TAXONOMIC STUDIES IN THE GENUS ACROSTEMON KL. AND RELATED GENERA.

by

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CONTENTS.

SUMMARY.

Investigations were carried out on the genus *Acrostemon* Kl. in the Ericaceae.

Examination of variation ranges in the species of *Acrostemon* revealed that the two monotypic genera, *Hexastemon* Kl. and *Arachnocalyx* Compton, could not be upheld as separate genera. They were therefore reduced under *Acrostemon*.

Studies of variation and intergradation in the distinguishing characters between *Acrostemon* and the genera, *Simochocheilus* Kl. and *Syndesmanthus* Kl., have shown that the three genera may have to be incorporated into a single genus in a future revision of the Ericaceae. However, further study is necessary to clarify this problem.

In this work eighteen taxa have been investigated and of these taxa only seven remained unaltered. In the genus *Acrostemon* thirteen species have been recognised, of which two are newly described, *A. vernicosus* and *A. glutinosus*. One new subspecies and two species reduced to varietal level have been recognised. Five changes in nomenclature have been found necessary. Two species have been referred to different genera, *Blaeria concinna* and *Simocheilus fourcadei*.

Studies of the cytology of five species of *Acrostemon* indicate that the basic chromosome number for the genus is twelve.

INTRODUCTION.

The South African Ericoideae have been enumerated in taxonomic works since the mid eighteenth century.

Linnaeus named the genus Erica and recognised only one other genus, Blaeria. It was not until the nineteenth century, however, that botanists began to group the numerous species, which were being accumulated, into different genera.

Of the 23 genera of the Ericaceae in South Africa, the genus Erica is by far the largest and has 600 species while the remaining 22 genera have only 170 species. On account of their small size, these 22 genera can be referred to collectively as the Minor Genera, a term used by Phillips (1944). In this work the term has been used to denote the genera of the Ericoideae other than Erica.

The main advance in the study of the Minor Genera came with the publication of several papers by Klotzsch in 1834 and 1838. In his work he recognised and described 24 genera.

Shortly afterwards Bentham's work on the Ericoideae was published in de Candolle's Prodromus (1838). In his work Bentham was much more conservative than Klotzsch and while recognising many of Klotzsch's genera, he reduced several to synonomy.

The next treatment of the Minor Genera as a whole was by N.E.Brown in Thistleton-Dyer's Flora Capensis (1909). Brown recognised 23 genera of which 19 were previously described and 4 were described by him. Brown's treatment of the group was by no means conservative but appears to have been thorough and careful. He had, however, very little material on which to work, even though it was all that was available at the time.

All the workers who have reviewed the Minor Genera have worked from scanty dried herbarium material, as none of them ever visited South Africa. Consequently it was decided in this work to obtain large samples of material from the natural habitat for the close examination of variation ranges.

Ten of the 13 species studied in this work were seen and collected in the natural habitat by the author. A. barkerae was searched for on two occasions but could not be

located. A. cereris was not seen as the author was unable to visit the Hex River Mountains. A. glandulosus, being a Thunberg "lost" species, was not located. Preserved material of all the species seen was examined.

Since the publication of Flora Capensis, a large amount of collecting has been carried out to increase the herbarium collections of the Cape Flora. The addition of this material has shown that considerable variation exists in the species and genera with the result that a fresh study was found necessary.

As a starting point to the study of the Minor Genera a preliminary investigation was carried out by the author on the 14 species occuring on the Cape Peninsula. This investigation was found most useful in preparing the way for the type of problem to be found in the Minor Genera before embarking on any detailed study.

The present author decided to investigate the genus Acrostemon Kl. and to investigate its relationships with other similar genera of the Ericoideae. The genus was chosen on account of its workable size and close similarities to other genera and because of its limited distribution.

In this work the author has been guided by the principles as suggested by du Rietz (1930) and Hedberg (1957), for the delimitation of taxa.

Species: The smallest natural population permanently separated from others by a distinct discontinuity in two or more independent characters.

Subspecies: A variant of the typical form with only one distinct character distinguishing it from the typical form and occupying a separate part of the distribution range, i.e. it is allopatric.

Variety: A variant similar to the subspecies but not occupying a separate part of the distribution range, i.e. it is sympatric.

The grouping of the nomenclatural synonyms in the section on taxonomy is in chronological order of the basionyms.

The figures accompanying the taxonomy of the species were drawn by the present author from herbarium specimens and from preserved material. Those not drawn by the author have been acknowledged in the figures. The first drawings that were done, were done by measurement and by eye. Later

on a camera lucida system was employed to give quicker and more accurate drawings.

In the maps indicating the distribution of the species, the mountainous regions have been shown in three altitudinal levels 2000ft 4000ft 6000ft
The maps were drawn up from the herbarium specimens examined and cited at the end of the taxonomic discussion of each species. Specimens from the Natural History Museum, Vienna, which were not however examined, have been included in the lists to augment the distribution records.

The abbreviations used in the citation of the specimens are according to those given in the Index Herbariorum.

ACKNOWLEDGEMENTS.

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The author's most grateful thanks are due to Dr. E. A. Schelpe, Bolus Herbarium, under whom the work was done.

ACROSTEMON KL.

Acrostemon Kl. in Linnaea 12 : 227 (1838); Benth. in D.C. Prodr. 7 : 702 (1838); Rach in Linnaea 26 : 790 (1853); N.E.Br. in Fl. Cap. 4 : 350 (1909).
Finckea Kl. in Linnaea 12 : 237 (1838).
Grisebachia sect. Finckea Benth. in D.C. Prodr. 7 : 701 (1838).
Comocephalus Kl. in Linnaea 12 : 224 (1838).
Hexastemon Kl. in Linnaea 12 : 220 (1838).
Eremia sect. Hexastemon Benth. in D.C. Prodr. 7 : 700 (1838).
Arachnocalyx Compton in J. S. Af. Bot. 9 : 143 (1934).

Perenial shrubs or shrublets, prostrate, spreading or erect. Leaves 3 or 4-nate, typically "ericoid". Inflorescences terminal, globose. Bracts mostly 3, in one species solitary, equal to markedly unequal, very small to 2mm long. Calyx equally 4-lobed from halfway to the base, lanate or villous with short or long hairs or scarcely hairy, often with sessile or subsessile glands on the margins or inner surface. Corolla hypogynous, 4-lobed, tubular or tubular-inflated, cylindrical or 4-angled. Stamens mostly 4, sometimes 3,5,6,7 or 8. Anthers usually basifixed, partially or wholly exserted, muticous or aristate, cells fused for about one quarter of their length, never free. Ovary mostly 2-celled, sometimes 1, 3 or 4-celled, all with a solitary ovule in each cell, pendulous or in two species basal and erect; style exserted; stigma simple or capitate.

In creating the genus Acrostemon in 1838, Klotzsch based his description on the three species, A. incanus Kl., A. equisetoides Kl., and A. hirsutus sensu Kl. The first two species were newly described by Klotzsch while the third species was what he regarded as a new combination for Erica hirsuta Thunb.

Klotzsch did not cite a type species when he described the genus. It is therefore necessary to nominate a type species,

As A. incanus has been reduced to a variety of A. equisetoides in this work, the selection had to be made from either of the two remaining species,

A. hirsutus sensu Kl. has proved to be an incorrect identification by Klotzsch. The taxon has been reduced in

this work to a variety of A. stokoei L.Guthrie as A. stokoei var. confusus. As a result of the confusion of this taxon the only valid species which may be selected as the type for the genus is A. equisetoides Kl. of which there is no holotype. A lectotype or neotype will therefore have to be selected for the species and for the genus.

In this work it has been found necessary to include the monotypic genera Hexastemon Kl. and Arachnocalyx Compton under Acrostemon. The widening of the generic description of Acrostemon has therefore been necessary. Variations found in the existing, newly recorded species and species which have been placed in other genera have required that alterations be made to the generic description.

As it stands in this work, the genus Acrostemon is considerably changed from its original form and Klotzsch's original description has been emended here to include several new characters and ranges of existing characters.

The generic discussion at the end of this work deals with the enlarging and the emendments to the genus.

KEY TO THE SPECIES.

1. Bract 1 ... ... 6. schlechteri
1. Bracts 3
   2. Anthers with short spurs ... ... 13. cereris
   2. Anthers spurless
      3. Corolla puberulous
         4. Filaments puberulous ... ... 10. eriocephalus
         4. Filaments glabrous ... ... 12. viscidus
      3. Corolla glabrous
         5. Leaves 4-nate
            6. Middle bract larger than the lateral bracts
               7. Leaves straight, sepals lanceolate
                  8. Old leaves with glands ... 4. barkerae
                  8. Old leaves glandless ... 1. stokoei
               7. Leaves incurved, sepals ovate ... ... 2. hirsutus
            6. Middle bract equal to the lateral bracts... ... ... 3. glandulosus
         5. Leaves 3-nate
            9. Ovary 3 or 4 celled ... ... 4. barkerae
            9. Ovary 2 or 1 celled
               10. Leaves subglobose to shortly terete, round in section
                  11. Stigma simple, truncate
                     12. Bracts equal... ... ... 7. vernicosus
                     12. Bracts unequal. ... ... 9. glutinosus
                  11. Stigma capitate... ... ... 8. utriculosus
               10. Leaves flat on upper side, convex on lower side
                  13. Calyx lanate on margins, glabrous on the back.. ... ... 11. xeranthemifolius
                  13. Calyx ciliate all over
                     14. Leaves imbricate ... ... 5. equisetoides
                     14. Leaves erect or spreading ... ... 1. stokoei

1. ACROSTEMON STOKOEI L.Guthrie in Ann. Bol. Herb. 4 : 23 (1925).

Erect semi-rigid shrublets up to 50cm high. Branches puberulous. Leaves 3 or 4-nate, erect or spreading, 1-11mm long, straight, slightly incurved or recurved, laxly imbricate, linear-lanceolate, obtuse, thinly pilose or pubescent with soft hairs, becoming scabrous, the younger sometimes with glands on the margins. Inflorescences terminal, globose, 4-16 flowered. Peduncles 0.5-1mm long, pilose. Bracts 3, approximate, unequal to very unequal, the middle bract leaflike, 1-2mm long, 2-4 times as long as the lateral pair, all villous with long white hairs. Calyx divided from threequarters the way down to almost to the base, narrowly linear-lanceolate to ovate-lanceolate, acute, ciliate with long white hairs, possessing on the inside a varying number of sessile glands, viscid, segments 1.5-2mm long. Corolla 1.5-4mm long, tubular to tubular-inflated to ovate and slightly contracted at the throat, glabrous, slightly viscid, lobes minute or large, deltoid, obtuse, connivent-erect or slightly spreading. Stamens 4. Filaments 3-3.5mm long, glabrous, filiform. Anthers 1.5-2mm long, exserted, linear, muticous, smooth, the pore $\frac{1}{4}$ the length of the cell. Ovary 2-celled, oblong to ovate, obtuse, glabrous; style up to 5mm long, filiform, exserted; stigma simple.

Type: Mountains near the mouth of the Palmiet River, Caledon Division, 30.xii.1923, Stokoe s.n. (BOL 17523, holotype).

Klotzsch was the first to make the combination Acrostemon hirsutus (Thunb.) Kl. He based this combination on Thunberg's description of Erica hirsuta in his Flora Capensis (1795) after seeing a Thunberg specimen in Wendland's Herbarium. It would seem that Klotzsch considered that the Wendland specimen fitted Thunberg's description of Erica hirsuta.

Rach stated in 1853 that the two specimens of Erica hirsuta in Thunberg's herbarium were A. incurvus (Kl) Benth. and A. glandulosus Rach. Brown (1909) confirms this opinion in Flora Capensis. One can therefore conclude that there is no specimen in Thunberg's herbarium of A. hirsutus sensu Kl. as interpreted in the Flora Capensis.

The Wendland specimen could have been a specimen from the Thunberg Herbarium but was wrongly identified as Erica

hirsuta by Klotzsch's linking of this specimen and Thunberg's description. Only an examination of the Thunberg specimen in Wendland's Herbarium, if it can be located, will clarify this point, but does not, however, affect the issue.

Thunberg's description in his Prodromus (1795) of Erica hirsuta is not sufficiently adequate to know to which of his specimens he was actually referring - "E. hirsuta - mutica foliis quaterniis lanceolatis villosis, floribus racemosis globosis, calycibus tomentosis."

In his Flora Capensis (1823) edited by Schultes, Thunberg enlarged his description considerably to - "E. hirsuta - mutica, foliis quaternis, lanceolatis scabris, pilosis; calycibus lanatis. Caulis frutescens. Rami at ramuli sparsi cinerei, tomentosi, flexuoso-erecti. Folia breviter petiolata, obtusa, incurva, imbricata, supra planiuscula, subtus convexa et sulcata, scabrida et pilis albis laxis villosa, lineam longa. Flores in ramulis terminales, aggregati, subracemosi. Calyces hirsutissimi piliis longis, albis. Corolla campanulata, purpurascens, glabra. Filamenta 4, capillaria. Antherae purpurae, exsertae, bipartibiles".

From this latter description one character does not fit A. hirsutus sensu Kl. - "leaves incurved". Brown stated that Thunberg's descriptions are doubtless chiefly based upon specimen no 9328 in his herbarium which is now regarded as A. incurvus (Kl) Benth.

Thunberg's description is precise enough to show that he was actually describing his sheet no 9328 which possesses incurved leaves. Klotzsch thus had no grounds for linking his species with Thunberg's description of Erica hirsuta and a new name was necessary for A. hirsutus sensu Kl. The taxon is here referred to as var. confusus.

All subsequent applications of the name A. hirsutus (Thunb.) Kl. must have been based on comparisons with the three Ecklon & Zeyher collections which Klotzsch cited with the Thunberg specimen in Herb. Wendland.

A.stokoei was described by Miss. L. Guthrie in 1925, basing her description on a Stokoe specimen (BOL 17523).

Superficially the species is very similar to var. confusus. Miss. Guthrie used the following characters to differentiate the two taxa :-

var. confusus.	A. stokoei.
1. Leaves 4-nate, erect.	Leaves 3-nate spreading.
2. Sepals small in relation to the corolla, without glands.	Sepals large in relation to the corolla, with glands.
3. Corolla tubular.	Corolla tubular-inflated.

These differentiating characters were examined in detail when superficial examination showed that it was difficult to separate the two species.

The main distinguishing character lay in the arrangement of the leaves in a whorl. The number of leaves in a whorl is often difficult to ascertain on herbarium material as the leaves often drop off completely or several members of a whorl may be missing or the leaves may be crowded together when young or the leaves may sometimes be slightly scattered and not strictly whorled.

A thorough examination showed that only one in 58 specimens of both species, Stokoe 945, possessed 3 and 4-nate leaves. Most of the leaves on the specimen were 3-nate but some side branches definitely possessed 4-nate leaves. There was only this slight overlap between the species in regard to the leaf number per whorl.

Variation in leaf whorl number is found in A. barkerae where it is not uncommon to find 3 and 4-nate leaves on the same plant and on the same branchlet.

There is no consistency in the herbarium material regarding the size of the angle of the leaves to the axis or the spread of the leaves. Both A. stokoei and var. confusus possess erect and spreading leaves.

The calyx segments of some specimens of var. confusus were found to vary in size and to reach the size of the segments recorded in A. stokoei (cf. table for the scatter diagrams). There was thus a certain degree of overlap in this character.

A search was made for the presence or absence of glands on the calyx segments. A complete range of variation in the frequency of glands was found on material of var. confusus. Many of the calyx segments possessed a number of sessile glands, equal in number to those in material of A. stokoei. This is shown in the accompanying figures.

The corollas of var. confusus similarly showed a large amount of variation in shape. Corollas from Parker 4881 of var. confusus, were decidely swollen and similar to those of specimens of A. stokoei, (cf. tables). A similar

are

variation was obtained in the relative lengths of the calyces to the corollas in the specimens of both taxa. The range and degree of intergradation of these characters is clearly shown in the scatter diagrams.

The separation of the two species is thus difficult to uphold on the variation and intergradation obtained in the specimens in the differentiating characters. It is thus necessary to reduce the two taxa to infraspecific level of one species.

A glance at the distribution map shows that the two taxa overlap completely in the Houw Hoek, Kleinmond, Betty's Bay area. On account of their being completely sympatric, the taxa have been recognised as varieties and not geographical subspecies of the same species.

As the name A. stokoei L. Guthrie is the oldest name available for the species, the species must be named A. stokoei, even though the taxon var. confusus is much older.

In the Flora of the Cape Peninsula Salter made no mention of the record, Schlechter 1074, from the Simonstown Mountains. Schlechter's collecting records do not show that he was away from the Peninsula at that time. However the species has not been subsequently recorded from this area and as Schlechter's records are not always to be relied upon, this record has been ommited from the distribution map.

Key to the varieties.

Leaves 3-nate	var. stokoei
Leaves 4-nate	var. confusus

(a) var. stokoei.

A. stokoei L.Guthrie in Ann. Bol. Herb. 4 : 23 (1923).

The typical variety is characterised by its 3-nate leaves and larger calyx segments.

Specimens examined:

CALEDON: Mountains near the mouth of the Palmiet River Mouth, 30.xii.1923, Stokoe s.n. (BOL 17523); 21.i.1946, Esterhuysen 12560 (BOL, PRE); viii,1925, Stokoe s.n. (SAM 54851); i.1944, Stokoe s.n. (SAM 58141); i.1924, Stokoe 945 (PRE); v, Stokoe s.n. (Sam 55078); xii, Stokoe 9108 (BOL); Kleinmond flats and mountains, 3.x.1961, Oliver 1533 (STE);

iv. 1932, Stokoe s.n. (SAM 50244); 16.xii.1958, Oliver 60 (STE); 28.i.1959, Oliver 438 (STE); iv. 1926, Stokoe s.n. (SAM 32326); x, Stokoe 8328 (BOL); Mountains west of the Palmiet River at Elgin, 24.iv. 1943, Leighton 384 (BOL); Houw Hoek Mountains, 12.viii. 1938, Compton 7834 (NBG); Klein River Mountains near Hermanus, vii.1927, Stokoe 1396 (PRE);
STELLENBOSCH: Helderberg, Stokoe 6063 (BOL);
WITHOUT LOCALITY: Stokoe 6061 (BOL).

(b) var. confusus E.G.H. Oliver var. nov.

A. hirsutus sensu Kl. in Linnaea 12 : 228 (1838); Benth. in D.C. Prodr. 7 : 702 (1838); N.E.Br. in Fl. Cap. 4 : 352 (1909). non A. hirsutus (Thunb.) Kl.

Differt a var. typica foliis quaternis, sepalis brevioribus.

This variety may be distinguished by its 4-nate leaves and shorter sepals.

It has been considered advisable to describe this taxon as a new variety in view of the uncertainty of the identity of A. hirsutus sensu Kl. non (Thunb.) Kl.

Type: North side of Houw Hoek Pass, 15.iii.1963. Oliver 1579 (STE, holotype).

Specimens examined:

BREDASDORP: Elim, 500ft, 24.iv.1896, Schlechter 7715 (BOL, PRE, W).
CALEDON: Houw Hoek Mountains, 1800ft, 7.iv.1896, Guthrie 2289 (BOL); 1200ft, iv.1884, Bolus 5345 (BOL); Bolus s.n. Her. Norm. Aust. Afr. 195 (BOL, SAM, W); 2000ft, 7.iii.1896, Schlechter 7408 (BOL); 1500ft, 12.viii.1938, Compton 7835 (NBG); vii, Zeyher 3316 (SAM); Zeyher s.n. (SAM 41338); iv.1884, Macowan 2540 (SAM); Scott-Elliot 1139 (PRE); 1500ft, 8.xii. 1897, Galpin 3720 (PRE); vii, Zeyher s.n. (PRE 29023); 15.iii.1963, Oliver 1579 (STE); Palmiet River Mountains, Stokoe 6059 (NBG); Stokoe 6060 (BOL); v.1941, Stokoe s.n. (SAM 55078); iv.1922, Andreae 868 (PRE); viii.1924, Stokoe 965 (PRE); Kleinmond Mountains, Stokoe 6204 (NBG); 7.v.1959, Oliver 466 (STE); 9.v. 1959, Oliver 483 (STE); iii.1949, Stokoe s.n. (SAM 62513); vi.1950, Stokoe s.n. (SAM 65524); 5.iv.1963, Oliver 1701 (STE); Rooiels, 1.vi.1952, Parker 4758

29.ii. 1959, Oliver 706 (STE); Kogelberg, ix, Esterhuysen 23137 (BOL); viii.1941, Stokoe 8232 (BOL); 3.xii.1958, Wood s.n. (NBG 41376); ix.1953, Stokoe s.n. (SAM 67014); Pringle Bay, 200m, 17.vi.1953, Parker 4881 (SAM); Bot River, 18.ix.1949, Wilman 776 (NBG, PRE); Elgin, 24.iv.1943, Compton 14511 (NBG); Top of Viljoen's Pass, iii.1951, Stokoe s.n. (SAM 65523); iii.1963, Oliver 1843 (STE); Kaaimansgat, 31.iv.1940, Compton 8807 (NBG); Settynsberg, vi.1949, Stokoe s.n. (SAM 62363); Boschesveld Mountains on Worcester side, 1.x.1955, Stokoe (SAM 69004);
WORCESTER: du Toits Peak, viii.1960, Esterhuysen 21700 (BOL);
CAPE: Mountains near Simons Town, 3.vi.1892, Schlechter 1074 (BOL);
WITHOUT LOCALITY: Zeyher 56.6 (PRE); Ecklon & Zeyher 273 (SAM); Zeyher 273 (BOL).

A. stokoei var. stokoei

Figure 1.

Stokoe s.n. (BOL 17523), holotype; (1) single flower; (2) corolla; (3) sepals (inner surface); (4)anther; Oliver 1533; (5) single flower; (6) corolla; (7) sepal; (8) anther; (9) single flower; (10) corolla; (11) sepal; (12) anther.

Figure 2.

Stokoe s.n. (BOL 17523), holotype. facsimile of sketch on the type sheet by L.Guthrie; 9(1) bracts; (2) single flower and corolla; (3) sepals (inner and outer surfaces); (4) anther (rear, lateral and front views); (5) gynaecium; (6) whorl of leaves; (7) leaf (lower and upper surface).

A. stokoei var. confusus.

Figure 3.

Oliver 1843; (1) single flower; (2) corolla; (3 & 4) sepal (inner surface); (5) anther;
Bolus s.n. (Herb.Norm. 195); (6) single flower; (7) corolla; (8) sepal (inner surface); (9) middle bract; (10) one lateral bract;
Parker 4881; (11) single flower; (12) corolla; (13) sepal (inner surface); (14) anther.

Measurements of calyx length - corolla length - corolla breadth

Measurements taken in millimetres

Acrostemon stokoei L. Guthrie.

Stokoe s.n. (BOL 17523)	1¾	3½	1¼	1¾	3¼	1
	1½	3½	1½	1¼	3	1¼
	1½	3¼	1½	1½	3	1¼
	1¾	3¼	1¼	1½	3	1¼
	1¾	3¼	1¼			
Stokoe 18328	2	3¾	1½	1¾	3¼	1¼
	1¾	3½	1½	2	3½	1½
	2	3½	1¼	2	3¼	1¼
Stokoe 6061	1¼	4	1¼	1¼	3	1¼
	1½	3¾	1½	1½	3	1¼
Stokoe 945	1½	3	1¾	1¾	3¼	1¼
	1½	3	1¼	1¾	3½	1¼
	2	3½	1¼	1½	3¼	1½

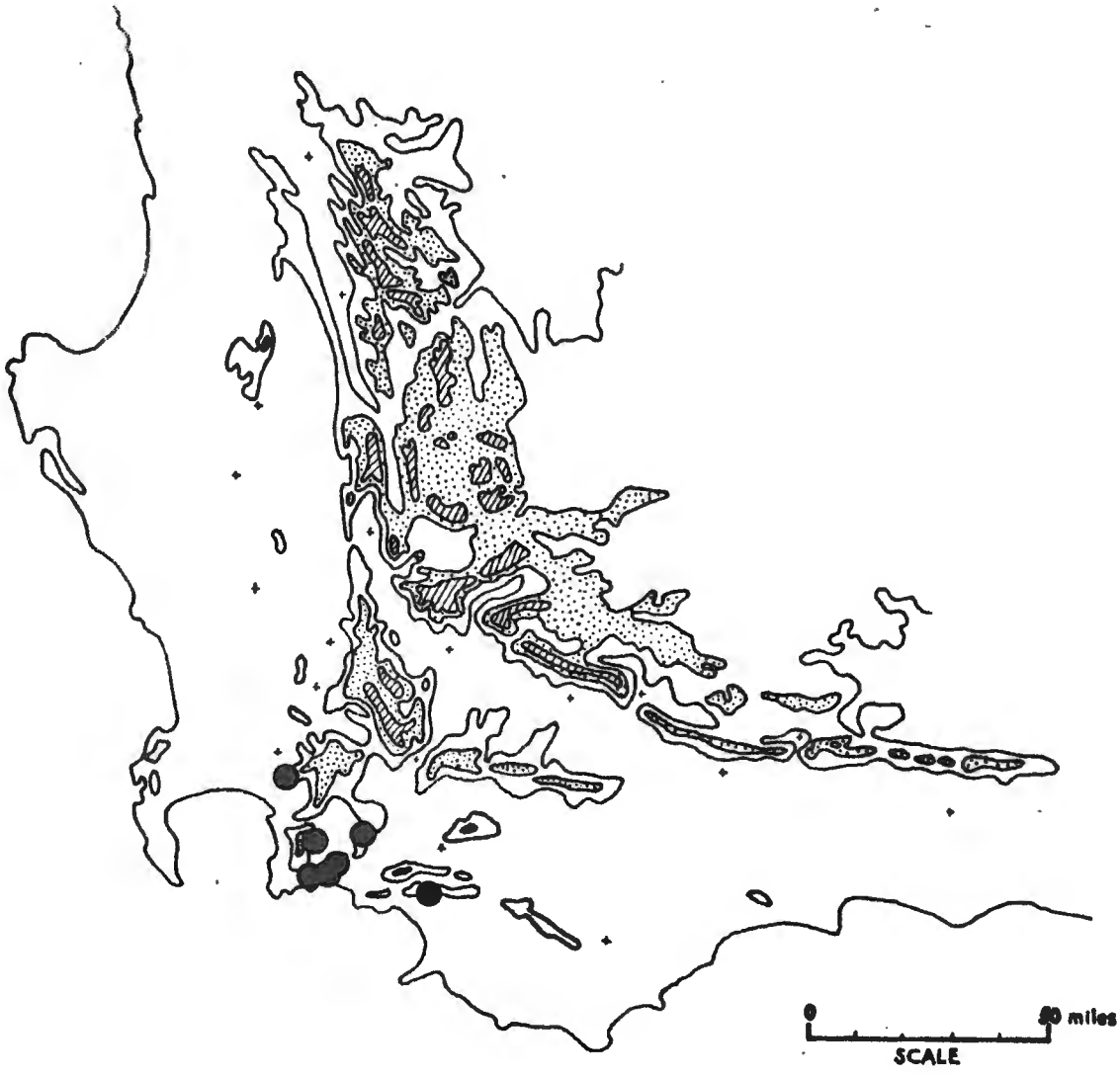
Acrostemon hirsutus sensu Klotzsch.

