins fringed to long-lanate, abaxially long-lanate. *Disc florets* functionally male with sterile ovary; corolla tubular, slightly widened, trumpet-shaped to infundibuliform, 5-lobed; lobes triangular; corolla white, cream-coloured, yellow or purple. *Style* cylindrical, unbranched, apex globose, with sweeping hairs, rarely 2-lobed. *Stamens* 5, anthers laterally fused, each with lanceolate apical appendage, ecaudate and ecalcarate, endothecial tissue polarised. *Basic chromosome number*: $x = 9$ ($2n = 18, 36, 54, 72$).

1a (1b: p. 3) Capitula radiate:
 2a Rays golden yellow, pale yellow or cream-coloured:
  3a Leaves pinnatisect, 3–7-lobed, alternate; peduncle 15 mm long or longer; disc florets 30–60 . . . . . 1. *E. pinnatus*

† Late of the National Herbarium of Namibia, Windhoek, Namibia.
* National Botanical Institute, Private Bag X101, Pretoria, 0001 South Africa.
** National Plant Genetic Resources Centre, National Botanical Research Institute, Private Bag 13184, Windhoek, Namibia.

3b Leaves mostly entire, rarely pinnatisect, 3-lobed, opposite but alternate on flowering shoots; peduncle shorter than 10 mm; disc florets 8–12 . . . . . 2. *E. macroglossus*

2b Rays white, pale to dark red-purple or white with purple tinge:

4a Paleae of marginal florets free:

5a Plants not spinescent . . . . . 18. *E. dinteri*

5b Plants spinescent:

6a Capitula sessile; Free State, Northern and Eastern Cape . . . . . 17. *E. karooicus*

6b Capitula shortly pedunculate; peduncle 2.5–4.0 mm long; endemic to Namibia . . . . . 19. *E. giessii*

4b Paleae of marginal florets partly or totally connate:

7a Capitula in terminal spike or spicate-racemose; peduncle very short, 0.3–0.5 mm long . . . . . 3. *E. capitellatus*

7b Capitula solitary, racemose, umbellate-racemose or paniculate; peduncle absent or up to 40 mm long:

8a Capitula sessile or subsessile:

9a Capitula large, 5–12 mm long; mainly solitary, rarely 2–4 in raceme, sometimes spinescent . . . . . 4. *E. eximius*

9b Capitula smaller, 3.5–4.0 mm long, umbellate-racemose or paniculate . . . . . 14b. *E. africanus* var. *paniculatus*

8b Capitula shortly to distinctly pedunculate:

10a (10b: p. 3) Leaves felty, glabrescent or felty-sericeous:

11a Rays always pale to dark red-purple . . . . . 6. *E. purpureus*

11b Rays white or sometimes pale red-purple or white with purple tinge:

12a Leaves alternate, 18–38 mm long; Northern Province . . . . . 5. *E. longifolius*

12b Leaves decussate, opposite or opposite and alternate on flowering shoots:

13a Leaves decussate or opposite:

14a Leaves decussate, glabrous except for felty axillary buds . . . . 8. *E. aromaticus*

14b Leaves opposite, felty, felty-sericeous, glabrescent:

15a Leaves sparsely felty, glabrescent; capitula 3–4 mm long; widespread (Mpumalanga, the Free State, Lesotho, the Northern, Western and Eastern Cape) . . . . . 10. *E. tenuifolius*

15b Leaves felty to felty-sericeous, glabrescent, semisucculent; capitula 4–6 mm long; plants sometimes spinescent; endemic to Namibia . . . . . 11. *E. klinghardtensis*

13b Leaves opposite, alternate on flowering shoots:

16a Leaves succulent:

17a Peduncle 10–30(–40) mm long; capitula large, 4–5 mm long; disc florets 40–45; leaves entire, rarely pinnatisect with 2 or 3 lobes; Namaqualand . . . . . 7. *E. pedicellaris*

17b Peduncle (3.9–)6.0–8.5(–12.0) mm long; capitula smaller, 3.5–4.0 mm long; disc florets (12–)16–18(–24); leaves palmatisect, 3–7-lobed or pinnatisect, 3-lobed or entire; exclusively coastal . . . . . 14a. *E. africanus* var. *africanus*

16b Leaves not succulent:

18a Leaves permanently felty-sericeous; capitula solitary or umbellate-racemose; Namaqualand (Northern Cape), Swartruggens-Roggeveld and Swartberg Mountains (Western Cape) . . . . . 12. *E. brevifolius*

18b Leaves felty, glabrescent:

19a Peduncles mostly longer than subtending leaves; capitula mostly with 7–10 disc florets; leaves entire to pinnatisect with up to 3 lobes . . . . . 9. *E. punctulatus*

19b Peduncles mostly shorter than or as long as subtending leaves; capitula mostly with 13–22 disc florets; leaves entire . . . . . 10. *E. tenuifolius*

10b (10a: p. 2) Leaves sericeous:

20a Plants spinescent . . . . . 15. *E. grandiflorus*

20b Plants not spinescent:

21a Involucral bracts almost totally membranous with narrow green central strips . . . . . 13. *E. scariosus*

21b Involucral bracts with membranous margins and broad green central strips:

22a Leaves sericeous, with a rough surface; restricted to the Langkloof Mountains (eastern border of the Western Cape and the Eastern Cape) . . . . . 16. *E. tenuipes*

22b Leaves permanently sericeous or glabrescent but then without rough surface:

23a Capitula 4–5 mm long; solitary or in umbellate racemes, with light brown long-pilose indumentum between involucral bracts and outer paleae after anthesis; leaves entire . . . . . 12. *E. brevifolius*

23b Capitula 3.5–4.0 mm long, umbellate-racemose or paniculate, with white long-pilose indumentum between involucral bracts and outer paleae after anthesis; leaves entire or lobed:

24a Leaves distinctly succulent, 3–5–7-lobed or entire, (6.0–)8.2–15.0(–34.0) × 0.8–2.5 mm; spreading shrubs, up to 4 m in diameter; branches rigid; exclusively coastal . . . . . 14a. *E. africanus* var. *africanus*

24b Leaves not or weakly succulent, mostly entire, (5–)8–17(–40) × 0.4–0.8 mm; mostly erect shrubs, 0.3–0.6 m in diameter; branches flexible; inland . . . . . 14b. *E. africanus* var. *paniculatus*

1b (1a: p. 1) Capitula disciform:

25a Paleae of marginal florets connate:

26a Leaves permanently silver-sericeous, decussate, alternate on flowering shoots; capitula usually solitary, rarely racemose; plants sometimes spinescent . . . . . 21. *E. decussatus*

26b Leaves permanently grey-felty, alternate, rarely opposite; capitula racemose or paniculate:

27a Capitula sessile to very shortly pedunculate; peduncle up to 5 mm long; disc florets (4–)7–9 . . . . . 20a. *E. racemosus* var. *racemosus*

27b Capitula distinctly pedunculate; peduncle (5–)10–15 mm long; disc florets 13–21 . . . . . 20b. *E. racemosus* var. *affinis*

25b Paleae of marginal florets free:

28a Capitula spicate, sessile . . . . . 23. *E. pauperrimus*

28b Capitula solitary, racemose, umbellate-racemose, paniculate, pedunculate, if spicate, not sessile:

29a Leaves alternate or rosulate on brachyblasts:

30a Plants mostly spinescent; capitula usually solitary, rarely in terminal racemes . . . . . 24. *E. ambiguus*

30b Plants not spinescent; capitula usually racemose or umbellate-racemose, sometimes solitary . . . . . 25. *E. luederitzianus*

29b Leaves decussate, opposite or opposite and alternate on flowering shoots:

31a Leaves sericeous or felty-sericeous:

32a Plants spinescent:

33a Capitula always solitary, sessile or peduncles up to 3.5(–5.0) mm long; shrub up to 1 m high, rigid; growing on sandy soils . . . . . 30. *E. spinescens*
33b Capitula often racemose or solitary; peduncles 2.5–12.0 mm long; shrub up to 400 mm tall, flexible; growing on shist . . . . . 31. *E. namaquensis*
32b Plants not spinescent:
34a Capitula relatively large, 4–8 mm in diameter; leaves opposite, decussate, permanently sericeous, semisucculent . . . . . 22. *E. kingesii*
34b Capitula smaller; leaves opposite, rarely alternate on flowering shoots, felty-sericeous or sericeous, glabrescent:
35a Leaves permanently felty-sericeous . . . . . 28b. *E. microphyllus* var. *pubescens*
35b Leaves sericeous, glabrescent:
36a Leaves small, 1.8–4.0 mm long; central Namaqualand (Northern Cape) . . . . . 28a. *E. microphyllus* var. *microphyllus*
36b Leaves 4–9(–14) mm long; southern Namibia and Northern Cape . . . . . 32. *E. merxmuelleri*
31b Leaves permanently felty or felty, glabrescent:
37a Capitula 4–6 mm long; leaves succulent; Worcester and Montagu Districts . . . . . 28c. *E. microphyllus* var. *carnosus*
37b Capitula shorter than 3 mm; leaves not succulent:
38a Leaves permanently long-felty; between Orange River and Botswana border (Northern Cape) . . . . . 26b. *E. ericoides* subsp. *griquensis*
38b Leaves felty, glabrescent:
39a Disc florets 10–18 . . . . . 27. *E. glandulosus*
39b Disc florets fewer than 10:
40a Leaves 0.8–1.6 mm long, decussate; capitula mostly solitary; much-branched shrubs; side branches forming an angle of 70–90° with main axis, opposite . . . . . 29. *E. microcephalus*
40b Leaves (0.75–)1.0–3.0(–5.0) mm long, opposite, decussate on brachyblasts, rarely alternate on flowering shoots; capitula spicate racemose, racemose or solitary; sparsely branched, conical or broom-like shrubs; branches tending to be vertically orientated . . . . . 26a. *E. ericoides* subsp. *ericoides*

Key to the species of *Eriocephalus* in different geographical areas of southern Africa

Namibia

1a Capitula radiate:
2a Paleae of marginal florets connate:
3a Rays golden yellow; capitula 10–12 mm long; leaves pinnatisect . . . . . 1. *E. pinnatus*
3b Rays white or pale red-purple; capitula up to 6 mm long; leaves entire, rarely dentate:
4a Leaves opposite or subopposite, felty to felty-sericeous, glabrescent; disc florets 12–15 . . . . . 11. *E. klinghardtensis*
4b Leaves alternate, densely sericeous to glabrous; disc florets 4–9 . . . . . 13. *E. scariosus*
2b Paleae of marginal florets free:
5a Plants not spinescent; involucral bracts shortly appressed sericeous . . . . . 18. *E. dinteri*
5b Plants spinescent; involucral bracts permanently long-sericeous to long-pilose . . . . . 19. *E. giessii*

1b Capitula disciform:
6a Capitula spicate, sessile . . . . . 23. *E. pauperrimus*
6b Capitula solitary, racemose, umbellate-racemose or paniculate, shortly to distinctly pedunculate:
7a Leaves alternate or rosulate on brachyblasts:
8a Capitula solitary, rarely in terminal racemes; plants spinescent . . . . . 24. *E. ambiguus*
8b Capitula racemose or umbellate-racemose, rarely solitary; plants not spinescent . . . . . 25. *E. luederitzianus*
7b Leaves opposite, decussate, rarely alternate on flowering shoots:
9a Capitula large, 4–8 mm in diameter; leaves 6–12 mm long, permanently densely sericeous, semisucculent . . . . . 22. *E. kingesii*
9b Capitula smaller, up to 5 mm long; leaves up to 9(–12) mm long, not succulent:
10a Leaves (0.75–)1.0–3.0(–5.0) mm long, initially densely felty, soon glabrescent, shiny; sparsely branched, conical or broom-like shrubs; branches tending to be vertically orientated . . . . . 26a. *E. ericoides* subsp. *ericoides*
10b Leaves 4–9(–14) mm long, felty-sericeous, sericeous to glabrescent; much-branched shrub; side branches opposite . . . . . 32. *E. merxmuelleri*

Botswana

Plants mostly spinescent; capitula usually solitary, rarely in terminal racemes . . . 24. *E. ambiguus*
Plants not spinescent; capitula usually racemose or umbellate-racemose, sometimes solitary . . . . . 25. *E. luederitzianus*

Northern Province and Mpumalanga

1a Capitula disciform; paleae of marginal florets free; leaves silver-grey sericeous . . . . . 25. *E. luederitzianus*
1b Capitula radiate; paleae of marginal florets connate; leaves felty, glabrescent:
2a Peduncle 12–17 mm long; capitula 5–6 mm long; leaves alternate, 18–38 mm long; Northern Province . . . . . 5. *E. longifolius*
2b Peduncles (3–)4–7(–10) mm long; capitula 3–4 mm long; leaves opposite, sometimes alternate on flowering shoots, 4–14(–24) mm long; Mpumalanga . . . . . 10. *E. tenuifolius*

Free State and Lesotho

1a Capitula disciform; disc florets (1–)3–5(–7); sparsely branched, conical or broom-like shrubs; side-branches tending to be vertically orientated . . 26a. *E. ericoides* subsp. *ericoides*
1b Capitula radiate; disc florets up to 35; much-branched shrubs:
2a Paleae of marginal florets free; disc florets 4–10; spinescent shrubs . . . . . 17. *E. karooicus*
2b Paleae of marginal florets connate; disc florets more than 10; plants spinescent or not:
3a Capitula 5–12 mm long, mainly solitary, rarely 2–4 in a raceme, sessile or subsessile; peduncle shorter than 0.5 mm; disc florets 26–35; leaves permanently silvery sericeous . . . . . 4. *E. eximius*
3b Capitula 3–4 mm long, in umbellate racemes; peduncle (3–)4–7(–10) mm long; disc florets 13–22; leaves sparsely felty, glabrescent . . . . . 10. *E. tenuifolius*

North-West and Northern, Western and Eastern Cape

1a Capitula radiate:
2a Rays cream-coloured to pale yellow . . . . . 2. *E. macroglossus*
2b Rays white, pale to dark red-purple or white with purple tinge:
3a Paleae of marginal florets free . . . . . 17. *E. karooicus*
3b Paleae of marginal florets partly or totally connate:
4a Capitula in terminal spike or spicate-racemose; peduncle very short, 0.3–0.5 mm long . . . . . 3. *E. capitellatus*
4b Capitula solitary, racemose, umbellate-racemose or paniculate; peduncle absent or up to 40 mm long:
5a Capitula sessile or subsessile:
6a Capitula large, 5–12 mm long, mainly solitary, rarely 2–4 in raceme; plants sometimes spinescent . . . . . 4. *E. eximius*
6b Capitula smaller, 3.5–4.0 mm long, umbellate-racemose or paniculate . . . . . 14b. *E. africanus* var. *paniculatus*
5b Capitula shortly to distinctly pedunculate:
7a Leaves felty, glabrescent or felty-sericeous:
8a Rays always pale to dark red-purple . . . . . 6. *E. purpureus*
8b Rays white or sometimes pale red-purple or white with purple tinge:
9a Leaves decussate; plants glabrous except for felty axillary buds . . . 8. *E. avonaticus*
9b Leaves opposite, alternate on flowering shoots:
10a Leaves succulent:
11a Peduncle 10–30(–40) mm long; capitula large, 4–5 mm long; disc florets 40–45; leaves entire, rarely pinnatisect with 2 or 3 lobes; Namaqualand . . . . . 7. *E. pedicellaris*
11b Peduncle (3.9–)6.0–8.5(–12.0) mm long; capitula smaller, 3.5–4.0 mm long; disc florets (12–)16–18(–24); leaves palmatisect, 3–7-lobed or pinnatisect, 3-lobed or entire; exclusively coastal . . . . . 14a. *E. africanus* var. *africanus*
10b Leaves not succulent:
12a Leaves permanently felty-sericeous; capitula solitary or umbellate-racemose; Namaqualand (Northern Cape), Swartruggens-Roggeveld and Swartberg Mountains (Western Cape) . . . . . 12. *E. brevifolius*
12b Leaves felty, glabrescent:
13a Peduncles mostly longer than subtending leaves; capitula mostly with 7–10 disc florets; leaves entire to pinnatisect with up to 3 lobes . . . . . 9. *E. punctulatus*
13b Peduncles mostly shorter than or as long as subtending leaves; capitula mostly with 13–22 disc florets; leaves entire . . . . . 10. *E. tenuifolius*
7b Leaves sericeous:
14a Plants spinescent . . . . . 15. *E. grandiflorus*
14b Plants not spinescent:
15a Involucral bracts almost totally membranous with narrow green central strips . . . . . 13. *E. scariosus*
15b Involucral bracts with membranous margins and broad central green strips:
16a Leaves sericeous, glabrescent, with a rough surface; restricted to the Langkloof Mountains (eastern border of the Western Cape and the Eastern Cape) . . . . . 16. *E. tenuipes*

16b Leaves permanently sericeous or glabrescent but then without rough surface:
17a Capitula 4–5 mm long, solitary or in umbellate racemes, with light brown long-pilose indumentum between involucral bracts and outer paleae after anthesis; leaves entire . . . . . 12. *E. brevifolius*
17b Capitula 3.5–4.0 mm long, umbellate-racemose or paniculate, with white long-pilose indumentum between involucral bracts and outer paleae after anthesis; leaves entire or lobed:
18a Leaves distinctly succulent, 3–5–7-lobed or entire, (6.0–)8.2–15.0(–34.0) × 0.8–2.5 mm; spreading shrubs, up to 4 m in diameter; branches rigid; exclusively coastal . . . . . 14a. *E. africanus* var. *africanus*
18b Leaves not or weakly succulent, mostly entire, (5–)8–17(–40) × 0.4–0.8 mm; mostly erect shrubs, 0.3–0.6 m in diameter; branches flexible; inland . . . . . 14b. *E. africanus* var. *paniculatus*

1b Capitula disciform:
19a Paleae of marginal florets connate:
20a Leaves permanently silver-sericeous, decussate, alternate on flowering shoots; capitula usually solitary, rarely racemose; plants sometimes spinescent . . . . 21. *E. decussatus*
20b Leaves permanently grey-felty, alternate, rarely opposite; capitula racemose or paniculate:
21a Capitula sessile to very shortly pedunculate; peduncle up to 5 mm long; disc florets (4–)7–9 . . . . . 20a. *E. racemosus* var. *racemosus*
21b Capitula distinctly pedunculate; peduncle (5–)10–15 mm long; disc florets 13–21 . . . . . 20b. *E. racemosus* var. *affinis*
19b Paleae of marginal florets free:
22a Capitula spicate, sessile . . . . . 23. *E. pauperrimus*
22b Capitula solitary, racemose, umbellate-racemose, paniculate; pedunculate, if spicate, not sessile:
23a Leaves alternate or rosulate on brachyblasts . . . . . 24. *E. ambiguus*
23b Leaves decussate, opposite or opposite and alternate on flowering shoots:
24a Leaves sericeous or felty-sericeous:
25a Plants spinescent:
26a Capitula always solitary, sessile or peduncles up to 3.5(–5.0) mm long; shrub up to 1 m high, rigid; growing on sandy soils . . . . . 30. *E. spinescens*
26b Capitula often racemose or solitary; peduncles 2.5–12.0 mm long; shrub up to 400 mm tall, flexible; growing on shist . . . . . 31. *E. namaquensis*
25b Plants not spinescent:
27a Leaves permanently felty-sericeous . . . . . 28b. *E. microphyllus* var. *pubescens*
27b Leaves sericeous, glabrescent:
28a Leaves small, 1.8–4.0 mm long . . . . . 28a. *E. microphyllus* var. *microphyllus*
28b Leaves 4–9(–14) mm long . . . . . 32. *E. merxmuelleri*
24b Leaves permanently felty or felty, glabrescent:
29a Capitula 4–6 mm long; leaves succulent; Worcester and Montagu Districts . . . . . 28c. *E. microphyllus* var. *carnosus*
29b Capitula shorter than 3 mm; leaves not succulent:
30a Leaves permanently long-felty; between Orange River and Botswana border (Northern Cape) . . . . . 26b. *E. ericoides* subsp. *griquensis*
30b Leaves felty, glabrescent:
31a Disc florets 10–18 . . . . . 27. *E. glandulosus*
31b Disc florets fewer than 10:

32a Leaves 0.8–1.6 mm long, decussate; capitula mostly solitary; much-branched shrubs; side branches forming an angle of 70–90° with main axis, opposite . . . . . 29. *E. microcephalus*

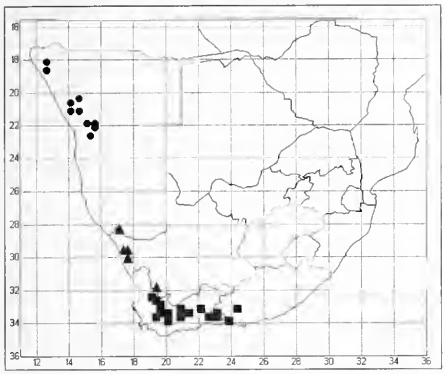
32b Leaves (0.75–)1.0–3.0(–5.0) mm long, opposite, decussate on brachyblasts, rarely alternate on flowering shoots; capitula spicate racemose, racemose or solitary; sparsely branched, conical or broom-like shrubs; branches tending to be vertically orientated . . . . . 26a. *E. ericoides* subsp. *ericoides*

1. **Eriocephalus pinnatus** *O.Hoffm.* in Botanische Jahrbücher 10: 277 (1889); Merxm.: 61 (1967). Type: Namibia, 'Hereroland, Ubib, in saxosis alt. 1000 m, *Marloth 1440*, Florif. m. Jun. 1886' (SAM, lecto.!, designated here; BOL!, GRA!, PRE!).

Erect, many-stemmed, freely branched, weakly woody shrubs or suffrutices, with annual regrowth, 350–450 mm tall, 350 mm in diameter. *Old stem* not displaying anomalous secondary growth, cylindrical, grey-yellow; young shoots golden brown, densely long-pilose mixed with dense felty indumentum, pubescence permanent; brachyblasts absent; dolichoblasts leafy, without cushion-like thickenings on stems. *Leaves* alternate, distinctly petiolate; lamina 20–75 mm long, pinnatisect, 3–7-lobed; lobes linear, up to 48 × 1.0–1.5 mm, adaxially basally flattened to concave, abaxially convex; permanently grey-golden hairy, indumentum sparsely long-pilose mixed with felty mat; petiole slightly broadened at base, temporarily retained after leaf fall, abscising later. *Capitula* heterogamous radiate, mostly racemose or in umbellate terminal racemes, rarely solitary in leaf axils, relatively large, 10–12 × 5–15 mm; peduncles cylindrical, 15–46 mm long, densely felty. *Involucral bracts* 5, 10–13 × 4–6 mm, with abaxially hairy, central, green, herbaceous strip and relatively broad, glabrous, membranous margins. *Paleae*: those of marginal florets connate into hard cylindrical sheath, 8–10 mm long, margin densely lanate, hairs septate; those of disc florets spathulate to linear, membranous, 6–8 mm long, abaxially densely lanate, indumentum intertwined with that of neighbouring paleae to form a mat, apex fringed. *Ray florets* female, 4–8, 6–10 mm long, lamina broadly cuneate, 6 × 5 mm, golden yellow, 3-lobed, abaxially glandular, longer than style branches. *Style* forked, branches flattened, linear. *Ovary* (and cypsela) oblong, lanceolate, long-pilose/lanate. *Seed* 5–6 mm long, flattish trigonous. *Disc florets* functionally male with sterile ovary, 30–60; corolla tube cylindrical to trumpet-shaped, 5-lobed, golden yellow. *Style* unbranched, cylindrical, apex globose, with sweeping hairs. *Stamens* 5, exserted at maturity. *Receptacle* after anthesis with long hairs between involucral bracts and marginal connate paleae. *Chromosome number*: $2n = 18$. *Flowering time*: March to May, sometimes continuing into August; flowering is linked to rainfall, which can be fairly sporadic in the distribution range.

This Namibian endemic occurs in the northern and central Namib, on the escarpment and mopane savanna (Giess 1971). These areas receive an average annual rainfall of less than 200 mm. Although the distribution of this species extends over a large area, plants are extremely scarce and occur fairly localised. They are usually found in groups of five to eight but sometimes of up to 20 plants. They grow mostly in stony areas or on sandstone koppies. Map 1.

E. pinnatus is unique in the genus in more ways than one. It has distinctly pinnatisect leaves, large golden yellow ray florets and is herbaceous—all characters not found in the rest of the genus. The whole plant is covered by an indumentum of dense golden grey felt interspersed with scattered long-pilose hairs. Some other species of the genus also have a felty indumentum, but it consists mostly of temporary, fine, soft, white hairs. Where a permanent felty indumentum occurs, it is more felty sericeous.



MAP 1.—● **Eriocephalus pinnatus**; ▲ **E. macroglossus**; ■ **E. capitellatus**.

Pinnatisect leaves are not uncommon in the genus *Eriocephalus*, but the degree of incision reaches its peak in this species. *E. pinnatus* has a distinct petiole and a blade with 3–7 lobes. The stems are mostly herbaceous, woody at base only. Anomalous secondary growth is absent only in this species and in *E. longifolius* (no. 5). The plant is browsed to the ground or above-ground parts die back every year and resprout after first good rains. It is the only species with golden yellow ray florets. Yellow disc florets are present *inter alia* in *E. luederitzianus* (no. 25) and *E. ambiguus* (no. 24) and pale yellow to cream-coloured rays in *E. macroglossus* (no. 2). Although each capitulum contains 4–8 female florets, very few cypselas are formed. From 10 capitula with probably 60 female florets, only two mature seeds were observed, thus a seed-set of only 3%. This possibly explains the scarcity of this species.

Common name: *kapokbossie*.

Vouchers: *Boss A107* (PRE); *Craven 1023* (WIND); *De Winter & Hardy 8230* (PRE, WIND); *Giess 7925* (WIND); *Hall 366* (BOL, NBG).

2. **Eriocephalus macroglossus** *B.Nord.* in Journal of South African Botany 30: 49–52 (1964). Type: Northern Cape, 10 km west of Springbok, *Maguire 374* (NBG, holo.!).

Vigorous, much-branched shrubs, 0.5–1.2 m high. *Old stems* and branches glabrous, displaying anomalous secondary growth, bark grey; young shoots erect, straight, shortly sericeous. *Leaves* opposite, alternate on flowering shoots, clustered on brachyblasts, sessile on cushion-like thickenings, linear, 3–20 × 1–5 mm, mostly entire, rarely pinnatisect, 3-lobed, adaxially flattened, concave towards base, abaxially convex, slightly keeled, permanently densely appressed silvery sericeous, apex acute, base slightly broadened. *Capitula* heterogamous radiate, 4–10, umbellate-racemose, terminal, 5–7 mm long; peduncles 4–8 mm long, densely sericeous. *Involucral bracts* 4, ovate, 4–5 × 2.5–4.0 mm, central part herbaceous to slightly coriaceous, apex obtuse, rarely acute, slightly fringed, margins brownish or blackish; 2 bracts narrow and slightly keeled, other 2 broader and flattened, overlapped by margins of narrow bracts. *Paleae*: those of marginal florets connate at base, broadly ovate, keeled, 6–7 mm long, coriaceous central part with membranous, fringed margins, abaxially long-lanate, hairs septate; those of outer disc florets ovate, of inner ones narrowly oblong to lanceolate, 6–7 × 1–3 mm, membranous, acute, margins and abaxially long-lanate. *Rays* 2 or 3; corolla tube 2–3 mm long, pale brown; lamina broadly oblong or oblong-cuneate, 6–7 × 4–6 mm, cream-coloured, obtuse, 3(or 4)-lobed. *Style branches* flattened, linear, acuminate, 2.5–4.0 mm long. *Ovary* (and cypsela) narrowly oblong, densely long-lanate. *Seed* 2–3 mm long, slightly flattened. *Disc florets* 8–12, functionally male with sterile ovary; corolla light brown to creamy, tubular, gradually widening distally, 3.5–4.0 mm long, 5-lobed; lobes acute, 0.5 mm long. *Style* unbranched with slight convex apex surrounded by short sweeping hairs. *Stamens* 5, 1.2–2.0 mm long, barely exserted at maturity. *Receptacle* after anthesis with dense indumentum between marginal paleae and involucral bracts, white or tawny to brown. *Chromosome number*: $2n = 36$. *Flowering time*: closely correlated with rainfall, June to August. The distri-

bution area receives winter rain, 150–300 mm annually.

E. macroglossus is currently known only from northern Namaqualand. The record from Botterkloof Pass is doubtful since the fragment was mounted with material of *E. purpureus* (*Barker 9293*, NBG). An attempt to locate it in that area proved to be unsuccessful. The plants are found ± 600 m above sea level on low mountains in stony soil. Its distribution falls into Acocks's (1975) Namaqualand Broken Veld. Map 1.

The species is distinguished by its leaves with a silvery sericeous indumentum, umbellate racemes, large capitula with distinct, large, cream-coloured (pale yellow) rays and well-developed long-lanate indumentum in the capitula. It is closely related to *E. grandiflorus* (no. 15). The latter is a much-branched, slightly spinescent shrub with pure white or pale to dark purple rays, whereas *E. macroglossus* is not spinescent and has pale yellow rays.

Common name: *kapokbos*.

Vouchers: *Acocks 19572* (BOL, NBG, PRE); *Goldblatt 2353* (NBG, PRE); *Marloth 12367b* (BOL, NBG, PRE); *Müller 3553* (WIND); *Müller 4021* (WIND).

3. **Eriocephalus capitellatus** *DC.*, Prodromus: 146 (1838); Harv.: 201 (1865). Type: Western Cape, 'Zwaanepoelspoortberg, auf steinigen, trocknen Bergrücken, 2000–3000 Fuss, August', *Drège 2144* (G-DC, holo.; G!, NBG!, P!, PRE, photo.!, SAM!).

Slender, erect, small, conical shrubs, 0.25–1.2 m high. *Old stems* grey to grey-brown, 4 mm in diameter; dolichoblasts red-brown, barely 0.5 mm in diameter, growing points green-brown. *Leaves* mostly alternate or rarely opposite, mostly palmatisect to pinnatisect, but sometimes entire, 4.0–7.5 mm long, 0.4–0.6 mm in diameter, basally adaxially slightly concave, abaxially convex, blue-green to grey-green, indumentum delicately sericeous with underlying felted layer and extending down to leaf base, those on dolichoblasts and brachyblasts of the same length; lobes linear, cylindrical to clavate, apex obtuse to slightly acute. *Capitula* heterogamous radiate, small, barely 2 mm long, in terminal spike or spicate-racemose; peduncles 0.3–0.5 mm long. *Involucral bracts* 4 or 5, oval to ovate, 1.7 × 1.0 mm, slightly keeled to flattened, with central green part and broad membranous margin, finely appressed sericeous. *Paleae*: those of marginal florets connate forming cylindrical sheath, membranous, up to 1.3 mm long, margins strongly fringed, abaxially long and densely lanate, hairs septate; those of central florets small, barely 0.6 mm long, transparent membranous, margins fringed, abaxially long-lanate. *Ray florets* 1 or 2 (or 3), up to 2.2 mm long with up to 1.2 mm long, white, strap-shaped to cuneate, 3-lobed lamina. *Style branches* strap-shaped, apex acute, up to 0.6 mm long. *Ovary* (and cypsela) oblong, flattish, trigonous, long-lanate. *Seed* 1.5–2.1 mm long, ovoid, slightly flattened. *Disc florets* 1–4(–13), functionally male with sterile ovary, up to 1.6 mm long; corolla infundibuliform, creamy white with red-purple tint, 5-lobed. *Stamens* 5. *Style* undivided, apex globose. *Receptacle* after anthesis with sparse white, long-hairy indumentum between involucral bracts and connate marginal paleae. *Chromosome number*: $2n = 18$. *Flowering and fruiting time*: April to September (winter-rainfall area), February to May (summer-rainfall area).

E. capitellatus occurs on the high mountains of the Western and Eastern Cape. It grows at an altitude of over 900 m in both winter- and summer-rainfall areas. The species never occurs in dense stands and is sparsely distributed on mountain slopes. Map 1.

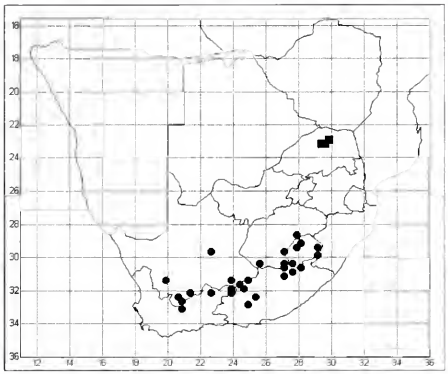
This shrub with its slender branches has blue-green to grey-green leaves, which turn darker upon drying. The pinnatisect to palmatisect leaves have extremely narrow lobes (0.4–0.6 mm). While other species of *Eriocephalus* are very attractive during flowering and/or fruiting, this species is not very con-

spicuous because its small capitula lack a conspicuous long, dense indumentum at fruiting and are hardly visible among other plants.

Common name: *kapokbos*.

Vouchers: *Barker 4526* (NBG); *Compton 5224* (BOL); *Dahlstrand 2365* (NBG, PRE); *Esterhuysen 4517* (BOL, PRE); *Marloth 9027* (NBG, PRE).