Parker 4881	1	3	1¼	1	3	1
	1	2¾	1	¾	3	1¼
	1	2¾	1	¾	3	1¼
	1	3	1¼	¾	2¾	1¼
	1	3	1¼	1	2¾	1¼
Bolus s.n. (Herb. Norm. 195)	1¼	3½	1	1	3¼	¾
	1¼	3½	¾	1¾	3½	1
Stokoe 6060	1¼	3½	1¼	1¼	3	1
	1¼	3½	1¼	1	3	1¼
	1½	3½	1¼			
Compton 7825	1½	3½	1	1½	3½	¾
	1¾	4	1			
Parker s.n. (NBG 41377)	1	3½	1	1¼	3½	1
	1¾	3¾	1½	1	3	1¼

Measurements were taken from herbarium specimens.

Figure 4.

Oliver 1579, holotype; (1) single flower; (2) corolla; (3) sepal (inner surface); (4) anther; Stokoe s.n. (SAM 65523); (5) single flower; (6) corolla; (7) sepal (inner surface); (8) 3 bracts; Esterhuysen 23137; (9) single flower; (10) corolla; (11) sepal (inner surface).



Distribution of A. stokoei var. stokoei.

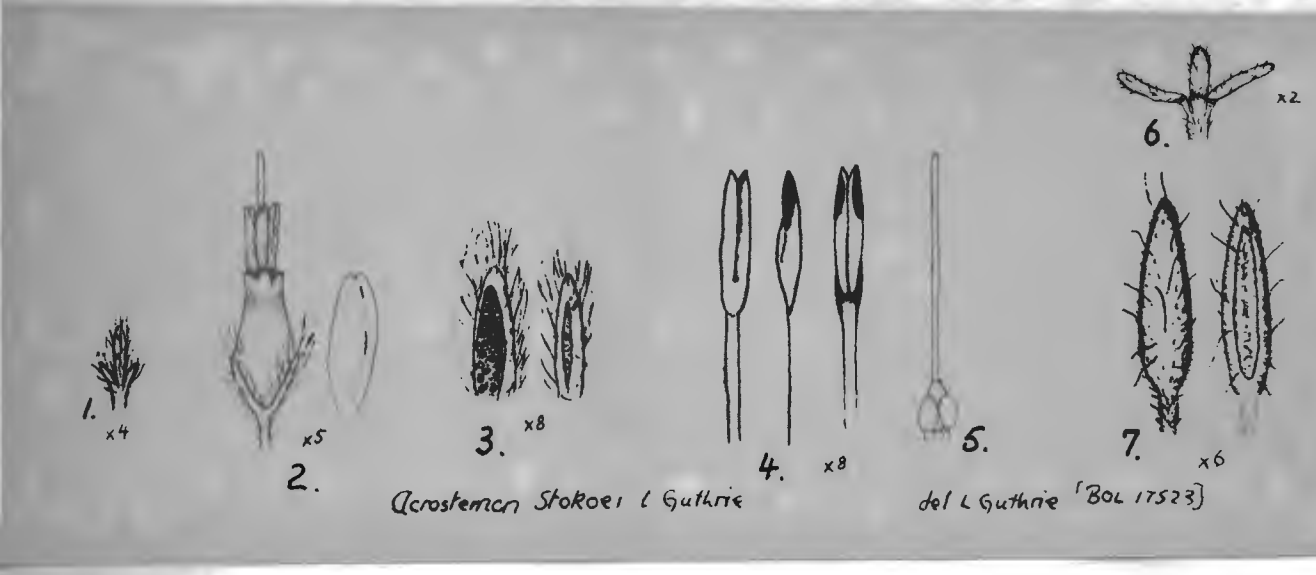
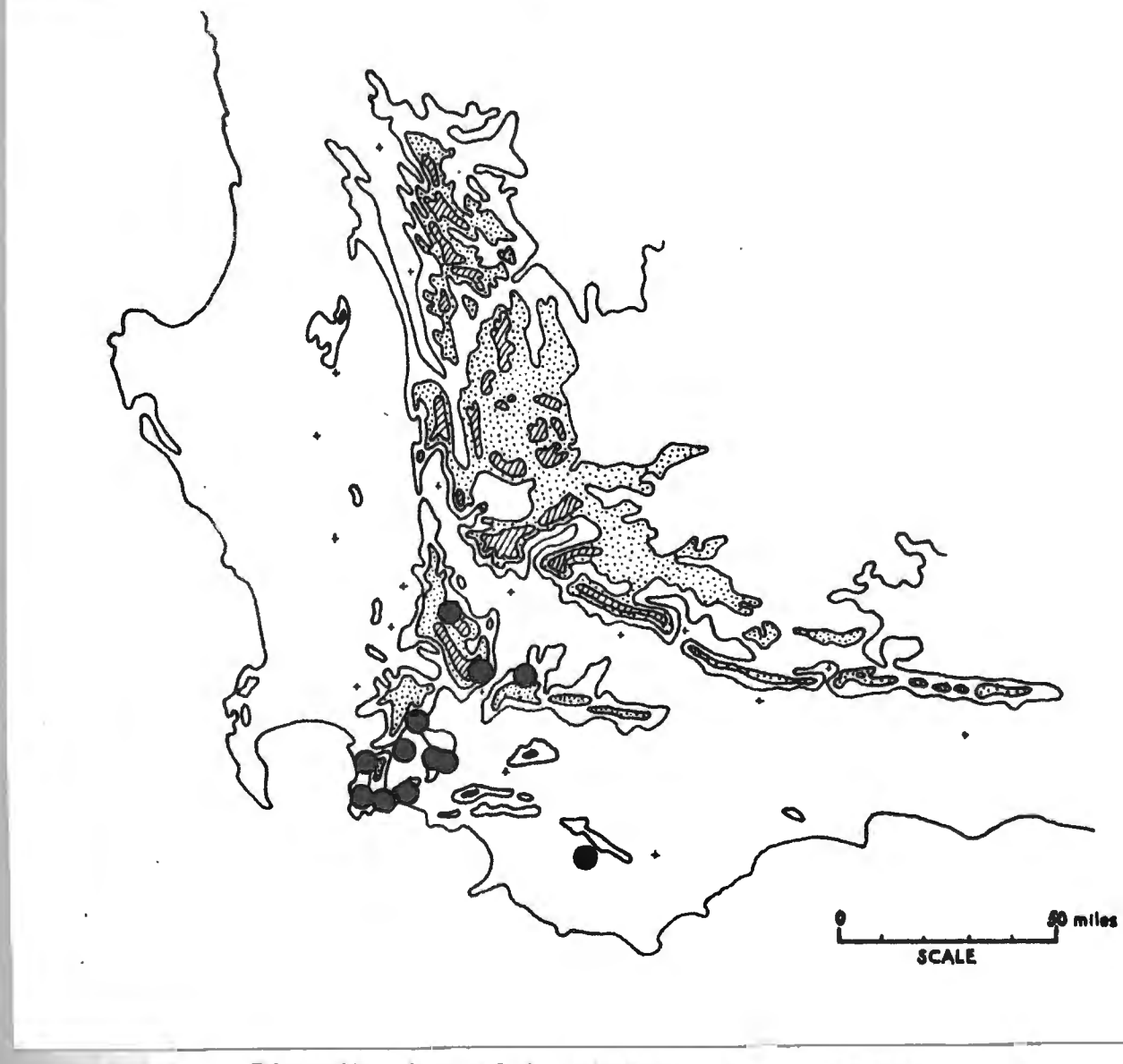
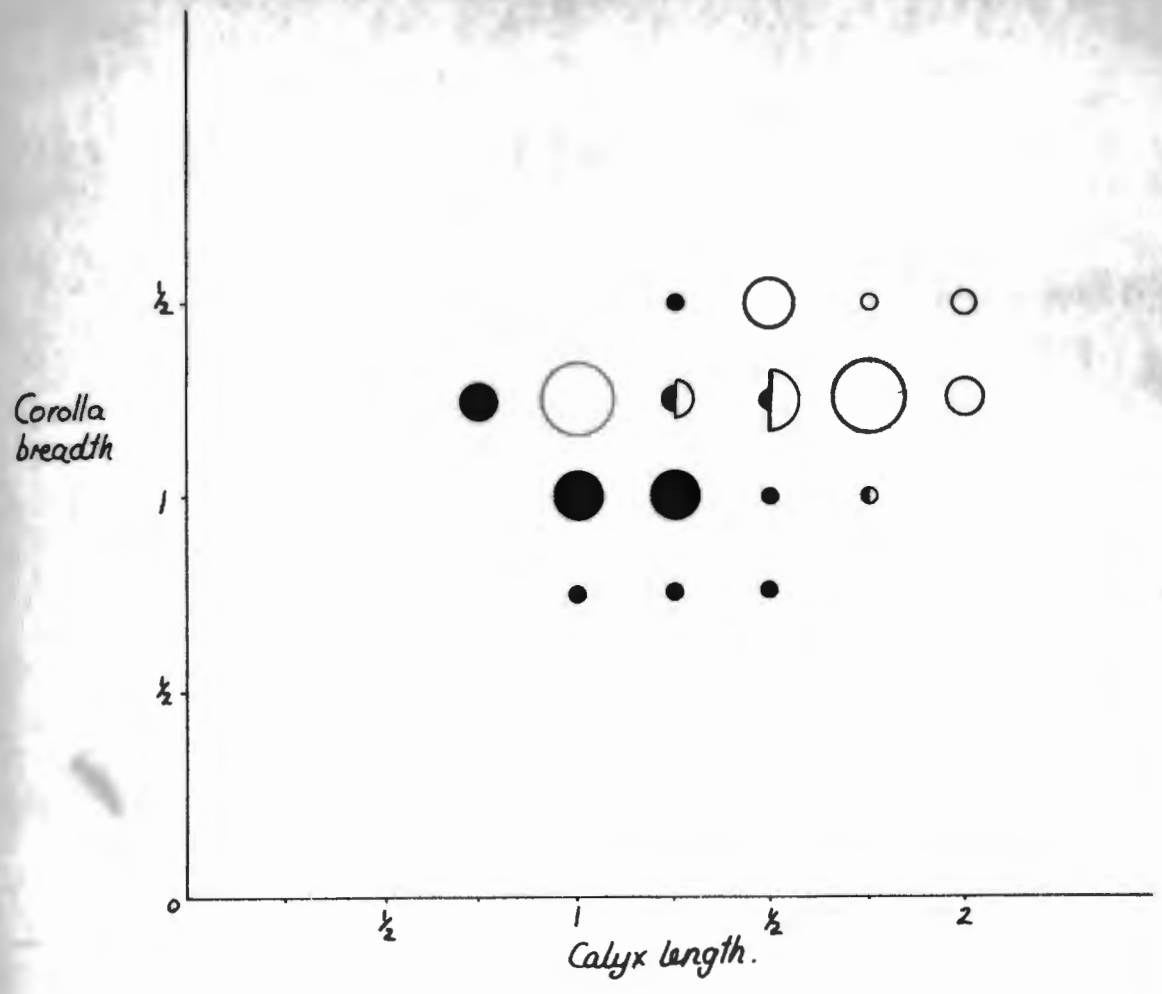
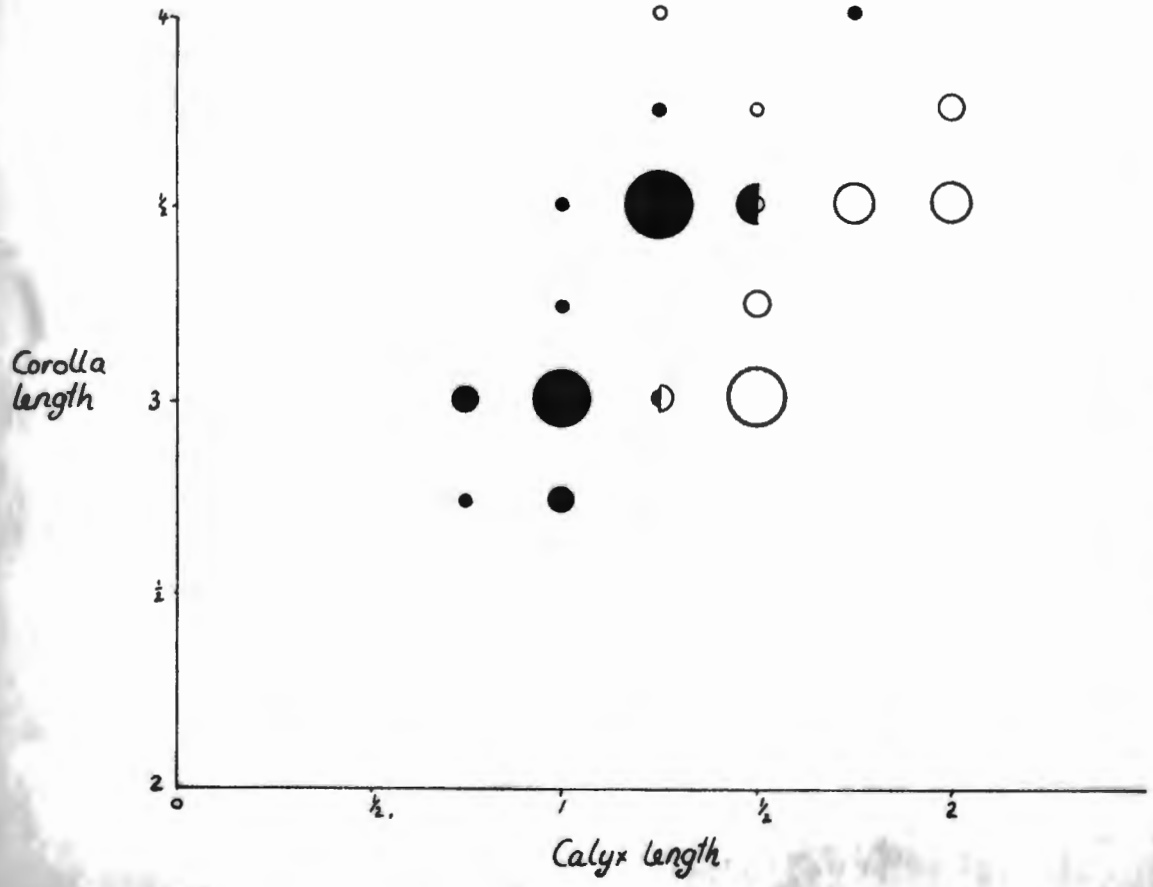


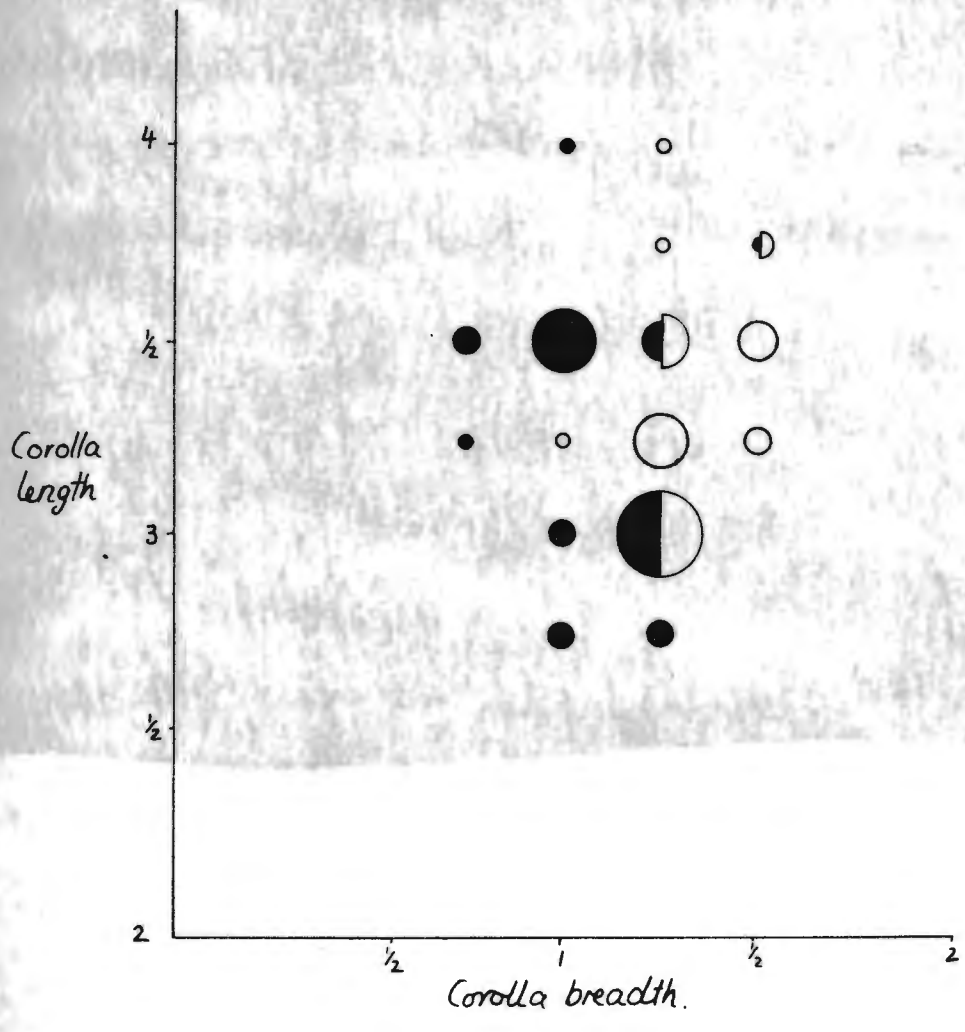
Fig. 2.



Distribution of A. stokoei var. confusus.


Corolla breadth
½
1
½
0
½
1
½
2
Calyx length.


Corolla length
4
½
3
½
2
0
½
1
½
2
Calyx length


4
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Corolla length
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½
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Corolla breadth.

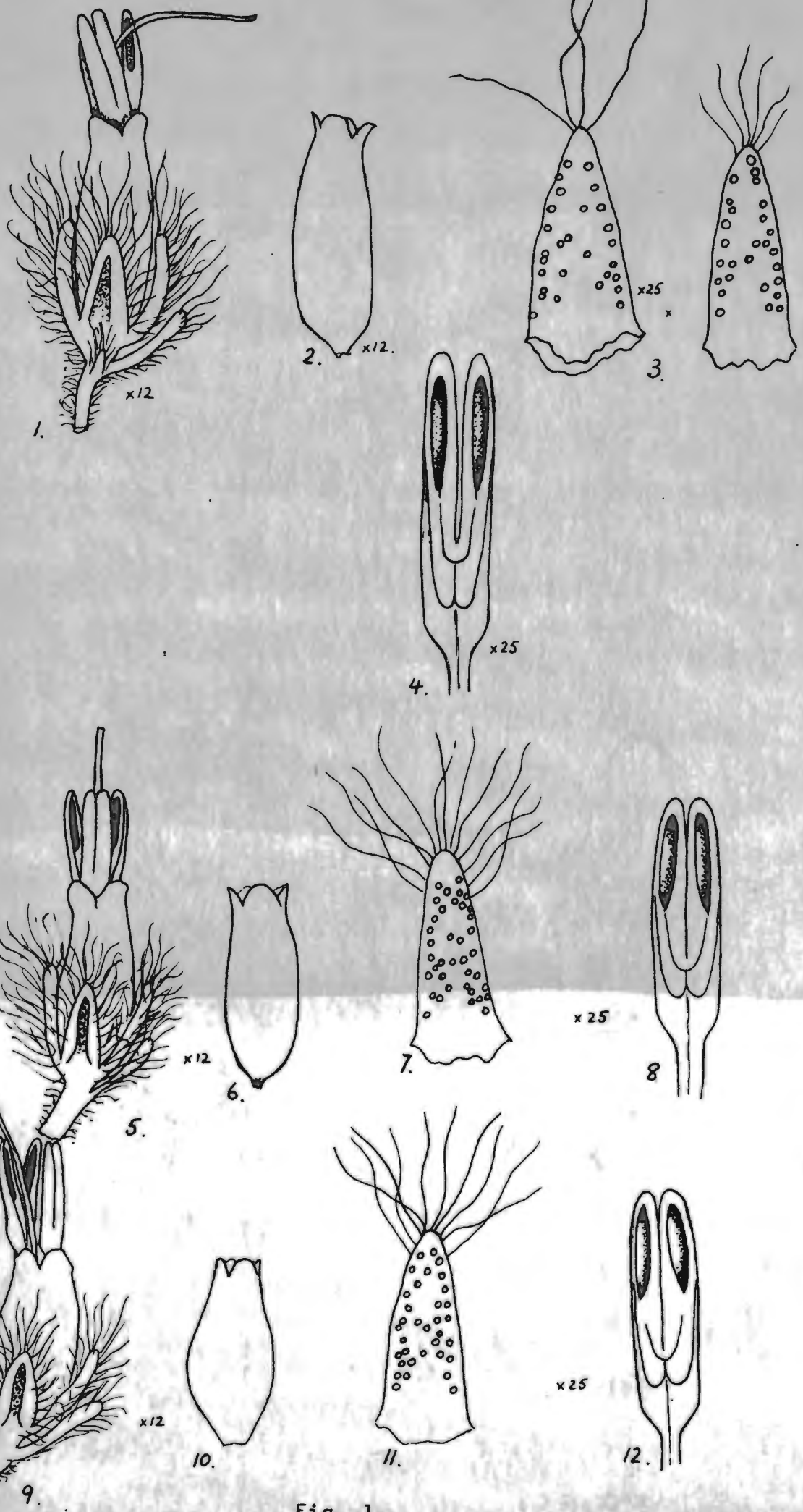


Fig. 1.

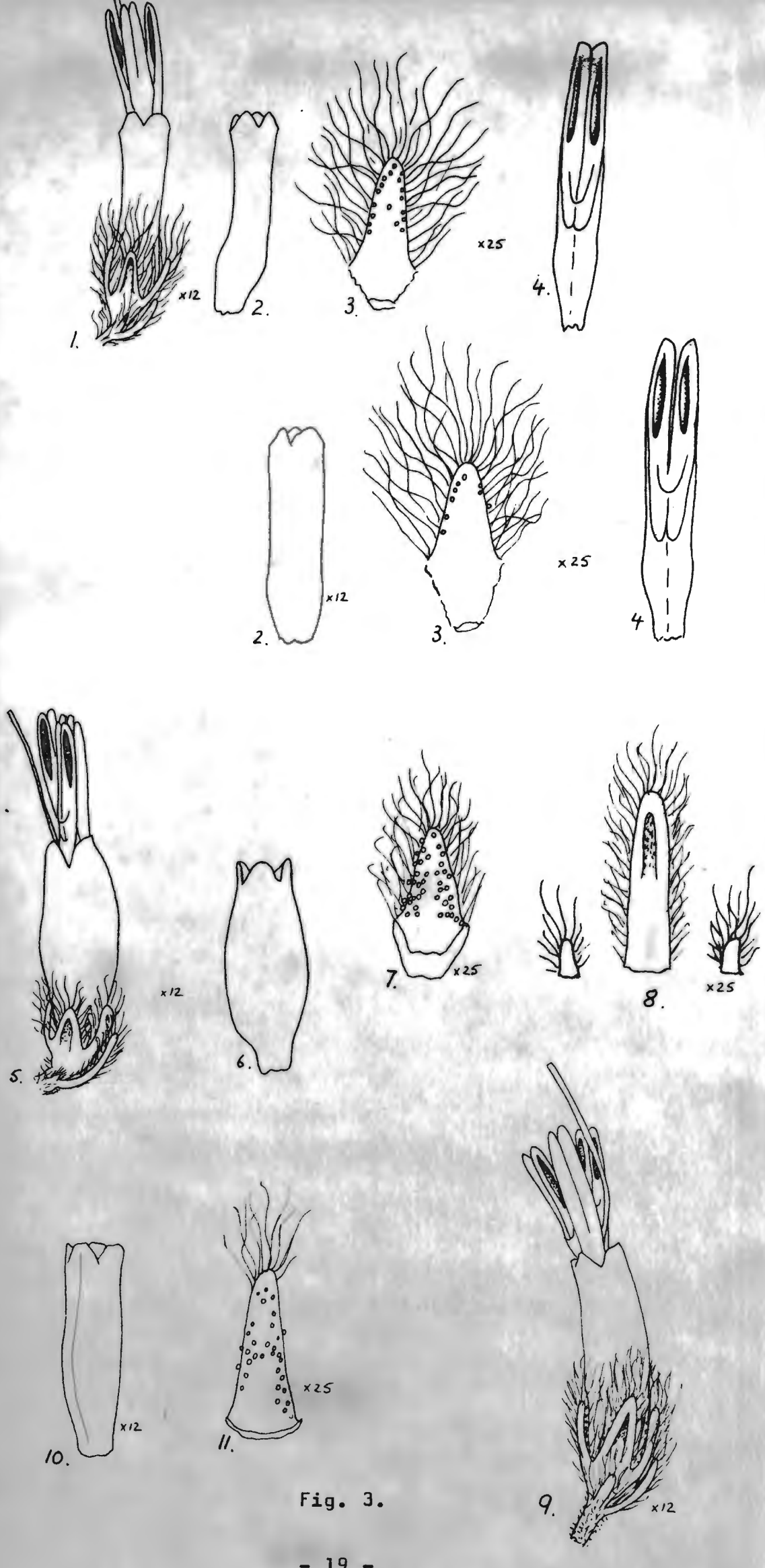


Fig. 3.

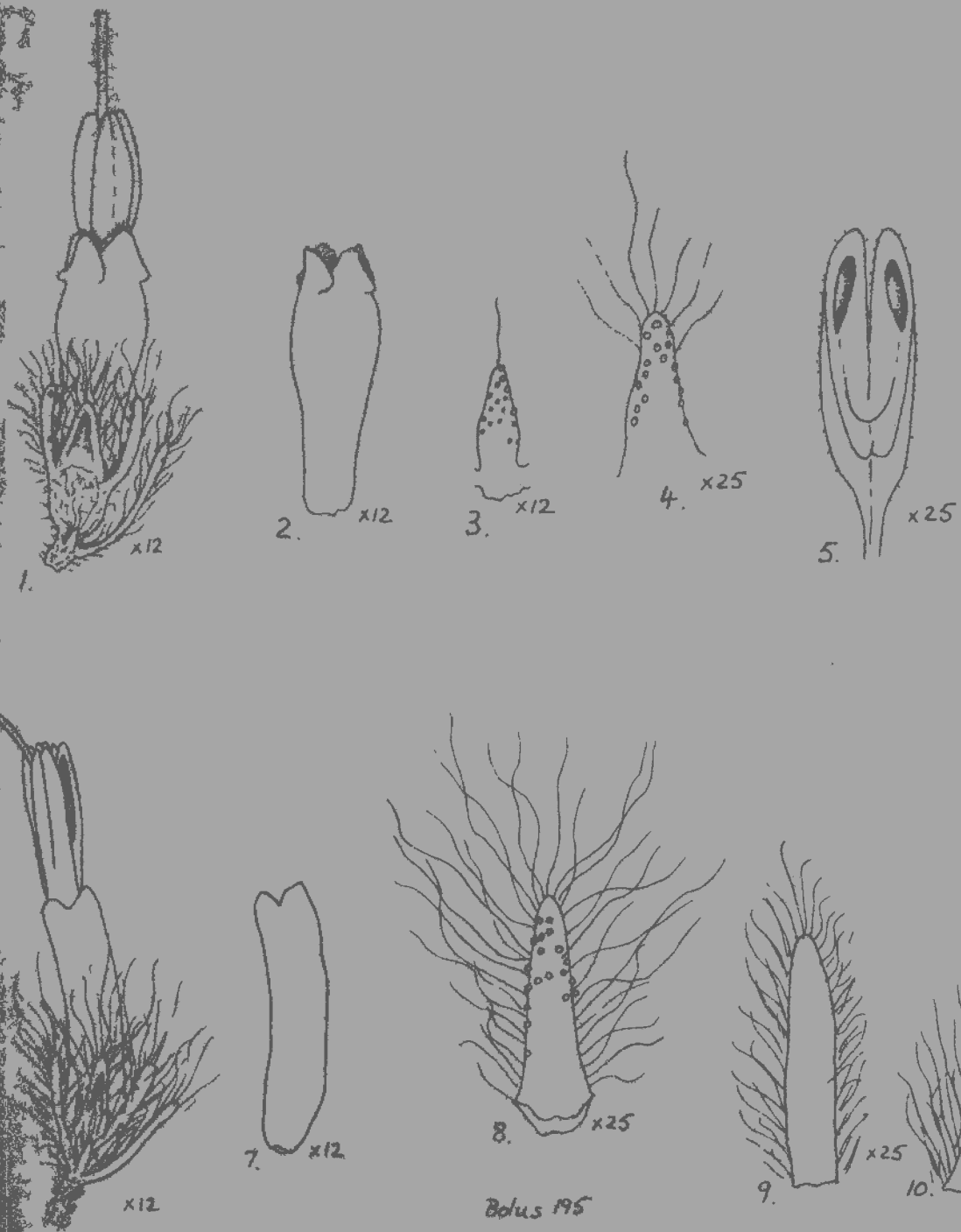

1.
x12
2.
x12
3.
x12
4.
x25
5.
x25
x12
7.
x12
8.
x25
Bolus 195
9.
x25
10.
14.
x25

Fig. 4.

2. ACROSTEMON HIRSUTUS (Thunb.) Kl. in Linnaea 12 : 228 (1838); non A. hirsutus sensu Kl. (1838).

Erica hirsuta Thunb. Prodr. 72 (1795) et in Schultes Fl. Cap. 358 (1823), pro parte, excl. no 9327; Salisb. in Trans. Linn. Soc. 6 : 339 (1802);
Blaeria hirsuta (Thunb.) Thunb. Diss. Blaeria 8 (1802).

Comocephalus incurvus Kl. in Linnaea 12 : 224 (1838).
Acrostemon incurvus (Kl.) Benth. in D.C. Prodr. 7 : 702 (1838); Rach in Linnaea 26 : 790 (1853); N.E.Br. in Fl. Cap. 4 : 352 (1909).

Blaeria thunbergii G. Don Gen. Syst. 3 : 805 (1834) nom. illegit.
Acrostemon thunbergii (G.Don) Alm & Fries in acta Hort. Berg. 8 : 263 (1924).

Small erect shrublets. Branchlets pubescent, ciliate, sometimes with glandular hairs, Leaves 4-nate, closely placed or loosely imbricate, incurved-erect or sometimes straight-erect, 2-4.5mm long, linear, subobtuse to acute, ciliate all over with long white hairs which often fall off the older leaves, glabrous on the upperside, sometimes sparsely glandular on the margins. Inflorescences terminal on short lateral branchlets, globose, 6-9 flowered. Peduncles 1-1.5mm long, pubescent. Bracts 3, approximate, from equal to very unequal, the middle bract leaflike, 2-3mm long, ciliate with long white hairs, linear or incurved, equal to or slightly longer than the calyx, the lateral bracts linear, ciliate. Calyx lobed from threequarters the way down to almost the base, segments 0.5mm long, ovate or ovate-lanceolate, acute, ciliate with long white hairs. Corolla 2.5-3.5mm long, tubular inflated, often 4-angled, narrowed slightly at the middle and often closed at the mouth, glabrous, lobes small, rounded, connivent-erect. Stamens 4. Filaments 3.5-4mm long, glabrous. Anthers much exserted, 1-1.5mm long, oblong, spurless, smooth or minutely scabrous on the margins, the pores $\frac{1}{3}$ the length of the cell. Ovary 3 or 4-celled and 3 or 4-angled, obtuse, subquadrate, glabrous; style 4.5mm long, exserted; stigma simple.

Type: Without locality, Thunberg no 9328 in Herb. Thunb. (UPS, holotype).

Klotzsch described this taxon in 1838 under his new

genus Comocephalus, basing his description on four Ecklon & Zeyher collections. Shortly afterwards Bentham recognised that Comocephalus was indistinguishable from the genus Acrostemon Kl. and he retained the epithet as A. incurvus for the taxon. This N.E.Brown followed in the Flora Capensis in 1909. However an earlier basionym was available to them.

While investigating Thunberg's herbarium about 1853, Rach found two specimens of Erica hirsuta Thunb. He recognised one of the specimens, no 9328, as being the same as Klotzsch's A. incurvus. This meant that A. incurvus (Kl) Benth. of 1838 was conspecific with Erica hirsuta Thunb. of 1795. Therefore A. incurvus (Kl) Benth. becomes a taxonomic synonym of Erica hirsuta Thunb.

The combination A. hirsutus was made by Klotzsch in 1838 but he misapplied the name through an incorrect interpretation of Thunberg's description of Erica hirsuta. However, the combination A. hirsutus (Thunb.) Kl. based on Thunberg's description must be applied to this taxon which has as its type, Thunberg's Erica hirsuta no 9328, and which has until now been referred to as A. incurvus (Kl) Benth.

G. Don's combination, Blaeria thunbergii, based on Salisbury's and therefore Thunberg's Erica hirsuta, is a superfluous name as the basionym "hirsutus" was available to him.

A. hirsutus forms a complex with A. stokoei var. confusus and A. barkerae in the southern part of the Worcester Division around Villiersdorp. The specimens of A.hirsutus from the northern part of the distribution range of the species where it is more frequent, are distinct and conform to the description of the species, having markedly incurved and hairy leaves without any glands on the margins.

In the southern part of the distribution range it becomes difficult to distinguish between the three species mentioned above. Specimens of A. hirsutus from this area, Stokoe 6269, Esterhuysen 14097, do not all possess markedly incurved leaves which are sometimes sparsely hairy and have marginal glands. The character of the 4-nate leaves which was found to be present in A. barkerae, makes this species very similar to the southern form of A. hirsutus. With A. stokoei var. confusus occuring in the area, Compton 8807, Esterhuysen 21700, Stokoe s.n. (SAM 62363), it is only with some difficulty that specimens from this area can be placed

in any one of the three species.

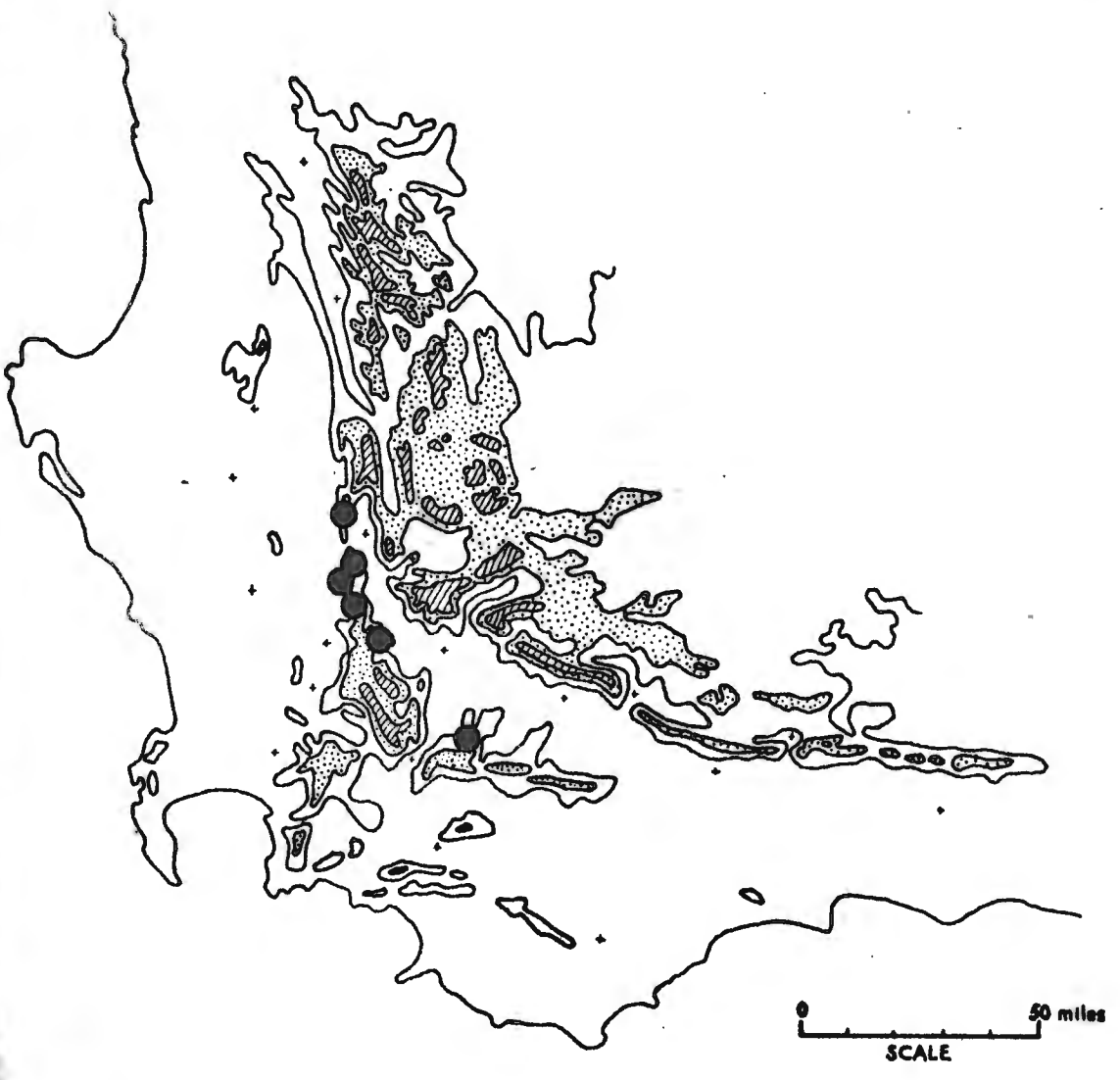
As there was insufficient material from this area and because time did not allow for a thorough search in the area, no detailed investigations could be carried out. It was therefore not possible to delimit the taxa satisfactorily and they have been retained unchanged.

Specimens examined:

CALEDON: ? Caledon, viii, Leipoldt s.n. (BOL);
PAARL: Sebastians Kloof, ix.1939, Stokoe 7276 (BOL); Bailey's Peak, ii.1941, Stokoe s.n. (SAM 55132); West slopes of Vogelvlei Mountains near Gouda, 9.ix. 1951, Esterhuysen 18814 (BOL); x.1920, Andreae 647 (PRE); Foot of Elandskloof Mountains, 6.x.1956, Stokoe s.n. (SAM 69668);
TULBAGH: Tulbagh Waterfall, 800ft, viii.1895, Bolus 7583 (BOL); 21.viii.1927, Stokoe 1419 (BOL); 16.ix. 1928, Hutchinson 412 (BOL, PRE); ix.1951, Stokoe & Davis s.n. (SAM 62369); 29.ix.1963, Oliver 1508 (STE); Mountains near Saron, x.1896, Schlechter 10680 (BOL, PRE, W);
WORCESTER: Molenaarsberg, 5.x.1947, Esterhuysen 14097 (BOL); Slanghoek River, near Goudini, 12.viii.1959, Oliver 955 (STE);
WITHOUT LOCALITY: Sieber 152 (BOL); Bowie s.n. (BOL).

Figure 5.

Esterhuysen 14097; (1) single flower; (2) sepal (inner surface); (3) anther; (4) 3 sets of bracts; Oliver 1508; (5) single flower; (6) corolla; (7) sepal (inner surface); (8) anther; (9) 2 sets of bracts.



Distribution of A. hirsutus.

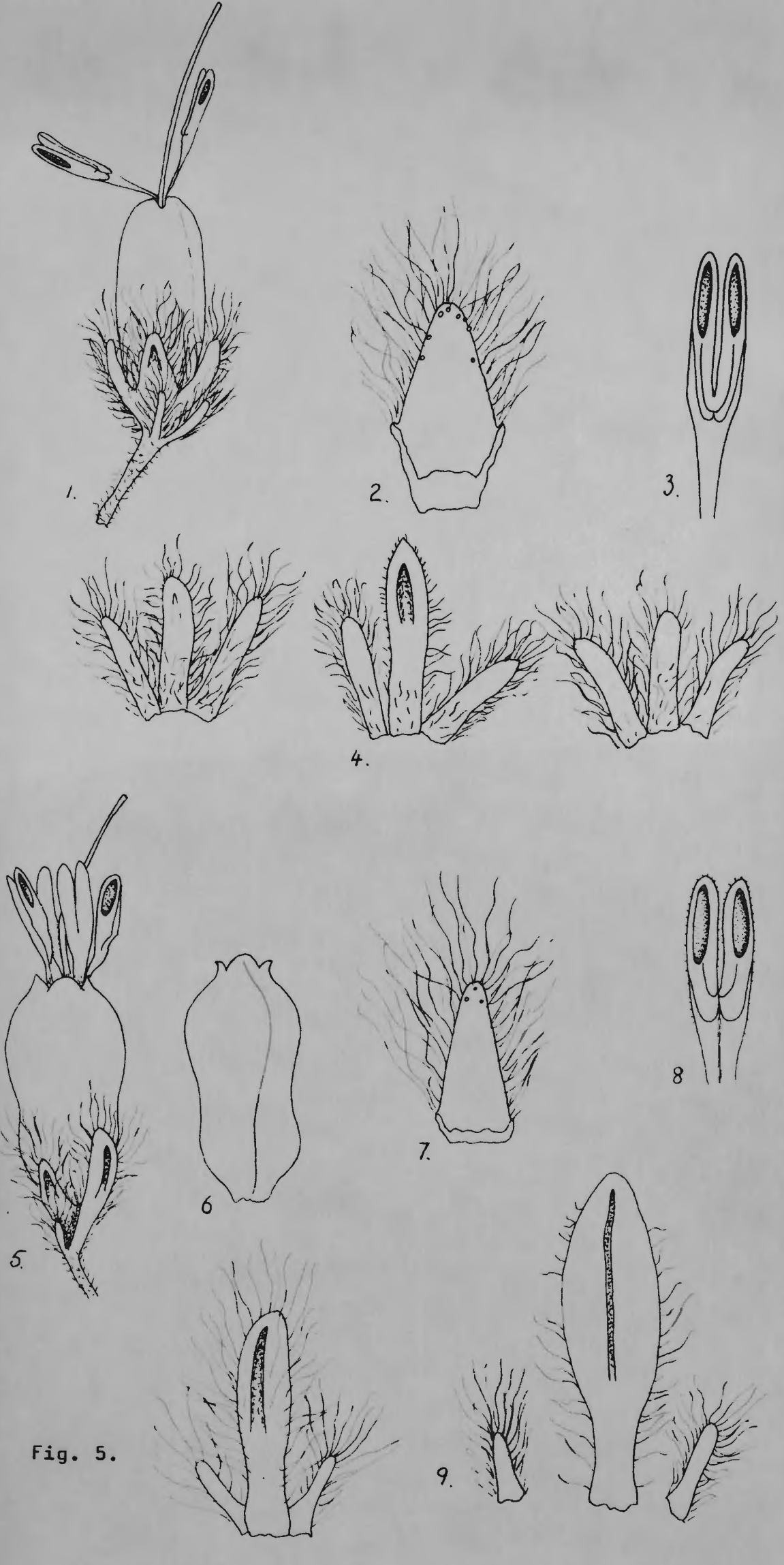


Fig. 5.

3. ACROSTEMON GLANDULOSUS Rach in Linnaea 26 : 790 (1853);

N.E.Br. in Fl. Cap. 4 : 353 (1901).

Erica hirsuta Thunb. Prodr. 72 (1795)

pro parte excl. no 9328 in Herb. Thunb.

Apparently laxly branched shrublet. Branchlets minutely tomentose. Leaves 4-nate, adpressed or imbricate, 1½-3mm long with the petiole, straight, linear-oblong, obtuse, flat with a median ridge above, very convex on the back, shortly pubescent on both sides, ciliate with long simple hairs and perhaps sometimes with similar long hairs on the back. Inflorescences several flowered. Peduncles 2mm long, bracteate at the apex. Bracts adpressed to the calyx, the middle bract about 1½mm long, not much longer than the lateral pair, all linear, pilose and ciliate with simple hairs, clammy. Calyx 1½mm long, divided to the base, segments about 1¼mm long, lanceolate, obtuse, pilose and ciliate with long simple hairs, clammy. Corolla 3½mm long, tubular, 4-angled, glabrous, lobes rounded, erect, small. Stamens 4. Filaments nearly 4mm long, glabrous. Anthers 1½mm long, linear, exserted, spurless. Ovary 2-celled, ovoid, subacute, glabrous, style imperfect, glabrous.

Type: Without locality, Thunberg in Herb. Thunb. no 9327 (UPS).

Rach, while working on Thunberg's Herbarium just prior to 1853, found two specimens labelled as Erica hirsuta in Thunberg's own hand. Herb. Thunb. no 9328 was in his opinion, a specimen of A. incurvus (Kl) Benth. (now referred to as A. hirsutus), while Herb. Thunb. no 9327 he found to be a different species and described it as A. glandulosus. He added that no 9327 consisted of a very poor specimen.

N.E. Brown, who had examined no 9327, stated that it contained a very poor specimen with flowers mostly destroyed. Rach described the branches, bracts and the calyx as "tubercled hispid with glandular hairs". Brown, on the otherhand, found that the type possessed hairs which were all simple but very "clammy". Rach also described the leaves as 3-nate whereas Brown found that they were all 4-nate.

So far there is only one authentic specimen of this species which is the type, Thunberg in Herb. Thunb. no 9327.

It is apparently an extinct species or else an unusual variant of A. stokoei.

N.E. Brown's description of the type specimen has thus had to be retained in its entirety, as the Thunberg specimen has not been available to the present author.

Specimens examined:

PAARL: Kopjies beyond French Hoek, 1000ft, xi.1913, Phillips 1232 (SAM); with some doubt cited for this species.

Figure 6..

Phillips 1232; (1) single flower; (2) corolla; (3) sepal (inner surface); (4) 3 bracts; (5) gynaecium; (6) anther (front, lateral and rear view).

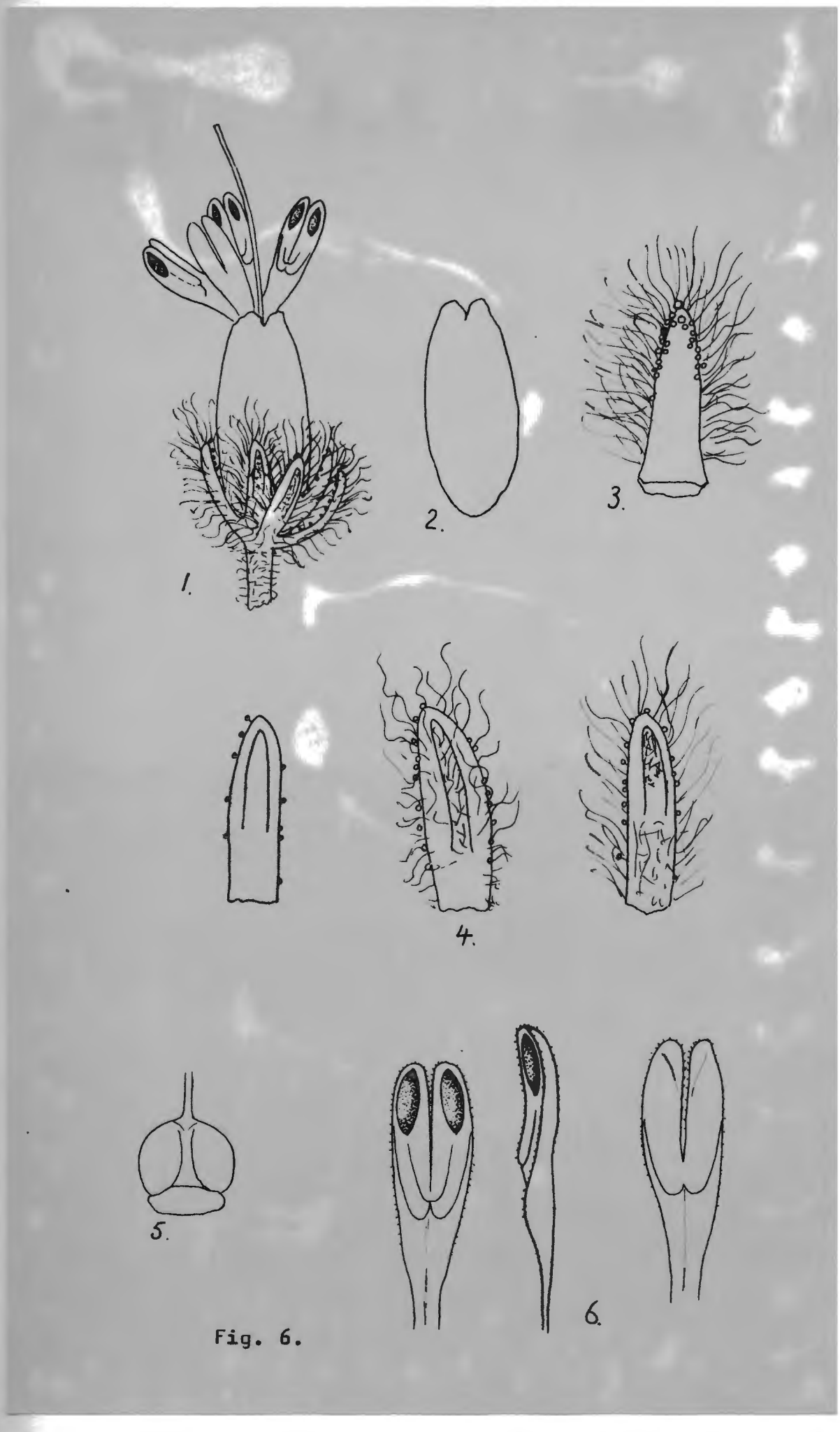


Fig. 6.