4. **Eriocephalus eximius** *DC.*, Prodromus: 147 (1838); Harv.: 203 (1865). Type: Western Cape, 'Auf steinigen, trocknen Bergrücken von Sneeuberge, 400–500 Fuss, August', *Drège 2138* (G-DC, holo.; PRE, photo.!).



MAP 2.—● **Eriocephalus eximius**; ■ **E. longifolius**.

Much-branched, rigid shrubs, 0.3–0.6 m high. *Old stems* and branches bare, sometimes spinescent, red-brown to grey-brown; young branches initially shortly hairy, soon glabrous. *Leaves* opposite, densely imbricate on brachyblasts, linear to triangular, 2–9 mm long, semi-rounded, abaxially slightly keeled, adaxially basally slightly flattened, entire, permanently silvery sericeous, silvery white, apex acute, base broadened, amplexicaul. *Capitula* heterogamous radiate, mainly solitary, terminal on brachyblasts, rarely 2–4 in terminal racemes, 5–12 × 3–8 mm, sessile or subsessile (peduncles shorter than 0.5 mm). *Involucral bracts* 4, broadly ovate, 4–6 × 3–5 mm, outer 2 slightly flattened, inner 2 more keeled, margin purple, abaxially sericeous, apex obtuse, rarely acute. *Paleae*: those of marginal florets partly or entirely connate forming a cylindrical tube, glabrous except for apex; those of disc florets narrowly oblong to lanceolate, 6–7 × ± 1 mm, membranous, acute, long-pilose on margins, ab- and adaxial surfaces glabrous. *Rays* 3 or 4; lamina broadly oblong or oblong-cuneate, 5–8 × 3–6 mm, many-veined, glandular abaxially, pale to dark red-purple or white, obtuse, 3-dentate, tubular part narrowly cylindrical, 2–3 mm long. *Style* branches flattened, linear, 2.0–3.5 mm long. *Ovary* slightly lanceolate-flattened, densely hairy. *Seed* ovoid, slightly flattened, 2–3 mm long. *Disc florets* 26–35, functionally male with sterile ovary; corolla tubular, widening in upper third, 6–8 mm long; glandular abaxially; corolla lobes acute, 0.5 mm long. *Stamens* 5, up to 4 mm long. *Style* unbranched, with slightly convex apex surrounded by short, sweeping hairs. *Receptacle* after anthesis with white, long-pilose indumentum between involucral bracts and connate marginal paleae. *Chromosome number*: $2n = 18$. *Flowering time*: correlated with rainfall, January to April in summer-rainfall areas, July to August in winter-rainfall areas.

The distribution of *E. eximius* is restricted to the high mountainous parts of the Free State, Lesotho and the Northern, Western and Eastern Cape. Its reported occurrence in the Prieska area is doubtful. In the communities where the species occurs, it is found singly or in small groups, never as the dominant component of the vegetation. Map 2.

Common name: *grootbergkapok* (Smith 1966).

Vouchers: *Ferreira F191* (PRE); *Galpin 6697* (BOL, GRA, PRE, SAM); *Hoener 1885* (PRE); *Marloth 5831* (NBG, PRE); *Thompson 2328* (NBG, PRE).

5. **Eriocephalus longifolius** *M.A.N.Müller*, sp. nov., folia 18–38 mm longa; caulis singularis sine crassificatione secundaria characteris-

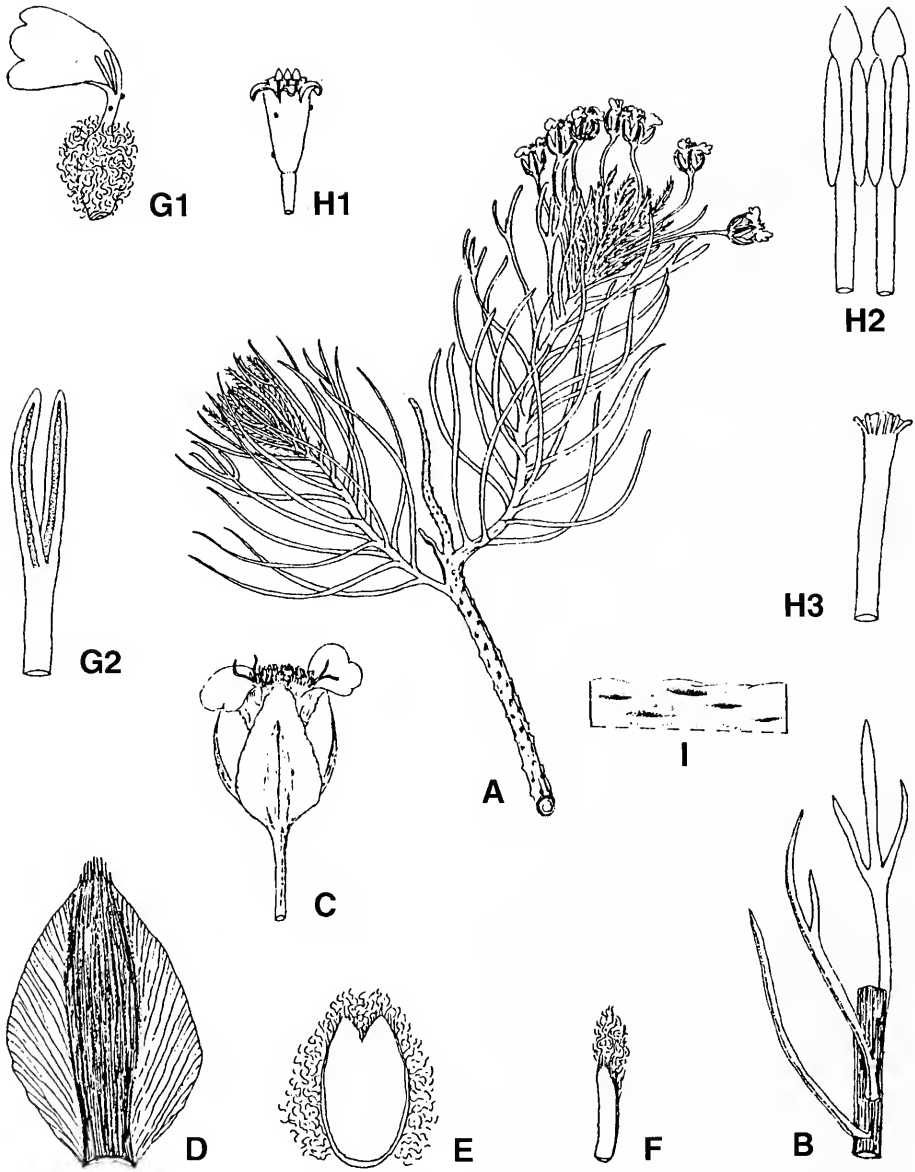


FIGURE 1.—**Eriocephalus longifolius**: A, flowering shoot with inflorescences and dried up peduncle, × 1; B, branch with leaves, × 1; C, capitulum, × 4; D, involucral bract, × 8; E, connate marginal paleae, × 4; F, central palea, × 4; G1, ray floret, × 4; G2, branched style, × 16; H1, disc floret, × 4; H2, anthers, × 16; H3, style, × 16; I, leaf surface, × 32 (*Gerstner 6099*, PRE).

tica fissuram caulis efficienti ut in speciebus ceteris *Eriocephali*.

Type: Northern Province, Soutpansberg, Farm Llewellyn, *Müller 4032* (PRE, holo.; K, WIND).

Slender, erect, sparsely branched shrubs, 0.4–1.5 m high. *Old stems* leafless, leaves only at branch tips, brown-grey to dark grey, regularly cylindrical not displaying anomalous secondary growth, growing points felty, glabrescent; young shoots brown. *Leaves* alternate, at maturity adaxially glabrescent, abaxially basally with permanent felty strip, acicular, 18–38 × 0.4–0.5 mm, mostly entire, sometimes pinnatisect with 3 lobes, semiconvex distally, abaxially flattened, main vein prominent in dried material in proximal third to half of leaf, then shallowly grooved to near apex, bright green, apex acute, base adaxially flattened, not broadened; young leaves felty/cobwebby, initially adhering to each other, later free. *Capitula* heterogamous radiate, umbellate-racemose, 5–6 × 6 mm; peduncles felty, 12–17 mm long. *Involucral bracts* 5, broadly ovate with narrow, green, central, herbaceous part and broad, membranous margin, 4.5–5.2 × 2.2–3.8 mm, felty to glabrous, apex slightly fringed. *Paleae*: those of marginal florets 4.2–4.6 mm long, totally connate into cylindrical sheath with 3 or 4 lobes, fringed, long-lanate abaxially, hairs septate; those of outer disc florets lanceolate, keeled, central ones oblong to linear, flattened, membranous, 3.5–6.0 × 1.2–0.5 mm, apices long-fringed, abaxially long-lanate. *Ray florets* 2 or 3, female, 6–7 mm long; corolla white with broad cuneate to broad strap-shaped lamina, distinct, 3-lobed or obtusely 3-dentate, 2.3 × 3.6 mm. *Style branches* linear, flattened, 0.7–1.4 mm long. *Ovary* (and cypsela) oblong to obovoid, slightly flattish, trigonous, long-lanate. *Seed* lanceolate to narrowly ovoid, 3–4 mm long. *Disc florets* 10–18, functionally male with sterile ovary; corolla white to creamy to pale purple, trumpet-shaped, 3.6–4.8 mm long, 5-lobed. *Stamens* 5. *Style* undivided, apex truncate with short, sweeping hairs. *Receptacle* after anthesis with dense, white, long-hairy indumentum between involucral bracts and connate, marginal paleae. *Chromosome number*: $2n = 18$. *Flowering time*: correlated with rainfall, December to March. Figure 1.

To date, *E. longifolius* has been collected only on the Soutpansberg and Waterberg in the Northern Province. It grows only on mountain tops, above 1 700 m, and forms part of Acocks's (1975) Sour Bushveld. It probably also occurs on high mountains in Mpumalanga and North-West. Although fairly rare, the species is not endangered. Very few young plants were seen. Most individuals in each community (± 15) were already a few years old. The percentage female florets producing fruit is low: less than 10% (86 capitula, with two or three female florets each, produced only 19 seeds). Map 2.

E. longifolius is distinguished from all other species by the long, acicular, alternate leaves and the sparsely branched, regularly thickened stems. In nature, branching occurs only when an inflorescence is formed. The umbellate racemes develop terminally on stems and side branches develop below this. If the upper part of the stem is damaged, the stem resprouts from the base.

Common name: *kapokbos*.

Vouchers: *Gerstner 6099* (PRE); *Meeuse 10241* (LISC, PRE); *Verdoorn 2232* (PRE).

6. **Eriocephalus purpureus** *Burch.*, Travels in the interior of southern Africa: 232 (1822); G.Don: 364 (1830). Type: Western Cape, Sutherland Division: on the Wind Heuvel-Koedoes Mountains, 22 July 1811, *Burchell 1281* (Goudbloem Heights) (K, holo.!).

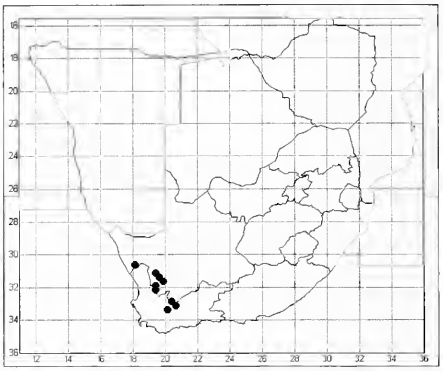
E. xerophilus Schltr.: 206 (1899). Type: Northern Cape, 'In regione carrooidea: In collibus aridis, carroideis, prope Matjiesrivier, in ditione Clanwilliam, alt. c. 2500 ped., 4 Sept. 1896', *Schlechter 8842* (B, holo.!; BOL!, GRA!, PRE!, SAM!, Z!).

Slender, erect, much-branched shrubs, 0.3–0.6 m high. *Old stems* dark grey, displaying anomalous secondary growth; young shoots yellow-brown, sparsely felty, glabrescent; older branches brown to brown-grey, striped; brachyblasts

short-lived, up to 5 mm long. *Leaves* opposite, but alternate on flowering shoots, decussate on brachyblasts, densely imbricate, entire, linear, 2–6 mm long, adaxially slightly flattened, concave towards base, abaxially convex, keeled distally, bright green, initially sparsely felty, glabrescent, shiny because of glands in cavities on leaves, apex acute, base semi-amplexicaul. *Capitula* heterogamous radiate, 4–6 mm long, in terminal umbellate-racemes as well as solitary on brachyblasts; peduncles slender, sparsely felty, 6–12 mm long. *Involucral bracts* 5, broadly ovate to ovate-lanceolate, 4 × 2.5 mm, abaxially glabrous, with glands in cavities on surface, central triangular part herbaceous, margin broad, membranous, apex obtuse to acute. *Paleae*: those of marginal florets connate with only apex free, hard, coriaceous, margins fringed, base abaxially densely lanate, hairs septate, glabrous distally; those of disc florets lanceolate to narrowly oblong, 3.0–4.5 mm long, flattened, margins and abaxially long-lanate. *Ray florets* 2 or 3, female; corolla 6–8 mm long with strap-shaped to cuneate, 3-lobed, 4 mm long lamina, pale to dark purple, very conspicuous because of size, abaxially glandular. *Style branches* flattened, 1.2–2.0 mm long. *Ovary* oblong to narrowly obovoid, long-pilose. *Seed* oblanceolate, 2–4 mm long. *Disc florets* 5–20, functionally male with sterile ovary; corolla trumpet-shaped, 5–7 mm long, 5-lobed, dark red-purple. *Style* unbranched, apex truncate, globose, with sweeping hairs. *Stamens* 5, exserted at maturity. *Receptacle* after anthesis with long hairs between involucral bracts and connate, marginal paleae. *Chromosome number*: $2n = 36$. *Flowering time*: correlated with rainfall, June to September with a peak from July to August.

The distribution of *E. purpureus* is restricted to the winter-rainfall area and extends from Locricsfontein southwards to Matjiesfontein in mountainous regions above 300 m. The eastern boundary of its distribution overlaps with the western distribution of *E. ericoides* (no. 26). Map 3.

E. purpureus has distinct, large, pale to dark purple, strap-shaped ray florets, which easily distinguish it from related species. However, sterile and fruiting material presents problems in identification as it closely resembles *E. ericoides* (no. 26). If no remains of the ray florets are present, the two species can be distinguished by the connate, marginal paleae forming a hard, cylindrical, coriaceous sheath in *E. purpureus* as opposed to the short, yellow, marginal female florets and free, marginal paleae in *E. ericiodes*.



MAP 3.—**Eriocephalus purpureus.**

Although *E. purpureus* had already been described in 1822 by Burchell from material collected in the Windheuvel-Koedoesberg, it was later mentioned by Don (1830) only as a plant known to British gardeners. De Candolle (1838) and Harvey (1865) did not include it in their studies on the genus *Eriocephalus*, although *E. decussatus* (no. 21) and *E. spinescens* (no. 30), two species described by Burchell (1822) in the same publication, were indeed included. Only after the publication of *E. xerophilus* by Schlechter (1899), was this species noted and all herbarium material included under this name.

Leipoldt 760 (BOL, SAM) mentioned that this species was a very valuable fodder plant. This can be confirmed by signs of heavy browsing visible on some herbarium specimens. Common name: *kapokbos*.

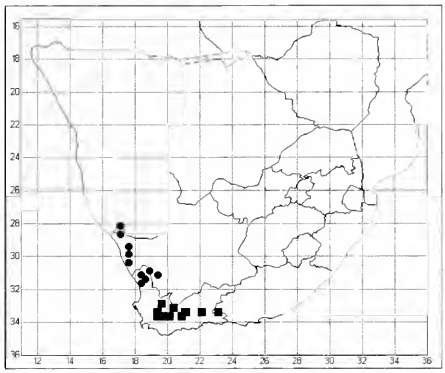
Vouchers: *Acocks 18863* (PRE); *Compton 3236* (BOL, NBG); *Goldblatt 2119* (NBG, PRE); *Middelmost 1604* (NBG); *Salter 7346* (BOL).

7. **Eriocephalus pedicellaris** *DC.*, Prodromus: 146 (1838). Type: Western Cape, 'Klein Namaqualand, bei Mierenkasteel, karrooartige Höhe, 1000–2000 Fuss, August', *Drège 6733* (G-DC, holo.; G!, NBG!, P!, PRE, photo.!, SAM!).

E. pteronioides DC.: 146 (1838). Type: Western Cape, (Olifants River) 'Ebenezar, auf steinigen trocknen (karrooartigen) Hügeln, unter 500 Fuss, Nov.', *Drège 6035* (G-DC, holo.; P!, PRE, photo.!).

E. punctulatus DC. var. *pedicellaris* (DC.) Harv.: 201 (1865). Type: as for *E. pedicellaris* DC.

Many-stemmed, slender, erect shrubs, 0.4–0.9 m high. *Stems* brittle; old stems deeply grooved basally, displaying anomalous secondary growth; young shoots with conspicuous purple-brown stems, glabrous; older branches with yellow-brown to grey to dark grey bark, smooth to shallowly grooved; brachyblasts 5 mm long, short-lived. *Leaves* mostly opposite to subopposite, scattered on young shoots, alternate on flowering shoots, sessile on cushion-like thickening on stem, blue-green, oblong-lanceolate to linear, 12–30 × 0.5–2.0 mm, those on brachyblasts slightly shorter than those on young shoots, entire, rarely pinnatisect with 2 or 3 lobes apically, succulent, distal part almost terete, adaxially proximally flattened to concave, abaxially convex, surface with cavities, glandular, glands in cavities, apex obtuse to slightly acute; young leaves sparsely felty, glabrescent. *Capitula* heterogamous radiate, relatively large, 4–5 × 5–8 mm, in terminal racemes or umbels, never solitary on brachyblasts or axillary; peduncles 10–30(–40) mm long, slender, red-brown to purple-brown, sparsely appressed pilose to glabrous. *Involucral bracts* 5, ovate, with triangular, central, brown, herbaceous part with white to pale brown membranous margin, apex fringed. *Paleae*: those of marginal florets connate with



MAP 4.—● **Eriocephalus pedicellaris**; ■ **E. aromaticus**.

distinct septa indicating the different paleae, 5 mm long, abaxially densely lanate, hairs septate, adaxially smooth, apex fringed; those of disc florets 5 × 1.5 mm, oblong, membranous, apex long-fringed. *Ray florets* 2 or 3, female; corolla white; tube 4–5 mm long, strap-shaped part 3 × 6 mm, broadly cuneate, 3-lobed, much longer than style branches. *Style branches* strap-shaped, flattened, apices acute. *Ovary* oblong to obovoid, slightly flattened. *Seed* flattish, trigonous, smooth, 2–4 mm long. *Disc florets* 30–45, functionally male with sterile ovary, infundibuliform, 5 mm long, red-purple, 5-lobed. *Stamens* 5, exserted at maturity. *Style* unbranched, truncate, with sweeping hairs. *Receptacle* after anthesis with long hairs between involucral bracts and connate marginal paleae. *Chromosome number*: $2n = 72$. *Flowering time*: closely corellated with rainfall, which extends from June to October with a peak from July to September.

This species grows mainly on sandy soils and rocky slopes with good drainage. It is restricted to the winter-rainfall area with an average of less than 200 mm per anum. The distribution extends from the Richtersveld to Nieuwoudtville along the west coast. Plants occur mostly singly or sparsely distributed and rarely form dense homogenous stands. Map 4.

Few herbarium specimens could be traced under the name *E. pedicellaris*. Most material was found under *E. punctulatus* (no. 9) or misidentified as *E. africanus* (no. 14). Although closely related to *E. punctulatus*, *E. pedicellaris* can be distinguished from that species by the long, blue-green, succulent leaves which turn noticeably darker upon drying, the relatively large capitula, 4–5 × 5–8 mm, on long peduncles, 10–30(–40) mm, and by the brittle stems. *E. pedicellaris* grows mostly at 300–600 m altitude, but often below 300 m, in contrast to *E. punctulatus* which grows at and above 600 m.

E. pedicellaris is a very palatable shrub, which is heavily and selectively browsed wherever it occurs, possibly because of its succulent leaves and soft shoots, in contrast to *E. punctulatus*, which is hardly browsed. Common name: *kapokbos*.

Vouchers: *Barker 7414* (BOL, NBG); *Müller 3576* (WIND); *Oliver, Tölken & Venter 616* (PRE); *Van Breda 4081* (PRE); *Van Jaarsveld 6234* (NBG).

8. **Eriocephalus aromaticus** *C.A.Sm.* in Kew Bulletin 1931: 100, 101 (1931). Type: Western Cape, Laingsburg Division: slopes of the Witteberg, 975 m, October, *Compton 2681* (K, holo.!; BOL!).

Erect, much-branched shrubs up to 0.6 m high. *Old stems* and branches dark brown, longitudinally grooved, displaying anomalous secondary growth, glabrous, rigid; young shoots red-brown, thin, straight, internodes relatively long, initially felty, glabrescent except for dense, white felt in leaf axils. *Leaves* decussate, oblong to linear-oblong, 2–4(–9) × 0.3–0.6 mm, entire, basally broadly amplexicaul, adaxially basally concave, slightly flattened towards apex, abaxially convex, semiterete, whole surface with cavities, sometimes with glands in cavities, shiny, glabrous except for felty, axillary buds, apex mucronate; leaves of dolichoblasts and brachyblasts of same size and shape, those of brachyblasts imbricate. *Capitula* heterogamous radiate, racemose or umbellate-racemose, small, 4.0 × 3.5 mm; peduncles 3–5(–12) mm long, glabrous to sparsely shortly pilose. *Involucral bracts* 4, 2 slightly keeled, 2 ovate, 2.5 × 2 mm, other 2 broadly ovate, 2.5 × 3.5 mm, with central part green to purple with broad membranous margin, abaxially glandular, apex slightly fringed. *Paleae*: those of ray florets connate to ± one third of their length, coriaceous, rigid, margins fringed, abaxially longlanate, hairs septate, adaxially glabrous, shiny; those of disc florets oblong-linear, 2 × 0.5 mm, membranous, transparent, weakly keeled to flattened, margins fringed, abaxially longlanate, adaxially smooth. *Ray florets* 2 or 3, female; corolla white, up to 6.5 mm long; lamina up to 3 mm long, broadly cuneate, 3-lobed, with or without glands. *Style branches* at most 1 mm long, tapering (acuminate), only apices exserted. *Ovary* (and cypsela) oblong-ovoid. *Seed* slightly flattened, obovoid, up to 3 × 1 mm. *Disc florets* 13–18, functionally male with sterile ovary, 3–4 mm long; corolla infundibuliform, distal widened part red-purple, 5-lobed, lower part yellow. *Stamens* 5, ± as long as corolla tube or exserted only up to 0.5 mm. *Style* truncate. *Receptacle* after anthesis densely long-sericeous between involucral bracts and connate marginal paleae. *Chromosome number*: $2n = 18$. *Flowering time*: (May to) June to October (to November), correlated with rainfall which varies in this area from 350–600 mm per annum.

E. aromaticus is restricted to the mountains of the winter-rainfall area of the Western and Eastern Cape, higher than 900 m above sea level. It never occurs in dense stands, but is rather sparsely distributed. The distribution of *E. aromaticus* and *E. punctulatus* (no. 9), a related species, overlaps only in the Witteberg and Klein Roggeveld Mountains. Map 4.

In the past, *E. aromaticus* was often confused with *E. punctulatus*, a closely related species. It can be easily distinguished from that species by the consistently opposite leaves, even on flowering shoots. On brachyblasts the leaves are distinctly decussate. The otherwise

glabrous leaves have a felty floccose indumentum in the axil. In his original description, Smith (1931) mentioned that the paleae of the marginal florets were free. Although they look free superficially, a thorough study showed that they are connate from the base for about one third of their length.

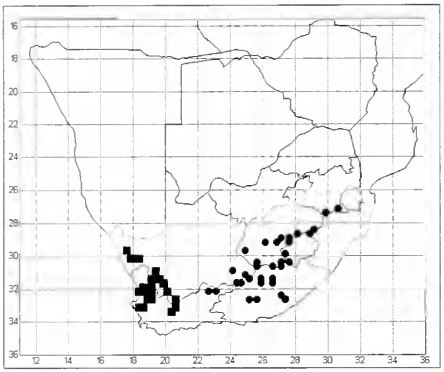
Common name: *kapokbos*.

Vouchers: *Acocks 18420* (PRE); *Compton 18405* (BOL, NBG); *Hafström & Acocks 1556* (PRE); *Hutchinson 450* (BOL, GRA, PRE); *Marloth 14160* (PRE).

9. **Eriocephalus punctulatus** *DC.*, Prodromus: 146 (1838); Harv.: 201 (1865). Type: Northern Cape, 'Namaqualand: Vorberge der Camisberge, bei Kasparskloof, Elleboogfontein und Geelbekskraal, 300–400 Fuss, August', *Drège 2734* (G-DC, holo.; PRE & WIND, photo.!).

Slender, erect, sometimes spreading shrubs, 0.5–1.5 m high. *Old stems* dark grey, displaying anomalous secondary growth; young shoots green to dark red to golden brown, dense felty indumentum with glands in cavities on leaves; older branches brown to brown-grey to dark grey; branches thin with relatively long internodes; brachyblasts short-lived, up to 20 mm long. *Leaves* mostly opposite, but alternate on flowering shoots, linear to almost clavate, (2–)4–7(–28) × 0.3–0.5 mm, entire to pinnatisect with up to 3 lobes, adaxially flattened, but concave towards base, abaxially convex, bright green, initially with felty indumentum, glabrescent, apex obtuse to acute, base semi-amplexicaul. *Capitula* heterogamous radiate, umbellate-racemose, terminal on young shoots and brachyblasts, 3–4 × 3 mm; peduncles (3–)5–8(–16) mm long, felty to glabrous, thin (0.2 mm in diameter), longer than subtending leaves. *Involucral bracts* 4 or 5, 2.8 × 1.7 mm, outer slightly keeled, inner more flattened, with green, herbaceous, central part and broad membranous margin. *Paleae*: those of marginal florets connate into a cylindrical sheath, 3 mm long, thickly coriaceous, margins fringed, abaxially densely lanate, hairs septate, adaxially glabrous; those of disc florets oblong to linear, 2.6 × 0.7–2.6 × 0.3 mm, margins fringed, abaxially densely lanate, adaxially glabrous, membranous. *Ray florets* 1–3, female, 3.9–4.2 mm long with cuneate lamina 1.5–1.9 mm long, mostly white or occasionally pale red-purple. *Style branches* flattened, apices acute. *Ovary* oblong, slightly flattened, with dense, lanate indumentum. *Seed* flattish, trigonous, obovoid, 1.3–2.1 mm long. *Disc florets* usually 7–10, functionally male with sterile ovary; corolla red-purple, 2.4–3.3 mm long; corolla tube trumpet-shaped to infundibuliform. *Style* not branched, apex globose, with sweeping hairs. *Stamens* 5, exserted at maturity. *Receptacle* after anthesis with long hairs between involucral bracts and marginal, connate paleae. *Chromosome number*: $2n = 36$. *Flowering time*: correlated with rainfall, May to October with a peak from July to September.

The distribution of *E. punctulatus* extends from Springbok in the Northern Cape along the western parts of the Western Cape (the Roggeveld and Witteberg Mountains) where it overlaps with the related *E. aromaticus* (no. 8). It is found mostly in high-lying mountainous localities, above 300 m altitude. Although the distribution is limited to the winter-rainfall area, there are indications that the amount of rain influences the growth form. In veld types such as Namaqualand Broken Veld, Succulent Karoo and Mountain Renosterbosveld (Acocks 1975) with an annual rainfall of 200 mm and less, slender, rigid, erect shrubs with relatively short leaves (2–7 mm long) and often shiny, red stems are found. In veld types with an annual rainfall of more than 200 mm, for instance Fynbos and Coastal Renosterbosveld (Acocks 1975), a strongly branched, slightly spreading, open, bushy shrub with relatively long leaves (4–28 mm long) and long, drooping shoots is found. However, these two forms cannot be separated from each other as there is no clear-cut transition. Map 5.



MAP 5.—■ **Eriocephalus punctulatus**; ● **E. tenuifolius**.

In *E. punctulatus* the subtending leaves are shorter than the peduncle and therefore the umbellate racemes are very obvious. In contrast, in the closely related *E. tenuifolius* (no. 10) the subtending leaves are as long as or longer than the peduncles, which are thus hidden among subtending leaves. *E. punctulatus* has mostly 7–10 disc florets while *E. tenuifolius* has mostly 13–22.

Common name: *kapokbos*.

Vouchers: *Goldblatt 2404* (NBG); *Leistner 336* (PRE); *Müller 4072* (WIND); *Oliver 4415* (NBG, PRE); *Verdoorn 1896* (BOL, PRE).

10. **Eriocephalus tenuifolius** *DC.*, Prodromus: 146 (1838). Type: Eastern Cape, 'Sneeuwbergen, auf steinigen Hügeln und an trocknen Abhängen, 4000–5000 Fuss, September', *Drège 2139* (G-DC, holo.; G!, NBG!, P!, PRE, photo.!).

E. punctulatus DC. var. *tenuifolius* (DC.) Harv.: 201 (1865). Type: as above.

Rigid, erect, many-stemmed shrubs, 0.3–1.3 m high. *Old stems* displaying anomalous secondary growth, dark grey to brown-grey; young shoots rigid, firm, chestnut-brown, sparsely felty hairy, glabrescent, densely leafy. *Leaves* opposite, but sometimes alternate on flowering shoots, linear, 4–14(–24) × 0.4–0.6 mm, entire, adaxially flattened, concave towards base, abaxially convex, keeled towards apex, pale green to yellow-green, greenish shiny white, glandular, glands in cavities on leaf surface, smooth, apex acute, base semi-amplexicaul; opposite leaves basally connate; young leaves sparsely felty, glabrescent. *Capitula* heterogamous radiate, in umbellate racemes, terminal on dolichoblasts or on brachyblasts, 3–4 mm long; peduncles as long as or shorter than subtending leaves, rarely longer, (3–)4–7(–10) mm long, felty to glabrous. *Involucral bracts* 5 (rarely 4), 3.2 × 2.2 mm, central triangular to spathulate part green, herbaceous with broad, membranous margin, keeled to slightly flattened, sparsely felty to glabrous, central part containing cavities with glands. *Paleae*: those of marginal florets connate into cylindrical sheath, 4 mm long, thickly coriaceous, abaxially lanate, hairs septate; those of disc florets lanceolate, 4 × 1.3–1 × 0.3 mm, membranous, margins fringed, abaxially densely lanate. *Ray florets* 2 or 3, female, 3.5–5.5 mm long; lamina cuneate, 3- or 4-lobed, 3.5–5.5 mm long, white, sometimes with red-purple tinge. *Style* branched; branches flattened, linear, up to 1.8 mm long, apex acute. *Ovary* oblong, slightly flattened, long-lanate. *Seed* oblong, 2–3 mm long. *Disc florets* usually 13–22, functionally male with sterile ovary, 3.0–4.5 mm long; corolla red-purple, trumpet-shaped, 5-lobed. *Style* not branched, apex globose, with sweeping hairs. *Stamens* 5, slightly exserted at maturity. *Receptacle* after anthesis with dense, white, long-pilose indumentum between involucral bracts and connate marginal paleae. *Chromosome number*: unknown. *Flowering time*: closely correlated with rainfall, occurring from January to almost October, with peaks in January to April in summer-rainfall area and July to September in winter-rainfall area.

This species is part of the vegetation of the mountains and hills of southern Mpumalanga, the Free State, Lesotho and the Northern, Western and Eastern Cape. Most of the distribution area receives summer rain. Map 5.

Although *E. tenuifolius* is closely related to *E. punctulatus* (no. 9), the two species can be separated by their leaf size, peduncle length, the length of the subtending leaves of the peduncles and their distribution. A further distinguishing character is the fact that *E. punctulatus* is hardly browsed in contrast to *E. tenuifolius*, which is heavily browsed (Smith 1966).

In the past, the leaves were used as substitute for buchu by the Griquas, hence the common name *boegoekapok* (Smith 1966). Another common name is *klein-bergkapokbossie*.

Vouchers: *Dieterlen 435* (GRA, PRE, SAM); *Muir 7764* (PRE); *Müller 4081* (WIND); *Smith 4478* (BOL, PRE); *Thode 7943* (NBG).

11. **Eriocephalus klinghardtensis** *M.A.N.Müller*, sp. nov., *E. africani* L. et *E. scariosi* DC. affinis sed foliis semper oppositis vel subopppositis et dense velutinis differt.

Type: Namibia, Klinghardt Mountains in Diamond Area No. 1, *Müller 695* (WIND, holo.; M, PRE).