4. ACROSTEMON BARKERAE Compton in J. S. Af. Bot. 19 : 122 (1953).

A densely branched erect shrublet. Young stems slender , puberulous. Leaves 3 or 4-nate, erect to spreading, linear when young, becoming ovoid, obtuse, sulcate, at first white-pilose especially towards the tip, soon becoming glabrous, the margins with minute sessile glands when young, 2-3½mm long. Inflorescences terminal, subglobose, about 8 flowered. Peduncle and bracts and calyx covered with long white spreading simple hairs. Peduncles pubescent, 1½mm long. Bracts approximate, the middle bract lanceolate, 1-1½mm long, the lateral bracts linear, shorter, ½-1mm long. Calyx divided nearly to the base, 1½mm long, sepals lanceolate, with sessile glands on the margins and inner surface. Corolla,ovoid, narrowed at the mouth and often constricted at the middle, glabrous, 4mm long and 2mm wide, lobes very small. Stamens 4. Filaments filiform, glabrous. Anthers far exserted, terminal, narrow, minutely toothed on the margins, muticous, 2mm long. Ovary globose, 3 or 4-celled, 4-angled or sometimes 3-angled, globose, glabrous, 1mm long, style filiform, glabrous, 7mm long, stigma simple.

Type: Scherpenheuwel hillside, Worcester, 29.ix.1951, Barker 7523 (NBG holotype; BOL, K, isotypes).

A. barkerae was described by Compton from Barker 7523 from the Worcester Karroo. In his type description Compton stated that the leaves were 3-nate. On examination of the type specimen, it was found that the leaves were not only 3-nate as described, but were distinctly 3-nate and 4-nate even on the same branch.

Compton cited Esterhuysen 15584 as a paratype of his A. barkerae. This specimen was examined and was found to possess 4-nate leaves only.

Compton used the character of 3-nate leaves to separate his new species from A. hirsutus (Thunb.) Kl. He found that it was most similar to A. equisetoides, also a species with 3-nate leaves, but was able to distinguish them readily although he stated no differentiating characters.

It is surprising that such an error as the number of leaves per whorl should have been incorrectly observed when preparing the description of a new species, especially as it was regarded as an important character.

The frequent possession of 4-nate leaves throws a new light on the species and its relationships in the genus. This character places it in the A. stokoei - glandulosus - hirsutus group. However, the possession of 3 and 4-celled ovaries immediately places the species close to A hirsutus to which it is very similar

The species has been mentioned as forming part of a complex with A. stokoei var. confusus and A. hirsutus in the area near Villiersdorp in the southern part of the Worcester Division. It is only with some difficulty that specimens from this area can be placed in any one of the three species.

Insufficient time did not allow for a search for ample material from the area in order to investigate any variation ranges in the species complex because the available herbarium material was insufficient. The species was therefore retained with a few alterations to the original description to include some new additional characters, the 4-nate leaves.

Specimens examined:

WORCESTER: Scherpenheuwel hillside, 29.ix.1951, Barker 7523 (BOL, NBG); Moordkuil, x.1951, Lewis 2698 (SAM); Stettynskloof,viii.1961, Barker 9465 (NBG).

Figure 7.

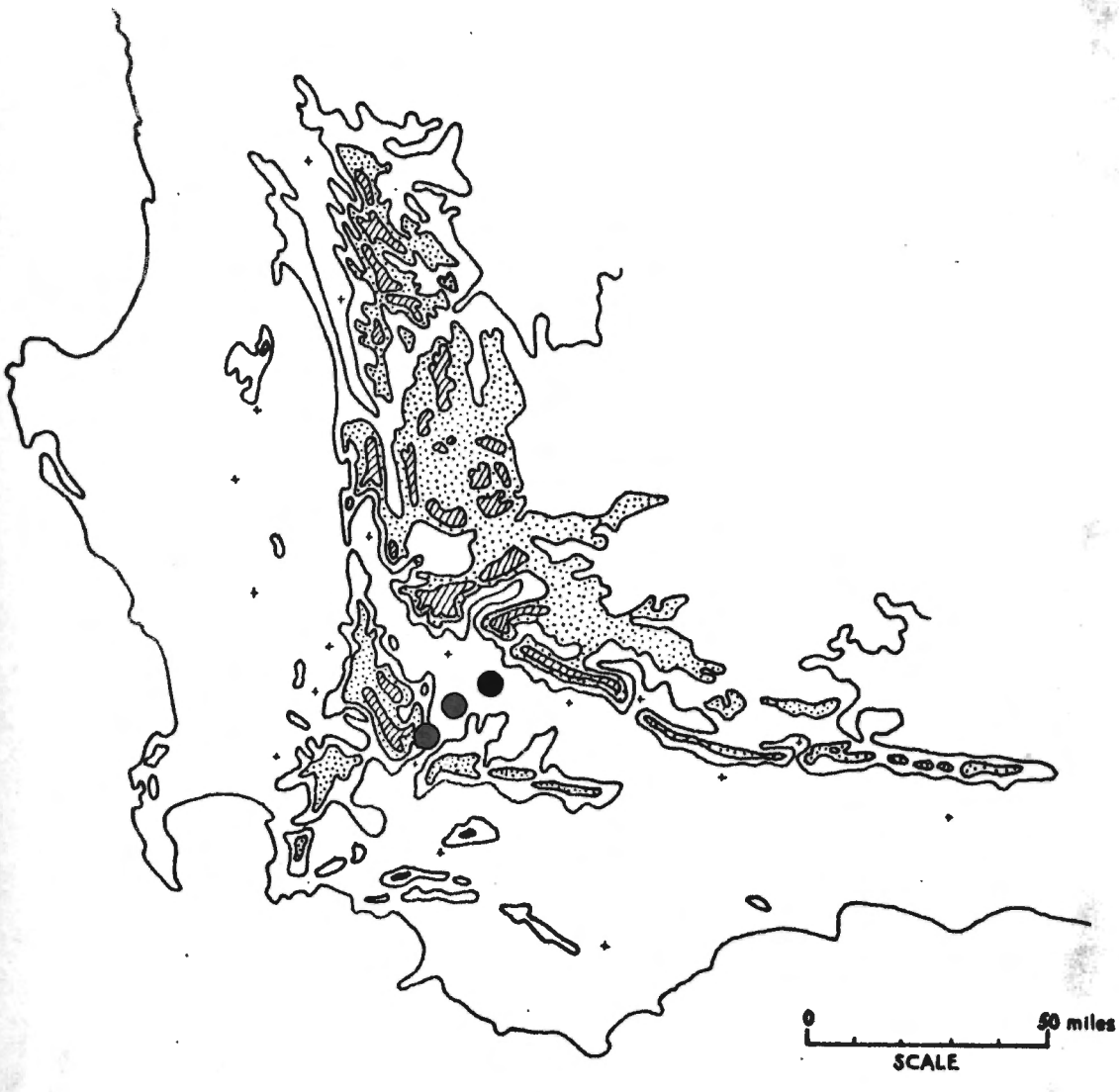
Barker 7523, holotype; (1) single flower; (2) corolla; (3) sepals (inner surface); (4) anther; (5) 2 sets of bracts; (6) gynaecium;
Esterhuysen 15584, paratype; (7) single flower; (8) corolla; (9) sepal (inner surface); (10) anther; (11) 3 sets of bracts.

Figure 8.

Barker 9465; (1) single flower; (2) corolla; (3) sepal (inner surface); (4) anther; (5) 3 sets of bracts.

Figure 9.

Lewis 2698; (1) single flower; (2) corolla; (3) sepal (inner view); (4) anther; (5) 3 seta of bracts; (6) leaf; (7) arrangement of leaves on a branch.



Distribution of A. barkerae.

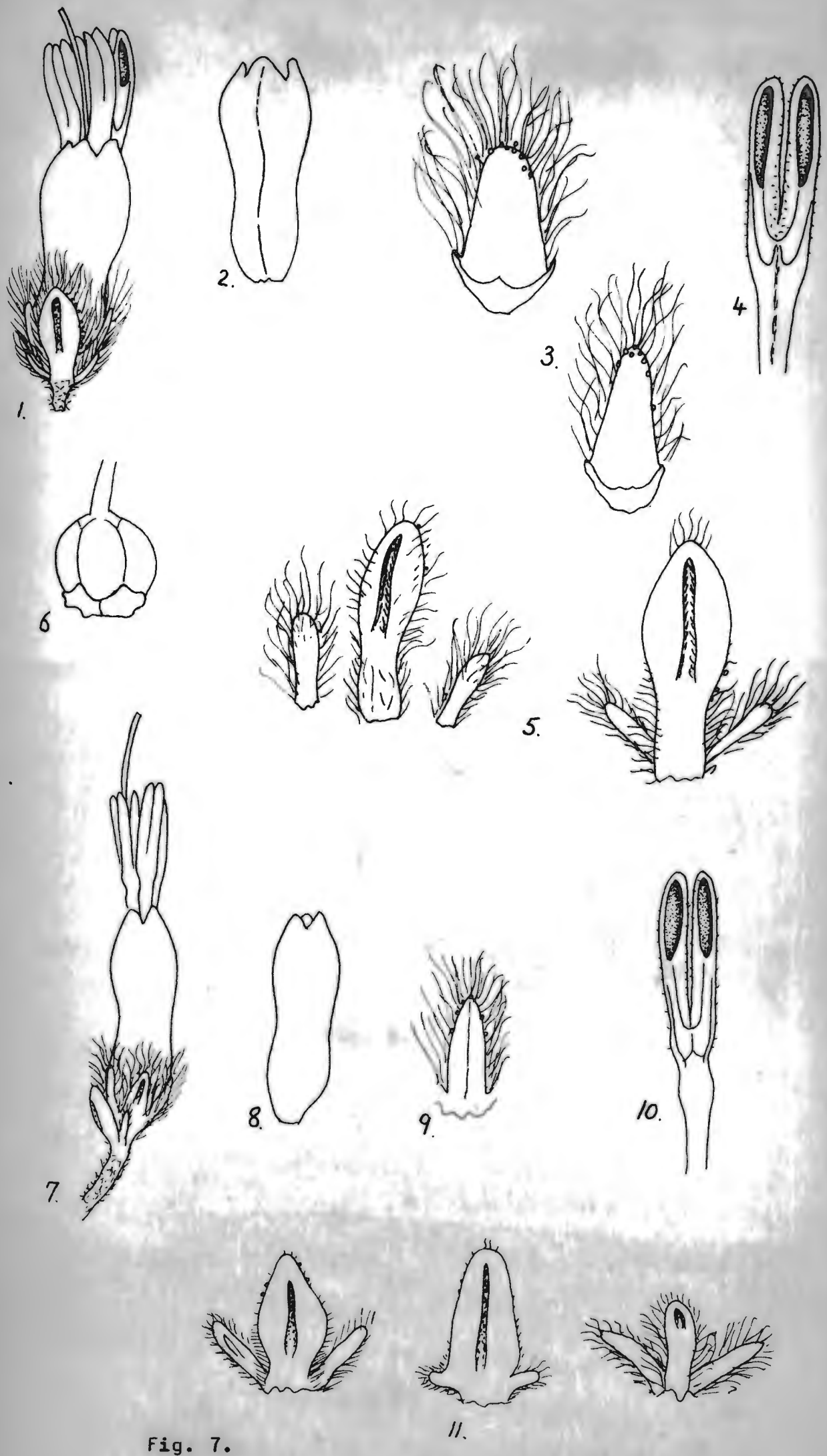


Fig. 7.

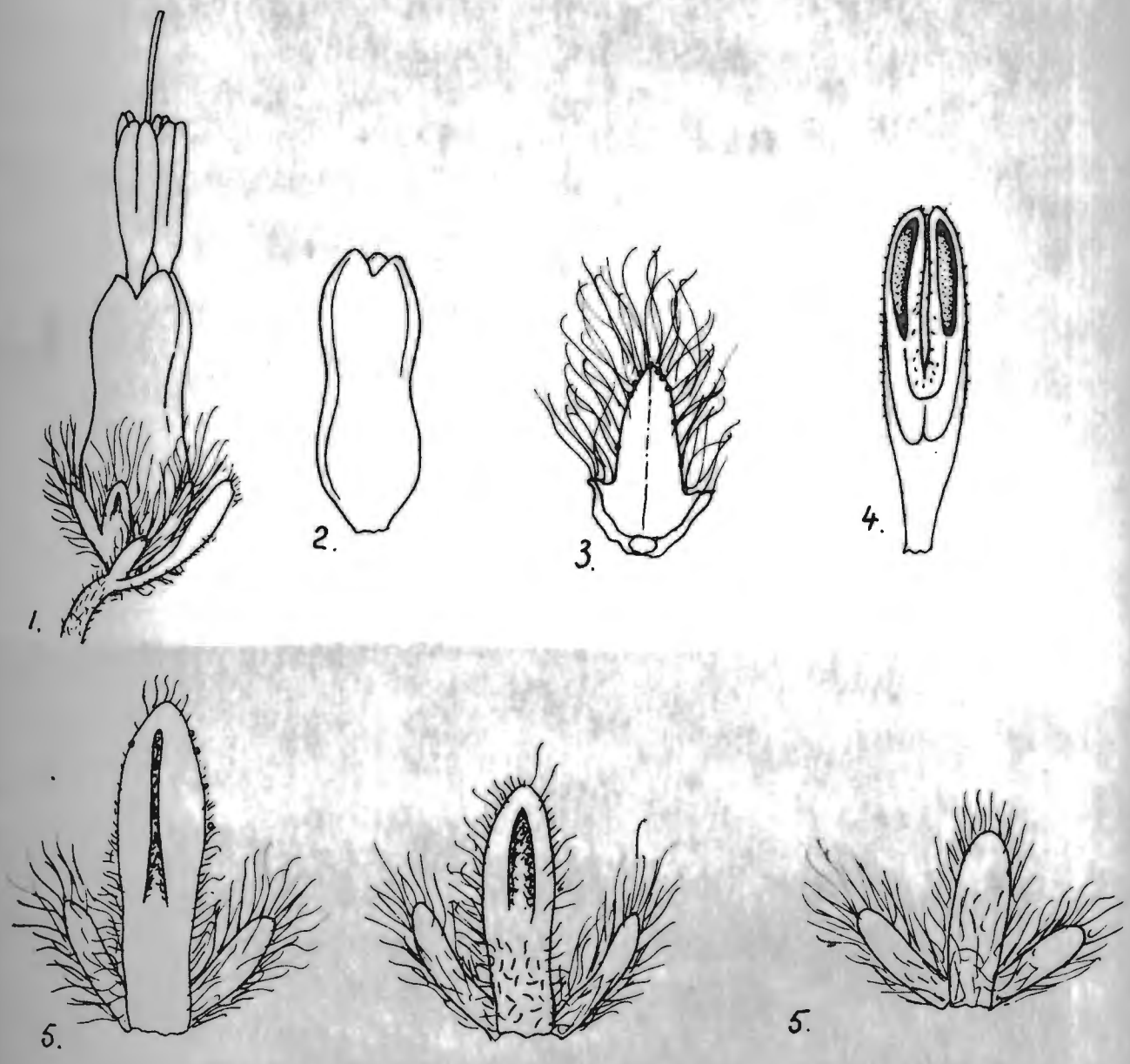


Fig. 8.

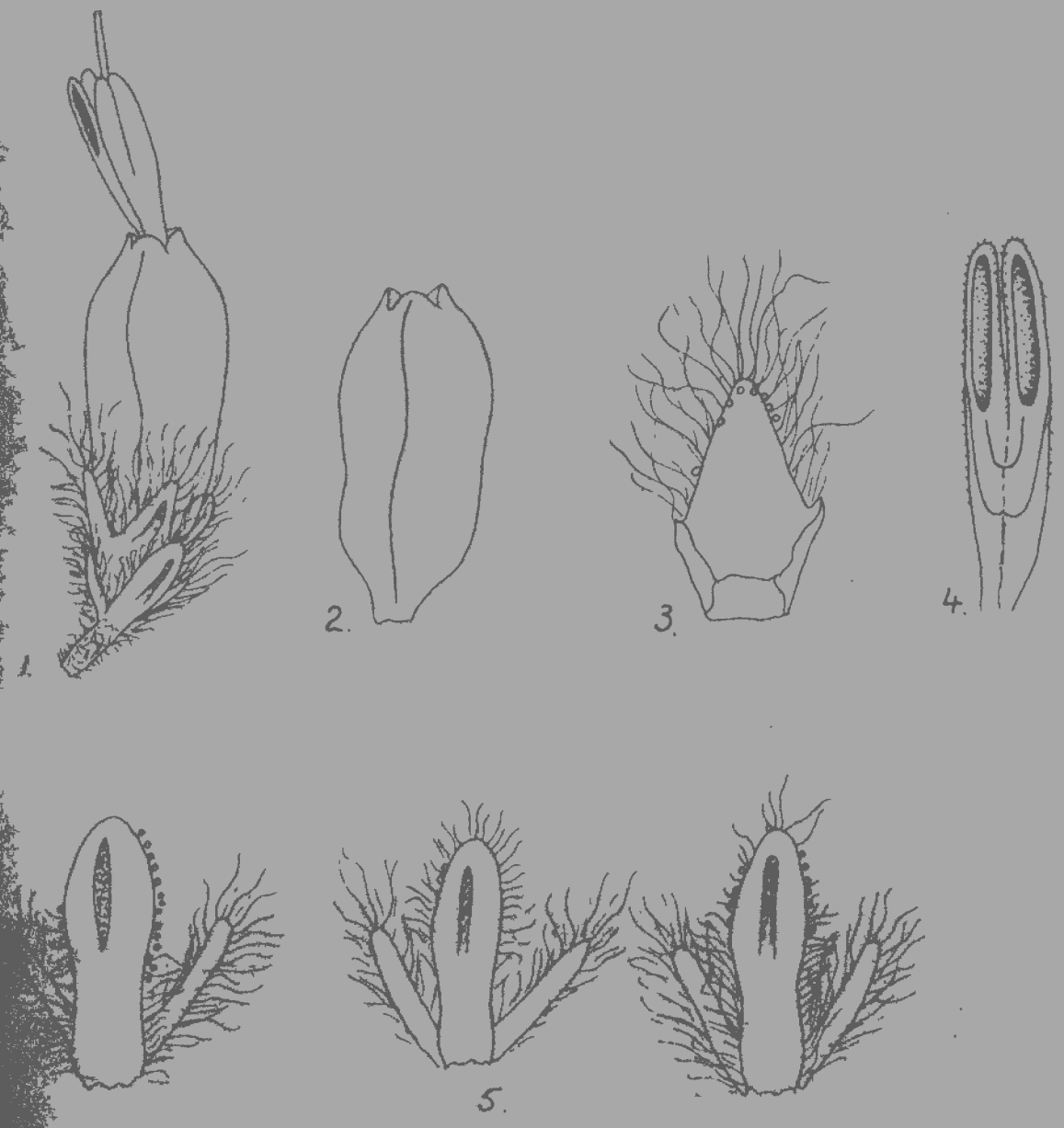


Fig. 9.

5. ACROSTEMON EQUISETOIDES Kl. in Linnaea 12 : 228 (1838).

Branchlets puberulous, with a few glandular hairs. Leaves 3-nate, adpressed-imbricate, 1.5-3mm long with the petiole, 0.5-1mm long, elliptic-ovate to linear-oblong, obtuse, glabrous, at first ciliate with deciduous long hairs or sparsely so, edged with sessile glands Inflorescences terminal, globose, 6-12 flowered. Peduncles 0.5-1.5mm long, puberulous, bracteate at the apex. Bracts 3, approximate, adpressed to the calyx, unequal, the lateral pair $\frac{1}{2}$-$\frac{3}{4}$ as long as the middle bract, middle bract 1-2mm long, linear-oblong, with a broad flat base, obtuse, edged with subsessile glands and long white hairs, glabrous or sparsely hairy on the back. Calyx 1.5-2mm long, divided almost to the base, base somewhat flattened, segments ovate, acute, edged with subsessile glands and long white hairs, hairy on the back. Corolla 3.5-4.5mm long, straight or slightly curved, tubular, 4-angled, contracted at the very shortly 4-toothed mouth and faintly narrowed at the middle, glabrous, lobes short, broader than long, obtuse, incurved or erect. Stamens 4. Filaments 3-4mm long, linear, glabrous, broadened at the top. Anthers completely exserted, 2mm long, linear, spurless, basifixed, pores one-third the length of the cell. Ovary 2-celled, obtuse, glabrous; style 5-6mm long, glabrous, far exserted; stigma simple.

Type; Tulbagh Waterfall, Ecklon & Zeyher s.n.

Klotzsch described A. equisetoides and A. incanus from specimens collected by Ecklon & Zeyher at the Tulbagh Waterfall, an area to which these two taxa are endemic. He separated the two taxa on the presence or absence of glands and of hairs on the margins of the leaves and on the calyx segments being lanceolate subacute or ovate-lanceolate subobtuse.

N.E. Brown had only three specimens available to him for examination when he revised the genus in 1909. For A. equisetoides he had Zeyher s.n. and Bolus 5149, while for A. incanus he had only Drège s.n. With these three specimens Brown retained the two taxa as separate species using the same differentiating characters as did Klotzsch.

The differences between the species as given by N.E. Brown may be tabulated as follows :-

ion as separate taxa at specific level. The areas of the two taxa are completely overlapping around the Tulbagh Waterfall. On these grounds it has been decided to reduce the rarer of the two taxa, A. incanus, to varietal level. No priority is possible as both species were described contemporaneously.

A. equisetoides var incanus is thus considered to be an occasional more hairy variant of the glabrous or more glabrous and more common typical variety.

The species is limited in its distribution to the mountain slopes around the Tulbagh Waterfall. The records of Zeyher as Witsenberg and Worcester are open to question, as the collector used wide terms for his collecting localities, e.g. Vogelvlei near Hermon is listed as "Vogelvlei, (Worcester)".

A. equisetoides var. equisetoides possesses leaves edged with numerous sessile glands, more than in any other species in the genus. The glands may be overlooked as they are small, but are nevertheless quite conspicuous under higher magnifications. Most of the species of Acrostemon possess some, whether only one or two, sessile glands on their leaves, at least in the younger stages.

In this respect A. barkerae and forms of A. hirsutus have similar leaves with variation in the number of glands. The leaves of A. equisetoides are, however, 3-nate whereas in A.barkerae and A. hirsutus the leaves are 4-nate, but A. barkerae does sometimes have 3-nate leaves.

An obvious character of most of the specimens of this species is the enlarged flattened base of the middle bract. This also occurs in the unusual specimen, Esterhuysen 18919, from the du Toit's Kloof area. This specimen is however in fruit and as yet cannot be placed in any species.

The type specimen of the species was cited by Klotzsch as Ecklon & Zeyher s.n. from the Tulbagh Waterfall. The holotype was destroyed during the Second World War in Berlin.

No authentic specimens collected by Ecklon & Zeyher from the Tulbagh Waterfall have been seen, but isotypes could be present in any of the large European herbaria. If available, one would serve as the lectotype. If no specimen can be found, a neotype will have to be selected from the existing herbarium material. There is no prefer-

A. equisetoides	A. incanus
1. Leaves edged with sessile glands, glabrous.	Leaves without sessile glands but edged with hairs.
2. Sepals ovate acute	Sepals oblong-lanceolate obtuse

All the available material was examined for the above characters to determine whether any variation or overlap could be found and to determine the validity of the distinctness of the two taxa.

Close examination of the specimens revealed that the characters were not effective in distinguishing the two species. Variation occured in the shape and the frequency of the marginal hairs on the leaves.

Leaves of specimens referred to A. incanus possessed inconspicuous sessile glands intermingled with the long hairs. This was found in Stokoe s.n. (SAM 62371), G.C.H. 31 and in Drege s.n. as shown in fig. 12(8) and fig. 11(7 & 8). It was also found that as the leaves grew older the hairs tended to fall off.

In specimens of A. equisetoides many leaves were quite glabrous except for a few short hairs at the apices. However, a few leaves showed some scattered hairs among the more conspicuous glands. A range of variation in the amount of marginal hairs was found in Stokoe 8890 and is shown in fig. 11(3-6).

All the specimens referred to A. incanus are more ciliate than those of A. equisetoides but there is the slight overlap in this character.

The differences between the shapes of the sepals of the two species, ovate to oblong-lanceolate, is very slight, as is also the shape of the apex of the sepals, acute to obtuse. There is little difference, if any, between the sepals of Oliver 1826 and Stokoe s.n. (SAM 62871). In fact the sepal of the Stokoe specimen of A. incanus is more acute than the sepal of the Oliver specimen of A. equisetoides. As the species were originally construed, the converse should have been the case.

There seems little doubt that the two species are very closely related and the slight distinction between them linked by some variation, is insufficient for their retent-

ence for any of the specimens cited by N.E. Brown as he did not compare his specimens with the holotype.

KEY TO THE VARIETIES.

Leaves mostly free of hairs; sessile glands on the leaf margins conspicuous — var. equisetoides

Leaves mostly ciliate on the margins; sessile glands not conspicuous — var. incanus

(a) var. equisetoides

A. equisetoides Kl. in Linnaea 12 : 228 (1838); Benth. in D.C. Prodr. 7 : 702 (1838); N.E.Br. in Fl. Cap. 4 : 354 (1909).

The typical variety is characterised by its leaves which are more elongate, are mostly without ciliate margins, are edged with conspicuous sessile glands and are usually shiny.

Specimens examined:

TULBAGH: Tulbagh Waterfall, 1500ft, xii.1879, Bolus 5194 (BOL); 20.viii.1927, Stokoe 1418 (BOL); ix.1962, Oliver 1509 (STE); ix.1963, Oliver 1826 (STE); mountain valley at Tulbagh, xii, Zeyher s.n. (SAM 18027); Witsenberg Mountains, x, Zeyher s.n. (SAM 18027);

WITHOUT LOCALITY: Hermanus Wild Flower Show, xii. 1924, Rogers 28184 (PRE); Zeyher 1.11 (PRE, W); Zeyher s.n. (BOL).

(b) var. incanus E.G.H.Oliver stat. nov. et comb. nov.

A. incanus Kl. in Linnaea 12 : 228 (1838);(basionym); Benth. in D.C. Prodr. 7 : 702 (1838); N.E.Br. in Fl. Cap. 4 : 354 (1909).

Type: Tulbagh Waterfall, Ecklon & Zeyher s.n.

This variety is distinguished by its more ovate leaves which are more ciliate on the margins and bear a few sessile glands on the margins.

Specimens examined:

TULBAGH: Mountains near Tulbagh Kloof, xi.1951, Stokoe s.n. (SAM 62371);

WORCESTER: Mountains of Worcester, Zeyher s.n. (SAM 18026);

WITHOUT LOCALITY: Drege s.n. (BOL); Drege s.n. (PRE 12632); Zeyher 271 (SAM); GCH 31 (BOL).

A. equisetoides var equisetoides.

Figure 9.

Oliver 1826; (1) single flower; (2) corolla; (3) lateral bract; (4) middle bract; (5) sepal; (6) leaf; (7) anther (lateral, front and rear views).
(7a) single flower; (8) corolla; (9) sepal (inner surface); (10) anther; (11) gynaecium; (12) 3 bracts; (13) middle bract.

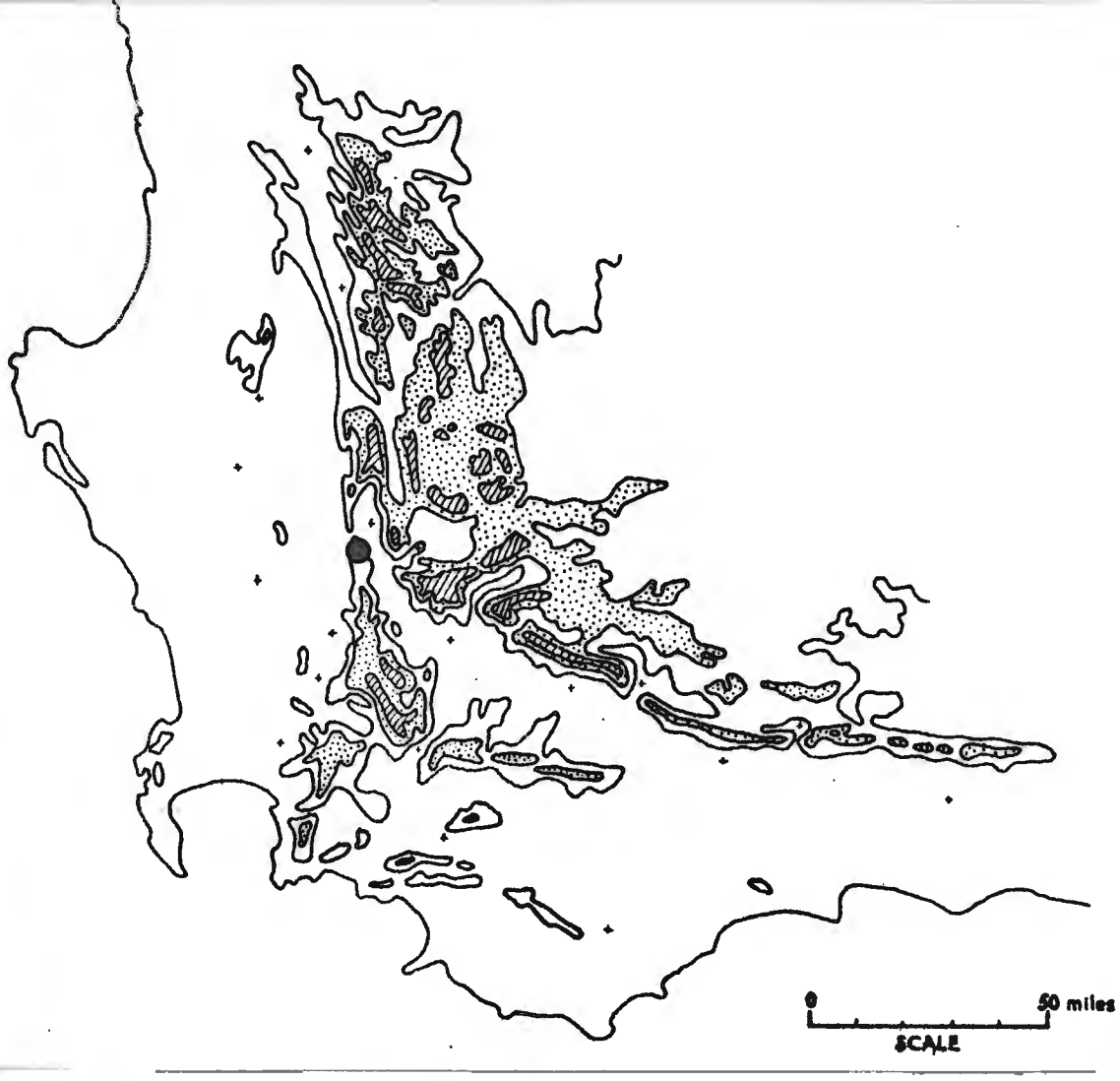
Figure 10.

Stokoe 8890; (1) lateral bracts; (2) middle bract (outer and inner surface); (3)(4)(5)(6)(7) variations in the leaf margins.

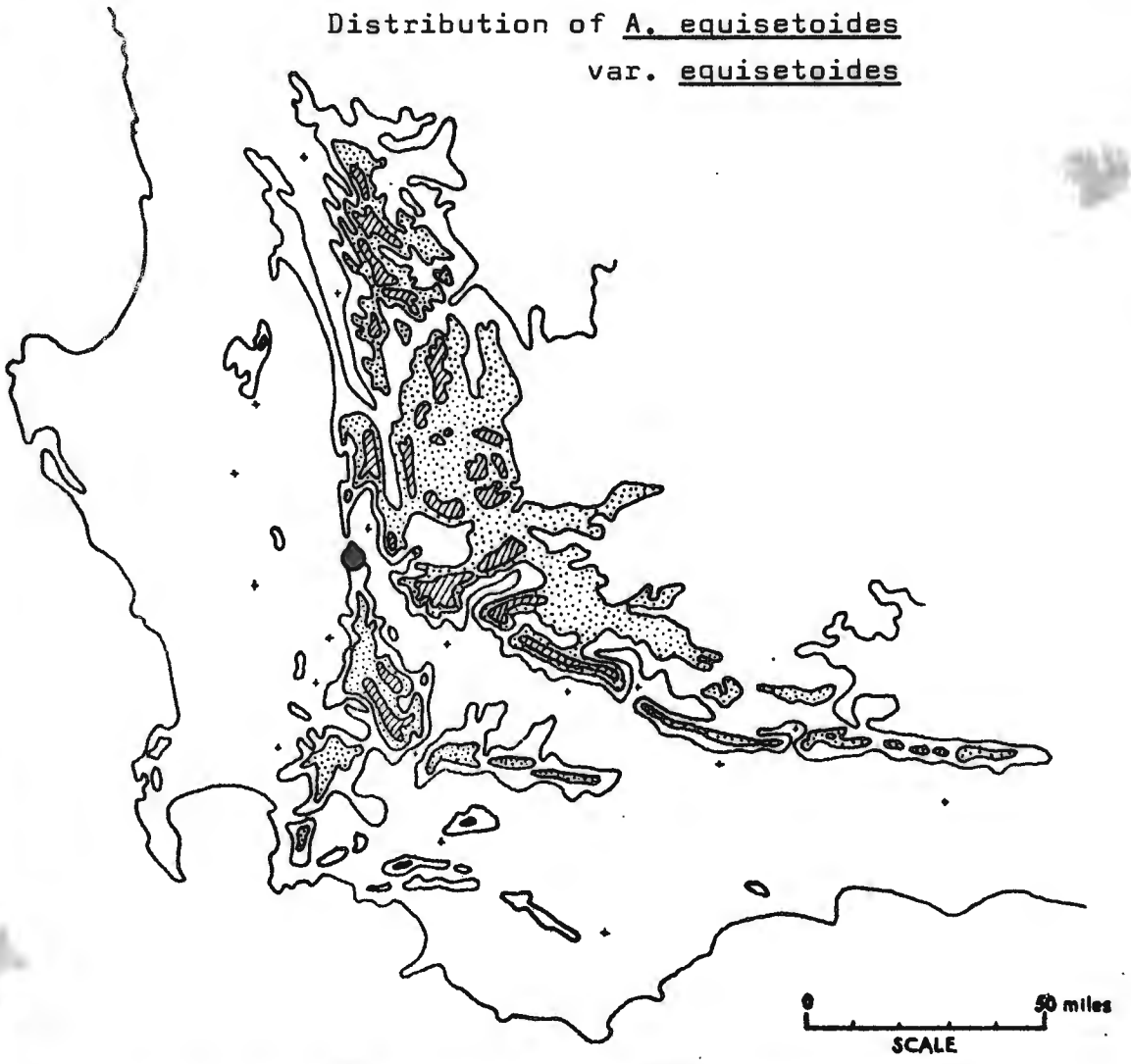
A. equisetoides var. incanus.

Figure 11.

Stokoe s.n. (SAM 62871); (1) single flower; (2) corolla; (3) sepal (inner surface); (4) gynaecium; (5) lateral bracts; (6) middle bract; (7) leaf; (8) leaf (upper surface); (9) anther.



Distribution of A. equisetoides var. equisetoides



Distribution of A. equisetoides var incanus.

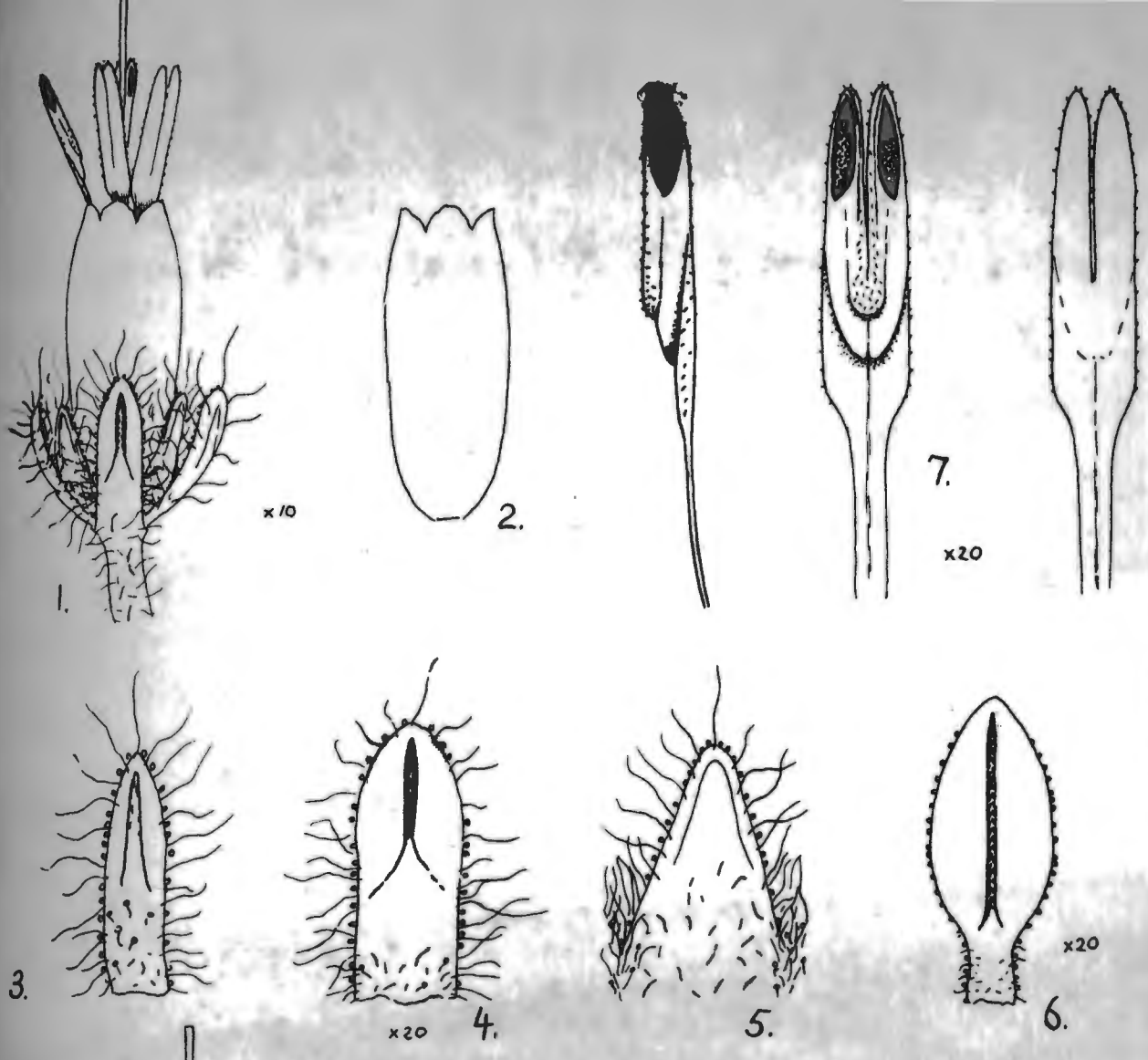
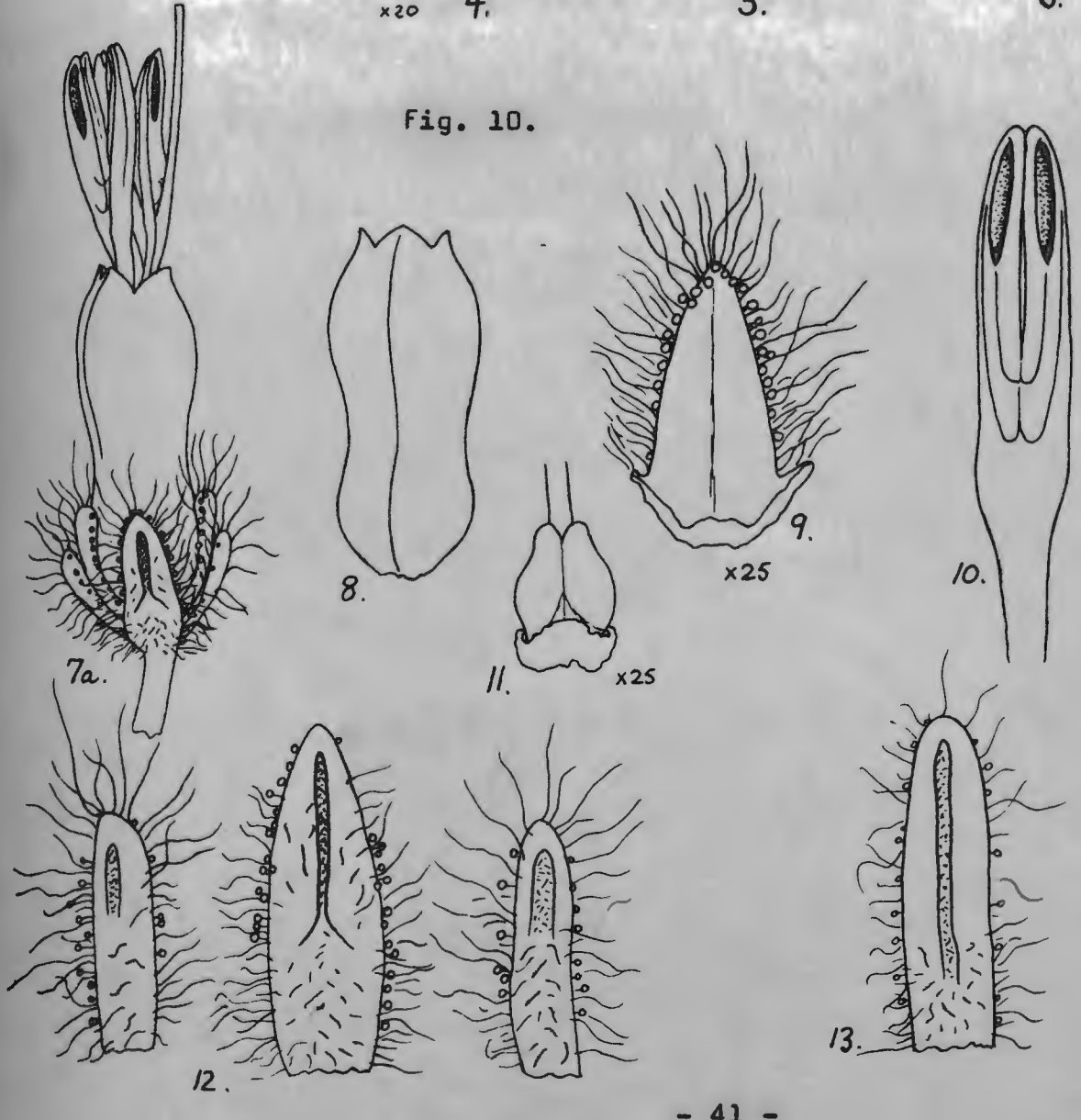


Fig. 10.



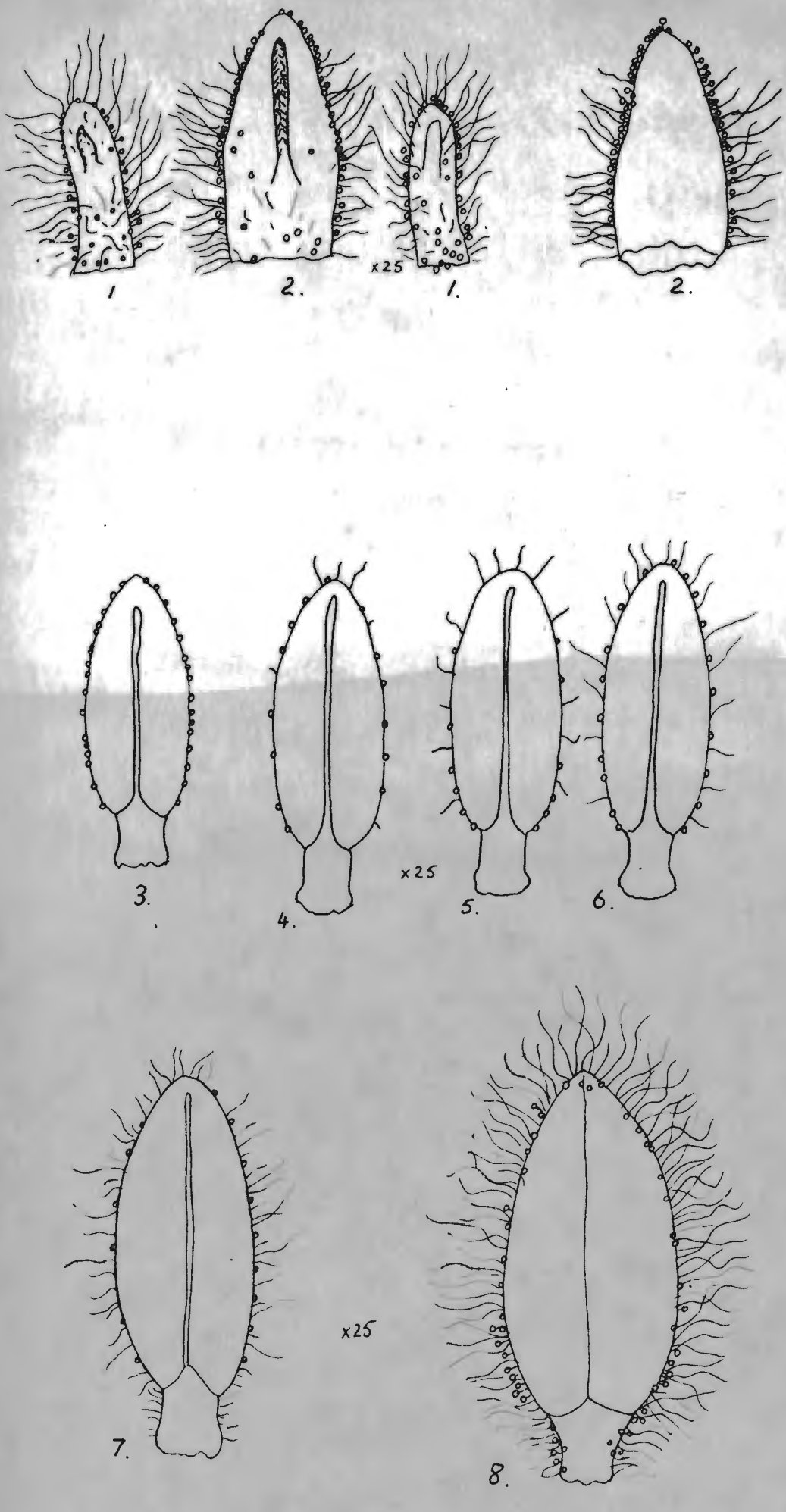


Fig. 11.

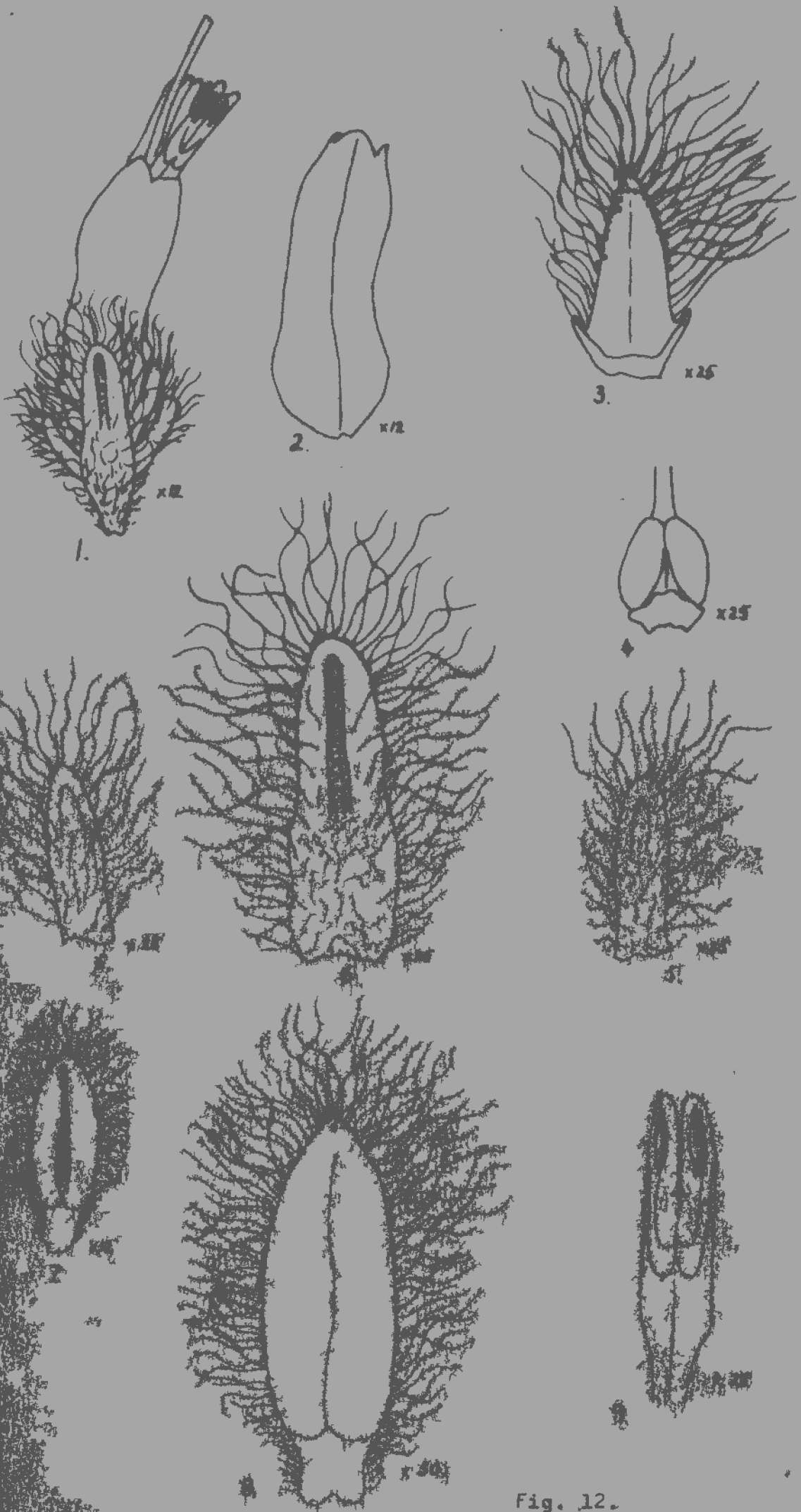


Fig. 12.

6. ACROSTEMON SCHLECHTERI N.E. Br. in Fl. Cap. 4 : 353 (1909).

Shrublets prostrate and spreading. Branchlets erect or divergent and straggling, rooting at places when touching the ground, pubescent. Leaves 4-nate, suberect to spreading, imbricate or shorter than the internodes, linear, obtuse, about equally convex on both sides, pubescent with short spreading hairs and with scattered sessile glands, slightly viscid, 2-4mm long. Inflorescences terminal and globose, shortly pedicellate. Bract solitary, approximate, adpressed to and about as long as the calyx, leaflike, pubescent, narrow-linear, 1mm long. Calyx cup-shaped, lobed to twothirds the way down, rarely only to halfway, pubescent all over, 1mm long, lobes erect, oblong or deltoid-oblong, obtuse, ciliate with sessile glands and having a whitish puberulent patch on the back between the slightly raised margins. Corolla tubular, slightly narrowing to the base, or funnel-shaped and markedly narrowed at the base, 4-angled, glabrous, 2-3½mm long, lobes erect or spreading, broader than long, rounded. Stamens 4 or sometimes 3. Filaments filiform, glabrous. Anthers shortly exserted, basifixed, about as long as broad, oblong or cuneate-subquadrate, muticous or with minute awns at the top of the filament, smooth or finely toothed. Ovary 2-3 celled, glabrous, style exserted, 2mm long, stigma simple.