Many-stemmed, much-branched, bushy, aromatic shrubs, 0.35–0.6 m high, 0.5 m in diameter. *Old stems* grey-black to almost black, displaying anomalous secondary growth; young shoots yellow-brown to brown-purple, densely felty; older shoots glabrescent, brown to grey-brown to grey-black, sometimes spinescent. *Leaves* opposite to subopposite, even on flowering shoots, sessile on cushion-like permanent thickening on stem, linear to clavate, semisucculent, 5–10(–17) × 0.7–1.2 mm, entire, by exception dentate with at most 2 teeth, silvery grey, adaxially flattened, slightly concave towards base, abaxially convex or semiterete, densely felty to felty sericeous, apex obtuse, base hardly broader than rest of leaf; older leaves glabrescent but never totally glabrous; leaves on brachyblasts densely imbricate without distinct decussate arrangement as in rest of genus. *Capitula* heterogamous radiate, mainly in terminal, umbellate racemes, rarely racemose, on dolichoblasts, 4–6 mm long; peduncles 7–10 mm long, permanently felty. *Involucral bracts* 4, 2 strongly keeled and 2 slightly flattened, lanceolate to ovate to obovate, 3.2–3.6 × 1.5–3.0 mm, with central, green, herbaceous strip and relatively broad, purple to light brown to transparent, membranous margin, abaxially permanently felty sericeous, sometimes glabrescent. *Paleae*: those of marginal florets connate into cylindrical, coriaceous sheath, up to 4 mm long, margins and abaxially long-lanate, hairs septate; those of central florets lanceolate to spathulate, 3.0–3.5 mm long, membranous, apices fringed, abaxially long-lanate. *Ray florets* 2 or 3, female, 3 mm long; corolla white, lamina broadly cuneate, 2.0–2.5 × 3–4 mm, 3-lobed, glandular below. *Style branches* up to 1.5 mm long, flattened, linear, apex acute. *Ovary* (and cypsela) oblong, long-lanate. *Seed* obovoid, 1.5–2.2 mm long. *Disc florets* 12–15, functionally male with sterile ovary, 3.6–4.0 mm long; corolla tubular, widening distally, 5-lobed, basal part creamy white, distal part red-purple, abaxially glandular. *Style* cylindrical, apex globose, with sweeping hairs. *Stamens* 5, exserted at maturity. *Receptacle* after anthesis with dense, white, long-lanate indumentum between involucral bracts and connate marginal paleae. *Flowering time*: correlated with winter rainfall, with a peak from June to August. Figure 2.

E. klinghardtensis is restricted to the Klinghardt Mountains, an isolated mountain range within the Desert and Succulent Steppe (Giess 1971) of Namibia. This region receives an average annual winter rainfall of less than 100 mm, supplemented by fog from the ocean at night. Although restricted in distribution, this sometimes weakly spinescent shrub is relatively common and grows in association with *E. giessii* (no. 19). Map 6.

E. klinghardtensis is closely related to *E. africanus* (no. 14) and *E. scariosus* (no. 13) from which it can be distinguished by the consistently opposite leaves covered with a dense, felty indumentum.

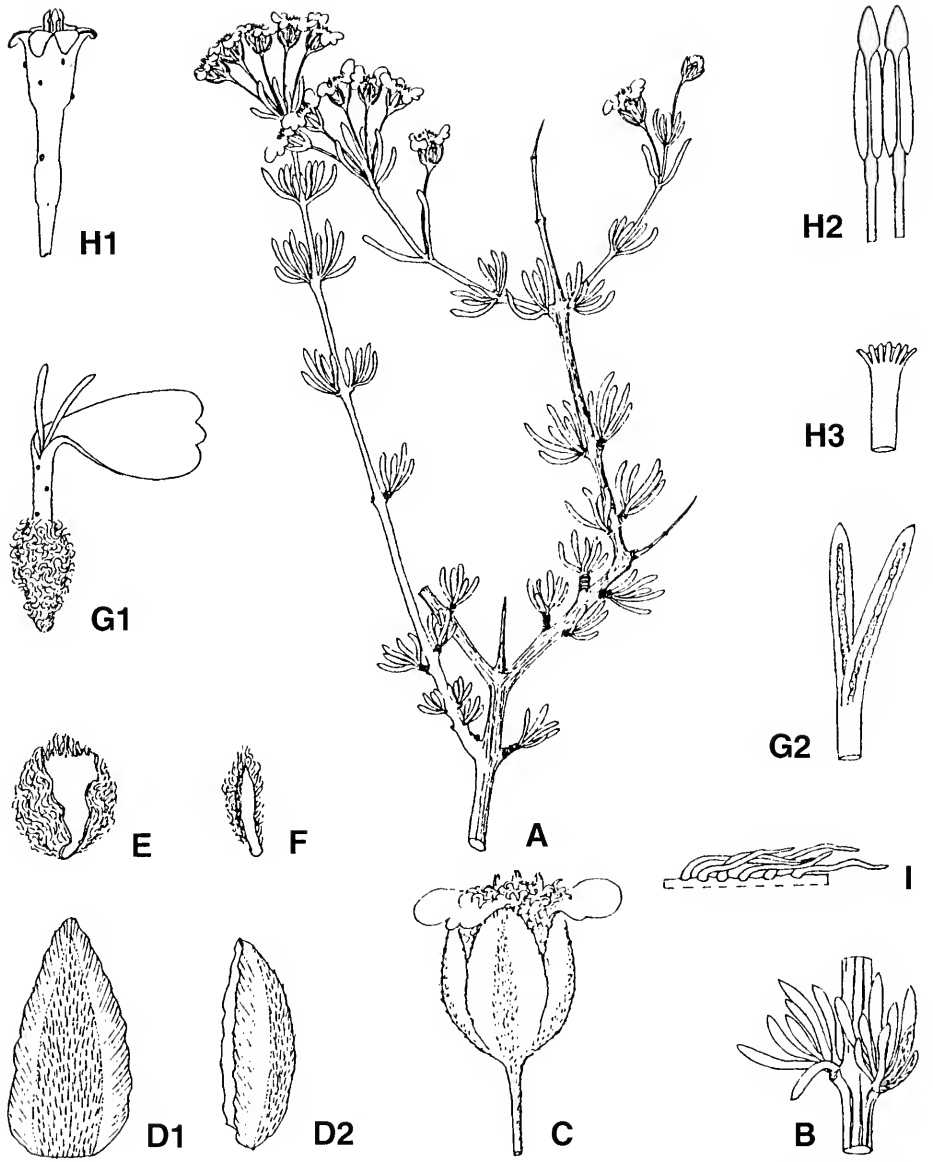
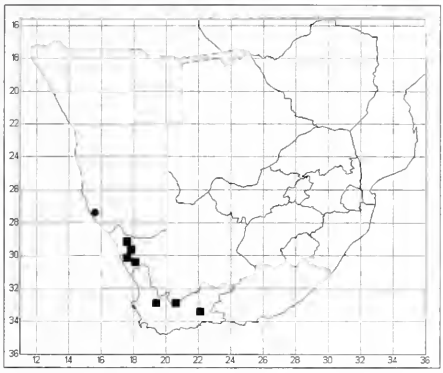


FIGURE 2.—**Eriocephalus klinghardtensis**: A, flowering shoot with infloreseenees, × 1; B, braneh with leaves, × 2; C, eapitulum, × 6; D1, D2 involueral braets, × 10; E, eonnate marginal paleae, × 4; F, eentral palea, × 4; G1, ray floret, × 8; G2, branehed style, × 16; H1, dise floret, × 8; H2, anthers, × 16; H3, style, × 16; I, indumentum, × 32 (*Müller 695*, WIND).



MAP 6.—● **Eriocephalus klinghardtensis**; ■ **E. brevifolius.**

Common name: *kapokbos*.

Vouchers: *Dinter 3935* (BOL, SAM, Z); *Merxmüller & Giess 32159* (M, WIND); *Müller 3371* (WIND).

12. **Eriocephalus brevifolius** *(DC.) M.A.N.Müller*, comb. et stat. nov.

E. punctulatus DC. var. *brevifolius* DC., Prodromus: 146 (1838). Type: Northern Cape: Namaqualand, Modderfonteinsberg, Kamiesberge, *Drège 6037* (G-DC, holo.; PRE, photo.!, SAM!).

Erect conical shrubs up to 1.2 m high. *Old stems* grey-brown to grey-black, displaying anomalous secondary growth, glabrous; young shoots grey, felty to shortly sericeous. *Leaves* opposite except flowering shoots where they are sometimes alternate, entire, linear, clavate, 3.0–4.5(–15.0) × 0.8–1.2 mm, with felty to shortly sericeous, permanent grey-green indumentum; long leaves on dolichoblasts slightly falcate to the inside, apex obtuse; short leaves on brachyblasts decussate, imbricate, ± naviculate. *Capitula* heterogamous radiate, solitary on brachyblasts or in umbellate racemes, terminally on dolichoblasts and brachyblasts, 4–5 mm long; peduncles 5–10(–20) mm long, permanently felty. *Involucral bracts* 5, broadly lanceolate to ovate, flattened, 3.0–3.5 × 1.3–2.0 mm, central part triangular, green with broad, membranous, straw-coloured to red-purple margin, abaxially appressed, shortly sericeous. *Paleae*: those of marginal florets partly connate, forming cylindrical sheath with free lobes, sheath abaxially long-lanate, hairs septate, adaxially glabrous, 4–5 mm long; those of disc florets narrowly lanceolate, flattened, 2.2–5.0 × 0.1–0.3 mm, transparent, membranous, apices fringed, only abaxially long-lanate. *Ray florets* 2 or 3, female, 3.0–3.5 mm long, with conspicuous 2.6–3.2 mm long, white lamina. *Ovary* (and cypsela) oblong, flattish, trigonous, densely long-lanate. *Seed* obovoid, slightly flattened, 1.3–2.1 mm long. *Disc florets* (7–)10–14(–16), functionally male with sterile ovary, 4.0–4.5 mm long; corolla red-purple, trumpet-shaped, 5-lobed, 4.0–5.5 mm long. *Stamens* 5, ± as long as corolla tube, exserted 0.5 mm at most. *Style* truncate, rarely with sweeping hairs. *Receptacle* after anthesis with dense, brown, long-pilose indumentum between involucral bracts and connate marginal paleae. *Chromosome number*: $2n = 54$. *Flowering time*: correlated with the rainy season, reaching a peak from July to September.

E. brevifolius is one of the more poorly collected species and initially all the known material came from Namaqualand. Its occurrence in the Swartruggens-Roggeveld and Swartberg Mountains was subsequently established and it is possible that it has an even wider distribution. It occurs at altitudes above 900 m, mainly in the winter-rainfall area. Map 6.

Although related to *E. africanus* var. *paniculatus* (no. 14b), it can be distinguished from that taxon by the dense, felty, sericeous indumentum of the leaves resulting in a grey-green appearance, as opposed to the silvery white appearance of *E. africanus* var. *paniculatus*. The capitula have a light brown, long-pilose indumentum in contrast to the white, long-pilose indumentum of *E. africanus* var. *paniculatus*. *E. africanus* var. *paniculatus* is hardly or not browsed, while *E. brevifolius* is readily browsed where it occurs.

The permanent short-sericeous indumentum of the peduncles together with the felty sericeous indumentum giving the leaves a grey-green colour, shows a close relationship with *E. africanus* var. *paniculatus*, *E. capitellatus* (no. 3), *E. scariosus* (no. 13) and *E. klinghardtensis* (no. 11). *E. punctulatus* (no. 9), on the other hand, has a sparse felty indumentum, glabrescent with smooth, shiny leaves and numerous multicellular glands in cavities on the leaf surface. The distinct large capitula of *E. brevifolius* (up to 3.5 mm long) with (7–)10–14(–16) disc florets show closer relationship with *E. africanus* var. *paniculatus* Group IIA (see p. 27) (up to 3.5 mm long) with (8–)11–14(–27) disc florets than with *E. punctulatus* (capitula up to 2.8 mm long and with 7–10 disc florets). The indumentum alone shows that *E. brevifolius* is not related to *E. punctulatus*, but rather to *E. africanus*. It is therefore incomprehensible why De Candolle (1838) described *E. brevifolius* as a variety of *E. punctulatus*.

Common name: *kapokbos*.

Vouchers: *Bond 1702* (NBG); *McDonald 669* (NBG); *Müller 3563* (WIND); *Rösch & Le Roux 450* (PRE).

13. **Eriocephalus scariosus** *DC.*, Prodromus: 147 (1838); Harv.: 202 (1865). Type: Northern Cape, 'Namaqualand, zwischen Natvoet und Gariep', *Drège 2738* (G-DC, holo. (fragment); G!, NBG!, P!, PRE, photo.!, SAM!).

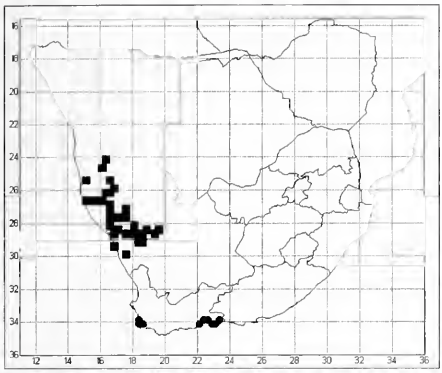
E. scariossisimus S.Moore: 1019 (1904); Merxm.: 62 (1967). Type: Namibia: 'Groot Namaland', farm Inachab, *Dinter 33* (BM, holo.!; Z!).

E. rangei Muschl. in Dinter: 260 (1921); Range: 56 (1935). Type: Namibia, Garub, *Range 512* (B, holo.†; SAM!).

E. virgatus Dinter: 87 (1932). Type: Namibia: 'Kamellager', north of Aus, *Dinter 3676* (B, holo.†; BOL!, NBG!, PRE!, SAM!, WIND!, Z!).

Slender, erect, much-branched, almost evergreen, strongly aromatic shrubs, 0.5–1.5 m high, 1–2 m in diameter. *Old stems* dark brown, deeply grooved; older branches yellow-brown, fairly smooth to slightly grooved, thin, glabrous; dolichoblasts green-yellow, cylindrical, smooth, sparsely to densely sericeous with sessile glands; brachyblasts short-lived, at most 2 mm long. *Leaves* alternate, sparse on dolichoblasts, dense on brachyblasts, densely sericeous to glabrous, leaves of dolichoblasts and brachyblasts of the same size and length, linear-lanceolate, 4–12 × 0.5–1.5 mm, entire, semisucculent, silvery white to green-grey to bright green, basally adaxially concave, abaxially convex, with glands in cavities on leaves. *Capitula* heterogamous radiate, solitary on brachyblasts or racemose, terminal on flowering shoots, 4–6 × 3–6 mm; peduncles slender, 6–12 mm long, sericeous. *Involucral bracts* 4 or 5, oval, 4 × 3 mm, with a green central strip surrounded by a broad membranous margin. *Paleae*: those of marginal florets connate, 4 mm long, sometimes only partially connate, fringed margins of connate paleae intertwined, abaxially densely long-lanate, hairs septate; those of disc florets narrowly linear, 4.0 × 0.5 mm, membranous, margins fringed. *Ray florets* (1)2(3), 4 mm long, female; corolla white, tubular, lamina strap-shaped to narrowly cuneate, 3-lobed or 3-dentate, up to 6 × 2 mm, much longer than flattened style branches. *Ovary* (and cypsela) oblong, flattened. *Seed* obovoid, flattened, 2.5 mm long. *Disc florets* 4–9, 4–5 mm long, functionally male, with sterile ovary; corolla tubular, 5-lobed, glandular abaxially. *Style* cylindrical, apex globose, with sweeping hairs. *Stamens* 5, distinctly exserted at maturity. *Receptacle* after anthesis with dense, white, long-pilose indumentum between involucral bracts and connate marginal paleae. *Chromosome number*: $2n = 72$. *Flowering time*: correlated with rainfall, varying from December to April and June to September.

The distribution of this species extends over both summer- and winter-rainfall areas. It grows on mountains and hills but never on open plains. It forms part of the flora of the sandstone hills and mountains extending from the Namib-Naukluft Park southwards to the Orange River. Map 7.



MAP 7.—■ **Eriocephalus scariosus**; ● **E. africanus** var. **africanus**.

E. scariosus is probably the most aromatic species of *Eriocephalus*. The leaves are semisucculent and, like those of the related *E. africanus* (no. 14), have a very variable indumentum. The plants occurring furthest north in Namibia, thus within the summer-rainfall zone, are relatively sparsely sericeous to glabrescent. Plants growing along the Orange River within the winter-rainfall area, have a dense, sericeous indumentum, giving it a silvery white appearance. Intermediate forms are found scattered irregularly throughout the distribution area. As a result of the variation in indumentum, the appearance of the plants varies from bright green to silvery white. Similar variation to that found in the indumentum occurs in the shape and length of the lamina of the ray floret. Moore (1904) separated *E. scariosissimus* from *E. scariosus* inter alia on the grounds of the variation in the lamina length of the ray florets. They vary from narrowly to broadly oblong, narrowly to broadly cuneate and 3-dentate to 3-lobed. In fresh material the colour of the rays is pure white, but it changes to bright yellow upon drying, as in *E. macroglossus* (no. 2).

Despite the strong aroma of *E. scariosus*, it is eagerly browsed by domestic and wild animals. Common name: *kapokbossie*.

Vouchers: *Dinter 6616* (BOL, NBG, SAM, Z); *Galpin 14141* (BOL); *Giess & Müller 14347* (M, WIND); *Hall 4574* (NBG, PRE); *Müller & Tilson 910* (WIND).

14. **Eriocephalus africanus** *L.*, Species plantarum, edn 1: 1310 (1753); Hill: 225 (1759); L.: 18 (1759); Burm.f.: 25 (1768); Houtt.: 428 (1775); Giseke: 12 (1779); Reichard: 938 (1780); Murray: 795 (1784); Lam.: 387 (1786); Aiton: 278 (1789); J.F.Gmel.: 1277 (1792); Lam.: t. 717, fig. 1 (1797); Thunb.: 168 (1800); Willd.: 2384 (1803); Curtis: t. 833 (1805); Pers.: 497 (1807); Thunb.: 724 (1823); Spreng.: 621 (1826); G.Don: 364 (1830); Loudon: 1074 (1838); Loudon: 742 (1855); Harv.: 200 (1865); Adamson & T.M.Salter: 800 (1950). Iconotypes: Dill., Hortus elthamensis 132, t. 110, fig. 134 (1732); Hill: fig. 79 (1759).

E. corymbosus Moench: 590 (1794). Iconotype: as for *E. africanus*.

E. variifolius Salisb.: 211 (1796). Iconotype: as for *E. africanus*.

E. frutescens R.Br.: 180 (1813). Iconotype: as for *E. africanus*.

E. septifer Cass.: 494 (1827); DC.: 145 (1838). Type: Cape Province, collector unknown (G-DC, holo.; WIND, photo.!).

E. septulifer DC.: 145 (1838). Type: Western Cape, 'Kaapsche Vlakte', *Drège 6040* (G-DC, holo.; PRE & WIND, photos!).

Much-branched, spreading to erect, conical shrubs, 0.3–0.9 m high, up to 4 m in diameter. *Old stems* displaying anomalous secondary growth, grey-brown to grey-black; young shoots red-brown to grey-green and densely leafy, silvery grey to green-grey, permanently hairy to glabrescent, internodes relatively long; older branches and stems yellow-brown to grey-brown to brown to shiny red-brown, rigid or slender. *Leaves* mostly opposite, sometimes even in whorls of 3, alternate on flowering shoots, sparsely spaced on dolichoblasts, (5–)8–17(–40) × 0.4–2.5 mm, palmatisect with 3–7 lobes or pinnatisect with 3 lobes distally or 3 lobes proximally or entire, adaxially flattened but basally almost triangular to concave, abaxi-

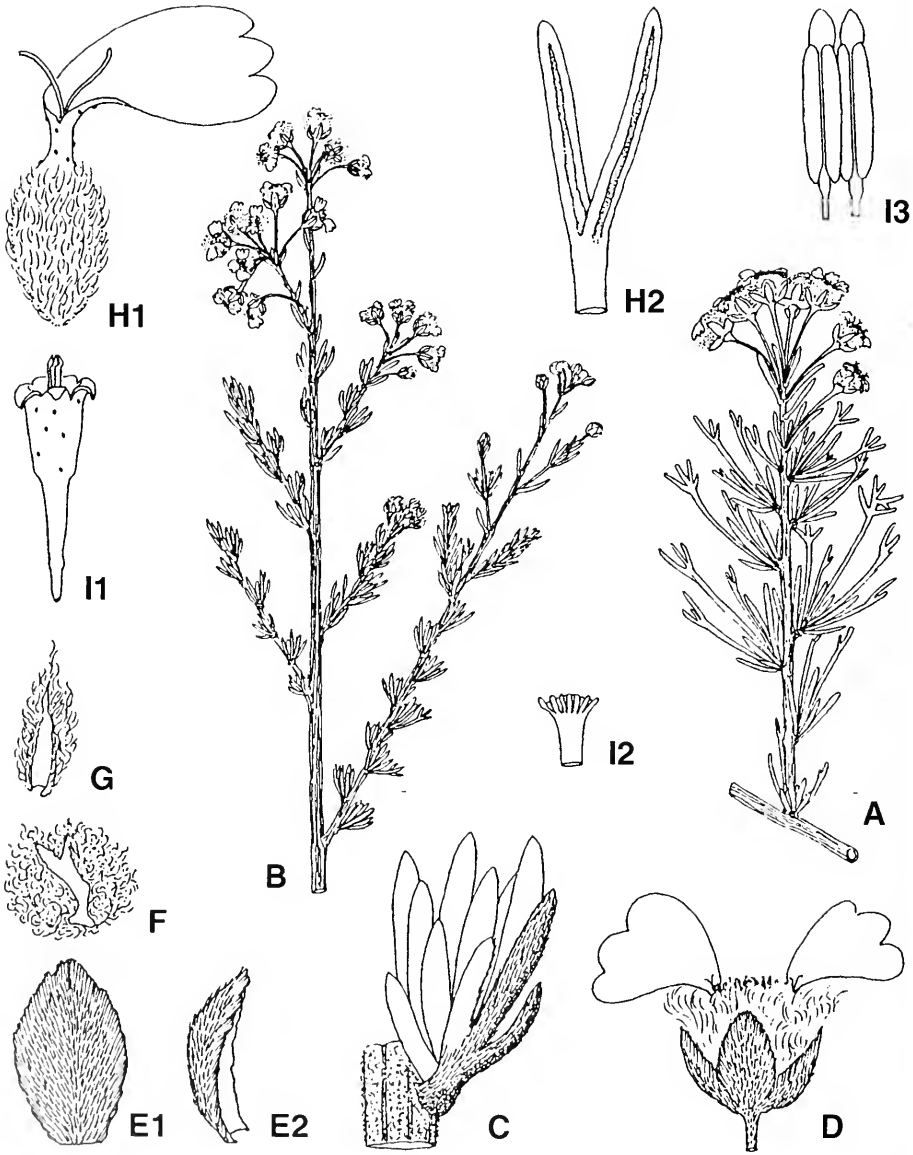


FIGURE 3.—**Erioecephalus africanus** var. **africanus**: A, flowering shoot with infloreseences, × 1; (*Müller 3624a*, WIND). E. **africanus** var. **paniculatus**: B, flowering shoot with inflorescences, × 0.6; C, branch with leaves, × 4; D, capitulum, × 4; E1, E2, involucral bracts, × 8; F, connate marginal paleae, × 5; G, central palea, × 5; H1, ray floret, × 8; H2, branched style, × 25; I1, disc floret, × 8; I2, style, × 25; I3, anthers, × 16 (*Müller 3628*, WIND).

ally convex, succulent or not, blue-green to grey-green to silver-grey, appressed silver-sericeous to densely felty sericeous, permanently hairy to glabrescent, apex obtuse to acute; lobes linear to clavate, straight or slightly curved inwards. *Capitula* heterogamous radiate, in terminal or lateral umbellate racemes or paniculate, 3.5–4.0 mm long; peduncles almost absent to 26 mm long, permanently sericeous to glabrous. *Involucral bracts* 4–6, oblong to ovate to obovate to lanceolate, 2.0–3.5 × 1.0–2.5 mm, central part green, herbaceous with light brown to red-purple membranous margin, margin fringed to entire, permanently sericeous to glabrous. *Paleae*: those of marginal florets connate, forming cylindrical sheath with free apices, adaxially smooth or sometimes with septa, abaxially long-lanate, hairs septate; those of disc florets lanceolate to oblong, slightly flattened, membranous, margins and abaxially long-lanate. *Ray florets* 3–5, female, 2–4 mm long; corolla distinctly strap-shaped; lamina 2–5 mm long, white to pale red-purple, cuneate to broadly cuneate. *Style branches* flattened, apices acute. *Ovary* oblong to obovoid, slightly flattish, trigonous, long-lanate. *Seed* obovoid, flattened, 1.3–2.5 mm long. *Disc florets* 2–27, functionally male with sterile ovary, 2–5 mm long; corolla tubular to trumpet-shaped, red-purple or yellow in proximal part and red-purple in distal part. *Style* unbranched, cylindrical, globose, with sweeping hairs. *Stamens* 5. *Receptacle* after anthesis with dense, white, long-pilose indumentum between involucral bracts and connate marginal paleae. *Chromosome number*: $2n = 18, 36$.

E. africanus is very widely distributed, occurring in a variety of vegetation types. This complex species shows much variation in life form, leaf shape, indumentum and flower composition in capitula, while hibridisation also seems to occur. Two well-demarcated groups can be distinguished. The one group occurs in the dune areas of the Coastal Fynbos, from sea level to about 100 m inland or on rocks arising from the sea. The plants therefore grow in soil with a high salt content. They have succulent leaves and a spreading habit. The second group occurs at a higher altitude, further inland. The plants are more erect, with thin, slender stems and nonsucculent or only slightly succulent leaves.

Two varieties are distinguished:

Leaves distinctly succulent, 3–5–7-lobed or entire, (6.0–)8.2–15.0(–34.0) × 0.8–2.5 mm; shrubs spreading, up to 4 m in diameter; branches rigid; exclusively coastal . . . . . 14a. var. *africanus*

Leaves not or weakly succulent, mostly entire, (5–)8–17(–40) × 0.4–0.8 mm; shrubs mostly erect, 0.3–0.6 m in diameter; branches flexible; inland . . . . . 14b. var. *paniculatus*

Note: in his thesis, Müller (1988) distinguished these two taxa as subspecies. It was decided, however, to change them to variety level as they occur in the same geographical area.

14a. var. **africanus**.

Spreading shrubs up to 4 m in diameter; branches rigid, up to 4 mm thick. *Young shoots* red-brown to grey-green depending on indumentum, densely leafy. *Leaves* mostly opposite, sometimes even in whorls of 3, alternate on flowering shoots, sessile on permanent cushion-like thickening, (6.0–)8.2–15.0(–34.0) × 0.8–2.5 mm, palmatisect, 3–7-lobed or pinnatisect, 3-lobed distally or entire, slightly widening distally, succulent, blue-green to grey-green. *Capitula* terminal, in umbellate racemes, rarely paniculate; peduncles (3.0–)6.0–8.5(–12.0) mm long, permanently felty sericeous. *Ray florets* 3 or 4(5), 3.2–4.0 mm long; lamina white, broadly cuneate, 4–5 mm long. *Disc florets* (12–)16–18(–24). *Flowering time*: correlated with rainy season, from July to September, but flowers can be found throughout the year as plants receive moisture from sea mist. Figure 3.

This variety is mostly restricted to the coast of the Cape Peninsula, but also occurs from

Mossel Bay to Knysna. The habitat extends from the high-water mark to about 100 m inland and on rocks arising from the sea. Map 7.

The spreading habit and succulent, palmatisect, blue-green to green-grey leaves with 3–5–7 lobes on firm, relatively thick shoots (up to 4 mm thick), are diagnostic characters of this variety. The growing points are normally enveloped by older leaves, giving it a quadrangular appearance. Eastwards between Mossel Bay and Knysna the plants are not as distinctly succulent as on the Cape Peninsula. The leaves are slightly smaller but have the same typical palmatisect shape with 3–5–7 lobes. The distribution areas of var. *africanus* and var. *paniculatus* overlap and possible hybrids were observed, e.g. *Tyson 3048* (NBG), *Tyson 3051* (SAM) and *Pearson 225* (NBG). In the case of *Esterhuysen 32159a* (BOL), the variations are clearly visible.

Although this is the oldest described species of the genus *Eriocephalus*, it is not widely known by the public and has few common names. It has the oldest known common name, namely clustery leaved scentwort (Hill 1759). Other common names are *kapokbossie* and *wilde roosmaryn* (Smith 1966).

Vouchers: *Bolus 364* (BOL, PRE, SAM); *Breyer sub PRE23892* (PRE); *Müller 3624* (WIND); *Pillans 3632* (BOL, PRE); *Wilman PRE43623* (PRE).

14b. var. **paniculatus** *(Cass.) M.A.N.Müller, P.P.J.Herman & H.H.Kolberg*, comb. et stat. nov.

E. paniculatus Cass., Dictionnaire des sciences naturelles 50: 493 (1827). Iconotype: Gaertn., De fructibus et seminibus plantarum 2,3: 428, t. 168, fig. 7 (1791).

E. racemosus Gaertn.: 428, t. 168, fig. 7 (1791) non L.: 1311 (1753); Jacq.: 157, 158, t. 11, fig. 2 (1796); Lam.: 4, t. 717, fig. 2 (1797). Type: based on that of var. *paniculatus*.

Monochlaena racemosus Cass.: 496 (1827). Type: based on that of var. *paniculatus*.

E. umbellulatus Cass.: 493 (1827); Sch.Bip.: 12 (1844); Levyns: 261 (1929); Marloth: 261 (1932). Type: based on that of var. *paniculatus*.

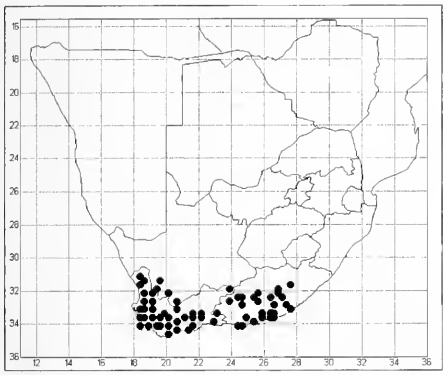
E. umbellulatus Cass. var. *glabriusculus* DC.: 147 (1838); Harv.: 202 (1865). Type: Western Cape, Paarl, *Drège 87* (G-DC, holo.; G!, K!, P!, PRE & WIND, photos!).

E. umbellulatus Cass. var. *argenteus* DC.: 147 (1838); Sch.Bip.: 676 (1844); Harv.: 202 (1865). Type: Cape Province, Little Namaqualand (precise locality unknown), *Drège 2737* (G-DC, holo.; G!, P!, PRE & WIND, photos!).

E. sericeus Gaudich. ex DC.: 145 (1838); Sch.Bip.: 676 (1844); Harv.: 201 (1865). Type: Cape Province, collector unknown (G-DC, holo.; PRE & WIND, photos!).

Erect to slightly spreading shrubs, up to 0.6 m in diameter. *Leaves* mostly opposite, alternate on flowering shoots, linear, (5–)8–17(–40) × 0.4–0.8 mm, not or weakly succulent, mostly entire, sometimes 1- or 2-dentate to pinnatisect with 3 lobes; lobes acicular to clavate, straight or slightly falcate inwards, tapering from base to apex, cushion-like thickening absent, silvergrey sericeous. *Capitula* in terminal or lateral umbellate racemes or paniculate; peduncles almost absent to 26 mm long, permanently sericeous to glabrous. *Ray florets* 3 or 4, 2.0–2.5 mm long, lamina white to pale red-purple, cuneate to broadly cuneate, 2.0–4.5 mm long. *Disc florets* 2–27. *Flowering time*: peaking from July to September, but January to March in summer-rainfall areas. Figure 3.

The distribution extends mostly over the winter-rainfall area. After *E. ericoides* (no. 26), *E. africanus* var. *paniculatus* is the taxon with the widest distribution. It must be regarded as the taxon with most potential for hybridisation, as it occurs together with so many other species. The distribution extends over the Northern, Western and Eastern Cape. The distribution area covers various veld types, e.g. Succulent Karoo, Fynbos, Coastal Renosterbosveld and Fynbos, Succulent Mountain Scrub, Karroid Broken Veld, False Fynbos, Knysna Forest, Alexandria Forest, Valley Bushveld, Noorsveld, False Karroid Broken Veld and False Upper Karoo (Acocks 1975). Such a large number of different habitats show the potential of the taxon to adapt to different soil types and altitudes. It furthermore grows in both winter- and summer-rainfall areas. Map 8.



MAP 8.—**Eriocephalus africanus** var. **paniculatus**.

The phenotypic plasticity of var. *paniculatus* is high. The variety shows much variation in habit, leaf size and shape, and degree of hairiness. Some varying characters can be ascribed to environmental influences, but others are genetically determined. Some characters are correlated with geographic distribution, but at this stage it seems best not to distinguish formal infravarietal groups as the morphological variation is continuous and it has not been studied in detail. The problem can be solved only by intensive population studies. It will be necessary to cultivate plants from the different areas under similar conditions.

Based on herbarium and field studies, the taxon can be divided into the following five groups.