Type: Hills near Rhenosterkop, 50ft, 28.iv.1897, Schlechter 10576 (BOL lectotype); hills near Agulhas, 250ft, 27.iv.1897, Schlechter 10559 (BOL, PRE, W, paratypes).

A. schlechteri was described by N.E. Brown in 1909. In his type description he cited Schlechter 10559 and Schlechter 10576 as his types. Both specimens have been examined and Schlechter 10576 has been selected to serve as the lectotype because Brown wrote a determinavit label on this specimen and not on Schlechter 10559. The lectotype is the Schlechter 10576 in the Bolus Herbarium.

A. schlechteri has no closely related species apart from the following three species which are, however, not very similar to it. It is distinct and local, occuring on the low hills around Cape Agulhas.

The species is peculiar in the genus for possessing a

single bract. In this regard it is similar to some of the species of Simocheilus and of Syndesmanthus, which may have no bracts or one or three per flower.

From the herbarium specimens there appears to be some doubt about the actual number of bracts in the species. A note by Bolus on Schlechter 10559 states "bracts one or more" and on Schlechter 10576 "bracts 1" while Guthrie has written "bracts 2". The specimens have been examined and no trace of the second bract can be found. The condition of the flowers in the specimens is poor and the bract number is not easy to ascertain.

Brown made no mention of any variation in the bract number in his type description. A dissection by Guthrie shows two bracts, but whether this can be taken as correct is uncertain. A thorough examination of preserved material of Oliver 1830 has shown that all the flowers possess a solitary bract.

A similar disagreement is found in the correct number of leaves in a whorl. The arrangement of the leaves is difficult to ascertain clearly. They are apparently all 4-nate in the herbarium specimens. For Schlechter 10576 both Guthrie and Bolus agree that the leaves are 4-nate, but on Schlechter 10559 Bolus has written "leaves 3-nate". Preserved material of Oliver 1830 showed only 4-nate leaves.

Brown stated that the anthers were muticous. On close examination of his syntypes, it was found that the filaments possess some minute outgrowths near the point where they join the anthers, Whether these minute outgrowths should be classed as appendages is questionable. There is however some variation in the size of the outgrowths (fig). They have been regarded as appendages in this work.

The ovaries examined in the material usually contained 2 cells with a single ovule in each cell. Some ovaries were found with 3 cells.

Specimens examined:

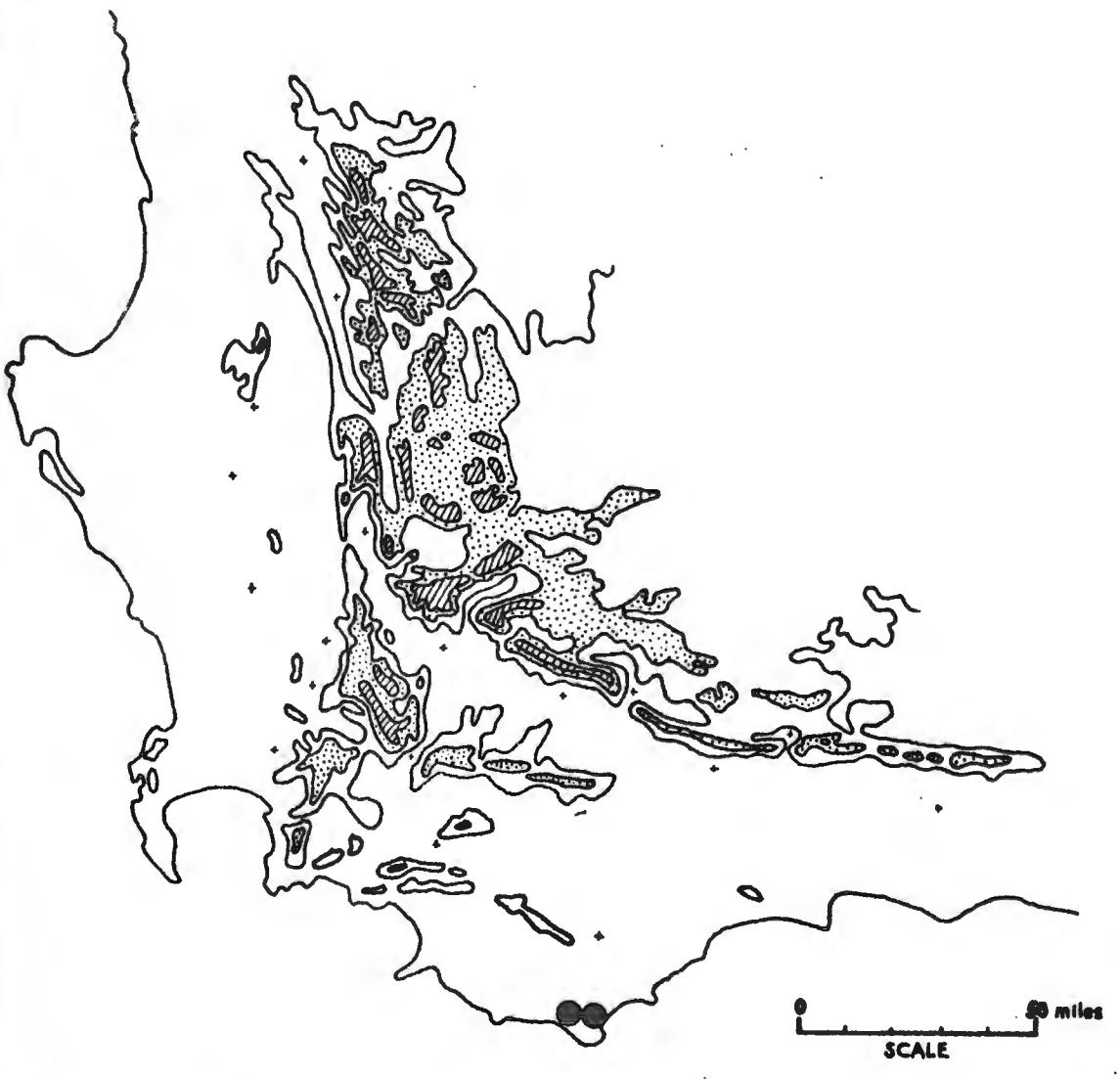
BREDASDORP::Hills near Rhenosterkop, 50ft, 28.iv.1897, Schlechter 10576 (BOL); Hills near Agulhas, 250ft, 27.iv.1897, Schlechter 10559 (BOL, PRE, W); 500ft, 11.iv.1948, Levyns 8836 (CT); 13.iv.1963, Oliver 1830 (STE); 17.iii.1964, Oliver 1831 (STE)

Figure 13.

Schlechter 10576, lectotype; (1) single flower; (2) corolla; (3) whorl of leaves; (4) leaf; (5) bract; (6) sepal; (7) anther (lateral, front and rear views)

Figure 14.

Oliver 1831; (1) single flower; (2) corolla; (3) sepal (inner surface); (4) range of size and form in the bract; (5) calyx; (6) anthers showing range in shape and aristation.



Distribution of A. schlechteri.

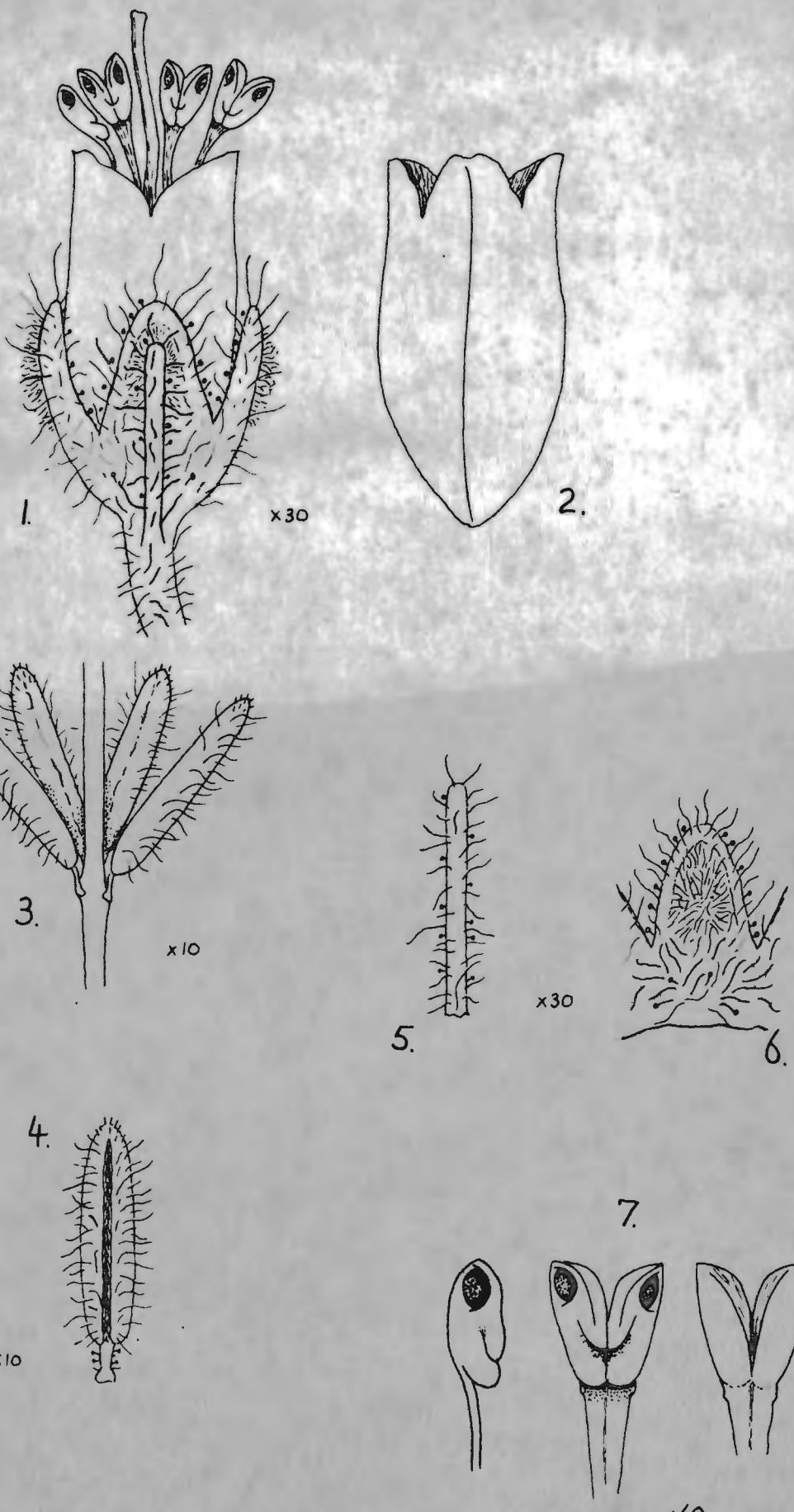
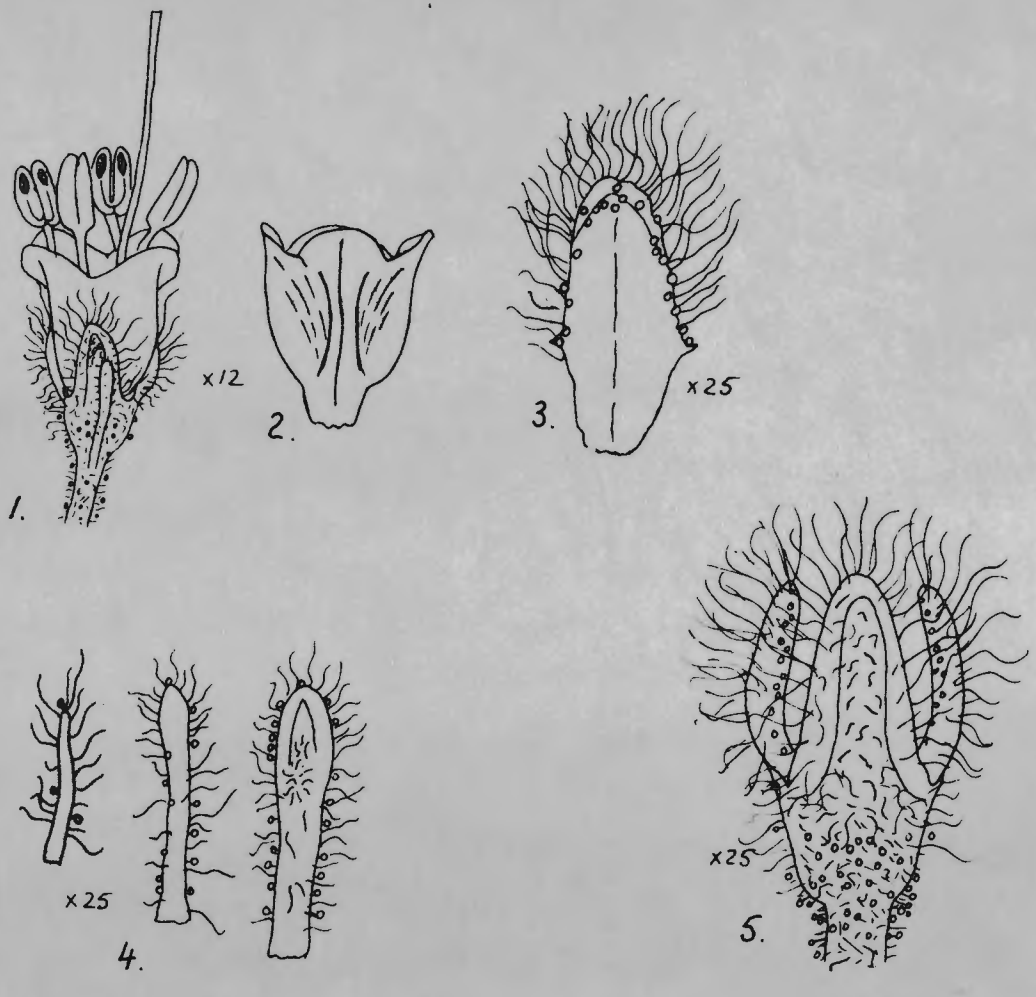


Fig. 13.



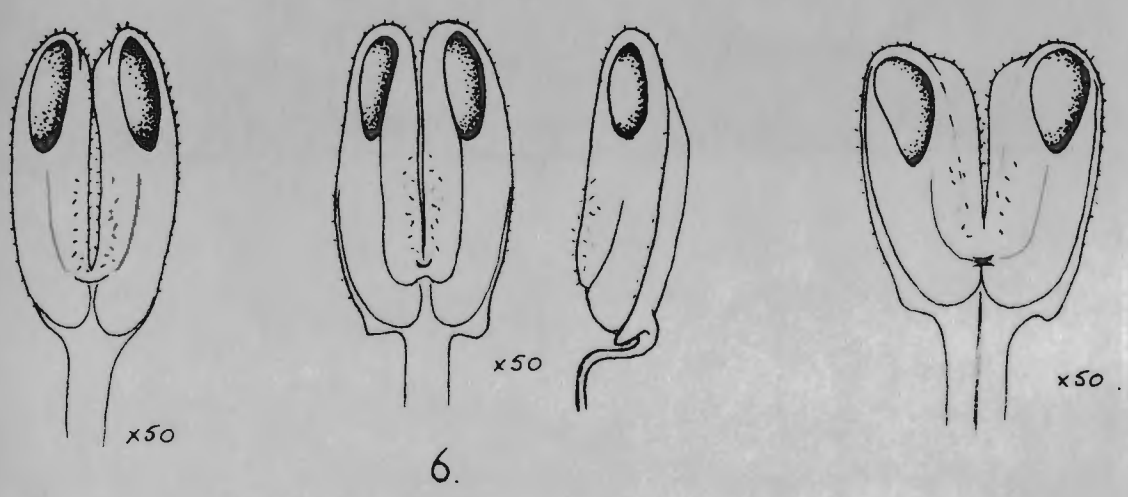


Fig. 14.

7. ACROSTEMON VERNICOSUS E.G.H. Oliver sp. nov.

Fruticulus prostratus, divaricatus. Rami erecti vel divaricati radicibus, juniores coccinei sparse pubescentes. Folia 3-nata, 0.5-3mm longa, divaricata vel reflexa, valde convexa et inflata, sulcata ovata ad lanceolata: petioli adpressi, juniores margine pubescentes, vetustiores minute tuberculati. Inflorescentiae terminales, globosae. Pedunculi pubescentes, 1mm longi. Bracteae 3, approximatae vel leviter remotae, marginibus pubescentibus, leviter sulcatae, area media pubescente indutae. Calyx campanulato-cyathiformis, pubescens infra medium lobatus: sepala erecta, oblonga, obtusa, marginibus breviter ciliatis et area albescente puberulente inter margines revolutos et infra absolute glandibus sessilibus, 1.2mm longa. Corolla 3mm longa, 1.5mm lata, inflato-tubularis, interdum leviter obliqua, glabra, prope calycem glutinosa, lobis erectis, latis, orbiculis. Stamina 4. Filamenta 2.8mm longa, plana, glabra, apice sigmoidea. Antherae 1.5mm longae, exsertae, basifixae, oblongae, diffusae, muticae vel minute aristatae, poro dimidium lobi. Ovarium ovoideum, 1mm longum, glabrum, cellis 2: stylus longe exsertus, 5mm longus: stigma truncata.

Prostrate spreading shrublet. Branches erect or spreading, and rooting on the ground, the younger red, sparcely pubescent. Leaves 3-nate, spreading or refexed with the petiole adpressed to the stem, markedly convex and inflated, sulcate, ovate to lanceolate, 0.5-3mm long: petiole 0.5mm long, the younger pubescent on the edges with short spreading hairs, sometimes with glands on the margins, the older minutely tuberculate, otherwise glabrous. Inflorescences terminal, globose. Peduncle pubescent, 1mm long. Bracts 3, approximate or slightly remote, the middle

The specimens possessed numerous flowers that were covered with a shining coat of sticky matter as if they corollas had been varnished. The species was therefore named Acrostemon vernicosus.

A. vernicosus is a distinct species and is not closely related to any of the existing species in the genus. It is more closely related to the following two new species from the Vogelvlei area of Bredasdorp, A. utriculosus and A. glutinosus, in general habit, leaf form and arrangement and in floral structure. Of the existing species in the genus it nearest to A. schlechteri.

It differs from A. schlechteri in the following respects :-

(1) the leaves are 3-nate, spreading and inflated;
(2) there are 3 short bracts;
(3) the calyx is much shorter in relation to the corolla;
(4) the corolla is viscid and not 4-angled;
(5) the anthers are much larger and differently shaped.

An investigation of the area around de Hoop showed that A. vernicosus is extremely abundant in the area, both on the flats and on the low hills. Dominance by this species was evident in more open vegetation where the species carpeted the ground.

The whole area around de Hoop has a limestone substrate and the hills are almost pure limestone. The species appeared to be confined to the area between the range of large limestone hills at de Hoop and the coastal hills at Skipskop.

It was most surprising that the species has not been recorded and described before now, even though it is very local in its distribution. The species could well occur on any of the limestone areas of the rest of the Bredasdorp coastal flats and of the adjacent Heidelberg and Riversdale coastal flats.

Although ample material was examined, very little variation was found in any of the floal characters of the species. The ovaries are constantly 2-celled with a single ovule per cell and there are constantly only 4 anthers.

All four species occuring in the Bredasdorp area are low spreading or prostrate shrublets. A. vernicosus is

bract from equal to twice the length of the lateral bracts, pubescent on the margins, slightly sulcate with a pubescent area in the middle. Calyx cup-shaped, lobed to two-thirds the way down, pubescent, sepals erect, oblong, obtuse, ciliate on the margins with short hairs, having a whitish puberulent area between the revolute margins, and having a complete covering of sessile glands on the inner surface, 1.2mm long. Corolla inflated-tubular, 3mm long, 1.5mm wide, straight or slightly oblique, glabrous, covered with a glutinous mass near the calyx, lobes erect, broad, rounded. Stamens 4. Filaments flat, glabrous, sigmoid at the top thus causing the anthers to bend outwards, expanded at the top and forming an edge to the cells, 2.8mm long. Anthers exserted, 1.5mm long, basifixed, spreading, longer than broad, oblong, spurless or minutely aristate, minutely toothed on the back, inner edge and front, pore $\frac{1}{3}$ as long as the cell. Ovary 2-celled, glabrous, 1mm long, ovoid: style far exserted, 5mm long: stigma truncate.

Type: Flats near de Hoop, Bredasdorp, 2.iii.1963, Oliver 1835 (STE holotype).

The first material of this species was collected at the same time in the environs of de Hoop, Bredasdorp, by three collectors, Dr. Levyns, Dr. Lewis and Miss. Barker. In the herbaria it was classified under A. schlechteri, the only species then known to occur in the Bredasdorp area.

Examination of the specimens showed that they belonged to a distinct and new species with A. schlechteri as the most similar species.

The material from Bredasdorp possessed characters which would place it nearest to the genus Acrostemon, i.e. a 2-celled ovary with a single ovule in each cell, a lobed calyx, 4 stamens, but was not far removed from the genus Simocheilus in possessing a tubular calyx which was divided only half the way down. The important characters were the 2-celled, single ovuled ovary and the slightly lobed calyx. As the species appeared to be similar to A. schlechteri and as the combination of characters seemed to the present author to justify its placing, the species was placed in the genus Acrostemon.

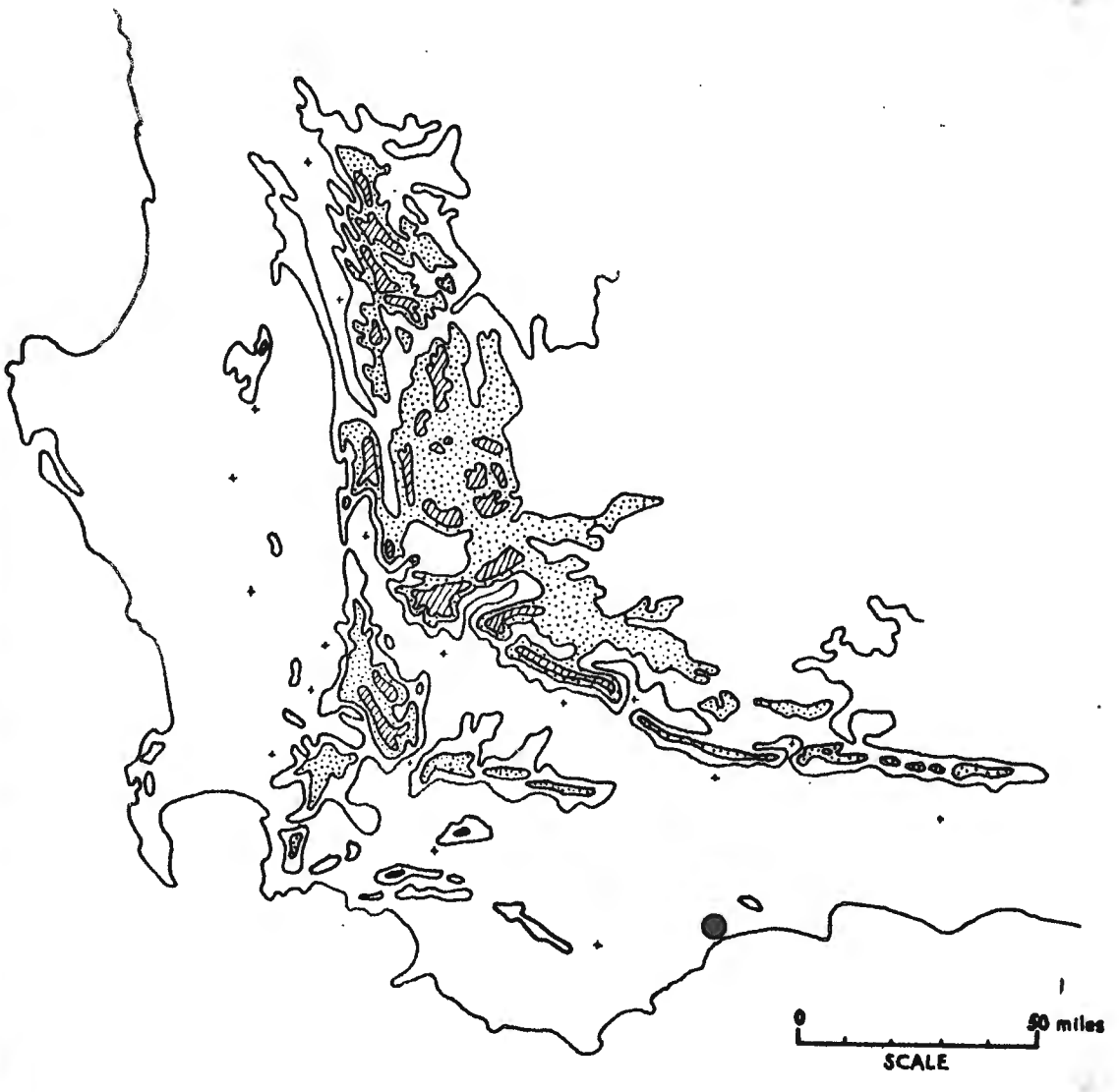
similar to A. schlechteri in its habit of rooting along the main branches at points where the branches touch the ground and become covered with earth. This is reminiscent of a similar condition found in Thoracosperma muirii, observed by the present author on the limestone hills of the Heidelberg coast.