Group I

Plants of this group have glabrescent leaves. The glabrescence varies, even on one plant. It seems that leaves produced during dryer seasons are more densely sericeous and tend to be less glabrescent, while those produced during the active growing season and flowering time tend to be more glabrescent. The distribution of this group is mainly along the western interior in the Calvinia area, Vanrhynsdorp to Citrusdal, with a few scattered localities like Paarl and Scheepersrus in the Western (southern) Cape and Somerset East and Tarkastad in the Eastern Cape. *Chromosome number*: $2n = 36$.

Group II

Two variants can be distinguished in this group:

IIA: Shrubs with early glabrescent rigid stems, sometimes with a glossy red-brown to chestnut-brown colour. The leaves are fairly short, grey-white sericeous. Capitula are borne on shortly pedunculate, sometimes almost sessile, umbellate racemes, alternate, terminally on shoots. The inflorescences develop mostly terminally on brachyblasts. The colour of the ray florets varies from pure white to pale red-purple to almost dark red-purple. The distribution of this group extends from the low-lying parts of the Bredasdorp coastal areas to the high-lying mountainous parts of the Hantam, Cedar, Langeberg, Waboom and Swartberg Mountains. *Chromosome number*: $2n = 18$.

IIB: In the Langeberg Mountains at Kogmanskloof and Baden, very slender shrubs with very small leaves and almost sessile to shortly pedunculate (1.5–3.0 mm) capitula are found. This variant shows a close resemblance to *E. capitellatus* (no. 3) from which it differs in indumentum and leaf shape. It might be a hybrid between *E. africanus* (no. 14) and *E. capitellatus*. *Chromosome number*: $2n = 18$.

Group III

This group is found in the low-lying areas (mostly below 300 m) from Humansdorp to Bushmans River mouth and inland to Grahamstown. The leaves are fairly short and of the same length, (3.5–)4.2–7.4(–10.5) mm on the entire plant. Plants at the coast have a strongly flattened habit. The leaves are distinctly silver-white-sericeous. The ray florets are white and the capitula shortly pedunculate, 1.0–3.0(–5.5) mm, borne terminally in umbellate racemes on flowering shoots. With a few

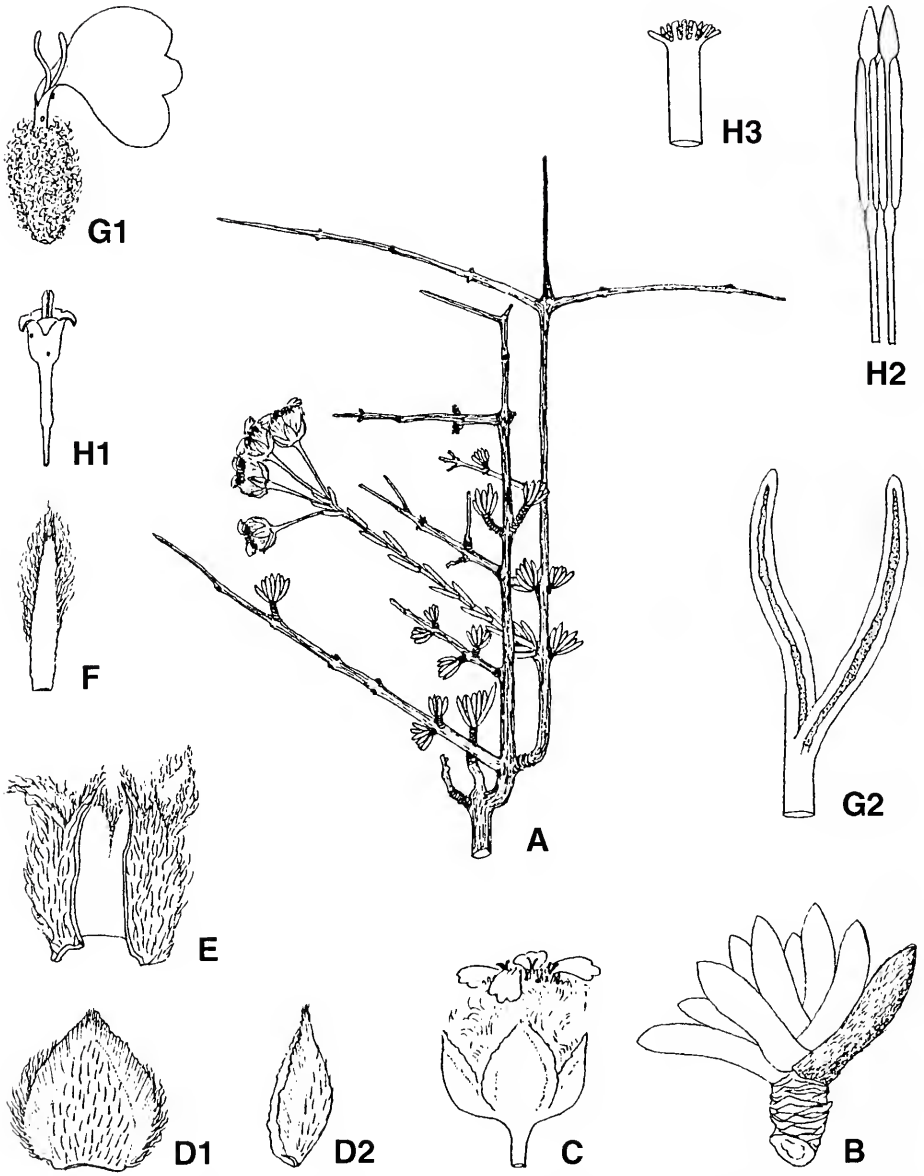


FIGURE 4.—**Eriocephalus grandiflorus**: A, flowering shoot with inflorescences, × 1; B, branch with leaves, × 4; C, capitulum, × 4; D1, D2, involucral bracts, × 5; E, connate marginal paleae, × 5; F, central palea, × 5; G1, ray floret, × 5; G2, branched style, × 20; H1, disc floret, × 5; H2, anthers, × 20; H3, truncate style, × 20 (*Müller 4040*, WIND).

exceptions, most capitula have four involucral bracts and two ray florets. *Chromosome number:* unknown.

Group IV

This group is restricted mainly to the mountainous regions of the Cape Peninsula, namely Table Mountain, Devil's Peak, Signal Hill and Muizenberg. The plants are compact, much-branched, slightly spreading, small shrubs with long, nonsucculent leaves, densely silver-white appressed sericeous in dense groups on brachyblasts and on young shoots. Capitula are fairly large, borne mainly in umbellate racemes or in pseudopaniculate racemes. The distribution of this group borders on that of *E. africanus* var. *africanus* (no. 14a) and hybridisation between the taxa does occur. Leaves of the hybrid individuals vary from succulent to nonsucculent. However, they all show the slightly spreading habit of *E. africanus* var. *africanus*. *Chromosome number*: $2n = 36$.

Group V

This group is found from the Cape Flats further inland. The small shrubs have slender, thin branches with sparsely leafy dolichoblasts and long internodes. The growing points are exposed as they are not enveloped by older leaves. Capitula, which are smaller than those of Group IV and with fewer rays, are densely grouped on flowering shoots on long-pedunculate, umbellate racemes or terminally on branches or brachyblasts in pseudopanicles. *Chromosome number*: $2n = 36$.

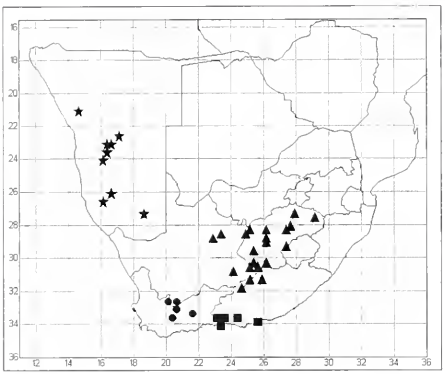
Common names: *kapokbossie, renosterveld-kapok*, *roosmaryn*, rosemary.

Vouchers: *Acocks 12154* (PRE); *Dyer 21* (PRE); *Goldblatt 2152* (NBG); *Taylor 10566* (NBG); *Van der Merwe 123* (NBG, PRE).

15. **Eriocephalus grandiflorus** *M.A.N.Müller*, sp. nov., *E. africani* L. et *E. eximii* DC. valde affinis, sed a *E. africani* foliis capitulisque majoribus, radiis distinctis, habituque multi ramoso rigido differt; a *E. eximio* capitulis pedunculatis differt.

Type: Western Cape, 11 km N of Matjiesfontein, *Müller 4074* (NBG, holo.; PRE, WIND).

Robust, rigid, spinescent, much-branched shrubs, 200–450 mm tall. *Old stems* and branches grey to grey-black; young shoots chestnut-brown, initially densely silvery sericeous, glabrescent, opposite branches forming an angle of almost 180°. *Leaves* decussate, rarely alternate on some flowering shoots or clustered on brachyblasts, sessile on cushion-like thickenings, 4.5–9.0 × 1.2–2.2 mm, entire, rarely with single lobe, adaxially basally strongly concave with glabrous, triangular, basal part where consecutive leaves press against each other, otherwise densely appressed sericeous, distally weakly concave to flattened, abaxially semiterete, permanently silver-white sericeous, apex obtuse to acute, leaf base slightly broadened. *Capitula* heterogamous radiate, 4–7, terminally, umbellate or semi-umbellate, or solitary on brachyblasts, relatively large, 5–6 mm long; peduncles 4–10 mm long, densely appressed sericeous. *Involucral bracts* 4 or 5, broadly ovate, 4.6 × 3.3 mm, triangular, herbaceous central part with broad purple to red-purple membranous margin, some slightly keeled, others flattened, appressed sericeous, apex obtuse, rarely acute, slightly fringed. *Paleae*: those of marginal florets connate, 6.0–6.5 mm long, 4-lobed, coriaceous, hard, free apices fringed, abaxially long-lanate; those of disc florets transparent, membranous, lanceolate to narrowly linear, 5.2–6.0 mm long, outer slightly keeled, inner slightly flattened, abaxially long-lanate, apex acute, fringed. *Ray florets* 2–4, 4–6 mm long; lamina broadly cuneate, 3- or 4-dentate or -lobed, 3.5 × 3.5–4.2 mm, white or pale to dark purple. *Style* cylindrical, forked, branches flattened, linear, acute, 2.0–2.6 mm long. *Ovary* (and cypsela) oblong to oblanceolate, densely long-lanate. *Seed* slightly flattened, obovoid, 3.0–3.5 mm long. *Disc florets* 12–22, 5–6 mm long, functionally male with sterile ovary; corolla trumpet-shaped to infundibuliform, base creamy, widened distal



MAP 9.—● **Eriocephalus grandiflorus**; ■ **E. tenuipes**; ▲ **E. karooicus**; ★ **E. dinteri**.

part red-purple, 5-lobed. *Style* unbranched, apex slightly convex, with sweeping hairs. *Stamens* 5. *Receptacle* after anthesis with dense, white to light brown, long-pilose indumentum between involucral bracts and connate marginal paleae. *Chromosome number*: $2n = 54$. *Flowering time*: June to September. Figure 4.

This species is confined to the mountainous area between the Roggeveld, Witteberg and Swartberg Mountains. Map 9.

Closely related to *E. africanus* (no. 14) and *E. eximius* (no. 4). Differs from *E. africanus* by its larger leaves, larger capitula with large conspicuous ray florets and its much-branched rigid habit. It differs from *E. eximius* by its pedunculate capitula.

It is one of the few species of *Eriocephalus* that are highly palatable. *E. africanus*, in contrast, is not or hardly browsed. Common name: *kapokbos*.

Vouchers: *Acocks 14310* (PRE); *Compton 11260* (NBG); *Hanekom 464* (PRE); *Levyns 11161* (BOL); *Müller 3610* (WIND).

16. **Eriocephalus tenuipes** *C.A.Sm.* in Kew Bulletin 1931: 101, 102 (1931). Type: Western Cape, Langkloof near Haarlem, *Fourcade 1334* (K, holo.!; BOL!).

Many-stemmed, slender, much-branched shrubs, 0.4–1.0 m high. *Old stems* displaying anomalous secondary growth; young shoots bright green to light brown; older branches brown-black. *Leaves* mostly alternate, sometimes opposite near growing points and on brachyblasts, sessile on cushion-like thickenings, linear to linear-oblong to clavate, 3.5–10.5 × 0.6–0.8 mm, entire, rarely pinnatisect with 1 or 2 lobes, adaxially flattened, slightly broadened towards base and concave, abaxially convex or semiterete, distally cylindrical, leaf surface pitted and rough, glands in cavities, initially silvery sericeous, glabrescent and matt green, turning olive-green to olive-green-brown to almost black upon drying, apex obtuse to slightly acute; leaves on dolichoblasts and on brachyblasts of equal length. *Capitula* heterogamous radiate, 3.5–5.0 mm long, in terminal and lateral, umbellate racemes, each with 3–8 capitula; peduncles slender, 5–7 mm long, longer than subtending leaves on flowering shoots, sericeous. *Involucral bracts* 4 or 5, elliptic-oblong to broadly ovate, 1.8–2.7 × 1.2–1.7 mm, with central olive-green herbaceous part and broad membranous margin, abaxially sericeous to glabrous, some bracts slightly keeled, others flattened, margins fringed. *Paleae*: those of marginal florets connate into cylindrical sheath, 2.5–4.0 mm long, hard, coriaceous, apex and abaxial surface long-lanate; those of disc florets linear, 2.5 mm long, membranous, margins fringed, abaxially long-lanate. *Ray florets* 2 or 3, female, up to 6.3 mm long; corolla with distinct white lamina, 3.4–4.1 × 3.4–4.4 mm, broadly cuneate, 3-lobed. *Style branches* linear, flattened, 1.4–2.0 mm long, apex acute. *Ovary* oblong to obovoid, slightly trigonous. *Seed* flattish, trigonous, 1.7–2.0 mm long. *Disc florets* 8–12, 3.0–6.5 mm long, functionally male with sterile ovary; corolla tube infundibuliform to trumpet-shaped, yellow with red-purple tinge, 5-toothed. *Style* cylindrical, apex globose, with sweeping hairs. *Stamens* 5, slightly exserted at maturity. *Receptacle* after anthesis with long hairs between the involucral bracts and connate

marginal paleae. *Chromosome number*: $2n = 36$. *Flowering time*: mainly June to September, but January to March when it rains in summer.

The distribution area receives mainly winter rain but often also summer rain. *E. tenuipes* is restricted mainly to the high-lying Langkloof Mountains where *E. capitellatus* (no. 3) also occurs. It seems that these two species hybridise, but it has to be confirmed. Map 9.

It is surprising that Smith (1931) considered *E. tenuipes* to be closely related to *E. punctulatus* (no. 9). The sericeous indumentum of *E. tenuipes* rather points to a close relationship with *E. africanus* (no. 14), especially var. *paniculatus* (no. 14b). Some specimens of *E. africanus* var. *paniculatus* are also glabrescent like *E. tenuipes*, but the leaf surfaces do not have the characteristic rough appearance of *E. tenuipes*. The leaves of *E. africanus* var. *paniculatus* are highly variable in length and appear bright green to silver-white (depending on indumentum) upon drying as opposed to those of *E. tenuipes* which are all of the same length and change to olive-green or olive-green-brown upon drying.

Common name: *kapokbos*.

Vouchers: *Compton 4229* (BOL, NBG); *Fourcade 5001* (NBG, PRE); *Müller 4086* (WIND); *Rycroft 2494* (NBG); *Thode A2444* (PRE).

17. **Eriocephalus karooicus** *M.A.N.Müller*, sp. nov., *E. spinescentis* Burch. affinis sed capitulis sessilibus radiisque prominentibus differt.

Type: Free State, Fauresmith Botanical Reserve, *Smith 4531* (BOL, holo.; PRE).

E. spinescens sensu DC.: 147 (1838), pro parte; sensu Harv.: 203 (1865), pro parte.

Many-stemmed, much-branched, spinescent, aromatic shrubs, 150–450 mm tall, spreading. *Old stems* displaying anomalous secondary growth, dark grey; young shoots yellow-brown, shortly sericeous; older shoots brown-grey to dark grey, terminally spinescent, 10–22 mm long. *Leaves* 1–4 mm long, always decussate, sessile on cushion-like thickenings, entire, permanently silver- to green-grey sericeous, adaxially proximally concave, distally flattened, abaxially semiterete, apex acute, base semi-amplexicaul, bases of two opposite leaves connate, leaves on brachyblasts obtuse-triangular to lanceolate, densely imbricate, those on young shoots linear to linear-lanceolate. *Capitula* heterogamous radiate, 2.0–4.5 mm long, sessile, solitary, terminal on brachyblasts or spicate on dolichoblasts, almost hidden among subtending leaves. *Involucral bracts* 4, 3.2–4.0 × 0.8–1.4 mm, 2 slightly keeled with margins overlapping, other 2 flattened; each with central thickened green to purple part and transparent margin, abaxially appressed sericeous, adaxially smooth. *Paleae*: those of marginal florets free, oblong-ovate, 3.5 × 1.2 mm, hardened, keeled, abaxially lanate, hairs septate, enveloping female florets; those of disc florets narrowly oblong to lanceolate, becoming narrower towards centre, 3.8 × 1.0–3.6 × 0.2 mm, with membranous margins, abaxially lanate. *Ray florets* 2 or 3, 2.5–2.8 mm long; corolla white with distinct 1.3–2.2 mm long lamina. *Style branches* linear, as long as or shorter than ray, rarely longer. *Ovary* (and cypsela) oblong, slightly flattened, densely lanate. *Seed* 2–3 mm long, obovoid, slightly flattened. *Disc florets* 4–10, 2.5–3.0 mm long, functionally male with sterile ovary; corolla trumpet-shaped, 5-lobed, white to pale yellow to yellow with red-purple lobes. *Stamens* 5, exserted at maturity. *Style* unbranched, apex truncate, with sweeping hairs. *Receptacle* after anthesis white-lanate between involucral bracts and marginal paleae. *Chromosome number*: $2n = 18$. *Flowering time*: December to March in summer, July to September in winter. Figure 5.

The distribution area receives both winter and summer rain. *E. karooicus* is centred in the Free State and bordering Northern and Eastern Cape in the following veld types: False Karoo, *Cymbopogon-Themeda* Veld, Transitional *Cym-*

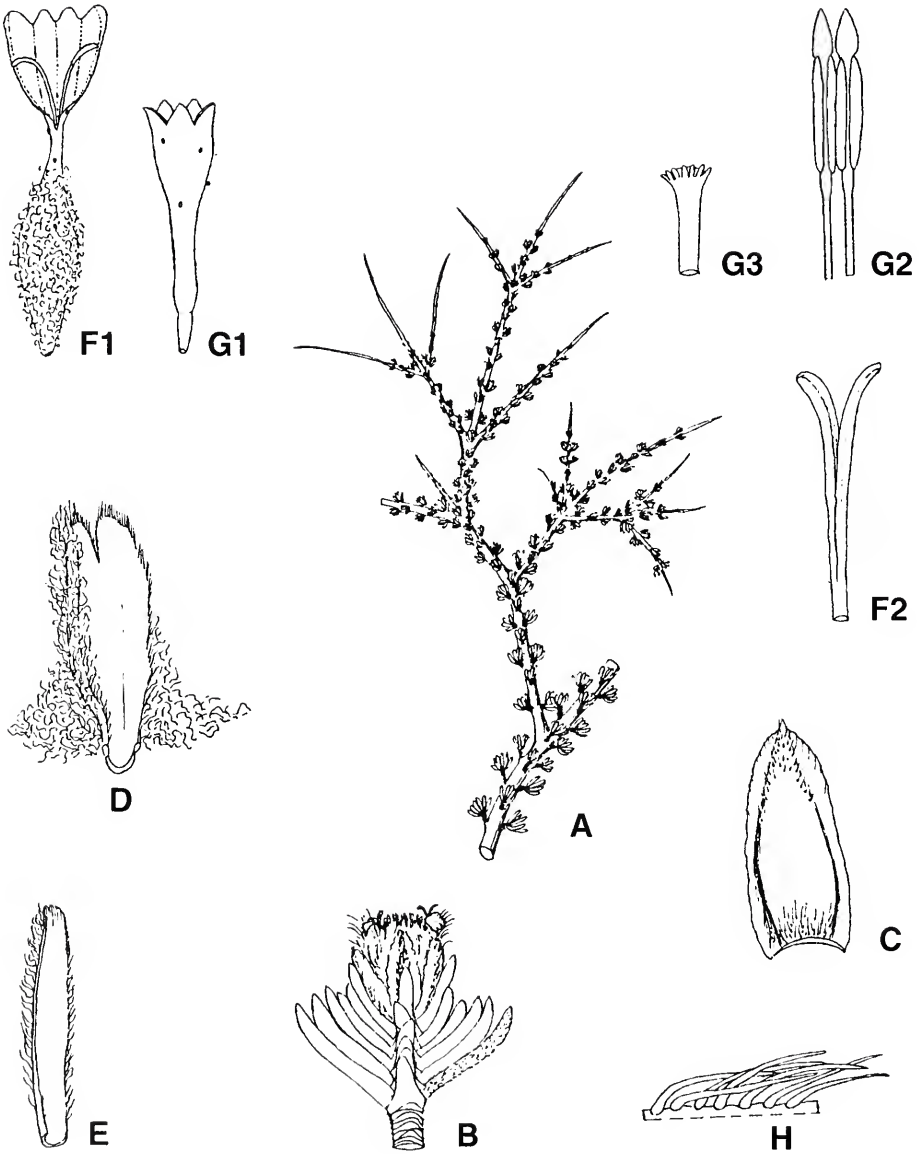


FIGURE 5.—**Eriocephalus karooicus**: A, flowering shoot with infloreseences, × 1.5; B, capitulum, × 3; C, involucral bract, × 8; D, marginal palea, × 16; E, central palea, × 16; F1, ray floret, × 10; F2, branched style, × 15; G1, dise floret, × 10; G2, anthers, × 12; G3, truncate style, × 16; H, indumentum, × 32 (*Smith 4531*, PRE).

bopogon-Themeda Veld, mainly on heavy soils, and the *Themeda* Veld to *Cymbopogon-Themeda* Veld Transition (Acocks 1975). Map 9.

This species is closely related to *E. spinescens* (no. 30). When Burchell described *E. spinescens* in 1822, he only mentioned the spinescence and position of capitula, but not the ray florets and whether the capitula were sessile or not ('branches spinescent terminally. Capitula solitary, lateral'). A more complete description of *E. spinescens* appeared in De Candolle (1838). It was, however, described as a plant with capitula solitary and sessile on terminal brachyblasts and the corolla of the ray florets strap-shaped and much longer than the style. This description of De Candolle was partly made from a second specimen mentioned by him, *Drège 6041* (G-DC) from the Sneeuw Mountains. This specimen is actually aspecific and belongs to the current *E. karooicus* (no. 17). It cannot be assumed that De Candolle did not see Burchell's specimen as both are on one herbarium sheet housed in the Herbarium, Conservatoire et Jardin botaniques de la Ville de Genève, under the name *E. spinescens*.

Harvey (1865) made the same mistake as De Candolle by, except for the type specimen of *E. spinescens* (*Burchell 1419*) (G-DC) and *Drège 6041* (G-DC) mentioned by De Candolle, quoting *Zeyher 279* (NBG) and *Zeyher 858* (GRA, NBG), which are all aspecific, under *E. spinescens*. The species was classified under the *Phaenogyne* (i.e. capitula with distinct ray florets, longer than the style and involucral bracts). Again the description was partly based on rays from the Drège specimen and partly on certain other specimens actually representing the current *E. karooicus*.

This misinterpretation by both De Candolle and Harvey caused all the *E. karooicus* material through the years to be misidentified as *E. spinescens* (no. 30). Although these two species look very similar superficially, the former can easily be distinguished from the latter by the sessile capitula and distinct ray florets.

Although the terminal spines are a conspicuous character of *E. karooicus*, during years of good rain, long shoots are produced without these spines. Spines develop again later when active growth slows down. As mentioned before, spicate synflorescences are sometimes produced terminally on young shoots.

These delicate, spinescent shrublets are very similar to *E. ericoides* during the active growing period. They differ from that species by the green-grey to silver-grey, small, imbricate leaves looking remarkably like a feather. From this stem the common names *veerkapok*, *veerkarookapok*, *veerkaroo*. In areas where the species occurs, plants form dense stands and are eagerly browsed. They are known as excellent fodder (according to Dr M.G.A. Henrici as quoted by *Mogg 13620*, PRE). *Smith 4333* (PRE) mentioned that specimens collected by Arnot in 1867 near Colesberg were locally known as *wilde dagga*. Other common names for this species in the Karoo and Fauresmith area are: *doringkapok*(*bossie*), *kleinkapokbossie*, *kleindoringkapokbos*, *silwerkapokbossie*, *veerkapok*(*bossie*) and *volstruiskapok* (Roux 1984; Smith 1966).

Vouchers: *Badenhorst 78* (PRE); *Brueckner 874* (BOL, PRE); *Gilfillan in herb. Galpin 5539* (GRA, PRE); *Muller 220* (NBG, PRE); *Smith 4483* (PRE).

18. **Eriocephalus dinteri** *S.Moore* in Bulletin de l'Herbier Boissier 2,4: 1018, 1019 (1904); Merxm.: 60 (1967). Type: Namibia, Hereroland, Windhoek, *Dinter 853* (BM, holo.!; Z!).

E. parviflorus Dinter: 87, 88 (1932). Type: Namibia, 'Gross-Namaland: Aus bei 1 400 m auf Granit in Blüte, 2 Juni 1922', *Dinter 3544* (B, holo.†; BOL!, PRE!, SAM!, WIND!, Z!).

Slender, erect, many-stemmed, much-branched shrubs, 0.3–1.0 m high, 300–500 mm in diameter. *Old stems* displaying anomalous secondary growth, 10–20 mm in diameter, mostly grey-brown, in some areas with grey-black bark;

dolichoblasts light yellow to yellow-brown, slender, densely appressed sericeous, internodes 4–10 mm long. *Leaves* always decussate, green-grey, linear to obtuse-triangular, scale-like, entire, permanently appressed sericeous, adaxially basally concave, glabrous to middle, distally flattened, abaxially semiterete, distally keeled, apex obtuse to slightly acute, base 0.25–0.50 mm wide, leaves on dolichoblasts 2.3–5.0(–13.0) mm long, those on brachyblasts 1.2–4.4 mm long. *Capitula* heterogamous radiate, terminal, racemose or umbellate-racemose or solitary on brachyblasts, 3.6–4.1 mm long; peduncles 2.3–8.5 mm long, appressed silver-sericeous. *Involucral bracts* 4, ovate, 1.7–3.3 × 0.9–2.4 mm, 2 slightly keeled, opposite, enveloping other 2 flattened bracts, green, margin broad, membranous, shortly appressed sericeous. *Paleae*: those of marginal florets free, keeled, margins fringed, 1.8–2.5 × 0.6–0.8 mm, each enveloping a single floret (mostly female), hard, coriaceous, abaxially densely long-lanate, hairs septate; those of disc florets linear, fringed, 2.0 × 0.3 mm, membranous, abaxially lanate. *Ray florets* (1 or) 2, 1.7–3.3 mm long; corolla white to red-purple; lamina conspicuous, irregularly 3-lobed, (0.8–)1.2–2.1 mm long, ± 2 mm broad, obovate. *Style branches* linear, 0.6–1.2 mm long, much shorter than lamina of ray floret. *Ovary* (and cypsela) oblong, slightly flattened, densely woolly. *Seed* obovoid, slightly flattish, trigonous, shorter than 2 mm. *Disc florets* 2–5, functionally male with sterile ovary, 1.6–3.2 mm long; corolla trumpet-shaped to cylindrical, 5-lobed, white to creamy at base with red-purple margins. *Receptacle* after anthesis with dense, white, long hairs between involucral bracts and marginal paleae. *Chromosome number*: $2n = 36$. *Flowering time*: January to March and sometimes to May in the northern summer-rainfall area, July to September and/or January to April in southern parts receiving winter and summer rainfall respectively.

The distribution is mainly restricted to summer-rainfall areas, although the southern extremes of its distribution near Aus fall in the transitional zone between summer and winter rainfall. *E. dinteri* is endemic to Namibia and has a restricted distribution, occurring only on a few high mountains, e.g. the Brandberg, Auas Mountains and Aus Mountains, above 1 000 m altitude. Population density at the different localities varies from scattered to rare, the plants occurring nowhere in dense stands. Map 9.

Only a single record of a hybrid between *E. dinteri* and *E. luederitzianus* (no. 25), *Müller 52* (WIND), could be positively identified. Hybridisation may possibly occur between *E. dinteri* × *E. merxmuelleri* (no. 32) and *E. dinteri* × *E. ambiguus* (no. 24), but it is difficult to confirm this.

Common name: *kapokbos*.

Vouchers: *Hardy 1997* (PRE, WIND); *Müller 51*; *945* (WIND); *Range 1117* (SAM); *Rennie in herb. Levyns 1973* (BOL).

19. **Eriocephalus giessii** *M.A.N.Müller*, sp. nov., *E. dinteri* S.Moore affinis sed habitu ramosissimo spinescenti; bracteis involucralibus indumento permanenti longe sericeo ad longe piloso tectis; floribus radii prominentibus anguste oblongis differt.

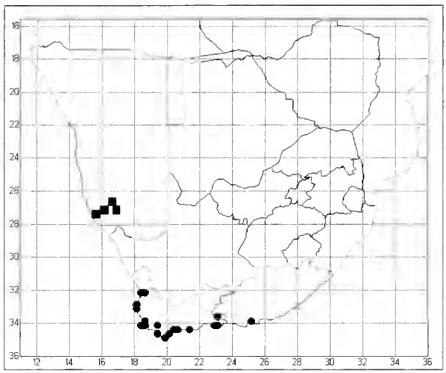
Type: Namibia, Lüderitz District, Farm Aar LUS 16. 'Am Quartzitberghang', *Giess 13383* (WIND, holo.; M, PRE).

Many-stemmed, much-branched, spinescent shrubs, 350–450 mm tall, up to 450 mm in diameter. *Old stems* much distorted at base, displaying anomalous secondary growth, yellow-grey; dolichoblasts yellow-brown, appressed sericeous, glandular, glabrescent; older branchlets yellow-grey to grey, glabrous; brachyblasts short, with restricted growth. *Leaves* opposite on dolichoblasts, distinctly decussate on brachyblasts, linear to obtuse triangular or keeled, 2.5–4.2 × 0.4–0.6 mm, entire, silver-grey, permanently silver-sericeous, adaxially flattened, concave to base, abaxially convex (semiterete), apex acute, base semi-amplexicaul, broadened. *Capitula* heterogamous radiate, mostly terminal, race-

mose or umbellate-racemose on dolichoblasts, also solitary or umbellate-racemose on brachyblasts, 3.2–4.0 mm long; peduncles short, 2.5–4.0 mm long, permanently sericeous to long-pilose. *Involucral bracts* 4, 2 keeled, other 2 slightly laterally flattened, 3.0–3.5 × 1.2–1.5 mm, red-purple to red-brown, transparent membranous margin absent, permanently long-sericeous to long-pilose, with subsessile, multicellular glands. *Paleae*: those of marginal florets free, totally enveloping marginal florets (usually female), keeled, lanceolate to ovate, rigid, membranous, 3.2–3.6 mm long, margins and abaxially long-lanate; those of disc florets broad to narrowly lanceolate, up to 3.2 mm long, membranous, margins and abaxially long-lanate. *Ray florets* female, 2, 2.2–2.4 mm long; corolla white, lamina up to 2.4 mm long, 3-lobed to 3-toothed, narrowly oblong, glandular abaxially. *Style branches* flattened, linear, apex acute. *Ovary* oblong to oblanceolate, long-lanate. *Seed* lanceolate, slightly flattened, 1.6–2.2 mm long. *Disc florets* 3–5, functionally male with sterile ovary, 2.4–3.4 mm long; corolla infundibuliform, 5-lobed, yellow with pale purple limb or entirely red-purple, with subsessile multicellular glands abaxially. *Style* cylindrical, apex globose, with sweeping hairs. *Stamens* 5, slightly exserted at maturity. *Receptacle* after anthesis with dense, white, long-hairy indumentum between involucral bracts and free marginal paleae. *Chromosome number*: $2n = 18$. *Flowering time*: correlated with rainfall, January to April and July to September, depending on time of rainfall. Figure 6.

The distribution area receives both summer and winter rain. *E. giessii* is restricted to the Lüderitz District of Namibia and occurs in and adjacent to Diamond Area No. 1. Plants grow in mountainous parts some 1 000 m above sea level and occur scattered. Map 10.

E. giessii is related to *E. dinteri* (no. 18) from which it can be distinguished by the much-branched, spinescent habit, permanent, long-sericeous to long-pilose indumentum on involucral bracts and the large, narrowly oblong ray florets.



MAP 10.—■ **Eriocephalus giessii**; ● **E. racemosus** var. **racemosus**.

Common name: *kapokbos*.

Vouchers: *Merxmüller & Giess 32248* (M, WIND); *Merxmüller & Giess 32250* (M, WIND); *Müller 825* (WIND); *Müller 3345* (WIND).

20. **Eriocephalus racemosus** *L.*, Species plantarum, edn 1: 1311 (1753); L.: 26 (1760); Burm.f.: 25 (1768); Murray: 795 (1784); Lam.: 387 (1786); J.F.Gmel.: 1277 (1792); Thunb.: 168 (1800); Willd.: 2385 (1803); Pers.: 497 (1807); W.T.Aiton: 180 (1813); Thunb.: 724 (1823); Spreng.: 621 (1826); G.Don: 364 (1830); DC.: 147 (1838); Loudon: 742 (1855); Harv.: 203 (1865); Adamson & T.M.Salter: 801 (1950). Type: Cape Province, precise locality unknown, collector unknown (LINN 1040.3, holo., microfiche!).

E. simplicifolius Salisb.: 211 (1796). Type: based on that of *E. racemosus*.

E. spicatus Burm. ex DC.: 147 (1838). Type: Western Cape, between Knysnadrif and Gowkamma-station, *Burchell 5605* (G-DC, holo.; GRA!, WIND, photo.!).

Many-stemmed, slender, erect shrubs, 1.2–2.0 m high. *Old stems* displaying anomalous secondary growth, brown-grey; young shoots grey, internodes either short, densely

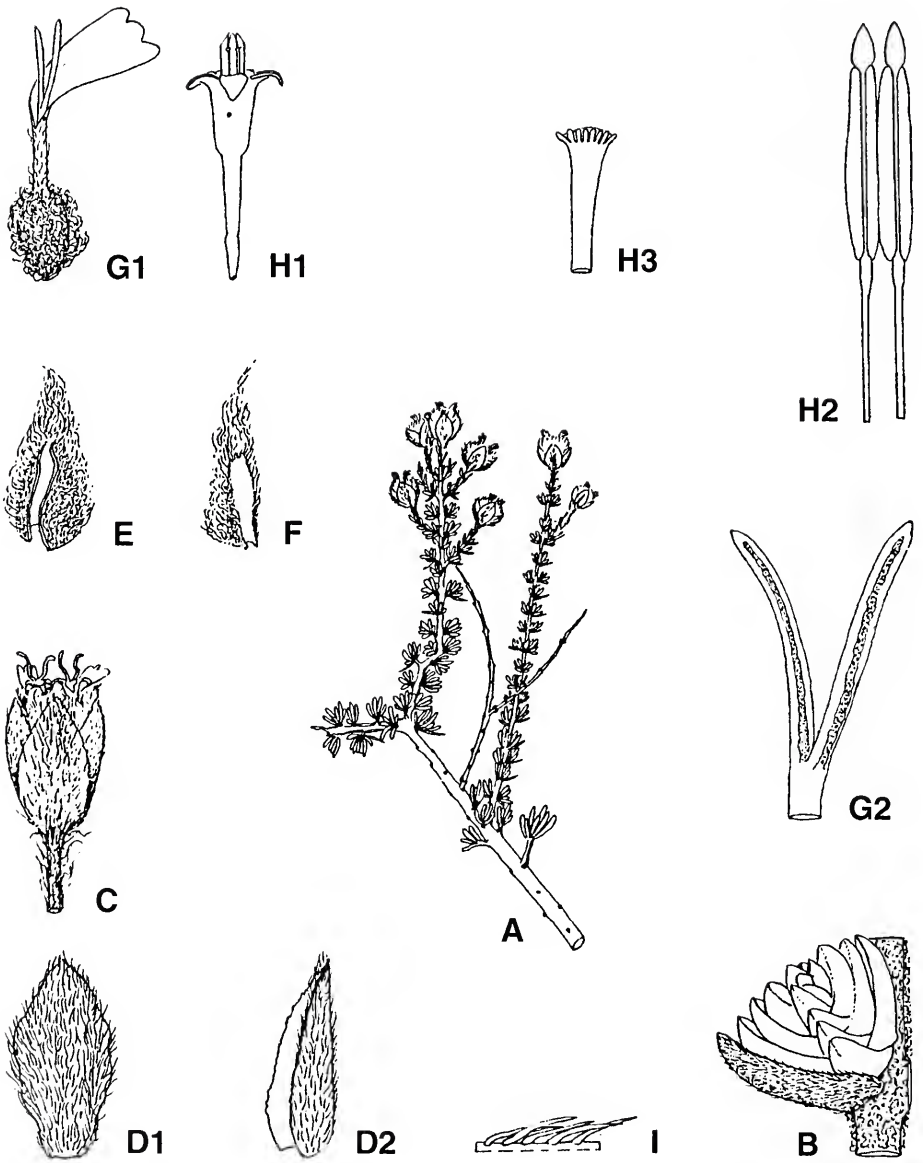


FIGURE 6.—**Eriocephalus giessii**: A, flowering shoot with inflorescences, × 1; B, branch with leaves, × 10; C, capitulum, × 5; D1, D2, involucral braets, × 8; E, marginal palea, × 5; F, central palea, × 10; G1, ray floret × 8; G2, branched style, × 25; H1, disc floret, × 8; H2, anthers, × 25; H3, style, × 25; I, indumentum, × 32 (*Giess 13383*, WIND).

leafy or relatively long with leaves scattered; brachyblasts short-lived. *Leaves* alternate, rarely opposite, sessile on cushion-like thickenings on stem, linear to narrowly lanceolate or obtuse-triangular, 3–30 × 0.5–1.5(–2.0) mm, entire, succulent, permanently grey-felty, adaxially flattened, concave towards base, abaxially convex, apex acute. *Capitula* heterogamous disciform, racemose or paniculate, 2.5–4.8 mm long, sessile to distinctly pedunculate; peduncles 0–15 mm long, felty. *Involucral bracts* 4, 3 × 2 mm, central part herbaceous, green, red-purple towards membranous margin, abaxially felty, 2 slightly keeled, 2 laterally flattened, margins enveloped by the two keeled bracts. *Paleae*: those of marginal florets connate into cylindrical sheath, basally slightly globose, apices and abaxially long-lanate, hairs septate; those of disc florets lanceolate to linear, 1.5–2.0 mm long, apices fringed, abaxially lanate, sometimes absent in central florets. *Marginal female florets* 1–3; corolla white to pink, obovate, constricted around style; narrowed part very short. *Style* almost totally exposed, cylindrical, forked; style branches flattened, linear, up to 1 mm long, apices acute. *Ovary* (and cypsela) ovoid-oblong, abaxially densely lanate, slightly flattened, 3 × 2 mm. *Seed* ovoid, laterally compressed, 1.5–2.3 mm long. *Disc florets* 4–21, functionally male with sterile ovary; corolla ± 3 mm long, widening distally, glandular abaxially, yellow-green to yellow with purple-red margins, rarely entirely purple-red. *Style* cylindrical, unbranched, apex broad, with sweeping hairs. *Stamens* 5, exserted at maturity. *Receptacle* after anthesis with dense, white, long-hairy indumentum between involucral bracts and connate marginal paleae. *Chromosome number*: $2n = 36$.

After *E. africanus*, *E. racemosus* is the oldest known species of *Eriocephalus*. Although it is relatively easy to distinguish *E. racemosus* from related taxa, a few herbarium specimens have been incorrectly identified as *E. africanus*. These misidentifications can be ascribed to a description and associated illustration of *E. racemosus* by Gaertner (1791), based on material of *E. africanus*, which were accepted by Lamarck (1796) and Jacquin (1796).

Obvious differences in capitulum structure together with differences in leaf shape, have led to the recognition of two varieties. This division is supported by chromosome morphology.

Note: in his thesis, Müller (1988) distinguished these two taxa as subspecies. It was decided, however, to lower them to variety level as they occur in the same geographical area.

Capitula sessile to very shortly pedunculate; peduncle up to 5 mm long; disc florets (4–)7–9 . . . . . 20a. var. *racemosus*

Capitula distinctly pedunculate; peduncle (5–)10–15 mm long; disc florets 13–21 . . . . . 20b. var. *affinis*

20a. var. **racemosus**.

Leaves linear. *Capitula* 2.5–3.5 mm long, sessile to very shortly pedunculate (at most 5 mm long). *Paleae*: those of marginal florets connate, thin, membranous; those of disc florets weakly developed and often absent in central florets. *Marginal female florets* (1)2. *Disc florets* (4–)7–9, 2.4–3.2 mm long. *Flowering time*: June to September, but depending on rain, continuing until November. Figure 7.

With a few exceptions, var. *racemosus* is almost always found near the coast. It extends as far east as Port Elizabeth and west to Lambert's Bay. Map 10.

This variety forms a dense, compact shrub, which is densely leafy at branch tips. The synflorescence is a dense, drooping, spicate raceme. Capitula are mostly sessile. In *Henrici 3721* (PRE) and *Bohnen 409/3* (NBG) the capitula are shortly pedunculate (less than 5 mm) and they could possibly be transitional forms to var. *affinis*. However, in both these specimens the capitula contain fewer than 10 disc florets, a feature which assigns them to var. *racemosus*.

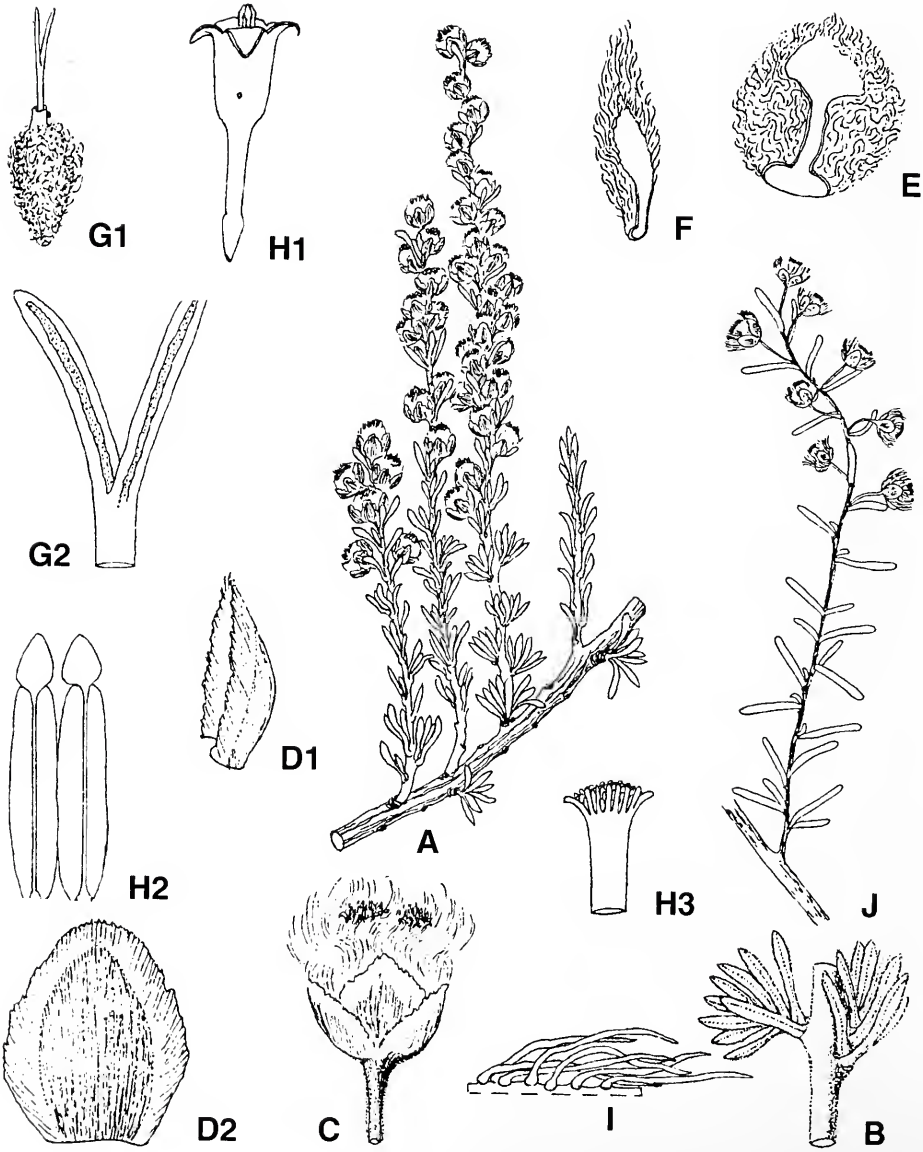


FIGURE 7.—**Eriocephalus racemosus** var. **racemosus**: A, flowering shoot with inflorescences, × 1; B, branch with leaves × 1.5; C, capitulum, × 4; D1, D2, involucral bracts, × 8; E, connate marginal paleae, × 12; F, central palea, × 10; G1, marginal female floret, × 12; G2, branched style, × 35; H1, disc floret, × 12; H2, anthers, × 25; H3, style, × 25; I, indumentum, × 40 (*Müller 3634*, WIND). **E. racemosus** var. **affinis**: J, flowering shoot with inflorescences, × 1 (*Müller 4003*, WIND).

Doubtful cases with shortly pedunculate capitula can therefore be positively identified by the number of disc florets.

E. racemosus var. *racemosus* which forms part of the Coastal Fynbos (Acocks 1975), can survive veld fires and has become an invader in certain areas. In some areas it is well browsed but in other areas it is not utilised at all. According to Smith (1966) the wool is used by the Cape Penduline Tit (*kapokvoëltjie*), *Anthoscopus minutus*, for making its nest, and by rural people for stuffing pillows. Common names: *sandveldkapok*, *strandveldkapok*, *rivierkapok* (Bredasdorp area) and *kapkappie*.

Vouchers: *Bolus 6323* (BOL, PRE, Z); *Boucher 3322* (NBG); *Brown in herb. Rogers 29217* (GRA, NBG, PRE); *Parker 3590* (NBG, PRE); *Van Breda 1635* (PRE).

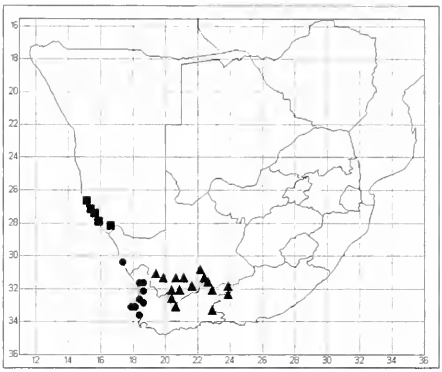
20b. var. **affinis** *(DC.) Harv.*, Flora capensis 3: 203 (1865). Type: Western Cape, 'Langevalei, an und in der Valei, unter 1000 Fuss, Juli', *Drège 2736* (G-DC, holo.; PRE, photo.!).

E. affinis DC.: 147 (1838). Type: as above.

Leaves semisucculent to succulent, linear. *Capitula* 3.8–4.8 mm long; peduncle (5–)10–15 mm long. *Paleae*: those of marginal florets connate into a hard coriaceous, tubular sheath; central florets each enveloped by well-developed palea. *Marginal female florets* (2)3. *Disc florets* 13–21, 3.6–4.5 mm long. *Flowering time*: June to September, but plants in flower collected as early as April and as late as November, depending on rain. Figure 7.

The distribution of var. *affinis* extends from near the coast to 50 km inland and it has been collected from Hondeklip Bay to Melkbosstrand. Most material has been collected away from the coast, on sandy soil. It forms dense stands, often dominating plant communities. Map 11.

Common name: *kapokbos*.



MAP 11.—● **Eriocephalus racemosus** var. **affinis**; ▲ **E. decussatus**; ■ **E. kingesii**.

Vouchers: *Acocks 14527* (PRE); *Hugo 2874* (NBG); *Le Roux 2588* (NBG); *Levyns 11690* (BOL); *Müller 4003* (NBG, PRE, WIND).

21. **Eriocephalus decussatus** *Burch.*, Travels in the interior of southern Africa: 272 (1822); G.Don: 364 (1830). Type: Northern Cape, between Karree River and Klein Quaggas Fontein, near Frazerburg, 24–26/8/1811, *Burchell 1407* (K, holo.!; PRE, photo.!).

E. aspalathoides DC.: 148 (1838); Harv.: 203 (1865); non *E. aspalathoides* sensu Merxm.: 60 (1967). Type: Western Cape, 'Zwischen Zwarteberg und Aasvogelberge, Namaqualand', *Drège 2142* (G-DC, holo.; P!, PRE, photo.!).

Shrubs much-branched from base, sometimes spinescent, 0.6–1.5 m high and in diameter; branches conspicuously opposite. *Old stems* grey-black, displaying anomalous secondary growth; dolichoblasts yellow-brown, silver-sericeous; older branches brown-grey. *Leaves* decussate, often alternate on flowering shoots, imbricate, scale-like, triangular, all leaves short, 0.75–1.75(–3.0) mm long, entire, permanently densely appressed silver-sericeous, giving plant silvery grey appearance, adaxially basally concave, abaxially basally convex, apex acute, base semilunate. *Capitula* heterogamous disciform, solitary on brachyblasts, rarely in terminal

racemes, 3.5–4.0 mm long; peduncles (1.0–) 2.0–3.5(–6.0) mm, appressed sericeous. *Involucral bracts* 4, rarely 5, ovate, slightly acute, 3.5 × 2.4 mm, greenish purple to reddish purple with silvery white sericeous indumentum, central part thickened, margin narrow, membranous. *Paleae*: those of marginal florets totally connate, forming cylindrical sheath with 2–4 free apical lobes, coriaceous, free apices fringed, abaxially long-lanate, hairs septate; those of outer disc florets slightly keeled, hard, coriaceous, those of central florets flattened, membranous, 3.2 × 0.6 mm, free apices fringed, abaxially long-lanate. *Marginal female florets* 2–4, creamy white, 3.6–5.0 mm long, lamina extremely short, 0.6–1.2 mm, inconspicuous, longer than point of furcation of style but shorter than style branches, 3-lobed or -dentate. *Style branches* strap-shaped. *Ovary* (and cypsela) oblong, flattish, trigonous, long-lanate. *Seed* 1.5–2.2 mm long, ovoid, flattened. *Disc florets* (3–)5–8(–11), functionally male with sterile ovary, 3.7–4.5 mm long; corolla tube trumpet-shaped, basally cream-coloured, apex red-purple. *Stamens* 5, exserted at maturity. *Style* undivided, cylindrical, apex truncate, with sweeping hairs. *Receptacle* after anthesis with long hairs between involucral bracts and marginal, connate paleae. *Chromosome number*: $2n = 18$. *Flowering time*: correlated with rainfall, extending from January to April and from July to September in the different rainfall regions.

The distribution of *E. decussatus* extends over both summer- and winter-rainfall regions, over the central Karoo and parts of Namaqualand, mostly on sandy soil. Although a large number of capitula are produced, this species is never found in dense stands but is rather scattered. Map 11.

E. decussatus is one of the species that, because of incomplete descriptions coupled with misinterpretations by later researchers, kept taxonomists on the wrong track. Burchell first collected it in 1811 and in 1822 a very short, incomplete description was published. De Candolle (1838) included it in his work, but in synonymy under *E. glaber* (= *E. ericoides*), which it superficially resembles, but from which it differs in indumentum and connate marginal paleae. Despite its obscurity to taxonomists, Don (1830) mentioned it as an ornamental known to gardeners in the United Kingdom. Harvey (1865) did not mention it in his work on *Eriocephalus*. Its synonym *E. aspalathoides*, as described by De Candolle, is better known. It is ironic, however, that almost all specimens identified with this name, do not belong to this species but rather to *E. ambiguus* (no. 24), *E. luederitzianus* (no. 25), *E. namaquensis* (no. 31) or *E. microphyllus* (no. 28), all taxa distinct from *E. decussatus*. Acocks (1975) had a realistic concept of this species and identified it correctly in most cases. The main reason for this confusion was Harvey's (1865) misinterpretation of De Candolle's (1838) description. Harvey (1865) described the plants as subspinescent while De Candolle (1838) explicitly described the plants as similar to *E. spinescens* but almost without spines ('sed rami subinermes'). The spines referred to by De Candolle are the hardened remains of the terminal racemose peduncles that sometimes occur (the capitula are mostly terminal on brachyblasts).

Another misunderstanding causing confusion and misidentifications was De Candolle's (1838) description of the leaves as opposite and alternate, which should have been opposite with alternate leaves on flowering shoots. Neither Burchell (1822) in his original description of *E. decussatus*, nor De Candolle (1838) in his description of *E. aspalathoides*, mentioned the connate paleae of the marginal florets, the most important character distinguishing this taxon from the closely related *E. microphyllus*.

Where *E. decussatus* and *E. microphyllus* occur together, they resemble each other in habit, but can be distinguished by the silvery sericeous indumentum in *E. decussatus*, giving the plants a silvery grey appearance, as opposed to the blue-green to grey-green to bright green colour of *E. microphyllus*.

Common name: *kapokbossie*.

Vouchers: *Acocks 19486* (PRE); *Acocks 19487* (PRE); *Leistner 481* (NBG, PRE); *Marloth 3355* (NBG); *Müller 3605* (WIND).

22. **Eriocephalus kingesii** *Merxm. & Eberle* in Mitteilungen der Botanischen Staatssammlung, München 2: 321 (1957); Merxm.: 61 (1967). Type: Namibia: Lüderitz, hills across Nautilus, *Kinges 2575* (M, holo.!; PRE!).

Robust, erect to spreading, many-stemmed, much-branched shrubs, 0.3–0.6 m high and in diameter; branches rigid. *Old stems* displaying anomalous secondary growth, 10–20 mm in diameter; young shoots yellow-brown, appressed sericeous; older shoots brown-grey to grey-black; brachyblasts opposite, short-lived. *Leaves* opposite, decussate, linear or naviculate, on young shoots 6–12 × 1.0–1.5 mm, scattered, on brachyblasts 2–5 × 1.0–2.5 mm, densely imbricate, entire, semisucculent, adaxially flattened, concave towards base, abaxially convex, slightly keeled, surface smooth, blue-green to yellow-brown, permanently densely sericeous, apex obtuse, base semi-amplexicaul and with cushion-like thickenings. *Capitula* heterogamous disciform, relatively large, 4–8 mm in diameter, solitary on brachyblasts or racemose, terminal on young shoots, flowering shoots rigid, thick; peduncles rigid, appressed sericeous, 3–12 mm long. *Involucral bracts* 4 or 5, ovate, obtuse, 4 × 3 mm, appressed sericeous, central part thickened, herbaceous, margin broad, membranous, sometimes red. *Paleae*: those of marginal florets mostly free, sometimes connate at base, ovate to oblong, 4–6 mm long, slightly keeled, firm, apices fringed, abaxially lanate, hairs septate; those of central florets narrowly ovate to oblong, margins fringed, abaxially long-lanate. *Marginal female florets* 1 or 2, 5–6 mm long; corolla 2- or 3-lobed, as long as style, but usually shorter, sometimes with scattered glands abaxially, white to creamy. *Style branches* linear. *Ovary* (and cypsela) oblong-obovoid, slightly flattish, trigonous, 2–3 mm long. *Seed* ovoid, flattish, trigonous, 2.2–3.0 mm long. *Disc florets* 5–15, functionally male; ovary sterile; corolla creamy to yellow, 4.2–6.5 mm long, 5-lobed. *Style* undivided, truncate. *Stamens* 5, well exserted at maturity. *Receptacle* after anthesis with dense, light brown, long-hairy indumentum between involucral bracts and marginal paleae. *Chromosome number*: $2n = 54$. *Flowering time*: almost throughout the year, no peak flowering time determined.

E. kingesii is endemic to Namibia and its distribution is limited to Lüderitz and Diamond Area No. 1, which falls in the winter-rainfall region of the Desert and Succulent Steppe (Giess 1971). Most localities are near the coast and are subject to fog at night. The average annual rainfall of this area is less than 50 mm. Map 11.

These rigid, flat, spreading shrubs with entire, succulent, silvery sericeous leaves are fairly common in the areas where they occur. This is the only *Eriocephalus* species with a high seed set (90%) and germination percentage. At a temperature of 28°C, 16 of 20 seeds germinated within 4 days—thus a germination percentage of 80%.

Since succulence in coastal habitats is often regarded as being determined by environment, young and mature plants were cultivated under uniform conditions at the Botanical Garden of the University of Stellenbosch. Succulence remained, leading to the conclusion that it is genetically determined in this species as is the case in *E. africanus* var. *africanus* (no. 14a), which also occurs along the coast.

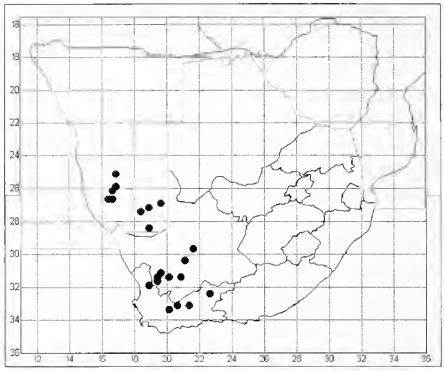
Common name: *kapokbos*.

Vouchers: *Giess & Robinson 13236* (WIND); *Giess & Van Vuuren 686* (BOL, K, PRE, WIND); *Giess & Van Vuuren 707* (BOL, K, PRE, WIND); *Marloth 4764* (NBG); *Merxmüller & Giess 3069* (M, WIND).

23. **Eriocephalus pauperrimus** *Merxm. & Eberle* in Mitteilungen der Botanischen Staatssammlung, München 2: 322 (1957);

Merxm.: 61 (1967). Type: Namibia: Maltahöhe District, Farm Duwisib MAL 84/Farm Blütputz MAL 105/111, *Volk 12666* (M, holo.!; WIND!).

Erect to spreading, many-stemmed, much-branched shrubs, 350–450 mm tall and in diameter. *Older stems* displaying anomalous secondary growth, sometimes twisted and distorted, grey to grey-black; young shoots felty, glabrescent, whitish, sparsely leafy; brachyblasts short-lived, alternate. *Leaves* alternate, densely imbricate on brachyblasts, scattered on young shoots, linear, 4–8 × 0.5 mm, those on brachyblasts 1–2 × 0.5 mm, entire, adaxially slightly flattened, concave towards base, abaxially convex, slightly keeled towards apex, surface pitted with glands in cavities, grey-white, apex obtuse, base widened, semi-amplexicaul; leaves at growing point cobwebby/felty, glabrescent. *Capitula* heterogamous disciform, terminal, spicate, 4–6 × 2–3 mm, alternate, sessile, compact. *Involucral bracts* 4, narrowly ovate, 4 × 2 mm, apex obtuse, narrow, herbaceous, green, central part with broad membranous margin, glabrous, surface pitted, glands in cavities. *Paleae*: those of marginal florets free, lanceolate, 2.0 × 0.5 mm, membranous, margins fringed, abaxially long-lanate, hairs septate; those of disc florets narrowly lanceolate to linear, margins fringed, abaxially long-lanate. *Marginal female florets* 1, 2.0–2.5 mm long; corolla tubular with short, linear to narrow cuneate lamina, yellow, glandular abaxially, shorter than style branches but longer than point of branching of style. *Style branches* flattened, linear, 1.2 mm long, apex acute. *Ovary* (and cypsela) obovoid, flattened, long-lanate, glandular. *Seed* narrowly obovoid, slightly flattened, 1.5 mm long. *Disc florets* 1–4, functionally male with sterile ovary; corolla 2–3 mm long, tubular to trumpet-shaped, yellow with red-purple margin, 5-toothed, abaxially glandular. *Stamens* 5, exserted at maturity. *Style* truncate, with sweeping hairs. *Receptacle* after anthesis with long hairs between involucral bracts and marginal paleae. *Chromosome number*: $2n = 18$. *Flowering time*: correlated with rainfall, January to March and June to September in summer- and winter-rainfall areas respectively.



MAP 12.—**Eriocephalus pauperrimus**.

The distribution of *E. pauperrimus* extends from the southern parts of Namibia through the Northern Cape to Matjiesfontein in the Western Cape. The areas where it occurs, receive less than 200 mm rain per annum. It occurs mainly in the summer-rainfall area but also partly in the area that receives both summer and winter rain at an altitude of 300–600 m. This species is under-collected in southern Namibia and the Northern Cape. Map 12.

Although closely related to *E. ericoides* (no. 26), it can easily be distinguished from that species by the alternate leaves and sessile capitula in terminal spikes.

Common name: *kapokbos*.

Vouchers: *Acocks 18254* (PRE); *Barker 9300* (NBG); *De Winter 3363* (PRE, WIND); *Giess & Müller 12051* (WIND); *Goldblatt 6086* (MO, WIND).

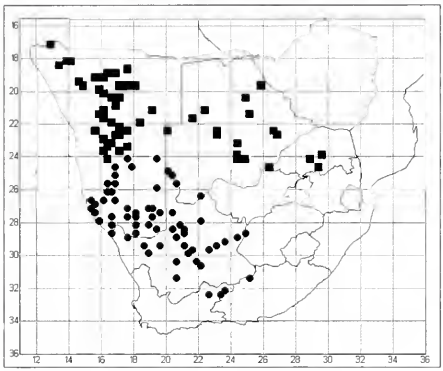
24. **Eriocephalus ambiguus** *(DC.) M.A.N.Müller*, comb. et stat. nov.

E. aspalathoides DC. var. *ambiguus* DC., Prodromus: 148 (1838). Type: Cape Province, precise locality unknown, *Drège 6038* (G-DC, holo.; P!, PRE, photo.!).

E. aspalathoides DC.: 148 (1838), pro parte; Harv.: 203 (1865), pro parte; Merxm.: 60 (1967), pro parte.

Many-stemmed, erect, much-branched, spinescent shrubs, 0.3–0.6 m high and up to 450 mm in diameter. *Older stems* with grey-brown bark, deeply grooved, eventually displaying anomalous secondary growth, 10–20 mm in diameter, breaking up into independent daughter plants; young branches yellow-brown, later yellow-grey to grey-brown, irregularly sympodially branched, tips of branches spinescent, 1–18 mm long; brachyblasts 1–10 mm long, short-lived. *Leaves* basally semilunate, adaxially concave, those on dolichoblasts alternate, linear, 4–15 × 0.5 mm, entire, densely silvergrey shortly pilose to pilose, apex obtuse; leaves on brachyblasts scale-like, rosulate, 2–4 × 0.5 mm, entire, apex obtuse. *Capitula* heterogamous disciform, 4 mm long, solitary on brachyblasts, rarely in terminal racemes; peduncles 1–11 mm long, shortly pilose. *Involucral bracts* 4 or 5, 2.5 × 1.5 mm, green, with narrow, sometimes purplish, membranous margin, ovate, flattened, abaxially appressed sericeous. *Paleae*: those of marginal florets free, 2 × 1.5 mm, keeled, lanceolate, apices fringed, abaxially long-pilose, hairs septate, adaxially smooth, glabrous; those of disc florets oblong-linear, membranous, apex fringed, 1 × 0.5 mm, abaxially long-pilose, adaxially smooth. *Marginal female florets* 2–5, yellow, inconspicuous, 2.0–2.5 mm long; lamina absent; corolla tubular-filiform, much shorter than branched style. *Style branches* flattened, linear, apex acute, 1–2 mm long. *Ovary* (and cypsela) oblong-ovoid, slightly flattened, densely lanate at maturity. *Seed* 1–2 mm long, flattish, trigonous. *Disc florets* 5–21, yellow, functionally male with sterile ovary, 2.5–3.0 mm long; corolla tubular, widening upwards, 5-toothed; teeth sometimes tinged red-purple. *Stamens* 5, exserted at maturity. *Style* unbranched, globose, truncate with short, sweeping hairs. *Receptacle* after anthesis with long, soft hairs between involucral bracts and marginal paleae. *Chromosome number*: $2n = 18$. *Flowering time*: January to April.

The distribution of *E. ambiguus* extends from the central parts of Namibia to Botswana and the Northern, Western and Eastern Cape. Its current known distribution in Botswana is limited to a single locality on the border between the Northern Cape and Botswana. The largest part of the distribution area receives an annual rainfall of less than 200 mm; only the southernmost part of its distribution receives an average annual rainfall of more than 200 mm. It is suspected that this species is more common in the southern parts, but that it has been under-collected here because of its similarity to and the resulting confusion with *E. karooicus* (no. 17) and *E. spinescens* (no. 30), both of which are associated with *E. ambiguus* in this area. Like *E. karooicus* and *E. spinescens*, *E. ambiguus* is found only in low-lying areas, ± 300 m above sea level, mainly in sandy and clayey soils, never on mountains or hills. Plants are scattered or at most found in small groups, but never form dense, dominant communities. Map 13.



MAP 13.—● **Eriocephalus ambiguus**; ■ **E. luederitzianus.**

After the description of *E. aspalathoides* var. *ambiguus* by De Candolle (1838), this taxon was not recognised by later researchers of the genus *Eriocephalus*. This can be attributed partly to the fact that later researchers like Harvey (1865) and Merxmüller (1967) placed it in synonymy under *E. aspalathoides* and partly to its poor representation in herbaria. It is only from 1963 onwards that this taxon has become better represented in herbarium collections.

E. ambiguus was confused with the earlier known *E. aspalathoides*, now *E. decussatus* (no. 21). Although *E. decussatus* has opposite leaves, they are alternate on flowering shoots, as in *E. ambiguus*. The capitula are solitary, pedunculate on brachyblasts, while the terminal raceme branches harden to form spinescent tips after the capitula have been shed. A thorough investigation of *E. ambiguus* showed that the leaves are always alternate, and a true spine is formed, not merely spinescent branch tips.