Specimens examined:

BREDASDORP: Flats between de Hoop farm and the limestone hills, 2.iii.1963, Oliver 1835 (STE); de Hoop Provincial farm, on limestone flats near the coast, 10,iv. 1957, Lewis 5166 (BOL, NBG); Barker 8696 (BOL, NBG); Levyns 8836 (CT); flats and hills just north of Skipskop near de Hoop, Bredasdorp, 9.iii.1964, Oliver 1836 (STE).

Figure 15.

Lewis 5166, paratype; (1) single flower; (2) corolla; (3) old leaf (lower and lateral views); (4) whorl of leaves; (5) young leaf (lower and lateral views); (6) gynaecium; (7) bract; (8) sepal; (9) anther (lateral, front and rear views).



Distribution of A. vernicosus.

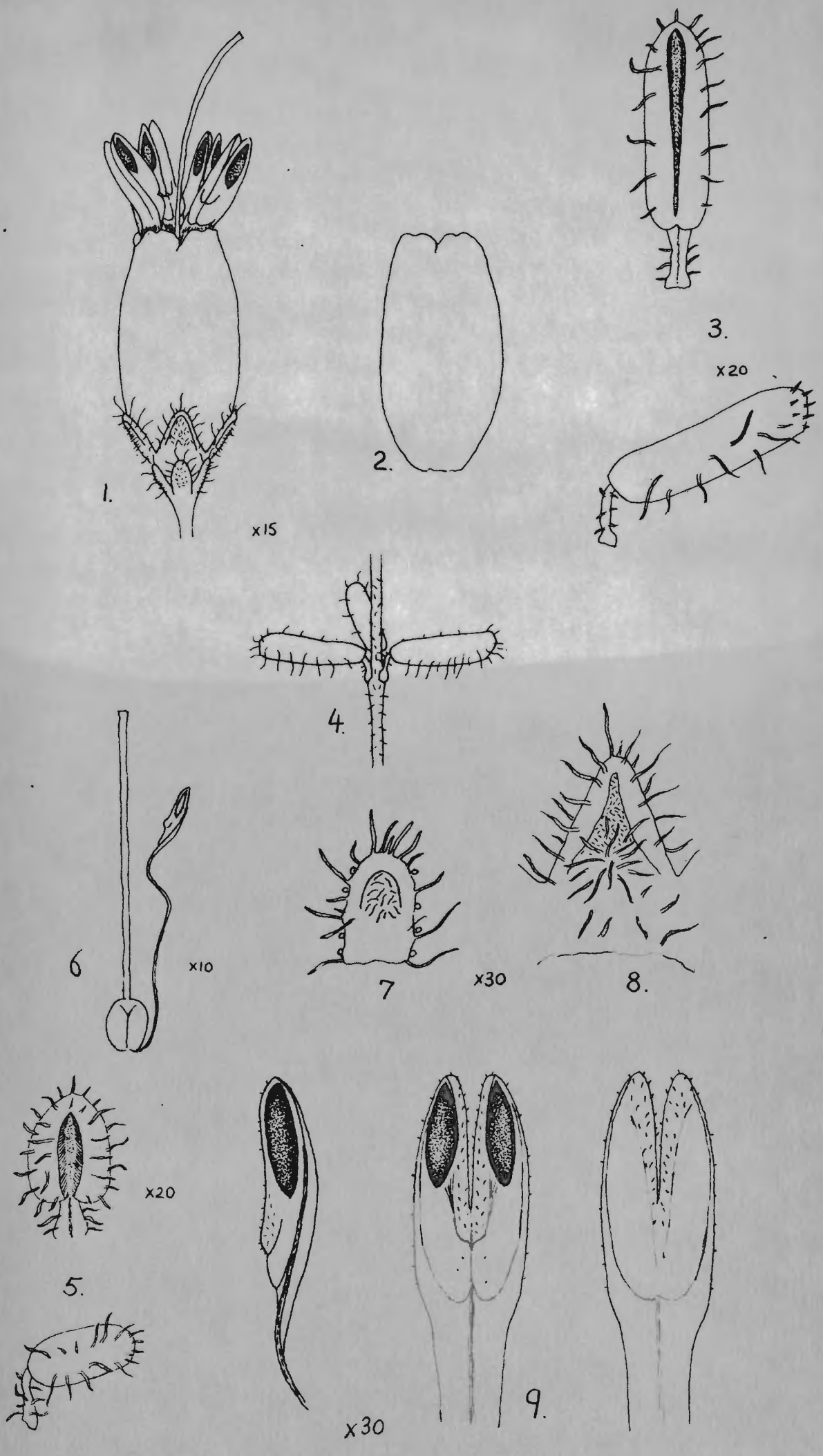


Fig. 15.

8. ACROSTEMON UTRICULOSUS E.G.H. Oliver nom. nov.

Syndesmanthus schlechteri N.E.Br. in Fl. Cap. 4 : 358 (1909)

Short. scrambling or erect shrublets, Branches pubescent, the younger with a few short glandular hairs, the younger nodes slightly swollen. Leaves 3-nate, spreading or reflexed with the petiole adpressed to the branch, round, globose-inflated like a utricle, sulcate, acute or obtuse, ovate, glabrous, the younger occasionally with a few sessile glands on the margins, ¼-1½mm long and ¼-1mm wide, the petiole ciliate on the margins. Inflorescences terminal, globose, 2-5 flowered. Peduncle pubescent ½mm long. Bracts 3, adpressed to the calyx, unequal, the middle bract slightly longer than the lateral pair, with or without the expanding base overlapping the lateral pair, reaching to the top of the calyx, broadly ovate, narrowing at the apex, acute, sulcate, 1mm long and ½-1mm wide, the lateral bracts ¾mm long and ½mm wide, obovate, slightly acute, with a small puberulent patch in the middle, all the bracts ciliate on the margins, otherwise glabrous. Calyx lobed to twothirds the way down, cup-shaped, 1mm long, sepals erect, agglutinated to the corolla, sparcely ciliate, oblong, acute, possibly clothed with sessile glands on the inner surface. Corolla obovate-tubular, slightly closed towards the mouth, narrowing towards the base, viscid, glabrous, 3mm long, lobes short, erect or slightly spreading, broad, rounded. Stamens 4. Filaments narrow, glabrous, 3mm long. Anthers exserted, spreading, basifixed, slightly longer than broad, muticous, smooth, 1mm long, pores elongate, very large, just over ¾ the length of the cell. Ovary 1 or sometimes 2-celled, ovoid, ¾mm long, style filiform, exserted, 3½mm long, stigma large, capitate.

Type: Flats near Vogelvlei, 23.iv.1897, Schlechter 10481 (BOL, holotype & isotypes).

Attention was first drawn to this species while the unidentified specimens of Ericaceae in the Bolus Herbarium were being investigated. A duplicate of Schlechter 10481 was among the unidentified material but had, however, been previously labelled as "Simocheilus schlechteri Bolus", a nomen nudum.

The specimen was recognised as being related to A.

schlechteri and to the new species A. vernicosus by the present author. Preliminary examination showed that the ovaries possessed 2 cells with single ovules. It thus appeared to be a new species of Acrostemon most similar to A. vernicosus. As it was a Schlechter specimen, it seemed surprising that it had not been described before.

As N.E. Brown had access to all Schlechter's material, a search was made in Flora Capensis for the citation of Schlechter 10481. It was eventually found as the type of Syndesmanthus schlechteri N.E.Br.

An investigation of some of the flowers of the type, labelled as such by N.E. Brown, showed that most of the ovaries possessed single cells and single ovules, but a few had 2 cells and a single ovule. Brown must thus have used the 1-celled character shown by some of the flowers, for placing the species in the genus Syndesmanthus. He made no mention of the 2-celled condition.

The character of a 1-celled ovary could place the species in the genus Syndesmanthus, while the character of a 2-celled ovary could place it in either of the genera, Acrostemon or Simocheilus. It may be excluded from the latter genus, with some difficulty, because it possesses a tubular calyx joined for just less than half the length of the calyx, a character which should exclude it from the genus Syndesmanthus as well. This aspect will be dicussed in the section on the distinction of the genera.

As A. eriocephalus is retained in the genus Acrostemon for similar reasons, although it has mostly 1-celled ovaries, it was decided to place Syndesmanthus schlechteri in the genus Acrostemon near to its most similar species, A. vernicosus.

The combination, A. schlechteri, is already occupied by Brown's species of 1909. A new specific epithet was therefore necessary for the species.

The species possesses very distinct globose-inflated leaves like utricles, even when the leaves are old, This character is reminiscent of the leaves of Erica utriculosa L. Bolus from the Cape Peninsula. It was decided to name this species A. utriculosus on account of the utricle-like leaves.

A. utriculosus is most similar to A. vernicosus but may be distinguished from the latter by :-

(1) the shorter globose-inflated leaves, which are glabrous;
(2) the 3 unequal bracts which are as long as the very short calyx;
(3) the distinct narrowing of the corolla towards the base;
(4) the capitate stigma;
(5) the differently shaped anthers with pores that are relatively much larger and with narrow filaments.

The corolla is more viscid than in A. vernicosus. This sticky condition in the species is similarly caused by secretions from the calyx. The agglutination of the corolla to the calyx renders the examination of the inner surface of the calyx in the herbarium specimens very difficult. There appeared to be a covering of sessile glands on the inner surface of the calyx segments.

The species is known only from the single collecting of Schlechter 10481, the type, from the Vogelvlei hills west of Bredasdorp. Brown stated that he had seen a Schlechter specimen bearing the same number as the type and localised as being from the Zeekoevlei area, but stated that he regarded this as an error for Vogelvlei.

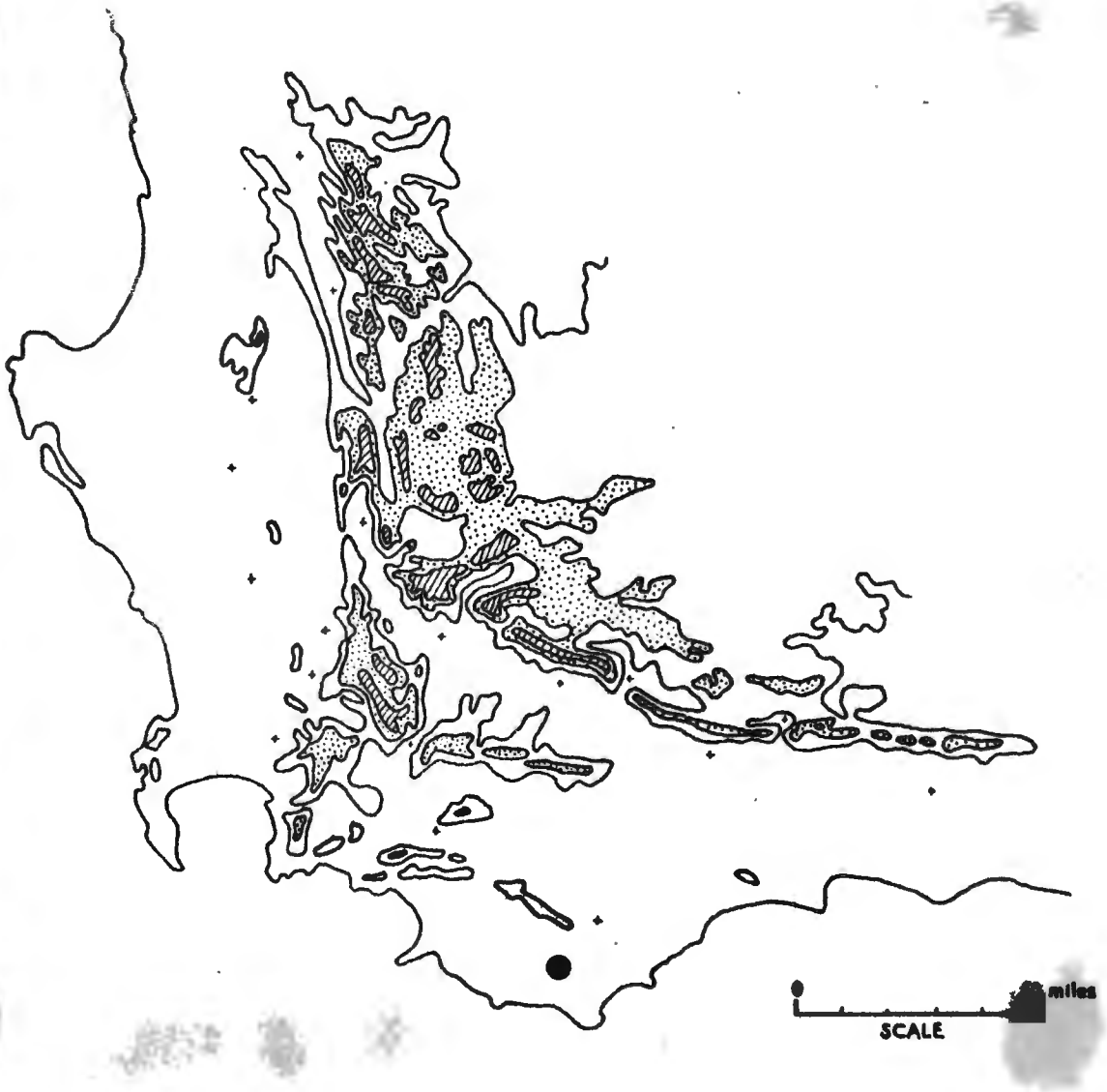
A search on part of the numerous hills overlooking Vogelvlei did not produce any material of this species. Further searches will have to be carried out for this species in the light of investigations on the following new species, which has shown some important variations in the ovary complement.

Specimens examined;

BREDASDORP: Flats near Vogelvlei, 23.iv.1897, Schlechter 10481, (BOL).

Figure 16.

Schlechter 10481, holotype: (1) single flower showing difference in the size of middle bract; (2) corolla; (3) sepal; (4) lateral bract; (5) middle bract, small & large; (6) leaf, lower & lateral views; (7) anther, lateral, front & rear views.



Distribution of A. utriculosus.

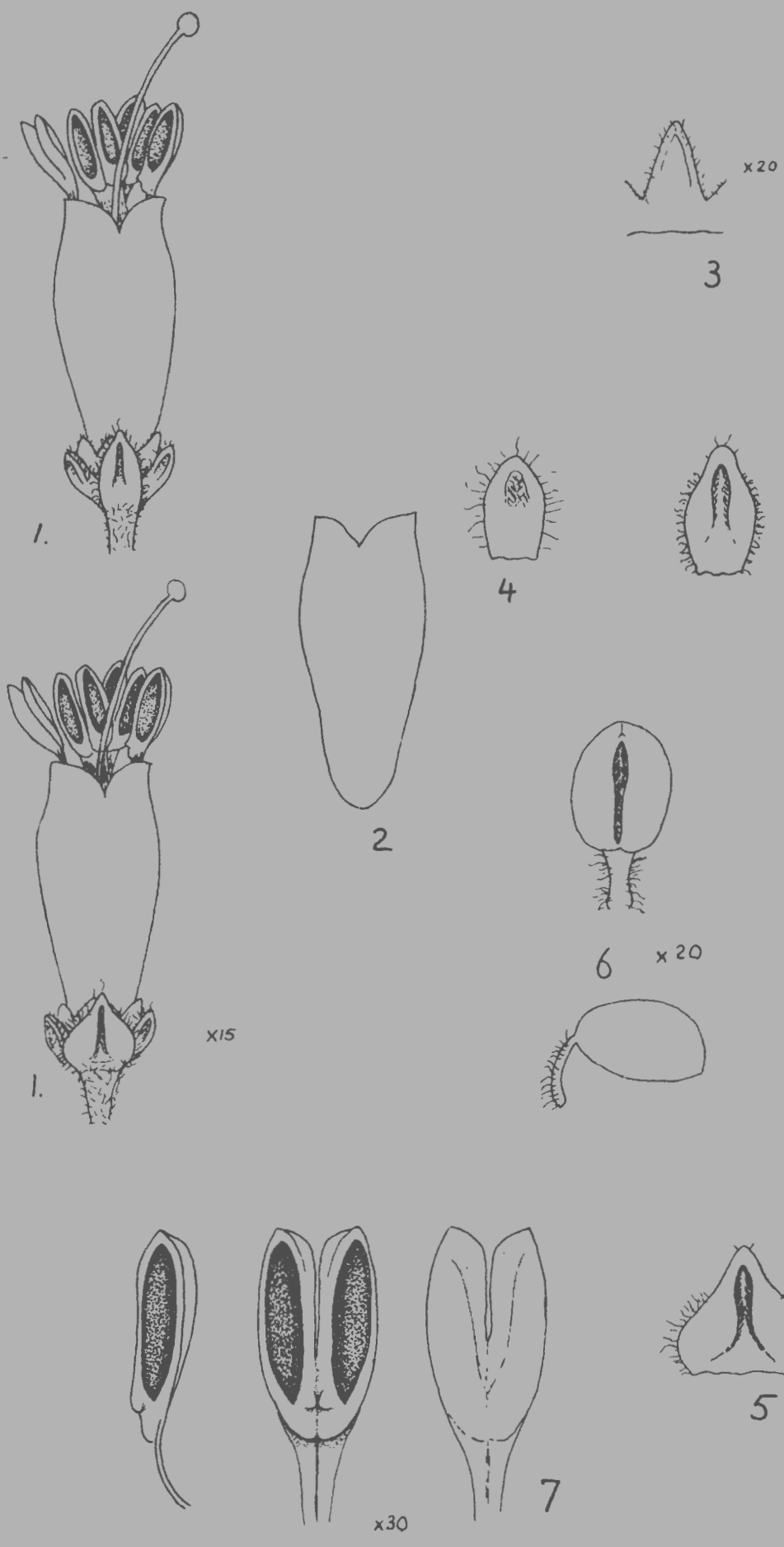


Fig. 16.

9. ACROSTEMON GLUTINOSUS E.G.H. Oliver sp. nov.

Fruticulus parvus, prostratus, caespitulosus. Rami pubescentes, junioribus crinibus paucis brevibus glandulosis induti et nodis turgidioribus. Folia 3-nata, 1.2- 2mm longa, sparse divaricata vel reflexa, petiolis adpressis, sulcata, inflata, acuta, glabra vel apice crinibus paucis longis induta: petioli ciliati, 1mm longi. Inflorescentiae terminales, globosae, agglutinatae floribus 2-6, omnibus sub ramis desuper pendulis. Pedunculi pubescentes, 1-1.5mm longi. Bracteae 3, inaequales, calyce adpressae, obovatae, glabrae, margine ciliato, interdum glandulis paucis sessilibus calycem, contingentibus. Calyx profunde lobatus, 0.5-0.8mm longus sepalis erectis, oblongis, acutis, glandulis sessilibus agglutinatis ad corollam indutis. Corolla infundibuliformis, 2-3mm longa, basin versus angusta glabra, viscidissima, lobis erectis vel divaricatis. Stamina 4. Filamenta glabra, 2.5mm longa. Antherae exsertae, terminales, ovatae, muticae, 0.5-0.8mm longae, margine setis minutis, poro dimidium lobi. Ovarium ovoideum, glabrum, 0.5mm longum, cellis 1, interdum 2, ovulo unico: stylus exsertus, 3.5mm longus: stigma truncata.

Shrublets small, prostrate, somewhat crowded in tuft-like patches. Branches pubescent, the younger with a few short glandular hairs and the nodes more swollen. Leaves 3-nate, 1.2-2mm long, sparse, spreading or reflexed, with the petiole adpressed to the branches, rounded and inflated, sulcate, acute, glabrous or with a few long hairs on the margins and apex: petiole ciliate on the margin, 1mm long. Inflorescences in terminal globose clusters of 2-6 flowers, agglutinated together, all underneath the branches and facing downwards. Peduncle pubescent, 1-1.5mm

long. Bracts 3, 1.5mm long and 1mm wide, unequal and adpressed to the calyx, the middle bract slightly longer than the lateral bracts and with an expanded base overlapping the laterals, obovate, glabrous, ciliate on the margins and sometimes with a few sessile glands, reaching to the top of the calyx and beyond, the lateral bracts short, linear, with a puberulent area near the base, ciliate on the margin. Calyx 4-lobed to two-thirds of the way down, 0.5-0.8mm long, segments erect, acute, oblong, the lower half puberulous, clothed on the inside with sessile glands, agglutinated to the corolla. Corolla funnel-shaped, 2-3mm long, narrowing to the base, sometimes slightly swollen near the mouth, glabrous, very viscid with a glutinous mass of sticky matter above the calyx, lobes short, erect or slightly spreading, broad and rounded, white to pale pink. Stamens 4. Filaments narrow, glabrous, 2.5mm long. Anthers exserted, spreading, basifixed, ovate, spurless, with toothed margins, 0.5-0.8mm long, the pores half the lehgth of the cells. Ovary ovoid 1 sometimes 2-celled, obliquely situated single ovule, glabrous, 0.5mm long: style exserted, 3.5mm long, filiform: stigma truncate.

Type: Hillslopes to the north-west of Vogelvlei, Bredasdorp, 15.iv.1963, Oliver 1837 (STE, holotype).

This species was discovered during a search for material of A. utriculosus. The only locality known for A. utriculosus is the type locality near Vogelvlei, Bredasdorp, from Schlechter 10481.

From Schlechter's collecting records the following localities and dates were extracted :-

22 April	at	Elim	10476.....10481
23 April	at	Vogelvlei	10494
24 April	at	Mierkraal	10527
25 April	at	Mierkraal	
26 April	at	Zeekoevlei	10536

It would appear from his records that Schlechter went from Elim over the hills and arrived from the north-west at Vogelvlei and then went straight to Mierkraal and Zeekoevlei. He must thus have bypassed the hills to the west and south-west. His collecting number, 10481,

coming between numbers 10476 and 10494, would suggest that A. utriculosus was collected just north-west of Vogelvlei.

A visit was made to the Vogelvlei area. Most of the land around the vlei itself is under wheat cultivation and very little natural vegetation still remains. The hill-slopes just to the north-west of the vlei looked promising and several areas were investigated without success.

Eventually a small patch of open sandy vegetation on the side of a road was investigated and specimens of what appeared to be A. utriculosus were found. The plants were noticed only on account of the open nature of the vegetation. They were growing in sand between small scattered clumps of Restionaceae. Even then it was not known what the plants were. They were only a few inches high and were spreading, and had to be turned over in order to locate the flowers, which were mostly hanging downwards and were not visible.

A closer examination of preserved flowers showed that the material collected was similar in general appearances to A. utriculosus, but, however, differed in a number of characters, which were as follows :-

(1) the corolla was more funnel-shaped and opened to the top;
(2) the bracts were more unequal, the middle bract being larger and much broader than in A. utriculosus;
(3) the anthers were much smaller, were differently shaped and had relatively smaller pores;
(4) the stigma was truncate.

The material was investigated thoroughly for any signs of variation and overlapping in the above characters. One of the characters was found to show some variation.

The corolla was mostly open funnel-shaped but some flowers did possess corollas similar to those of A.utriculosus with a slight sweeling above the middle and slightly closed around the mouth. There was little variation in the bracts in the material but variation in the size of the bracts found in A. utriculosus showed some intergrading with those of the preserved material of the new species. In the former, the bracts were usually only slightly unequal and were of a similar shape, but occasionally the middle bract was larger and with an expanded base.

The differences in the anthers and the stigma shape

are marked and show no signs of intergrading.

The material showed distinct differences in two characters, i.e. in the anther shape and the stigma, and a slight separation in two other characters, i.e. in the shape of the corolla and in the shape and relative sizes of the bracts. It was decided therefore that the material could not be included under A. utriculosus and should be described as a new species.

The two taxa are undoubtedly sympatric but cannot be relegated to subspecific or to varietal level on the evidence at present available. Further investigations will have to be made to rediscover A. utriculosus in the field and to determine the exact relationship between the two species, if they are to be retained as distinct taxa at specific level.

The species has been named A. glutinosus on account of the extremely glutinous property of the flowers. The sticky matter appears to be secreted by numerous sessile glands which are located on the inner surface of the calyx and which function only in the early stages of the development of the inflorescence. Examination of the inner surface is extremely difficult in any of the floral stages, both fresh and preserved, due to this glutinous layer. The number and the exact position of these glands is therefore not known.

The species of plants which are known to be endemic to the Bredasdorp area, are mostly confined to some or all of the limestone hills and flats which are numerous in the area. Of the species of the genus Acrostemon occuring in the area, both A. schlechteri and A. vernicosus grow only on a limestone substrate. A. glutinosus grows in pure sand which is derived from Table Mountain Sandstone. It may be assumed probable that A. utriculosus grows on the same substratum as there is no limestone in the vicinity of the region to the north-west of Vogelvlei.

Variations were found in the number of anthers per flower in the preserved material. There were usually 4 anthers but occasionally there were only 3 anthers. This 3-anthered condition is most interesting as it is found in a number of species of the genus Syndesmanthus which are endemic to the Bredasdorp area. In the case of the species of Syndesmanthus, all the parts are reduced to three's.

The condition of the ovaries in the preserved material is discussed in the section on the generic distinction of Acrostemon and its related genera, as the variation found is comparable with that found in Syndesmanthus.

The position of the flowers on the plants is of interest. Most of the flowers hang down under the branches and are only a very short distance from the ground. The question arises as to the nature of the pollinating agent. If the agent were able to locate the hidden flowers, a flying insect would be unable to land on them because of their extreme stickiness. The insect, if large enough, may be able to stand on some other part of the plant nearby and reach into the flowers.