Although closely related to *E. luederitzianus* (no. 25), it can be easily distinguished from that species by the spines, the capitula borne mainly on brachyblasts and the much-branched growth form. *E. luederitzianus*, in contrast, has mainly terminal racemes of which the central flowering axis becomes hardened and spinescent after maturity and shedding of capitula.

During good rainy seasons *E. ambiguus* tends to form long, drooping shoots without spines and with long leaves similar to those of *E. luederitzianus* instead of the typical spinescent habit with rigid branches and very short leaves. This variation of *E. ambiguus* can easily cause confusion with *E. luederitzianus*, but as these two species are allopatric, all material can be separated on distribution alone.

Note: during preparation of the manuscript and investigation of the taxa, Herman found three specimens in PRE (*Hafström & Acocks 1554*, *Shearing 558*, *Van Rooyen & Bredenkamp 168*) in which the paleae of the marginal female florets were connate. No other differences could be detected in these three specimens; they fit the description of *E. ambiguus* perfectly, except for the connate paleae.

Common name: *doringkapok*.

Vouchers: *De Winter 3590* (PRE); *Giess 14617* (WIND); *Giess & Robinson 13253* (WIND); *Müller 791* (WIND); *Pole Evans 2248* (BOL).

25. **Eriocephalus luederitzianus** *O.Hoffm.* in Bulletin de l'Herbier Boissier 1: 86 (1893); Engl. & Prantl: 270 (1894); Merxm.: 62 (1967). Type: Namibia, 'Reise von Walfish Bay nordöstlich nach Odyitambi, Dec. 1885 bis Febr. 1886', *Lüderitz s.n.* (Z, holo.!).

E. eenii S.Moore: 351 (1902). Type: Namibia, Damaraland, *Een s.n.* (BM, holo.!).

E. squarrosus Muschl. in Dinter: 260 (1921) nom. nud. Type: Namibia, Farm Hoffnung WIN 66, *Dinter 985* (B, holo.; SAM!).

E. hirsutus Burtt Davy: 106 (1935). Type: Northern Province, Bushveld, Klippan, *Rehmann 5232* (K, holo.!; Z!).

E. pubescens sensu Merxm.: 62 (1967).

Erect, many-stemmed, sparsely branched shrubs, 300–500 mm tall. *Old stems* dark brown, rough, deeply grooved, displaying anomalous secondary growth; bark yellow brown to dark brown; young branches smooth, yellow-white, densely white sericeous; older branchlets yellow-brown, superficially grooved, sparsely hairy; brachyblasts short, up to 10 mm long. *Leaves* alternate, densely imbricate, those on young shoots 4–25 × 0.5–1.0 mm, those on brachyblasts linear, 3–6 × 0.5–1.0 mm, entire, permanently densely appressed silver-grey sericeous, adaxially basally concave, abaxially convex, distally semiterete to cylindrical, apex obtuse, base semi-amplexicaul. *Capitula* heterogamous disciform, mostly terminal, racemose or umbellate racemose, also solitary, terminal on brachyblasts, 4–8 × 4–6 mm; peduncles 2–16 mm long, appressed sericeous. *Involucral bracts* 4 or 5, ovate, flattened, ± 3 × 1.5 mm, central part green, herbaceous with narrow membranous, colourless to purple margin, abaxially permanently appressed sericeous. *Paleae*: those of marginal florets free, keeled, lanceolate, 2.5 × 1.0 mm, abaxially long-pilose/lanate, hairs septate, apex fringed; those of disc florets oblong to linear, transparent, membranous, 1–2 × 0.5 mm, abaxially lanate, adaxially smooth, apex fringed. *Marginal female florets* 2–5, indistinct, 2.5–3.0 mm long; corolla yellow, tubular, narrowed at throat, sometimes with very short lamina, scarcely 0.5 mm long, much shorter than

TABLE 1.—Comparison of morphological characters of *Eriocephalus ambiguus* and closely related taxa

Character	*E. ambiguus*	*E. luederitzianus*	*E. microphyllus* var. *pubescens*	*E. merxmuelleri*
Leaf arrangement	Alternate	Alternate	Opposite, sometimes alternate on flowering shoots	Opposite, sometimes alternate on flowering shoots
Leaf length	4–15 mm	4–25 mm	1.5–4.0 mm	4–9(–14) mm
Indumentum	Permanently sericeous	Permanently sericeous	Permanently felty sericeous	Sericeous, glabrescent
Inflorescence	Solitary on brachyblasts	Racemose or umbellate-racemose or solitary on brachyblasts	Racemose or paniculate or solitary on brachyblasts	Racemose or solitary on brachyblasts
Involucral bracts	4(5), permanently sericeous	4(5), permanently sericeous	4, felty sericeous to glabrous	4(5), sericeous to glabrous
Disc florets	5–21, yellow, sometimes with red-purple margin	14–28, yellow	(3)4–6(–8), cream-coloured with red-purple margin	1–(5) or 6(–9), cream-coloured with red-purple margin
Habit	Much-branched shrubs with terminal spines	Many-stemmed shrubs with long, sparsely branched shoots	Much-branched shrubs	Much-branched shrubs with long peduncles

branched style. *Style branches* flattened, linear, 1–2 mm long, apices acute. *Ovary* (and cypsela) oblong-ovoid, slightly flattish, trigonous, at maturity densely lanate. *Seed* flattish, trigonous, 1–2 mm long. *Disc florets* 14–28, functionally male with sterile ovary, yellow, 3 mm long; corolla tube 5-toothed. *Stamens* (4)5, well exserted at maturity. *Style* unbranched, apex globose, with sweeping hairs. *Receptacle* after anthesis densely white or tawny lanate between paleae of marginal florets and involucral bracts. *Chromosome number*: $2n = 36$. *Flowering time*: October to May with a peak from January to March.

E. luederitzianus occurs only in the summer-rainfall area. It extends over the northern half of Namibia, most of Botswana into the Northern Province of South Africa. In Namibia it is the most abundant species with the widest distribution. Information from Botswana is very deficient, but it seems that with the exception of a single locality for *E. ambiguus* (no. 24), this is the only species occurring in Botswana. It is also possible that this species is more abundant in Botswana, but that it has been under-collected until now. Map 13.

As there is so much confusion between *E. ambiguus* (no. 24) [*E. aspalathoides pro parte* after De Candolle (1838), Harvey (1865) and Merxmüller (1967)], *E. luederitzianus*, *E. microphyllus* var. *pubescens* (no. 28b) and *E. merxmuelleri* (no. 32), a comparison between these species is given in Table 1.

During good rainy seasons *E. ambiguus* produces water shoots with long leaves and lacking characteristic spines. This material can easily be confused with *E. luederitzianus*. Later growth shows the characteristic terminal spines. These two species are allopatric and difficulties regarding positive identification can be solved by consulting the distribution map.

In the past, all material of *E. luederitzianus* was identified as *E. pubescens*, the current *E. microphyllus* var. *pubescens*, because Merxmüller (1967) had put it into synonymy under *E. pubescens*. As a result, material of *E. merxmuelleri* and *E. ambiguus* was also identified as *E. pubescens*.

Note: during preparation of the manuscript and investigation of the taxa, Herman found six specimens in PRE (*Koekemoer 205, Kreulen*

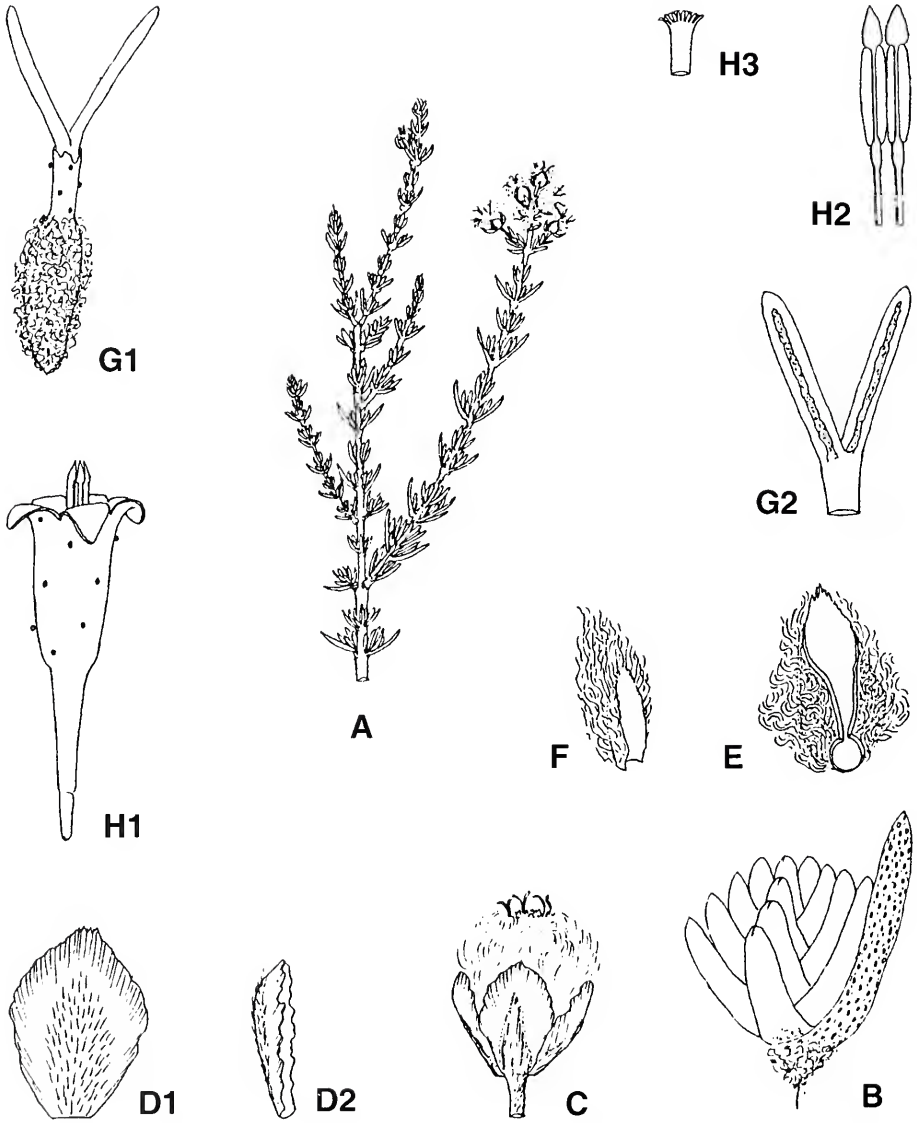


FIGURE 8.—**Eriocephalus ericoides** subsp. **ericoides**: A, flowering shoot with inflorescences, × 1; B, branch with leaves, × 12; C, capitulum, × 6; D1, D2, involucral braets, × 10; E, free marginal palea, × 10; F, central palea, × 15; G1, marginal female floret, × 18; G2, branched style, × 25; H1, disc floret × 20; H2, anthers, × 14; H3, truncate style, × 14 (*Müller & Tilson 873*, WIND).

562, Moss & Jacobsen K18, Seydel 1405, Skarpe S-359 and *Vahrmeijer & Steenkamp 3067*) in which the paleae of the marginal female florets were connate. No other differences could be detected in these six specimens; they fit the description of *E. luederitzianus* perfectly, except for the connate paleae.

Common name: *kapokbos*.

Vouchers: *De Winter & Leistner 5539* (PRE, WIND); *Giess 13572* (NBG, WIND); *Hutchinson 2651* (BOL, PRE); *Müller & Kolberg 2119* (WIND); *Story 4901* (NBG, PRE).

26. **Eriocephalus ericoides** *(L.f.) Druce* in Supplement to Botanical Exchange Club of the British Islands for 1916: 622 (1917); Merxm.: 61 (1967). Type: Cape Province, exact locality unknown. Collector unknown (LINN 983.5, holo., microfiche!; WIND, photo.!).

Tarchonanthus ericoides L.f.: 360 (1782). Type: as above.

E. glaber Thunb.: 168 (1800); Willd.: 2384 (1803); Pers.: 497 (1807); Thunb.: 724 (1823); Spreng.: 621 (1826); DC.: 148 (1838); Harv.: 204 (1865). Type: Cape Province, without exact locality, *Thunberg sub Thunberg Herb. nr. 20911* (UPS, holo.; WIND, photo.!).

E. glaber Thunb. var. *sessiliflorus* Sond. ex Harv.: 204 (1865). Type: Eastern Cape, Graaff-Reinet, *Zeyher 23* (MEL, holo.!).

Erect, many-stemmed, relatively sparsely branched, conical or broom-like shrubs, 0.3–1.0 m high, 300–400 mm in diameter, not or rarely spinescent. *Old stems* displaying anomalous secondary growth, 15–30 mm in diameter, grey-brown; dolichoblasts bright green to yellowish, sparsely to densely white-felty and glandular; older branchlets grey to grey-brown, delicately branched, tending to be vertically orientated; brachyblasts short-lived, sometimes very long with leaves at apex. *Leaves* opposite, rarely alternate on flowering shoots, linear, (0.75–) 1.0–3.5(–7.0) × 0.2–0.5 mm, entire, adaxially flattened, concave towards base, abaxially convex, initially densely felty, glabrescent, or permanently hairy, when glabrous shiny, bright green or dull green, pitted with glands in cavities, apex obtuse to slightly acute, base broadened and semi-amplexicaul; leaves on brachyblasts conspicuously decussate, imbricate, initially shortly felty, glabrescent or permanently hairy; those on dolichoblasts scattered, sessile on permanently callous, cushion-like thickenings, much longer than those on brachyblasts. *Capitula* heterogamous disciform, spicate racemose or racemose or solitary on brachyblasts, rarely paniculate, 1.5–2.5 mm long; peduncle 1.0–5.5 mm long, sometimes almost absent, felty, glabrescent. *Involucral bracts* 4, ovate to lanceolate, up to 2 × 1.5 mm, 2 slightly keeled, other 2 laterally flattened, central part herbaceous, green, margin broad, membranous, purple, abaxially sparsely felty to sericeous, glabrescent, with permanent, almost sessile glands in cavities. *Paleae*: those of marginal florets free, 1.5–2.0 mm long, ovate, keeled and enveloping florets, abaxially long-lanate, hairs septate; those of disc florets linear, 2.0 × 0.3 mm, membranous, margins fringed, abaxially lanate. *Marginal female florets* (1)2, 2.0–2.5 mm long; corolla narrowly tubular-filiform; lamina extending at most to furcation of style, yellow, cylindrical. *Style branches* flattened, linear, apex acute. *Ovary* oblong to oblanceolate, slightly flattened, long-lanate. *Seeds* 1.2–2.2 mm long, obovoid, slightly flattened. *Disc florets* (1–)3–5(–7), functionally male with sterile ovary, 2.0–2.5 mm long; corolla tubular to trumpet-shaped, 5-lobed, red-purple, sometimes yellow towards base. *Stamens* 5, exserted at maturity. *Style* unbranched, cylindrical, apex globose, with sweeping hairs. *Receptacle* after anthesis with dense, white, long hairs between involucral bracts and marginal paleae. *Chromosome number*: $2n = 18$. Figure 8.

E. ericoides occurs from Namibia to the Free State and the Northern, Western and Eastern Cape. The plants in Namibia are fairly isolated from those in South Africa. Except for the indumentum of plants north of the Orange River, there seem to be no obvious differences between the plants in Namibia and those south of the Orange River. They all have a conical to broom-like growth form. The shape and length

of the leaves differ very little between the different individuals.

Individuals from a population in the Northern Cape, north of the Orange River, have dull green leaves with permanent, long-felty hairs. In contrast, other individuals of the species in South Africa and Namibia have shiny, bright green, glabrescent leaves. On the grounds of the dull green leaves with permanent, long-felty indumentum and geographical isolation, this group is described as a subspecies of *E. ericoides*.

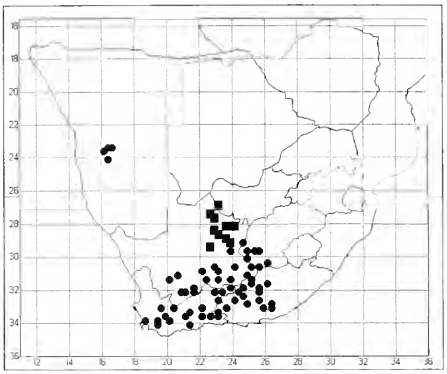
Two subspecies are recognised:

Leaves glabrescent, shiny, bright green . . . . . 26a. subsp. *ericoides*
Leaves permanently long-felty, dull green . . . . . 26b. subsp. *griquensis*

26a. subsp. **ericoides**.

Older leaves glabrescent, shiny, (0.75–)1.0–3.0(–5.0) × 0.3–0.4 mm. *Peduncles* 1–5 mm long. *Marginal female florets* (1)2. *Disc florets* (1–)3–5(–7). *Flowering time*: correlated with rainfall, January to April in summer-rainfall areas and July to September in winter-rainfall areas.

E. ericoides subsp. *ericoides* has the widest distribution of all *Eriocephalus* taxa. It extends from Namibia into the Free State and Northern, Western and Eastern Cape, being absent only from the northwestern and western parts. The species is distributed mostly inland: it does not extend to the coast and occurs mostly above 300 m altitude. The distribution includes both summer- and winter-rainfall areas, ranging from those with an annual rainfall of less than 250 mm to areas with more than 500 mm. Compared to *E. africanus* var. *paniculatus* (no. 14b), the taxon with the second-widest distribution, occurring in coastal areas with higher rainfall, this subspecies is more representative of the arid karoo region. The disjunct distribution of *E. ericoides* subsp. *ericoides* is very obvious. Not only does the population in Namibia stand isolated from the rest of the species (both subsp. *ericoides* and subsp. *griquensis*), but there is very little correlation between the two distribution areas of subsp. *ericoides*. In Namibia, their habitat is high-lying mountains, 1 000 to 1 700 m in altitude, and receives summer rainfall of only 250 to 300 mm rain annually, whereas in South Africa it occurs both on high-lying parts and near the coast (300 m altitude) and receives both summer and winter rainfall, with a precipitation of about 500 mm annually. Both populations of subsp. *ericoides* occur in the Karoo-Namib plant geographical region (Werger 1978). This region is characterised by a wealth of dwarf shrubs belonging to the Asteraceae. Between this Karoo-Namib plant geographical region and the Capensis region where the distribution of subsp. *ericoides* continues, there are many floristic similarities. It is therefore possible that *E. ericoides* had a much wider distribution earlier but that it was disrupted by unknown factors. Map 14.



MAP 14.—● **Eriocephalus ericoides** subsp. **ericoides**; ■ **E. ericoides** subsp. **griquensis**.

As this subspecies occurs in so many different veld types, it has adapted to various habitats. This in turn has led to much variation in morphological characters. The most common growth form is conical or broom-like shrubs with thin branchlets and delicate, small, bright green, decussate leaves on brachyblasts. The leaves at the growing points of young shoots are

initially felty, but soon become glabrous. The growing points of the brachyblasts are, however, felty sericeous.

The arrangement of capitula shows almost as much variation as there are plants. The most common is racemose with relatively shortly pedunculate capitula. Two specimens were collected by Tyson at Murraysburg: *Tyson 269* (SAM) has an almost paniculate synflorescence, while *Tyson 289* (SAM) has sessile capitula (the so-called var. *sessiliflorus* Sond. ex Harv.). The leaves are mostly opposite, but are often alternate on flowering shoots.

E. ericoides subsp. *ericoides* is well browsed compared to *E. microphyllus* (no. 28). According to Roux (1984), this bush is not unpalatable, but palatability varies from season to season. It is best utilised during late autumn and spring. This subspecies can become invasive in disturbed veld. Roux (1984) mentions that it hampers the establishment of *Panicum* species in the Karoo to a certain degree. Common names: *gewone kapokbossie*, *renosterveldkapok*, *roosmaryn*, rosemary (Smith 1966); *gladdekapokbos*, *regtekapok*, *gewonekapok*, *grootkapokbos*, *sandveldkapokbos* (Roux 1984).

Vouchers: *Dahlstrand 2105* (NBG, PRE); *Dyer 427* (GRA, PRE); *Hugo 245* (NBG); *Smith 951* (PRE); *Walter 1692* (WIND).

26b. subsp. **griquensis** *M.A.N.Müller*, subsp. nov., *E. ericoidi* (L.f.) Druce subsp. *ericoidi* affinis sed foliis permanenter velutinis differt.

Type: Northern Cape, Herbert District: Farm Eureka, *Acocks 8753* (BOL, holo.; PRE).

Older leaves dull green, permanently long-felty, rarely glabrescent, 1.5–3.0(–7.0) × 0.2–0.5 mm. *Peduncles* (1.0–)2.0–3.5(–5.5) mm. *Marginal female florets* (0)(1)2. *Disc florets* (2–)4 or 5(6). *Flowering time*: correlated with rain in summer, January to April, occasionally extending from July to August when the area receives winter rain.

Subsp. *griquensis* is restricted to the Northern Cape, from the Orange River to near the Botswana border. Map 14.

The habit closely resembles that of subsp. *ericoides*, but the leaves of subsp. *griquensis* are permanently long-felty, rendering it a dull, green colour, and are very rarely glabrescent.

Common name: *kapokbos*.

Vouchers: *Coetsee 48* (PRE); *Esterhuysen 2295* (BOL, PRE); *Kotze 795* (PRE); *Leistner 1449* (PRE); *Pole Evans 2504* (NBG, PRE).

27. **Eriocephalus glandulosus** *M.A.N.Müller*, sp. nov., *E. ericoidi* (L.f.) Druce et *E. aromatico* C.A.Sm. affinis sed habitu ramosissimo spinescenti, foliis saepe ex rubro-purpureis pallide viridis nitidis; lemma florum marginalium stylum aequans.

Type: Northern Cape, 5 km E of Williston on road to Carnarvon, *Müller 3596* (PRE, holo.; WIND).

Erect to slightly spreading, rounded, many-stemmed, much-branched, rigid, spinescent shrubs, 0.2–0.6 m high and in diameter. *Old stems* grey to grey-black, displaying anomalous secondary growth, growing points sparsely felty, soon glabrous; dolichoblasts green-yellow, glandular, when older yellow-brown, glabrous, branches rigid. *Leaves* decussate, densely imbricate, in 4 rows, obtuse triangular to linear, those on dolichoblasts 2.3–6.2 mm long, those on brachyblasts 1.5–2.3 mm long, entire, shiny, bright green, often with red-purple tinge, initially sparsely felty, soon glabrous, with glands in cavities on leaf surface, adaxially proximally concave, distally flattened, abaxially semiterete, keeled, apex obtuse, base semi-amplexicaul. *Capitula* heterogamous disciform, mostly solitary on brachyblasts, sometimes racemose or umbellate-racemose, 2.3–2.6 mm long; peduncle 3–7 mm long, cylindrical, glabrous. *Involucral bracts* 4, broadly ovate, 2.5 × 2.5 mm, with thickened herbaceous cen-

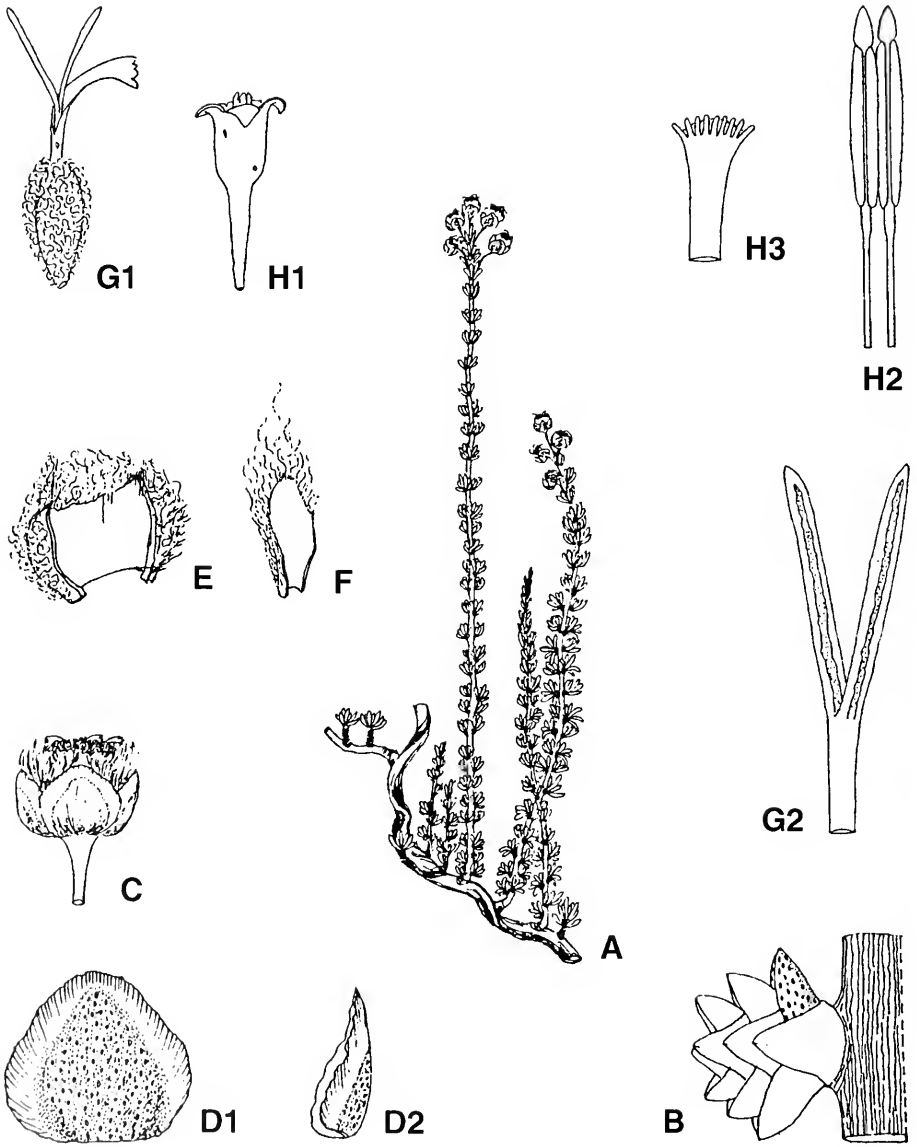
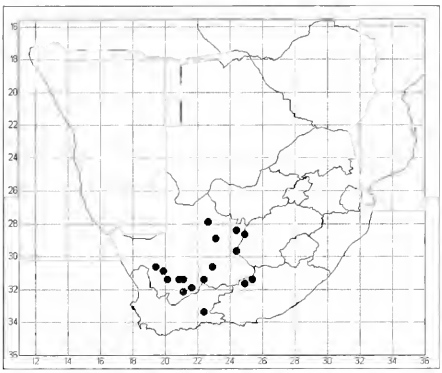


FIGURE 9.—**Eriocephalus glandulosus**: A, flowering shoot with inflorescences, × 1; B, branch with leaves, × 4; C, capitulum, × 3; D1, D2, involucral bracts, × 6; E, free marginal palea, × 6; F, central palea, × 8; G1, marginal female floret, × 10; G2, branched style, × 25; H1, disc floret, × 10; H2, anthers, × 20; H3, truncate style, × 25 (*Acocks 548* and *566*, PRE).

tral part and broad membranous margin, mostly red-purple, sometimes shiny green, glabrous, 2 slightly keeled bracts enveloping 2 flattened ones. *Paleae*: those of marginal florets free, mostly only 2, 2.0–2.4 × 1.5 mm, keeled with central hardened part and membranous margin, apex fringed, abaxially long-lanate, hairs septate; those of disc florets 2.0–2.3 × 0.5 mm, membranous, flattened, narrowly ovate to narrowly lanceolate, margins fringed, abaxially lanate. *Marginal female florets* small, 2, white, 3.6–4.2 mm, lamina up to 2.2 mm long, strap-shaped, as long as to slightly longer than style branches. *Style branches* strap-shaped, apex acute. *Ovary* (and cypsela) oblong to ovoid, slightly flattened, long-lanate. *Seed* 1.4–2.0 mm long, lanceolate, slightly flattened. *Disc florets* 10–18, functionally male with sterile ovary, 2.5–3.2 mm long; corolla red-purple, trumpet-shaped to infundibuliform, 5-lobed. *Stamens* 5, exserted at maturity. *Style* unbranched, truncate, with sweeping hairs. *Receptacle* after anthesis densely white, long-pilose between involucral bracts and marginal paleae. *Chromosome number*: $2n = 18$. *Flowering time*: July to October and February to March according to winter rainfall in the western parts and summer rainfall in the eastern parts of the distribution area. Figure 9.

The distribution of *E. glandulosus* extends over the Northern, Western and Eastern Cape, in the following Acocks (1975) veld types: Kalahari Thornveld and Shrub Bushveld, Kalahari Thornveld invaded by Karoo, Orange River Broken Veld, Arid Karoo and Desert False Grassveld, and False Arid Karoo. These areas receive an average annual rainfall of less than 400 mm. Although the species occurs over a large area, it is never found in dense stands, but rather scattered. Map 15.

Closely related to *E. ericoides* (no. 26) and *E. aromaticus* (no. 8) from which it can be distinguished by its much-branched, spinescent habit, shiny, light green leaves, often with a red-purple tinge, and marginal female florets with lamina about as long as style branches.



MAP 15.— **Eriocephalus glandulosus**.

E. glandulosus and *E. ericoides* are closely related, with some similar characters. Both species have decussate, initially felty but soon glabrous leaves and umbellate, racemose or solitary capitula, terminally on brachyblasts. They can, however, be distinguished as follows: the two marginal paleae of *E. glandulosus* are relatively broad, 2.0–2.4 × 1.5 mm, and membranous; the two lateral margins are extended to touch each other, thus enveloping all the florets, but they are nonetheless free. In contrast, the marginal paleae of *E. ericoides* are narrower, 1.5–2.0 × 0.5–1.0 mm, with incurved margins so that each envelops only one female floret The lamina of the marginal female floret is absent in *E. ericoides* but fairly well developed in *E. glandulosus*, as long as to longer than the style branches.

Common name: *kapokbos*.

Vouchers: *Acocks 548* (BOL, PRE); *Acocks 566* (PRE); *Hutchinson & Dyer 3124* (BOL, PRE); *Müller 3590* (WIND); *Southy in herb Galpin 5591* (GRA, PRE).

28. **Eriocephalus microphyllus** *DC.*, Prodromus: 148 (1838). Type: Cape Province, Little Namaqualand, without exact locality, *Drège 2735* (G-DC, holo.; P!, PRE & WIND, photo.!).

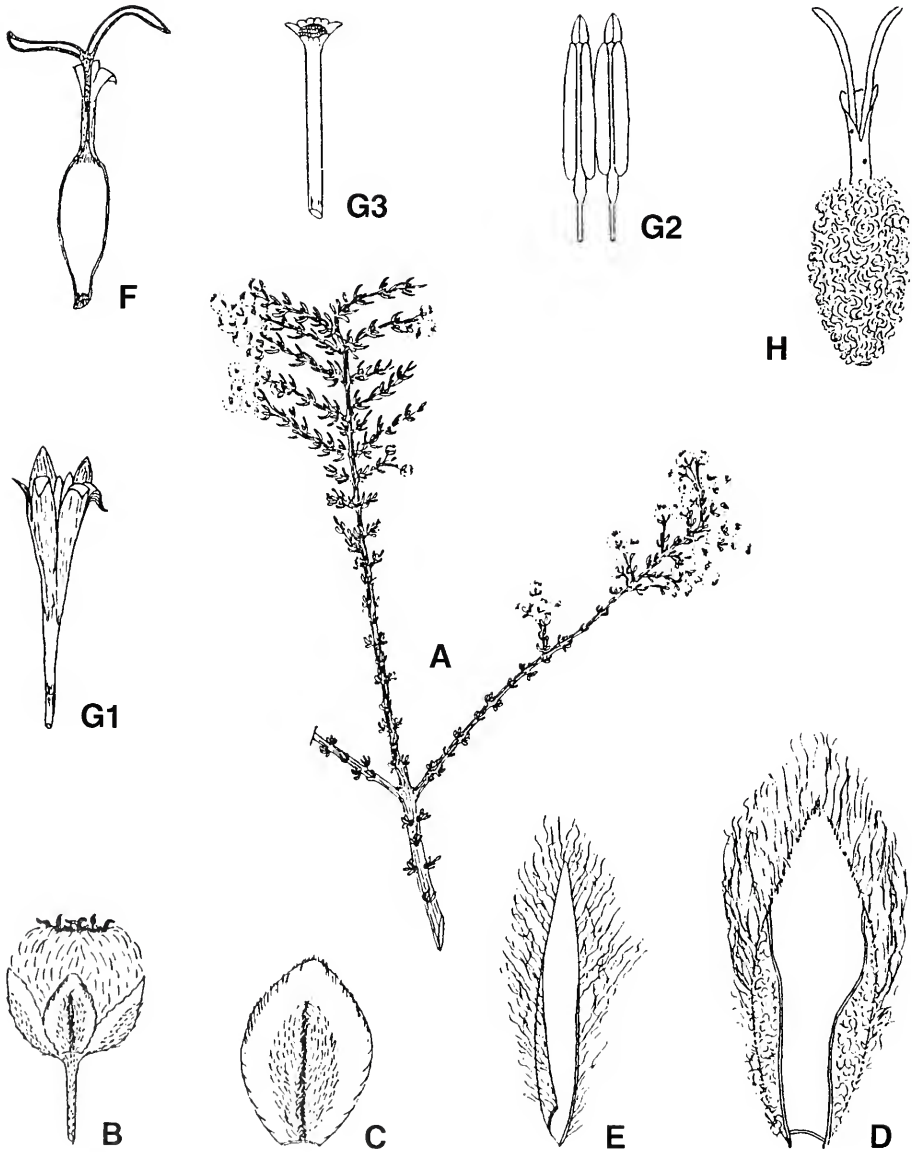


FIGURE 10.—**Eriocephalus microphyllus**: A, flowering shoot with inflorescences, × 1; B, capitulum, × 5; C, involucral bract, × 10; D, marginal palea, × 16; E, central palea, × 16; F, marginal female floret, × 12; G1, disc floret, × 12; G2, anthers, × 16; G3, truncate style, × 16 (*Müller 3564*, WIND). **E. microcephalus**: H, marginal female floret, × 14 (*Oliver 3527*, NBG).

E. glaber Thunb. var. *pubescens* Harv.: 204 (1865) non *E. pubescens* DC.: 148 (1838). Type: based on that of *E. microphyllus* and the following syntype: Cape Province, Gariep (without precise locality), *Burchell s.n.* (G-DC, PRE, photo.!).

Many-stemmed, markedly dichotomously but sparsely branched to densely intertwined shrub, 0.2–0.4–0.8 m high, 0.4–1.2 m in diameter. *Old stems* displaying anomalous secondary growth, grey-black; young shoots yellow-brown, initially felty or felty sericeous, glabrescent, glandular; older branches and stems yellow-brown to grey-brown to grey-black, 3–5 mm in diameter; brachyblasts short-lived, relatively short, 1–2 mm long. *Leaves* opposite, decussate on brachyblasts, densely imbricate, sometimes alternate on flowering shoots, linear, those on brachyblasts almost obtuse triangular, (1.2–)1.5–4.0(–7.0) × 0.6–0.8 mm, entire, blue-green, bright green to grey-green, felty at growing points, the rest felty sericeous to glabrescent, glandular (subsessile glands in cavities on leaves), adaxially flattened to slightly concave, strongly concave towards base, abaxially convex, slightly keeled towards obtuse to slightly acute apex, base semi-amplexicaul broadened. *Capitula* heterogamous disciform, terminal, racemose or spicate racemose or solitary on brachyblasts, rarely paniculate, 4–6 mm long; peduncles 1.5–11.0 mm long, felty to glabrous, glabrescent. *Involucral bracts* 4, ovate to broadly lanceolate, 2.3–4.0 × 1.0–1.5(–2.0) mm, central part red-purple to green, herbaceous with broad transparent membranous margin, appressed felty sericeous to glabrous, 2 slightly keeled, 2 laterally flattened, enveloped by the 2 keeled bracts. *Paleae*: those of marginal florets free, 3.2–4.5 mm long, keeled and enveloping single floret (mostly female), narrowly ovate to lanceolate, margins fringed, central part coriaceous, rigid with membranous margin, abaxially long-lanate, hairs septate; those of disc florets up to 2.5 mm long, broadly to narrowly lanceolate, outer slightly keeled, inner more flattened, membranous, margins and adaxially long-lanate. *Marginal female florets* (1)2(–4), 2.5–3.2 mm long; corolla white, narrowly tubular, narrowed around style, with short lamina, narrowly cuneate to oblong, 3-lobed or -toothed, 0.3–0.8 mm long, mostly shorter than point of style furcation, sometimes as long as style branches, abaxially with subsessile glands. *Style branches* linear, flattened, apex acute. *Ovary* oblong to oblanceolate, long-lanate. *Seed* 2.0–2.5 mm long, slightly flattish, trigonous. *Disc florets* (3)4–6(–8), functionally male with sterile ovary, 2.6–3.5 mm long; corolla tubular to trumpet-shaped, 5-lobed, proximal half cream-coloured, distal half gradually darker red-purple, with subsessile glands abaxially. *Style* cylindrical, unbranched, apex globose, with sweeping hairs. *Stamens* 5, slightly exserted at maturity. *Receptacle* after anthesis with long hairs between involucral bracts and marginal paleae. *Chromosome number*: $2n = 36$. Figure 10.

Three varieties are recognised:

1a Peduncles 1.5–3.0(–4.0) mm long, permanently felty; leaves blue-green; branches drooping . . . . . 28c. var. *carnosus*

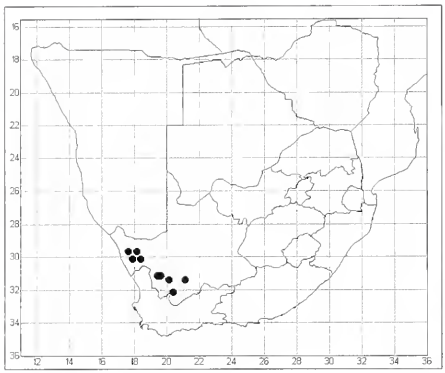
1b Peduncles 5–11 mm long, felty sericeous to glabrescent; leaves bright green to grey-green; branches rigid:

2a Leaves initially felty sericeous, glabrescent; peduncle 6–10 mm long . . . . . 28a. var. *microphyllus*

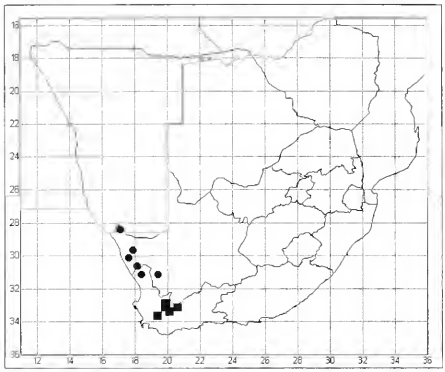
2b Leaves permanently felty sericeous; peduncle (5–)7–9(–11) mm long . . . . . 28b. var. *pubescens*

28a. var. **microphyllus**.

Much-branched, rigid shrubs, 0.4–0.8 m high, 0.4–1.2 m in diameter, with open branching. *Leaves* opposite and decussate, rarely alternate on flowering shoots, green to grey, initially felty, glabrescent, with subsessile glands in cavities, those on young shoots 1.8–4.0 mm long, those on brachyblasts 1.5–2.0 mm long. *Capitula* terminal, racemose or solitary on brachyblasts; peduncle 6–10 mm long, densely felty to glabrous. *Involucral bracts* 2.5–4.0 mm long, sometimes distinct, red-purple to green,



MAP 16.—**Eriocephalus microphyllus** var. **microphyllus**.



MAP 17.—● **Eriocephalus microphyllus** var. **pubescens**; ■ **E. microphyllus** var. **carnosus**.

glabrous. *Marginal female florets* (1)2. *Disc florets* 5–7. *Chromosome number*: $2n = 36$. *Flowering time*: correlated with rainfall (both summer and winter rainfall), reaching a peak from February to March and July to August in the different rainfall areas.

This variety is typical of central Namaqualand (Northern Cape) and occurs mainly on low-lying plateau areas. It is fairly common and often forms dense stands. Map 16.

Common name: *kapokbos*.

Vouchers: *Hugo 520* (NBG, WIND); *Hugo 2884* (NBG); *Levyns 5079* (BOL, PRE); *Rösch & Le Roux 921* (KPA-J); *Thompson 2398* (NBG, PRE).

28b. var. **pubescens** *(DC.) M.A.N.Müller*, comb. et stat. nov.; non *E. glaber* Thunb. var. *pubescens* Harv.: 204 (1865).

E. pubescens DC., Prodromus: 148 (1838); Harv.: 203 (1865). Type: Western Cape, 'Bei Mierenkasteel, karrooartige Höhe, unter 1 000 Fuss', *Drège 6039* (G-DC, holo.; PRE & WIND, photo.!).

Young shoots felty sericeous, glabrescent. *Leaves* always opposite, rarely alternate on flowering shoots, permanently felty sericeous; those on young shoots 3–7 mm long; those on brachyblasts 1.2–2.0 mm. *Capitula* terminal, racemose, rarely paniculate; peduncles (5–)7–9 (–11) mm long, permanently felty sericeous or glabrescent. *Involucral bracts* felty sericeous to glabrous, 2.3–3.2 mm long, green. *Marginal female florets* 2. *Disc florets* 4–6. *Chromosome number*: $2n = 36$. *Flowering time*: mainly July to September.

The distribution of this variety is concentrated mainly along the west coast. The habitat is more mountainous than that of var. *microphyllus*. Map 17.

Common name: *kapokbos*.

Vouchers: *Acocks 16440* (PRE); *Acocks 19519* (NBG, PRE); *Bolus 9568* (BOL); *Müller 4054* (WIND); *Rösch & Le Roux 509* (KPA-J, PRE).

28c. var. **carnosus** *M.A.N.Müller*, var. nov., *E. microphyllo* DC. var. *microphyllo* affinis sed pedunculis 1.5–3.0(–4.0) mm, permanente velutinis; foliis aeruginosis; ramis cernuis.

Type: Western Cape, ridge NE of Jan de Boers, *Oliver 3474* (PRE, holo.; NBG).

Mostly sparsely branched, compact shrubs, at most 0.6 m high, normally 200–400 mm tall;

branches tending to be long, drooping and sparsely branched, with open branching; young shoots felty. *Leaves* opposite to decussate on brachyblasts, alternate on flowering shoots, 1.6–2.6 mm long on young shoots, 1.2–1.8 mm long on brachyblasts, succulent, felty, glabrescent, blue-green, cylindrical distally. *Capitula* almost spicate racemose; peduncles relatively short, 1.5–3.0(–4.0) mm long, permanently felty. *Involucral bracts* 2.3–3.2 mm long, green. *Marginal female florets* (1)2 or 3(4). *Disc florets* (3)4–6(–8). *Chromosome number*: $2n = 36$. *Flowering time*: correlated with winter rainfall, June to September.

The distribution of this variety is restricted mainly to the Worcester and Montagu Districts. It grows on shale and gravel plateaus, forming relatively dense stands. Map 17.

In contrast to the other two varieties, which are hardly browsed, this one is palatable and heavily browsed. Common name: *kapokbos*.

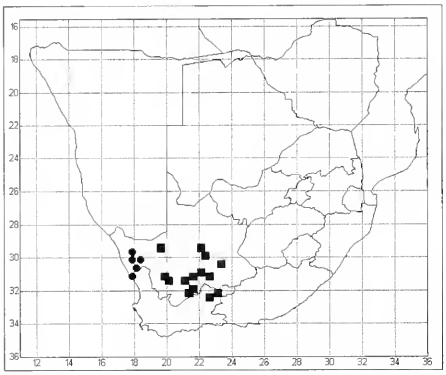
Vouchers: *Compton 2871* (BOL); *Müller 4067* (WIND); *Oliver 3473* (NBG); *Olivier 220* (NBG, PRE).

29. **Eriocephalus microcephalus** *DC.*, Prodromus: 148 (1838); Harv.: 204 (1865). Type: Northern Cape, Little Namaqualand, Modderfontein, *Drège 6376* (G-DC, holo.; G!, K!, PRE, photo.!).

Slender, many-stemmed shrubs, much-branched from base, 0.4–1.2 m high. *Old stems* dark brown, displaying anomalous secondary growth; growing points green-purple, felty, glandular; young shoots red-purple to red-brown, up to 0.3 mm in diameter, internodes 4.0–8.5 mm long; older branches dark brown, up to 1 mm in diameter, side branches forming an angle of 70–90° with main axis; brachyblasts short-lived, up to 1.5 mm long and barely 0.5 mm in diameter. *Leaves* decussate, grey-green, relatively small, 0.8–1.6 × 0.3–0.5 mm, up to 4.5 mm long on young shoots, entire, scale-like, obtuse-triangular and sometimes linear-lanceolate on young shoots, adaxially flattened, abaxially semiterete, distally slightly keeled, leaf surface with permanent multicellular glands in cavities, apex obtuse, concave towards base, leaves at growing point glandular and densely white-felty, glabrescent. *Capitula* heterogamous disciform, mostly solitary on brachyblasts, also terminal, racemose on dolichoblasts, in fruiting stage 3 × 3 mm; peduncle 2.0–3.5 (–7.0) mm long, 0.1–0.2 mm in diameter, slender, initially felty, glabrescent with permanent glands in cavities. *Involucral bracts* 4, 2 × 1.2 mm, 2 slightly keeled and margins overlapping those of other 2, central part slightly thickened, green to purple, margin broad, membranous, initially felty, glabrescent. *Paleae*: those of marginal florets free, 1.5 × 1.5 mm, slightly keeled, hard, coriaceous at base, margins membranous, fringed, abaxially long-lanate, hairs septate; those of outer disc florets slightly keeled, inner ones flattened, lanceolate to linear, 1.5 × 0.2 mm, membranous. *Marginal female florets* 1 or 2, 2.2 mm long; corolla cream-coloured, lamina obliquely truncate to slightly 3-lobed, shorter than furcation of style. *Style branches* linear, 0.5 mm long, apex acute. *Ovary* oblong, flattish, trigonous, after anthesis long-lanate. *Seed* up to 1.0–1.5 mm long, obovoid, slightly flattened. *Disc florets* 1–4(–8), functionally male with sterile ovary, trumpet-shaped, basally yellow to cream-coloured, limb 5-lobed, red-purple. *Style* truncate, with sweeping hairs. *Stamens* 5, slightly exserted at maturity. *Receptacle* after anthesis with long hairs between involucral bracts and marginal paleae. *Chromosome number*: $2n = 18$. *Flowering time*: mainly June to September. Figure 10.

E. microcephalus occurs in Namaqualand, only above 600 m, at the top of mountains or high on mountain slopes, usually forming dense, almost impenetrable stands. Where the closely related *E. microphyllus* (no. 28) occurs in the same area, it grows at the foot of mountains or in low-lying areas, but these two are not habitat-sympatric. Map 18.

Although closely related to *E. microphyllus* (no. 28), *E. microcephalus* can be distinguished by the thin, small leaves 0.8–1.6 × 0.3–0.5 mm,



MAP 18.—● **Eriocephalus microcephalus**; ■ **E. spinescens.**

slender, delicate branches and mostly red-purple young shoots with a diameter of less than 1 mm. The leaves of *E. microphyllus* are (1.2–)1.5–4.0(–7.0) × 0.6–0.8 mm on rigid branches. Internodes of young shoots of *E. microcephalus* are 4.0–8.5 mm long as opposed to the 3–5 mm of those of *E. microphyllus*. Side branches are mostly opposite, forming an angle of 70–90° with the main axis in *E. microcephalus*, but less than 70° in *E. microphyllus*. *E. microcephalus* is fairly rare and restricted to a few high mountains, whereas *E. microphyllus* is common in Namaqualand.

E. microcephalus did not transplant well and even cuttings did not survive, but mature *E. microphyllus* plants transplanted well and cuttings rooted successfully. Common name: *kapokbossie*.

Vouchers: *Acocks 14980* (PRE); *Boucher 3115* (NBG); *Esterhuysen 5436* (BOL); *Müller 3558* (WIND); *Schlechter 11114* (BOL, GRA, PRE, Z).

30. **Eriocephalus spinescens** *Burch.*, Travels in the interior of southern Africa: 272 (1822); DC.: 147 (1838), pro parte; Harv.: 203 (1865), pro parte. Type: Northern Cape, 'between Karree River and Klein Quaggasfontein, near Frazerburg', *Burchell 1419* (K, holo.!; G-DC, fragment; PRE & WIND, photo.!).

Robust, many-stemmed, sympodially branched, spinescent shrubs, 0.5–1.2 m high and in diameter. *Old stems* displaying anomalous secondary growth, grey to dark grey; young shoots light yellow-brown, shortly sericeous, glabrescent, glandular; older branchlets grey, glabrous. *Leaves* opposite on dolichoblasts, decussate and densely imbricate on brachyblasts, linear, 2.5–3.5(–5.0) × 0.6–0.8 mm, entire, permanently densely silver-sericeous, adaxially flattened, slightly concave towards base, abaxially convex, slightly keeled distally, apex acute. *Capitula* heterogamous disciform, solitary, terminal on brachyblasts, 4.5–5.2 mm long, sessile or peduncles 1.0–3.5(–5.0) mm long, densely appressed silver-sericeous. *Involucral bracts* 4, oblong-ovate to almost ovate, 4.3 × 2 mm, apex acute, fringed, 2 slightly keeled, other 2 slightly flattened, central part herbaceous, green with purple margin; transparent membranous margin absent or very narrow. *Paleae*: those of marginal florets free, lanceolate, up to 4.5 mm long, margins long-pilose, enveloping floret totally, abaxially long-pilose, hairs septate, membranous; those of disc florets lanceolate to oblong, 2–4 × 1–2 mm, membranous, apex acute, margin and abaxially long-pilose. *Marginal female florets* 2, cream-coloured to yellow; corolla tube 5 mm long; lamina cuneate, 3-lobed, up to 2.2 mm long, relatively inconspicuous. *Style branches* flattened, apices acute, 2.5 mm long. *Ovary* (and cypsela) oblong, slightly flattened, long-pilose. *Seed* 2–3 mm long, oblanceolate, slightly flattened. *Disc florets* 6–8, functionally male with sterile ovary, 5 mm long; corolla tubular, widening upwards, 5-lobed, tubular part yellow with red-purple margins. *Style* unbranched, truncate, apex globose, with sweeping hairs. *Stamens* 5, exserted at maturity. *Receptacle* after anthesis with abundant white or brown hairs between involucral bracts and marginal paleae. *Chromosome number*: $2n = 36$. *Flowering time*: varying from June to October or January to March depending on time of rainfall.

The distribution area falls in the transition zone between winter- and summer-rainfall areas. *E. namaquensis* (no. 31), *E. spinescens* and *E. karooicus* (no. 17) are allopatric and succeed each other from west to east. The distribution of *E. spinescens* extends from Calvinia eastwards in the Northern and Western Cape. This region is very arid and consists mostly of Arid Karoo and False Desert Grassveld (Acocks 1975), with an average annual rainfall of less than 250 mm. *E. spinescens* is never found in dense communities, although it is fairly common in and along watercourses and seasonal rivulets and in sandy, gravelly soil. *E. namaquensis*, on the other hand, occurs mostly in high-lying areas on hills and in stony, clay soil. Map 18.

De Candolle's (1838) erroneous association of Burchell's type material with material from the current *E. karooicus* (no. 17), collected by Drège, resulted in most herbarium material of *E. karooicus* being identified as *E. spinescens*. Although closely related, there are conspicuous differences (see discussion under *E. karooicus*).

E. spinescens is a robust shrub, up to 1 m high and in diameter, with rigid, strong spines. *E. namaquensis* (no. 31), another closely related species, is a delicately branched shrub barely 400 mm tall and in diameter. The capitula of *E. spinescens* are relatively large, 4.5–5.2 mm long, and fairly shortly pedunculate, 0–3.5 (–5.0) mm long, to almost sessile, borne only terminally on brachyblasts. It is therefore easy to distinguish *E. spinescens* from the closely related *E. karooicus* and *E. namaquensis*, which are also spinescent, since *E. karooicus* has a small, but distinct ray lamina and sessile capitula and *E. namaquensis* has long-pedunculate capitula, solitary on brachyblasts, as well as in racemes borne terminally on dolichoblasts.

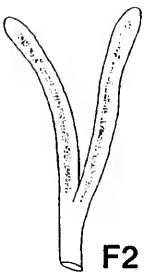
Common name: *kapokbos*.

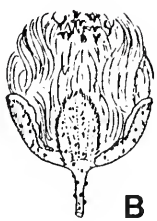
Vouchers: *Maguire 1941* (NBG); *Müller 3599* (WIND); *Pole Evans 2248* (BOL); *Pole Evans 2281* (PRE); *Van Breda 531* (PRE).

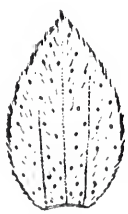
31. **Eriocephalus namaquensis** *M.A.N.Müller*, sp. nov., *E. microphyllo* DC. affinis sed indumento argenteo-sericeo, ramisque spinis terminalibus munitis differt.

Type: Northern Cape, Namaqualand, 29 km from Loeriesfontein on road to Calvinia, *Müller 3565* (PRE, holo.; K, NBG, WIND).

Many-stemmed, mostly sympodially branched, spinescent shrubs, 250–450 mm tall and in diameter. *Old stems* displaying anomalous secondary growth, bark grey; young shoots light brown, often with purple tinge, shortly sericeous, glabrescent; older branches grey. *Leaves* opposite, even on flowering shoots, decussate and densely imbricate on brachyblasts, linear-triangular, 1–3(–5) × 0.4–0.6 mm, entire, adaxially flattened and slightly concave towards base, abaxially convex and keeled distally, permanently densely silver-sericeous, apex acute. *Capitula* heterogamous disciform, solitary on brachyblasts and/or in terminal racemes, 2.8–4.0 mm long; peduncles 2.5–12.0 mm long, densely appressed silver-sericeous. *Involucral bracts* 4, ovate to narrowly lanceolate, 2.0–3.5 × 1.5–2.0 mm, apex acute, 2 slightly keeled, other 2 slightly flattened, central part herbaceous, green with red-purple tinge, membranous margin narrow or absent. *Paleae*: those of marginal florets free, lanceolate, 4–8 mm long, membranous, margins long-pilose and enveloping female florets, abaxially long-pilose, hairs septate; those of disc florets lanceolate to narrowly oblong, 2.5–3.0 mm long, membranous, margins and abaxial surface long-lanate, apex acute. *Marginal female florets* 2, 2.5–3.5 mm long, cream-coloured; corolla tube with short lamina, narrowly cuneate, 3-lobed, shorter than style furcation. *Style branches* flattened, apex acute. *Ovary* (and cypsela) slightly flattened, long-lanate. *Seed* 1.5–2.3 mm long. *Disc florets* (3–)5–8(–10), functionally male with sterile ovary, 3.2–4.0 mm long; corolla tubular, widening upwards, 5-lobed, tubular part yellow-white with red-purple limb. *Style* unbranched, truncate, with sweeping hairs. *Stamens* 5, slightly exserted at maturity. *Receptacle* after anthesis with dense, white,







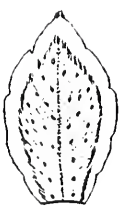
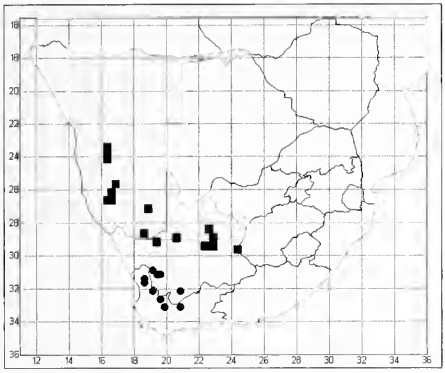


FIGURE 11.—**Eriocephalus namaquensis**: A1, A2, flowering shoots with inflorescences, × 1; B, capitulum, × 6; C1, C2, involucral bracts, × 8; D, marginal palea, × 16; E, central palea, × 10; F1, marginal female floret, × 8; F2, branched style, × 16; G1, disc floret, × 6; G2, anthers, × 12; G3, truncate style, × 16 (*Müller 3569*, WIND).



MAP 19.—● **Eriocephalus namaquensis**; ■ **E. merxmuelleri**.

long-pilose indumentum between involucral bracts and marginal paleae. *Chromosome number*: $2n = 18$. *Flowering time*: varying from July to October and January to March in the different rainfall regions. Figure 11.

The western part of the distribution range falls in the winter-rainfall area, but summer rain sometimes occurs in the eastern part. The rainfall is low, less than 200 mm annually, and the area is often subject to periodic droughts. This small shrublet is fairly common in the areas where it occurs. It is an important component of the Western Mountain Karoo and the Succulent Karoo (Acocks 1975). Map 19.

E. namaquensis grows in association with *E. microphyllus* var. *pubescens* (no. 28b), which it superficially resembles. Especially in the western part of its distribution range where *E. namaquensis* is less spinescent, it is difficult to distinguish between the two species in their natural habitat. *E. namaquensis* has a permanently silver-sericeous indumentum in contrast to *E. microphyllus* var. *pubescens* which is basically felty, clearly seen at the growing point. As the leaves age, the indumentum becomes more sericeous, slightly wavy, and this can lead to confusion with *E. namaquensis*. If there is doubt, the growing points and peduncles of the specimen should be examined. In *E. microphyllus* var. *pubescens*, the young leaves at the growing points stick together because of the intertwined felty indumentum of the overlapping leaves. The leaves of *E. namaquensis* are always free.

This species is under-collected, especially in the southern Karoo (Acocks 1975), partly because these regions are often subject to drought and therefore under-collected, and partly because of confusion with species like *E. microphyllus* var. *pubescens* and *E. decussatus* (no. 21), which it superficially resembles.

Common name: *kapokbos*.

Vouchers: *Acocks 18489* (PRE); *Acocks 19488* (PRE); *Hugo 508* (NBG, WIND); *Le Roux 2079* (KPA-J, NBG); *Levyns 5032* (BOL).

32. **Eriocephalus merxmuelleri** *M.A.N.Müller*, sp. nov., *E. microphyllo* DC. affinis sed habitu ramosissimo, foliis 4–9(–15) × 0.5 mm; lamina florum marginalium femineorum brevis, 0.3–0.6 mm, interdum brevior sed plerumque quam stylus longior sed quam stylus cum rami styli brevior.

Type: Namibia: 'Aus, an der Strasse nach Lüderitzbucht, 17 August 1963', *Merxmüller & Giess 2930* (M, holo.; PRE, WIND).

Erect, many-stemmed, much-branched shrubs, 0.4–1.2 m high, 0.3–0.6 m in diameter. *Old stems* grey-black, displaying anomalous secondary growth; young shoots yellow to yellow-brown; older branches yellow-grey to grey; branches opposite; brachyblasts short-lived. *Leaves* decussate, sometimes alternate on flowering shoots, lanceolate to linear-lanceolate, obtuse triangular, those on young shoots 4–9 (–14) × 0.5 mm, those on brachyblasts 1–4 × 0.5 mm, entire, very rarely pinnatisect, 3-lobed, green-grey, indumentum of leaves on growing point felty sericeous, mature leaves appressed sericeous to glabrescent (not glabrous), adaxially more strongly concave from apex to base, abaxially convex to slightly keeled towards

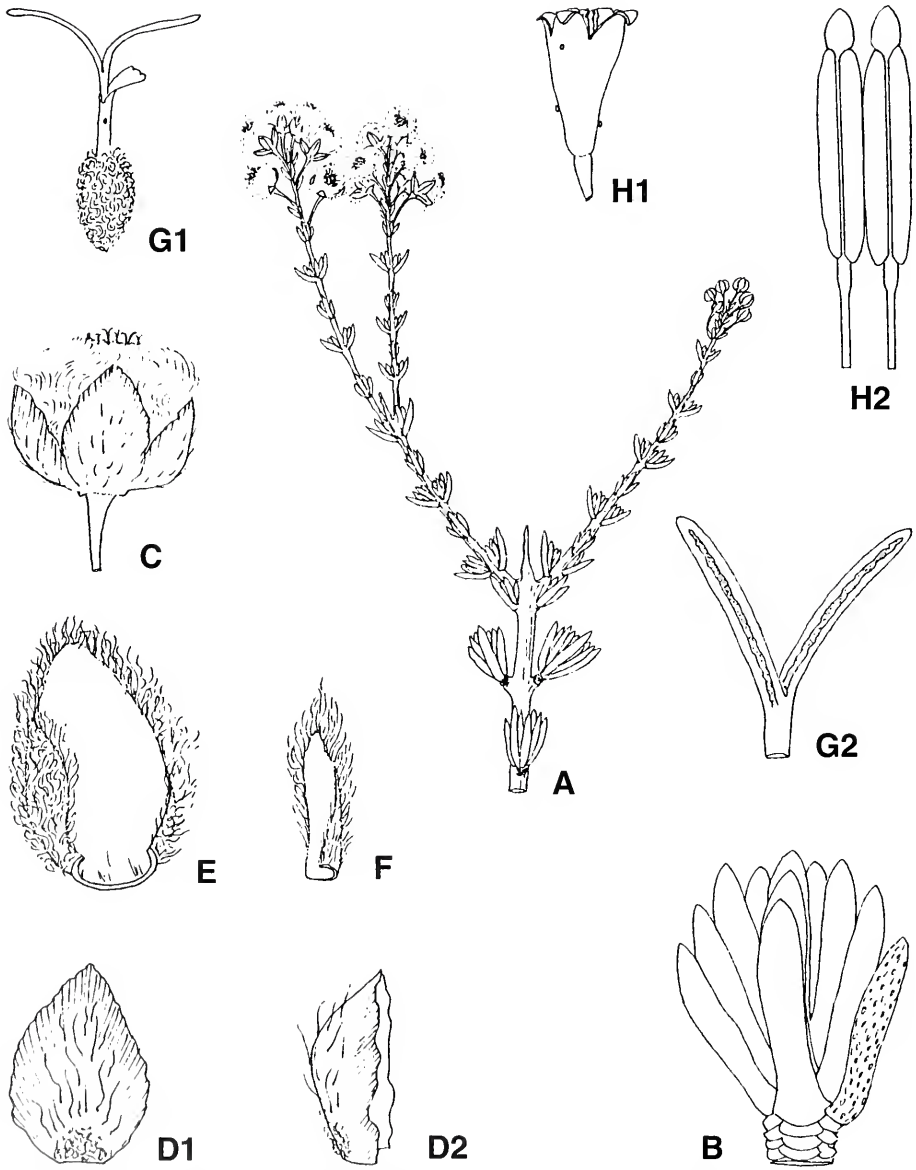


FIGURE 12.—**Eriocephalus merxmuelleri**: A, flowering shoot with inflorescences, × 1; B, branch with leaves, × 10; C, capitulum, × 5; D1, D2, involucral bracts, × 10; E, marginal palea, × 16; F, central palea, × 8; G1, marginal female floret, × 8; G2, branched style, × 16; H1, disc floret, × 6; H2, anthers, × 20 (*Giess 13453*, WIND).

apex, base semi-amplexicaul. *Capitula* heterogamous disciform, mostly racemose or paniculate, rarely solitary on brachyblasts, 3.5–5.0 mm long; peduncles (1–)2–7(–12) mm long, sparsely felty sericeous, glabrescent. *Involucral bracts* 4(5), ovate, 3.2–4.8(–8.0) × 2.2–4.8 (–5.5) mm, 2 slightly keeled, other 2 laterally flattened, central part thickened, herbaceous with membranous margin, green to red-purple, sparsely sericeous, glabrescent. *Paleae*: those of marginal florets free, slightly keeled, broadly lanceolate, 3.4–5.0 × 2.1–3.0 mm, central part hard, coriaceous with membranous, fringed margin, abaxially long-lanate, hairs septate, enveloping female florets; those of disc florets narrowly lanceolate to almost linear, 2.0–3.5 × 0.6–1.0 mm, membranous, margins fringed, abaxially long-lanate. *Marginal female florets* (1)2–4, 2.5 mm long; corolla cream-coloured; lamina short, 0.3–0.6 mm long, sometimes shorter than but mostly longer than style furcation, but shorter than style branches, cuneate to oblong, 3-lobed. *Style branches* 0.3–1.5 mm. *Ovary* (and cypsela) oblong, slightly flattened, 1.5–2.5 mm long, long-lanate. *Seed* oblong-ovoid, laterally flattened, 1.5–2.0 mm long. *Disc florets* (1–)5 or 6(–9), functionally male with sterile ovary; corolla tubular, widening upwards, basally cream-coloured to yellow, limb red-purple, 2.5–3.5 mm long. *Style* unbranched, apex slightly globose with sweeping hairs. *Stamens* 5. *Receptacle* after anthesis densely white long-pilose between involucral bracts and marginal paleae. *Chromosome number*: $2n = 54$. *Flowering time*: December to April and from June to September in the different rainfall areas. Figure 12.

The species occurs in both summer- and winter-rainfall areas and extends over the border between South Africa and Namibia, but it is restricted to the Namaqualand Broken Veld (Acocks 1975). Map 19.

E. merxmuelleri is closely related to *E. microphyllus* var. *pubescens* (no. 28b), which occurs in Namaqualand.

Common name: *kapokbos*.

Vouchers: *Giess 13454* (WIND); *Giess, Volk & Bleissner 7173* (WIND); *Müller 1380* (PRE); *Pearson 4243* (BOL); *Rowland, Scott & Steyn PRE43673* (PRE).

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9321000 **2. LASIOSPERMUM**

by M.A.N. MÜLLER, P.P.J. HERMAN & H.H. KOLBERG
(Literature references on p. 72)

Lasiospermum *Lag.*, Genera et species plantarum: 31 (1816) nom. cons. provis.; Trevir.: 205 (1826); Cass.: 304 (1822); Rchb.: 225 (1831); Less.: 250 (1832); DC.: 37 (1838); Endl.: 431, 432 (1838); Harv.: 153 (1865); Benth.: 416 (1873); Adamson & T.M. Salter: 803 (1950); Merxm.: 108 (1967); R.A.Dyer: 702 (1975); M.A.N.Müller: 124 (1988); K.Bremer & Humphries: 94 (1993); K.Bremer: 451 (1994); P.P.J.Herman *et al.*: 146 (2000); non *Lasiospermum* Fisch.: 34 (1812). Type: *L. pedunculare* Lag. (type cons.).

Eriosphaera F.Dietr.: 221, 222 (1817).
Lanipila Burch.: 259 (1822).
Mataxa Spreng.: 297 (1827).
Eriocarpha Lag. ex DC.: 38 (1838).

Annual or perennial herbs, sometimes decumbent, rooting at nodes. *Leaves* alternate, long-pilose to glabrous, pinnatisect to bipinnatisect; lobes narrowly linear, rarely entire. *Capitula* pedunculate, terminal, solitary or paniculate, many-flowered, homogamous discoid or heterogamous radiate. *Involucre* broadly saucer-shaped; involucral bracts in 2–4 rows, narrowly oblong to elliptic to almost square, with membranous margin and apex, long-pilose or felted to glabrous. *Receptacle* broad, flat to conical with membranous paleae. *Ray florets* when present, few, female. *Style* bifurcate, with linear, truncate branches. *Ovary* oblong. *Pappus* absent. *Disc florets* numerous, campanulate; corolla 5-lobed. *Stamens* 5, anthers fused, ecaudate and ecalcarate, with lanceolate apical appendage; endothecial tissue polarised. *Style* bifurcate with linear, truncate branches. *Ovary* ovoid, slightly triangular, without any appendages, after anthesis with dense, woolly indumentum, hairs often septate. *Cypselas* oblong-ovoid, slightly flattened, smooth, dark yellow-brown. *Pappus* absent. *Basic chromosome number*: $x = 9$ ($2n = 18$).

The genus name *Lasiospermum* Lag. (1816) is a later homonym of *Lasiospermum* Fisch. (1812) and should be rejected according to Article 64.1 of the ICBN. Cassini (1822) was aware of *Lasiospermum* Fisch., but recommended the conservation of the name *Lasiospermum* for Lagasca's genus as Fischer 'published only the name without a description or indicating diagnostic features; therefore he (Cassini) felt that the name *Lasiospermum* should be preserved (retained) for Lagasca's genus and Fischer's genus should receive a different name'. As type species he named *L. pedunculare* Lag.

The genus name *Scorzonera* L. (1735 & 1737) (Asteraceae) was conserved against *Lasiospermum* Fisch. (1812). Cassini's (1822) motivation for the conservation of the genus name *Lasiospermum* Lag. is herewith supported, especially as it has been in use for such a long time.

De Candolle (1838) classified the taxa of the genus *Lasiospermum* in two sections, namely section *Eulasiospermum* DC. with discoid capitula and section *Lanipila* (Burch.) DC. with radiate capitula.

According to Article 21 of the ICBN (Stafleu 1978): 'The epithet of a subgenus or section is not to be formed from the name of the genus to which it belongs by adding the ending *-oides* or *-opsis*, or the prefix *Eu-*.' The implication of this rule means that the section epithet *Eulasiospermum* as published by De Candolle (1838) is invalid. The name *Lasiospermum* is therefore proposed for this section (Article 22, ICBN).

The section *Lanipila* is based on the genus *Lanipila* described from *Burchell 1336* (herbarium specimen), housed in Kew. Treviranus's (1826) description of *Lasiospermum radiatum*, based on the same specimen, does not agree with the Kew specimen, but fits *Lasiospermum bipinnatum*. Because of the confusion about the identity of the specimen used by Treviranus for his species description, the use of the name *Lanipila* for the section is unacceptable according to Article 22 (ICBN) as the type of *Lanipila* is in the section *Eulasiospermum*. The new name *Radiatum* M.A.N.Müller is proposed for this section.

Key to sections of the genus *Lasiospermum*

Capitula homogamous discoid; disc florets bisexual, tubular . . . . . sect. *Lasiospermum*
Capitula heterogamous radiate; ray florets female; disc florets bisexual, tubular . . . . sect. *Radiatum*

Section **Lasiospermum**. Type species: *L. pedunculare* Lag.

Lasiospermum Lag. sect. *Eulasiospermum* DC.

Capitula homogamous discoid. Disc florets bisexual.

Section **Radiatum** *M.A.N.Müller*, sect. nov. Type species: *L. bipinnatum* (Thunb.) Druce.

Capitula heterogama radiata. Flosculi radii feminei. Flosculi disci hermaphroditi.

Capitula heterogamous radiate. Ray florets female. Disc florets bisexual.

Key to the species of the genus *Lasiospermum*

1a Capitula heterogamous radiate; rays female, white, pale red-purple, red-purple or purple with yellow apex (sect. *Radiatum*):
2a Ray florets white or pale red-purple, up to 15 × 2.5 mm; perennial herbs . . . 1. *L. bipinnatum*
2b Ray florets red-purple or red-purple with yellow apex; very small (± 1 mm long, rarely up to 3.5 mm long), annual herbs . . . . . 2. *L. brachyglossum*
1b Capitula homogamous discoid, all florets bisexual, tubular, golden yellow (sect. *Lasiospermum*):
3a Terminal part of peduncle and involucral bracts long-pilose; involucral bracts permanently hairy and with narrow, inconspicuous, membranous margin . . . . . 3. *L. pedunculare*
3b Terminal part of peduncle and involucral bracts densely felted; involucral bracts glabrescent and with obvious, broad, transparent, membranous margin . . . 4. *L. poterioides*

Key to *Lasiospermum* species based on vegetative and geographic features

1a Annual herbs . . . . . 2. *L. brachyglossum*
1b Perennial herbs:
2a Leaves initially sparsely hairy, soon glabrous; distributed in North-West, Gauteng, the Free State, Lesotho and the Northern, Western and Eastern Cape . . . . . 1. *L. bipinnatum*
2b Leaves initially densely hairy, glabrescent to glabrous; restricted to the Northern and Western Cape and Roggeveld Mountains:

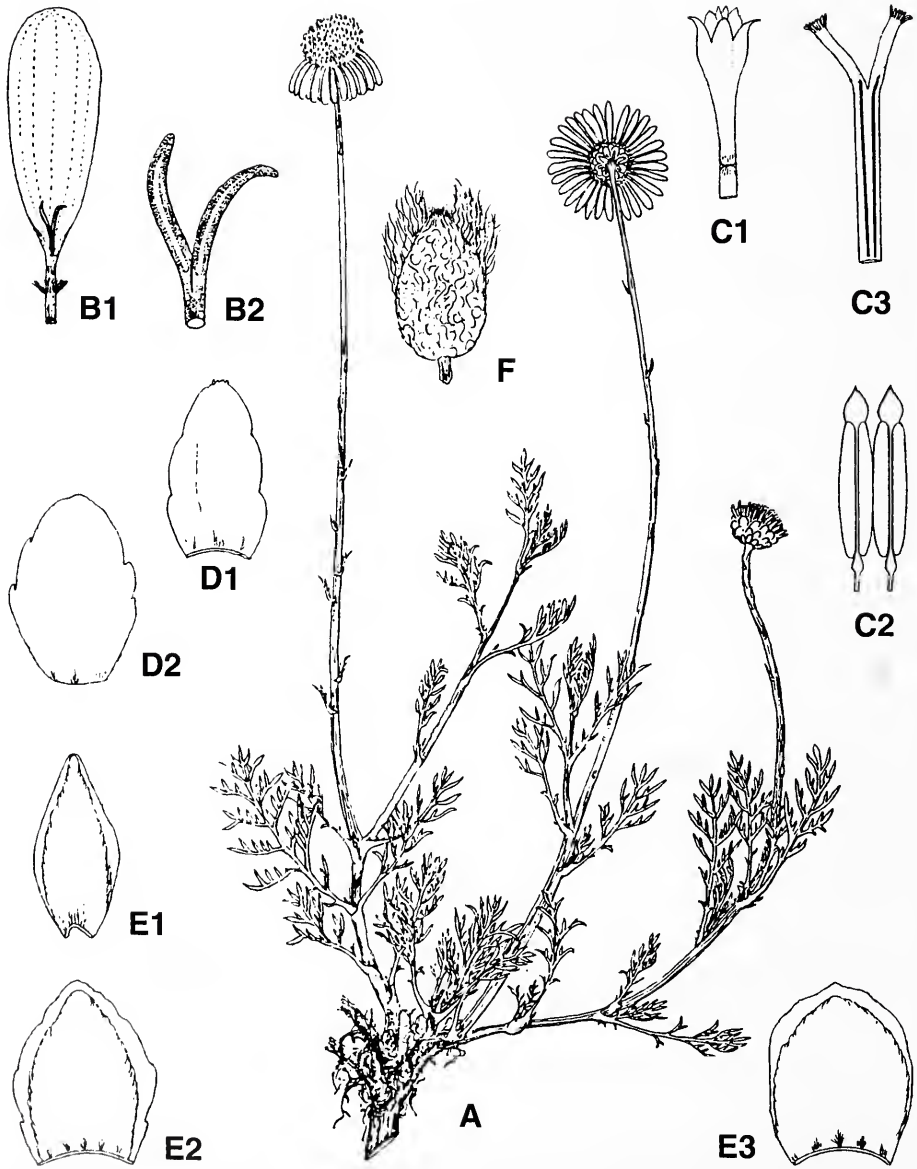


FIGURE 13.—**Lasiospermum bipinnatum**: A, branch with capitula, × 1; B1, ray floret, × 4; B2, branched style, × 20; C1, bisexual disc floret, × 8; C2, anthers, × 16; C3, branched style, × 16; D1, D2, paleae, × 8; E1, E2, E3, involucral bracts, × 8; F, cypsela with indumentum, × 4 (*Müller 4088*, WIND).

3a Older leaves sparsely long-pilose, rarely glabrous, apex of leaf lobes acute; restricted to strip parallel with the west coast (Northern and Western Cape), between 300 and 1 500 m altitude . . . . . 3. *L. pedunculare*

3b Older leaves glabrescent, apex of leaf lobes obtuse; restricted to Roggeveld Mountains (Northern Cape), above 1 500 m altitude . . . . . 4. *L. poterioides*

1. **Lasiospermum bipinnatum** *(Thunb.) Druce* in Report of the Botanical Exchange Club of the British Isles for 1916: 631 (1917); Adamson & T.M.Salter: 803 (1950). Type: Western Cape, Langkloof, Eselsjagt (Eseljag), *Thunberg 20232* (UPS, holo.; PRE & WIND, photo.!).

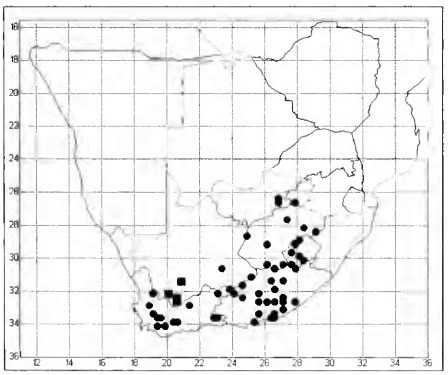
Lidbeckia bipinnata Thunb.: 161 (1800); Willd.: 2165 (1803); Thunb.: 694 (1823). *Lancisia bipinnata* (Thunb.) Pers.: 463 (1807). *Matricaria bipinnata* (Thunb.) Spreng.: 582 (1826).

Mataxa capensis Spreng.: 303 (1827); G.Don: 368 (1839). Type: based on *Lasiospermum radiatum*.

Perennial, erect to ascending, much-branched herbs, up to 0.6 m high. *Older stems* decumbent, rooting at some nodes; growing points initially sparsely long-pilose, soon glabrous. *Leaves* alternate, bipinnatisect, lobes linear, sometimes slightly falcate, yellow-green, 30–80 mm long, smaller on flowering shoots, mucronate with hard white mucro, margins irregularly serrate; young leaves sparsely long-pilose, soon glabrous; petiole semi-amplexicaul basally, sheathing, margins irregularly serrate. *Capitula* heterogamous radiate, terminal, solitary on long glabrous peduncles. *Involucral bracts* imbricate, in 3 or 4 rows, enlarging from outside to inside, up to 3 × 2 mm, with narrow, transparent margins, glabrous; outer narrowly oblong to lanceolate, slightly keeled, inner broadly lanceolate to ovate, more flattened. *Receptacle* disc-shaped, flattened. *Paleae* membranous with green main vein, ovate, 3.0–3.5 mm long, marginal paleae keeled, central paleae flattened, margins irregularly dentate. *Ray florets* female, 24–40, up to 15.0 × 2.5 mm, white or pale red-purple. *Style* bifurcate, apices without sweeping hairs. *Disc florets* 130–150, pale yellow, bisexual; corolla tubular, 5-lobed (-dentate), 3.5–4.5 mm long. *Style* bifurcate with linear branches, distally truncate, with sweeping hairs. *Stamens* 5. *Ovary* slightly triangular, yellow-brown, smooth, lanceolate to oblong-ovoid, slightly flattened, after anthesis with dense, white, woolly indumentum, hairs septate. *Cypsela* dark yellow-brown, smooth, lanceolate, flattened triangular. *Flowering time*: varying from January to December with a peak from August to October (winter rainfall) and November to April (summer rainfall). Figure 13.

L. bipinnatum is widely distributed in North-West, Gauteng, the Free State, Lesotho and the Northern, Western and Eastern Cape in both summer- and winter-rainfall regions. In some areas it is even regarded as a weed in agricultural land. It grows in dark brown sandy loam, sandy soil, clay and even dolerite, with preference for moist areas like vleis, marshes, river banks and roadsides where pools of water have formed. Map 20.

Burchell (1822) described the genus *Lanipila* Burch., without mentioning any species, from material obtained from the Roggeveld



MAP 20.—● **Lasiospermum bipinnatum**; ■ **L. poterioides.**

Mountains as follows: '*Lanipila C.G. 1336, Genus Cotulae affine. Nomen a lana et pila; ob semina lana involuta, et in capitulo spherico conglomerata.*' The holotype of the genus *Lanipila* (*Burchell 1336*, K!) was collected between Jackalsfontein and Kuilenberg, near Sutherland. Treviranus described *Lasiospermum radiatum* in 1826 with 'floribus radiatis', i.e. with ray florets, and cited the type as *Burchell 1336* of *Lanipila* Burch. The description of *Lasiospermum radiatum* agrees totally with that of *Lasiospermum bipinnatum*, although the type at Kew on which the description was supposedly based, represents *Lasiospermum poterioides* Hutch., a taxon described only in 1946. It is concluded that the material of Burchell used by Treviranus for the description of *Lasiospermum radiatum* was not the same as the material at Kew.

Although the plants are eagerly browsed by sheep, Walsh (1909) reported that it probably caused animal poisoning. This probability is confirmed by notes on herbarium specimens and according to Dr T.F. Adelaar (pers. comm.) of the Onderstepoort Veterinary Institute, it contains a liver toxin. According to Vahrmeijer (1981), it causes photosensitivity. Inhabitants of the Middelburg District (Eastern Cape) make a decoction of the plant and use it for affection of the chest. The aromatic nature is apparently connected to disinfection as it is used as such by the South-Sotho in an ointment used to disinfect a sick bay (Phillips 1917).

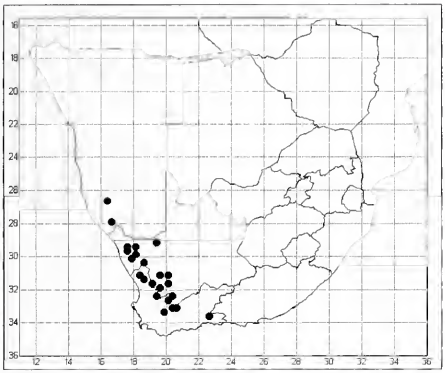
The ray florets are horizontally orientated in relation to the capitula during the day, but they are recurved at night so that the capitulum resembles a shuttlecock. Ray florets are absent in some specimens, e.g. *Compton 10248* (NBG) and *Schlechter 8961* (Z). It does happen sporadically that rays are absent, giving rise to incorrect identifications, e.g. as *L. pedunculare*.

Vouchers: *Codd 8072* (PRE); *Esterhuysen 29688* (BOL); *Flanagan 1352* (BOL, SAM); *Jacobsz 2157* (NBG); *Jacot-Guillarmod 4756* (PRE).

2. **Lasiospermum brachyglossum** *DC.* in Prodromus: 38 (1838); Harv.: 154 (1865); Merxm.: 108, 109 (1967). Type: Northern Cape, 'Zilverfontein, auf der Fläche', *Drège 2863* (G-DC, holo.; P!, PRE, photo!, SAM!).

Erect, rarely ascending, annual herbs, 100–400 mm high. *Stems* branched or unbranched from the base, all ending in inflorescences. *Leaves* alternate, sometimes rosulate at base; petioles of basal leaves well developed, with stipule-like appendages; appendages irregularly dentate; lamina pinnatisect to bipinnatisect, entire on flowering shoots, 15–50 × 10–30 mm; lobes of second order linear, 0.5–1.0 mm in diameter, sometimes semifalcate, mucronate with a hard white mucro. *Capitula* heterogamous radiate, in panicles or racemes with oldest capitula terminal and younger ones proximal, semiglobose when young, up to 5 mm in diameter, in fruiting stage almost globose, up to 15 mm in diameter; distal part of peduncle glabrous. *Involucral bracts* in 3 or 4 rows, imbricate, broadly membranous, 1.5–2.5 × 1.0–1.5 mm, glabrous, apex obtuse, outer bracts relatively narrow, linear, inner ones ovate. *Receptacle* conical. *Marginal paleae* ovate, central paleae lanceolate with arista which is the continuation of the main vein, main vein distinctly yellow-brown, rest of palea transparent, membranous, 1.2–1.8 × 0.8–1.2 mm. *Ray florets* 12–20, female, strap-shaped; corolla red-purple to red-purple with yellow distal part, rarely completely yellow, very short, 1 mm long, rarely up to 3.5 × 1.6 mm, 3-dentate, cuneate. *Style* branches linear, 0.1–0.2 mm long. *Ovary* oblong-ovoid. *Disc florets* 130–150, bisexual; corolla tubular, 5-dentate (-lobed), pure yellow to yellow with red-purple margin, up to 2.5 mm long. *Stamens* 5. *Style branches* linear, truncate, with sweeping hairs at apex. *Ovary* oblong; ovaries of both ray and disc florets with dense, woolly indumentum after anthesis, hairs septate. *Flowering time*: July to November, with a peak from July to September.

The distribution of *L. brachyglossum* var. *brachyglossum* extends from Aus in Namibia to the Oudtshoorn District in the Western Cape



MAP 21.—**Lasiospermum brachyglossum**.

along the western part of the continent and is mainly confined to the winter-rainfall area of southern Africa. Var. *sinaicum* is confined to the Sinai Desert. Map 21.

Common names: *knoppiesopslag* (Namaqualand) (Le Roux & Schelpe 1984), *knoppies-stinkkruid* (Pofadder, from *Conradie 1*, NBG).

Vouchers: *Acocks 16908* (PRE); *Bolus 392* (BOL, SAM); *Giess 14640* (PRE, WIND); *Maguire 1982* (BOL, NBG); *Van der Schijff 8092* (PRE).

3. **Lasiospermum pedunculare** *Lag.*, Genera et species plantarum: 31 (1816); DC.: 38 (1838); Harv.: 154 (1865). Iconotype: P.Micheli, Nova plantarum genera ..... t. 27 (1729).

Santolina erecta Lam.: t. 671, fig. 4 (1796); Poir.: 508 (1805); non Barr.: 522 (1714); nec *S. erecta* Pers.: 407 (1807); nec *S. erecta* et *S. eriosperma* Reichard: 730 (1780); Desf.: 99 (1804).

?*S. pinnata* Donn: 107 (1800). Type: ? Western Cape, collected in 1791, collector unknown.

S. eriosperma Pers.: 407 (1807).

Eriosphaera multifida F.Dietr.: 221 (1817).

S. alpina Bertol.: 43 (1819); Loudon: 694 (1855); non *S. alpina* L.: 1180 (1763); L.: 616 (1774); Willd.: 1800 (1803); Guss.: t. 58 (1826); nec *Lasiospermum alpinum* (L.) Rchb.: 225 (1831).

Eriocarpha peduncularis Lag. ex DC.: 38 (1838).

L. eriospermum (Pers.) G.Don: 337 (1839).

L. erectum (Lam.) Druce: 631 (1917).

Erect to ascending, sometimes mat-forming, much-branched, perennial herbs, 150–200 mm tall, up to 1 m in diameter. *Older stems* decumbent, sometimes rooting at nodes; stems cylindrical, permanently white, long-pilose; young growing points densely white, long-pilose, but sparsely hairy with age. *Leaves*: petiole basally semi-amplexicaul, sheathing with membranous margins, axils densely long-pilose, flattened to distal point; lamina bipinnatisect, 50–150 × 10–30 mm, grey-green because of long-pilose indumentum; lobes of first order up to 15 mm long, each with 3 or 4 incisions, lobes of second order linear, 3–6 × 0.4–0.6 mm, apices acute, mucronate, with hard white mucro; lobes mostly alternate, sometimes opposite; older leaves glabrescent but never glabrous; petiole of leaves on flowering shoots basally with serrate, stipule-like appendages, petiole of leaves nearer to capitula decreasing in size with reduction in number of lobes until totally absent. *Capitula* homogamous discoid, solitary, terminal on long peduncle; peduncle long-pilose. *Involucral bracts* in 3 or 4 rows, imbricate, 3.5 × 2.5 mm, linear to lanceolate and increasing in size towards the centre to obtuse-triangular, with relatively narrow membranous margin, abaxially permanently pilose, adaxially glabrous. *Receptacle* disc-shaped, flattened. *Paleae* membranous, transparent, ovate, 1–3-dentate, 3–4 mm long, with main vein, paleae maturing before florets. *Disc florets* 130–140, all bisexual; corolla tubular, 5-dentate (-lobed), golden yellow, turning red-brown with age, 4–5 mm long. *Stamens* 5, fused. *Style* bifurcate with linear branches and truncate apices, apices with sweeping hairs. *Ovary* after anthesis with dense, woolly indumentum. *Flowering time*: correlated with the rainy season, August to October, but a few flowering specimens collected in December and March. Figure 14.

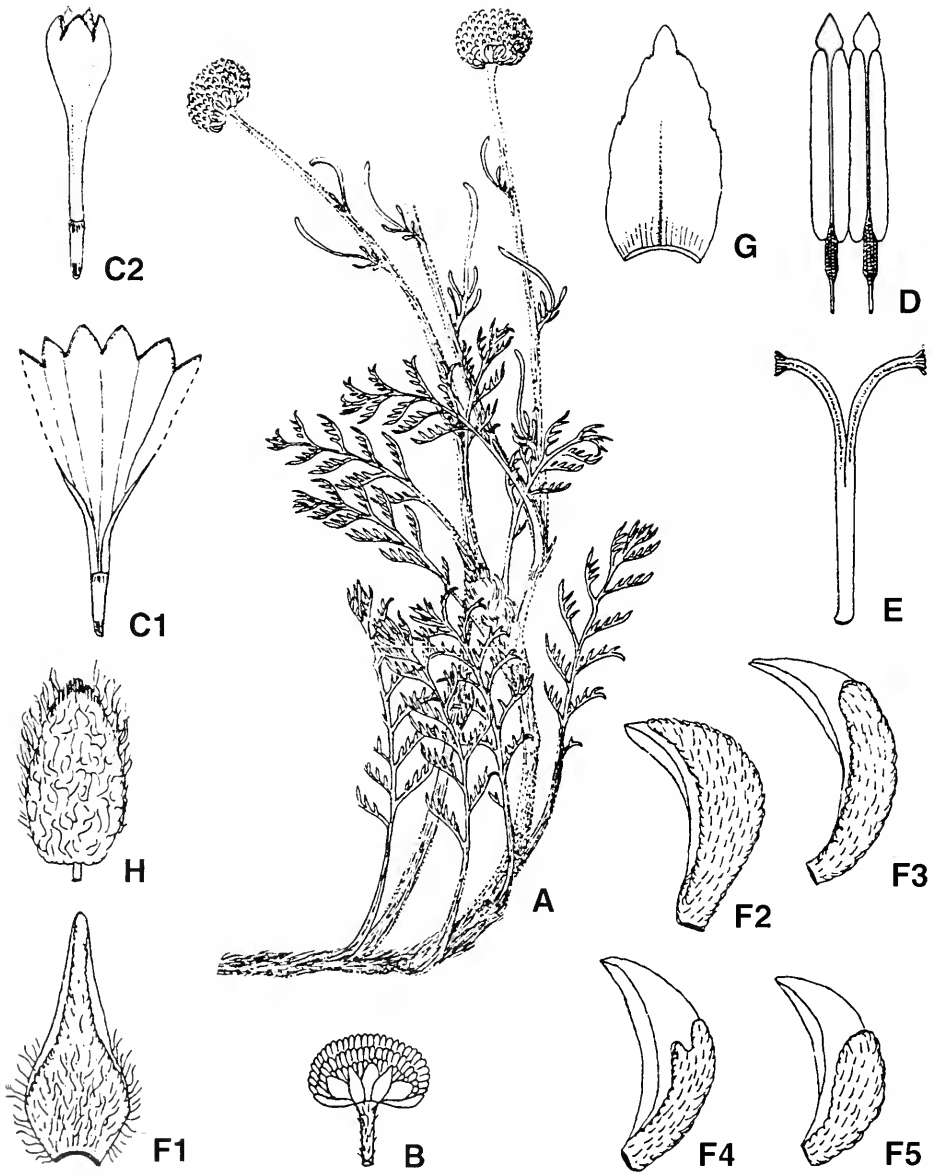
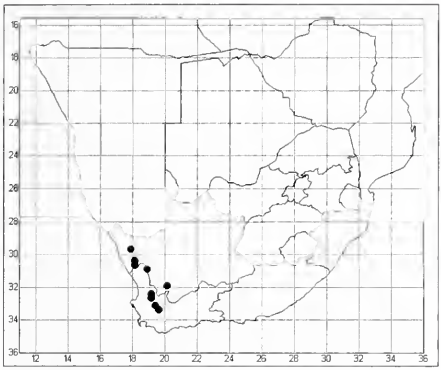


FIGURE 14.—**Lasiospermum pedunculare**: A, branch with inflorescences, × 1; B, capitulum, × 2; C1, C2, bisexual disc florets, × 8; D, anthers, × 16; E, branched style, × 20; F1–F5, involucral bracts, × 8; G, palea, × 10; H, cypsela with woolly indumentum, × 4 (*Müller 4030*, WIND).



MAP 22.—**Lasiospermum pedunculare**.

The distribution of *L. pedunculare* in southern Africa is, with a few exceptions, restricted to the winter-rainfall area, all along the west coast. Until now, it has been found on sandy, loam and clay soils at altitudes of 300–1 500 m. Map 22.

The works of earlier researchers like Linnaeus (1763, 1774), Reichard (1780) and Desfontaines (1804) caused much confusion about the identity of *Santolina alpina* L. and *S. erecta* Lam. The type material of both these species originates from Italy and shows close relationships. Morphologically *S. alpina* closely resembles *Lasiospermum pedunculare*, except for the glabrous cypselas of *S. alpina* in comparison to the woolly cover of the cypselas of *L. pedunculare*. Another misinterpretation, which has led to further confusion, is the fact that Linneaus cited the specimen of Micheli as a synonym of *S. alpina*, an error perpetuated by later researchers.

Only photographs of *S. alpina* and related taxa were studied. Another problem encountered, was locating type material. It is clearly mentioned that *S. maschalantha* Spreng. (in Schrader 1799, *Journal für die Botanik*) was described from material 'Aus dem National-Museum zu Paris', but no such material could be located there or in other herbaria. In this specific case, the description mentioned: 'paleis receptaculi lanatis', i.e. paleae lanate. The probability does exist that it is the cypselas that are lanate, meaning that it is a synonym of *Lasiospermum pedunculare*. *Santolina pinnata*, put into synonymy under *Lasiospermum pedunculare* by various earlier researchers (Persoon 1807; Bertolini 1819; Don 1839), originated from southern Africa according to Donn (1800)—the first indication that the taxon occurs in southern Africa. In spite of many attempts, the type material of this taxon could not be located. A photocopy of material identified as such from Liverpool [Herbarium, Merseyside Country Museums (LIV)] does not agree with southern African material at all. Italian representatives of the species differ from southern African material by the presence of rays (Bertoloni 1819), while southern African specimens have discoid capitula. Further confusion is added by Reichenbach's (1831) description, stating that the ray florets are white and female and that the cypselas are woolly.

The aromatic smell of the plants has led to the common names *laventelkatoen* or lavender cotton by Donn (1800). The lanate indumentum of the cypselas led to the names *veelvertakte wolbol* or *vielspaltige Wollkugel* (Dietrich 1817) and *wolvrug* or *Wollfrucht* (Reichenbach 1831). It is known that the plants are eagerly browsed by sheep and no poisoning of sheep has been reported to date.

Vouchers: *Bohlmann 202* (NBG); *Compton 11544* (NBG); *Compton 11792* (NBG); *Esterhuysen 5994* (BOL, PRE); *Leipoldt 3531* (BOL).

4. **Lasiospermum poterioides** *Hutch.*, A botanist in southern Africa: 140 (1946). Type: Northern Cape, Sutherland, between Matjiesfontein and Sutherland. *Hutchinson 693* (K, holo.!; BOL!).

Lanipila (*sic*) Burch.: 259 (1822). Type: Northern Cape, Roggeveld Mountains, between Jackalsfontein and Kuilenberg, near Sutherland, *Burchell 1336* (K, holo.!; PRE, photo.!).

Much-branched, mat-forming, perennial herbs, rarely erect, rather ascending, 100–300 mm tall, up to 400 mm in diameter. *Older stems* decumbent, glabrescent, sometimes rooting at nodes; young growing points densely long-pilose. *Leaves* initially rosulate; petiole broadened basally, semi-amplexicaul, relatively short with serrate-dentate margins; lamina pinnatisect to bipinnatisect, 40–75 × 5–15 mm, initially delicately long-pilose, glabrescent; leaves on flowering shoots basally pinnatisect with decreasing number and size of lobes transending to peduncle; lobes oblanceolate, mucronate with hard, white mucro. *Capitula* homogamous discoid, solitary, terminal, pedunculate, in flower ± 15 mm in diameter, in fruit more than 20 mm in diameter; distal part of peduncle and involucral bracts felted, soon glabrescent. *Involucre* saucer-shaped, involucral bracts in 3 or 4 rows, imbricate, broadly ovate, rarely obtuse-triangular, increasing in width from outer to inner, with conspicuous, broad, transparent, membranous margin, up to 4 × 3.2 mm. *Receptacle* flattened. *Paleae* broadly ovate to oblong-elliptic, irregularly dentate, transparent, membranous, 3–4 mm long, outer many-veined, inner with conspicuous main vein. *Disc florets* ± 250, bisexual; corolla tubular, 5-dentate (-lobed), golden yellow, turning red-brown with age, 4.0–5.2 mm long. *Stamens* 5. *Style* bifurcate, branches linear, truncate, with sweeping hairs on distal apices. *Ovary* up to 2.5 mm long, after anthesis with dense, woolly indumentum. *Flowering time*: August to October.

This taxon is restricted mainly to the Sutherland District, the Berg-Roggeveld of the Beaufort clay series, with a single specimen from Williston (Northern Cape). Map 20.

L. poterioides can easily be confused with *L. pedunculare*. The presence of the felty indumentum at the tip of the peduncle and involucral bracts, the conspicuous, broad, transparent, membranous margin of the bracts, the leaf lobes that are almost obtuse and the distribution with one exception above 1 500 m altitude, distinguish *L. poterioides* from *L. pedunculare*.

Common names for this taxon are: *gansgras*, *ganzies gras* (*Marloth 9720*, PRE), *Reveldsgras* (*Hanekom 2124*, PRE). It is called *gansgras* as it is one of the first plants turning green after the rain and is then utilised by geese. Although eaten by geese without any ill effects, Hanekom (*Hanekom 2124*, PRE) mentioned that it caused 'dikkop' in sheep.

Vouchers: *Acocks 16931* (PRE); *Bayliss 556* (NBG); *Hanekom 2124* (PRE); *Hutchinson 693* (BOL, K, PRE); *Marloth 9720* (PRE).

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* Synonyms are in italics.

APPENDIX

PLAN OF *FLORA OF SOUTHERN AFRICA*

Cryptogam volumes will in future not be numbered, but will be known by the name of the group they cover. The number assigned to the volume on Charophyta therefore becomes redundant. Occasional contributions to the *Flora* are published in *Bothalia* under the title *FSA contributions*.

Exotic families are marked with an asterisk.

Published volumes and parts are shown in bold.

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The genera of southern African flowering plants, Vols 1 (1975) and 2 (1976). Replaced by Seed plants of southern Africa: families and genera, published as *Strelitzia* 10 (2000).

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