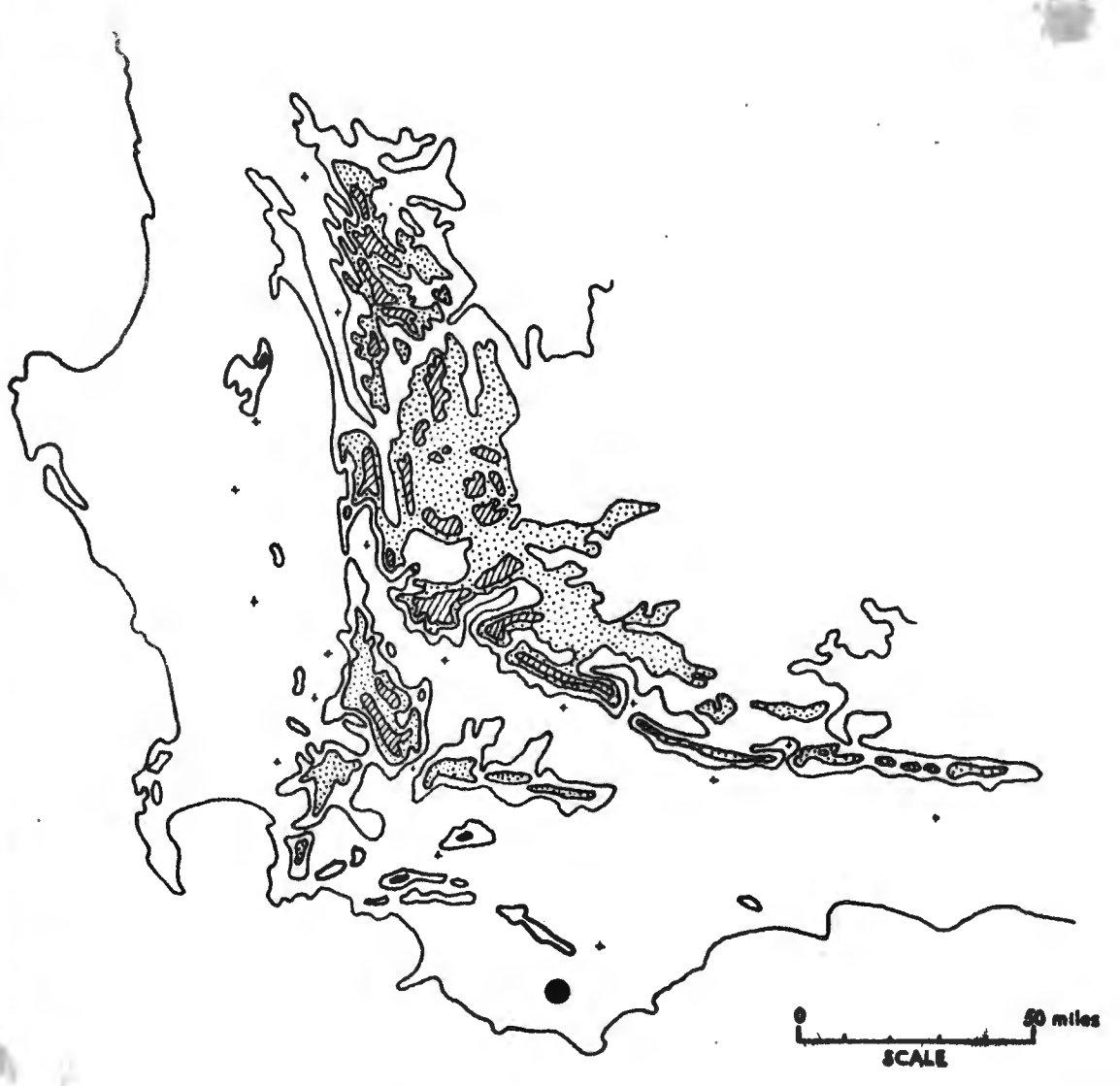
It seems more likely that a crawling insect, such as an ant, might be able to reach the flowers from the ground without touching the sticky corolla. The exserted and reflexed anthers and style would provide a foothold for the ant to reach the supply of nectar at the base of the flower.

Specimens examined:

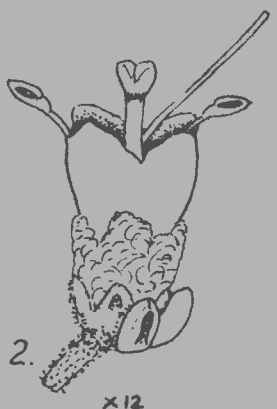
BREDASDORP: Hillslopes to the north-west of Vogelvlei, Bredasdorp, 15.iv.1963, Oliver 1837 (STE).

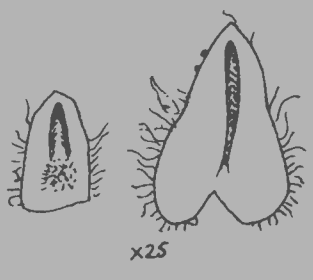
Figure 17.

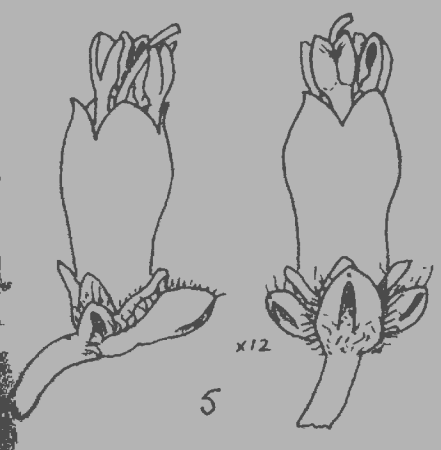
Oliver 1837, holotype; (1) single flower; (2) single flower showing the recurved stamens and the glutinous mass; (3) sepal; (4) lateral and middle bract; (5) single flowers showing variation in corolla shape; (6) gynaecium; (7) leaf (lateral and lower views); (8) anther (front, rear and lateral views); (9) whorl of leaves.

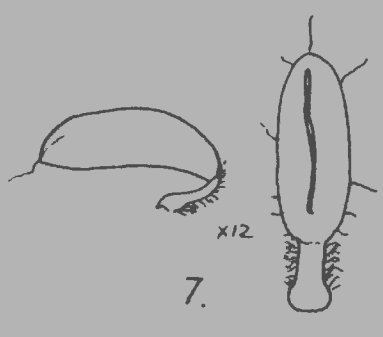


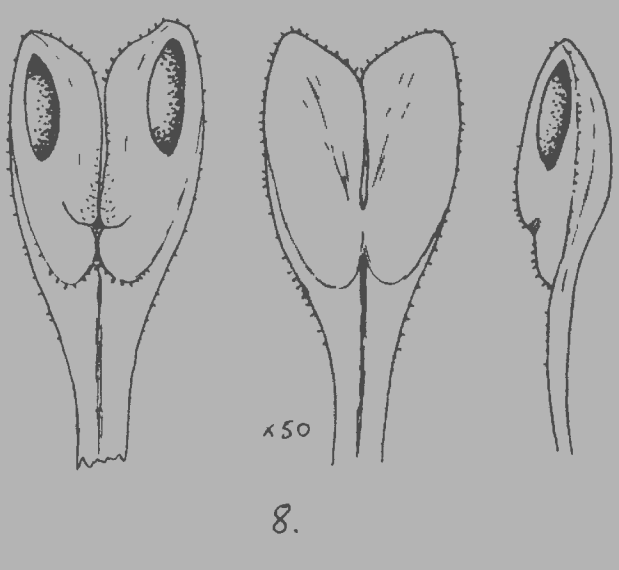
Distribution of A. glutinosus.











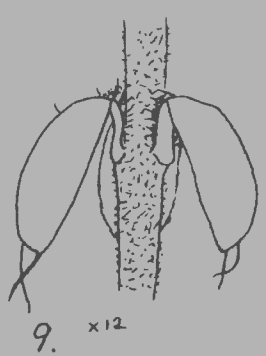


Fig. 17.

10. ACROSTEMON ERIOCEPHALUS (Kl) N.E.Br. in Fl. Cap. 4 : 355 (1909).

Finckea eriocephala Kl. in Linnaea 12 : 238 (1838).

Grisebachia eriocephala (Kl) Benth. in D.C. Prodr. 7 : 702 (1838).

Acrostemon eriocephalus (Kl) N.E.Br. in Fl. Cap. 4 : 355 (1909).

Finckea bruniades Kl. in Linnaea 12 : 238 (1838).

Grisebachia bruniades (Kl) Benth. in D.C. Prodr. 7 : 702 (1838).

Shrublet up to 10cm high, with spreading pubescent or minutely tomentose branchlets. Leaves 3-nate, spreading or the upper more or less adpressed, 1.5-5mm long with the petiole, linear to subovate, puberulous and clothed, sometimes densely, with long fine hairs, becoming glabrous. Inflorescences terminal, globose, 3-12 flowered, lanate. Peduncles 1.5mm long. Bracts 3, approximate, unequal, small, the lateral pair about as long as the 0.5-1.5mm long middle bract, linear, densely ciliate with long simple white or pink hairs. Calyx divided to the base, segments 2-2.5mm long and 0.5mm wide, linear or linear-lanceolate, acute, densely covered on the back with long white or bright pink hairs, glandular-ciliate on the inner side of the margins, Corolla shorter than, equal to, or slightly longer than the calyx, 2-2.8mm long, cylindric, closed at the mouth, 4-toothed but appearing subtruncate at the top, puberulous outside, lobes very small, rounded, incurved. Stamens 4, 5 or 6. Filaments hairy, about 2mm long. Anthers shortly or far exserted according to age, 0.8-1.5mm long, narrow linear, minutely scabrous on the margins, spurless, pore $\frac{1}{2}$-$\frac{3}{4}$ the length of the cell. Ovary 1 or 2-celled, ellipsoid, acute, glabrous; style much exserted, 3mm long, glabrous; stigma simple.

Type: Cape of Good Hope, Drege 7804 (BOL, K, PRE, W, isotypes).

In 1838 Klotzsch described two species under his new genus Finckea, F. bruniades and F. eriocephala. Bentham shortly afterwards retained both species but transferred them to his section Finckea of the genus Grisebachia Kl.

Klotzsch separated the two species merely on the anther colour and the spread of the leaves. N.E. Brown examined both of the holotypes and stated "the type of F. bruniades has its anthers faded to a paler brown and has more spreading leaves than in F. eriocephala, but there is no specific

distinction". He retained only one of Klotzsch's species, F. eriocephala, and placed it in Klotzsch's genus Acrostemon, stating that Finckea was inseparable from Acrostemon in his opinion. He chose A. eriocephalus as opposed to A. bruniades, which was described at the same time. This is justifiable according to the International Rules.

The type specimen of the species is "Prom. bon. spei, Drege" as cited by Klotzsch (1838). Brown in Flora Capensis (1909) stated that he had examined the type and as he cites only Drege 7804, this number can presumably be regarded as the type number.

The holotype was destroyed in Berlin in the Second World War. Fortunately several isotypes exist in the herbaria at Kew, Vienna, Pretoria and the Bolus Herbarium. Both of the isotypes in the latter two herbaria are poor specimens and thus no lectotype has been chosen until the specimens in Kew and Vienna have been seen.

Dr. H. Dulfer in a private communication stated that there is another Drege specimen in Vienna which is identical to Drege 7804 but is not labelled in Drege's own hand.

Meyer (1844) gives one locality only for a Drege collecting of Finckea eriocephala. The specimen was collected at Genadendal at 3000ft in October. As this was the only specimen collected it can be assumed that the above is the exact locality of the type, Drege 7804, Cape of Good Hope.

A. eriocephalus is a distinct species in the genus with A. xeranthemifolius as its most similar species.

Investigation of all available material has brought to light some interesting variations not hitherto recorded in the species.

The anther number varies in A. eriocephalus. All the herbarium material possesses flowers with only 4 anthers. The material of subsp. roseus from Robertson possesses flowers with mostly 5 anthers but some flowers had as many as 6 anthers.

Variation also occurs in the ovary complement. All known herbarium material, with very few exceptions, possesses 1-celled ovaries with a single ovule. Only rarely do the flowers have 2-celled ovaries. This led Brown to regard it as a degenerate species of Acrostemon. This 1-celled condition allies the species to the genus Syndesmanthus, which has a 1-celled ovary. The single population of

subsp. roseus possesses flowers all with 2-celled ovaries.

It is of interest to note here that Klotzsch based his genus Finckea on a "2-celled ovary. Brown made no mention of this character.

As a result of the differences found between the Robertson population and the rest of the known populations of the species, it was decided that two separate taxa should be recognised. The differences are marked but not sufficiently to warrant specific recognition. At infraspecific level the two taxa should be recognised as subspecies in that they are allopatric, occupying different areas.

The new subspecies from Robertson has been named subspecies roseus because it possesses very striking pink hairs on the calyx. This is in complete contrast to the populations of the typical subspecies which all possesse white or greyish-white hairs.

Key to the subspecies.

Calyx hairs white, stamens 4, ovary 1-celled — subsp. eriocephalus

Calyx hairs pink, stamens 5, sometimes 6, ovary 2-celled — subsp. roseus

(a) subsp. eriocephalus.

A. eriocephalus (Kl) N.E.Br. in Fl. Cap. 4 : 355 (1909).

The typical subspecies is characterised by the possession of white hairs on the bracts and calyx; the 4 stamens; and the 1-celled, rarely 2-celled, ovary.

Specimens examined:

CALEDON: Houw Hoek Mountains, 1000ft, xi.1893, Bolus s.n. (BOL); 1500ft, 14.x.1894, Schlechter 5439 (BOL, W); 800ft, 31.xii.1894, Guthrie 3143 (BOL); xi.1928, Stokoe s.n. (BOL); 20.x.1941, Maguire 1086 (NBG); 1000ft, x.1927, Levyns 2289 (CT); 1500ft, 8.xi.1897, Galpin 3835 (PRE); On the way from Houw Hoek to Palmiet River, xi.1879, Bolus s.n. (BOL); Hills between Houw Hoek and Caledon, x.1878, Spilhaus s.n. (BOL 3997); Mountains between French Hoek and Villiersdorp, 1800ft, xi.1879, Bolus 5108 (BOL); Mountains at Genadendal, 3000ft, x , Drege 7804 (BOL, K, PRE, W); Drege s.n. (W); STELLENBOSCH: Mountain slopes below Sir Lowry's Pass, 600ft, x.1880, Bolus 5555 (BOL, SAM); 150m, 16.x.1948, Parker 4358 (BOL, NBG); 9.xi.1941, Compton 12388 (NBG);

1000ft, x.1928, Levyns 2534 (CT); 1200ft, 14.x.1929, Adamson s.n. (CT); Zeyher 3290 (W); 10.x.1963, Oliver 1750 (STE).

(b) subsp. roseus E.G.H.Oliver subsp. nov.

Type: North-west end of Schurfteberg, Robertson, 1800ft, 16.viii.1963, Oliver 1706 (STE, holotype).

A subsp. eriocephalo bractiis et sepalis roseis villosis, antheris 5, interdum 6, et ovario cellis 2, distinguitur.

This subspecies is distinguished by the pink hairs on the bracts and calyx, the 5, sometimes 6, anthers, and the 2-celled ovary.

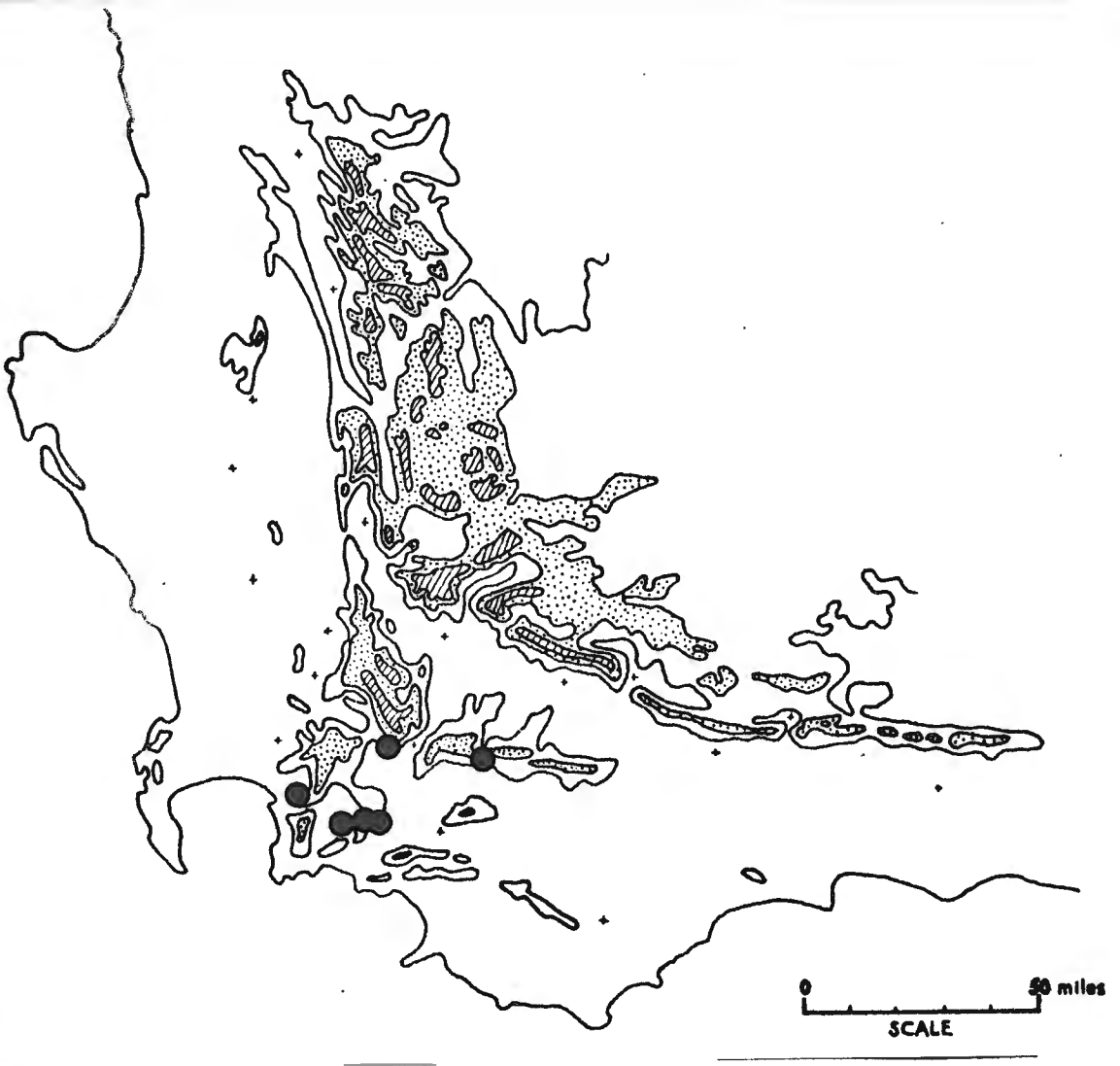
Specimens examined;

ROBERTSON: On the Schurfteberg near Robertson, 1800ft, 4.xii.1951, Levyns 9808 (CT); viii.1962, Levyns 12354 (CT); 16.viii.1963, Oliver 1706 (STE).

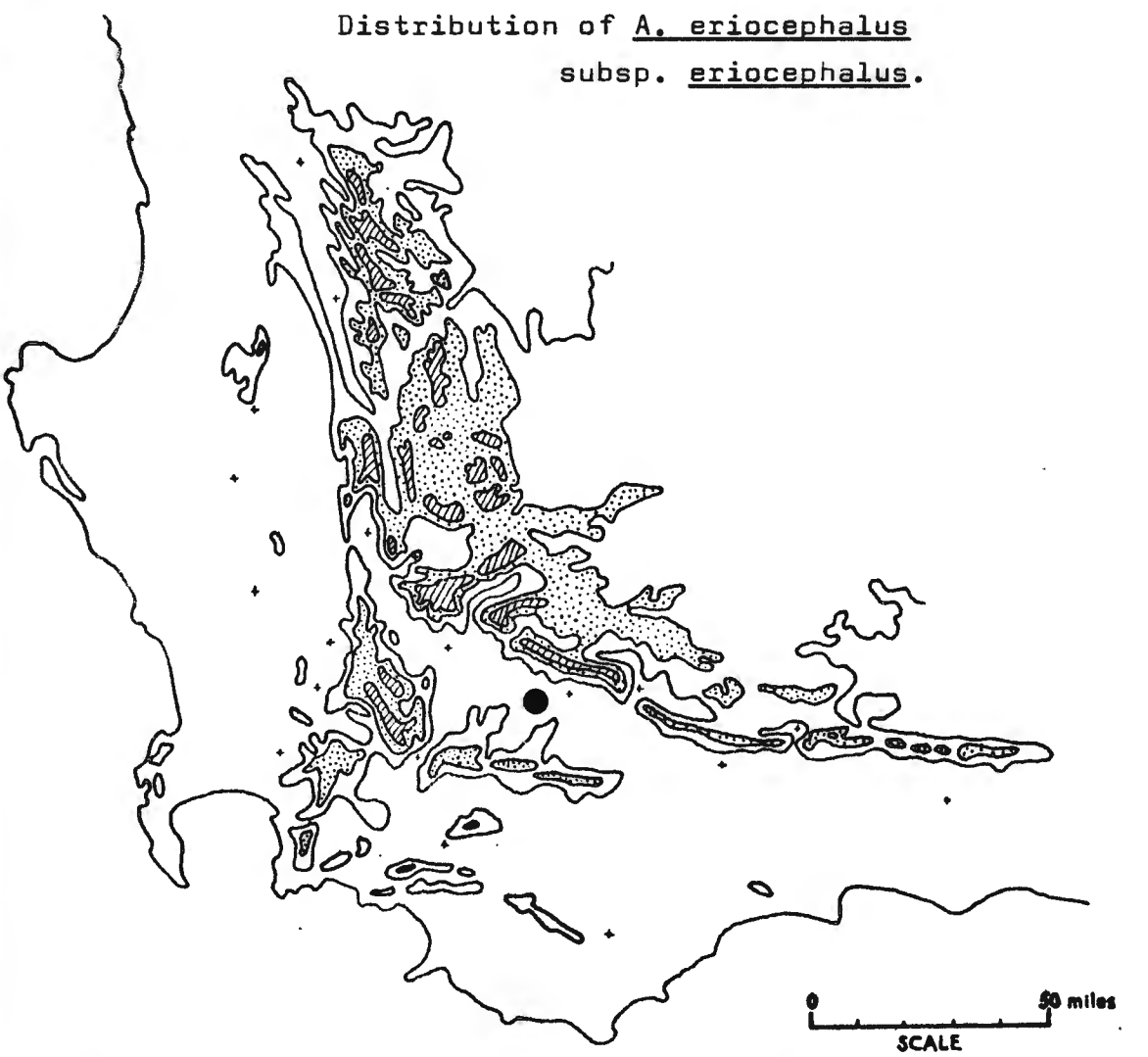
The histogram at the end of the citation of specimens of A. xeranthemifolius shows the variation in the stamen number in A. eriocephalus subsp. eriocephalus and subsp. roseus compared with the variation in A.xeranthemifolius. The numbers obtained for A.eriocephalus subsp. eriocephalus were from Oliver 1750, while those for subsp. roseus were from Oliver 1706.

Figure 18.

Drege 7804, isotype; (1) single flower; (2) corolla; (3) sepal (inner surface); (4) 3 bracts; (5) anther (lateral. front and rear views); (6) ovary of subsp. Oliver 1750; (6) ovary of subsp. eriocephalus; Oliver 1706; (7) ovary of subsp. roseus.



Distribution of A. eriocephalus subsp. eriocephalus.



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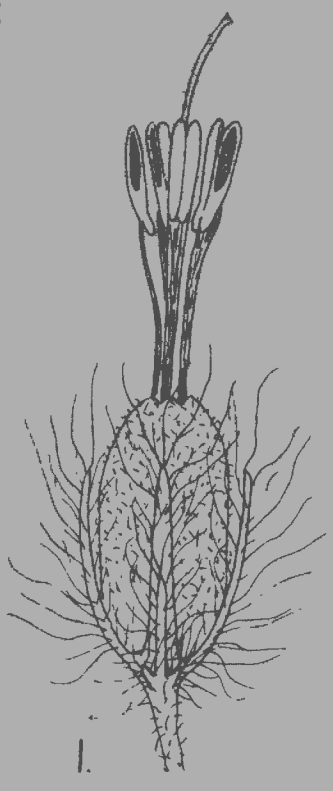
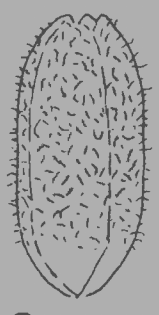


1.

x15



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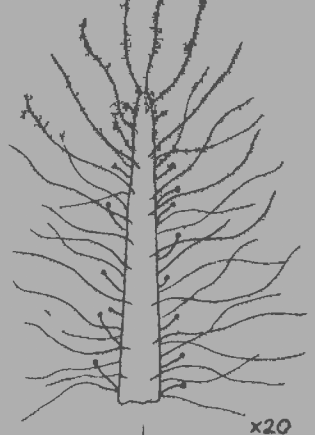
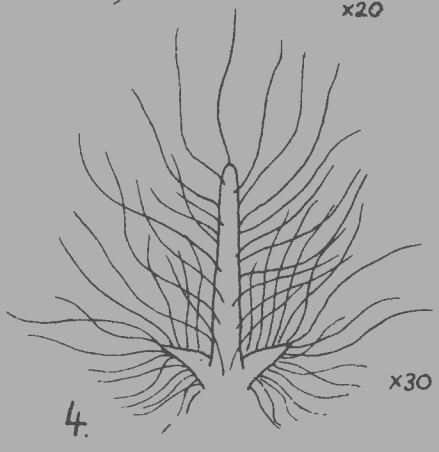


3.

x20



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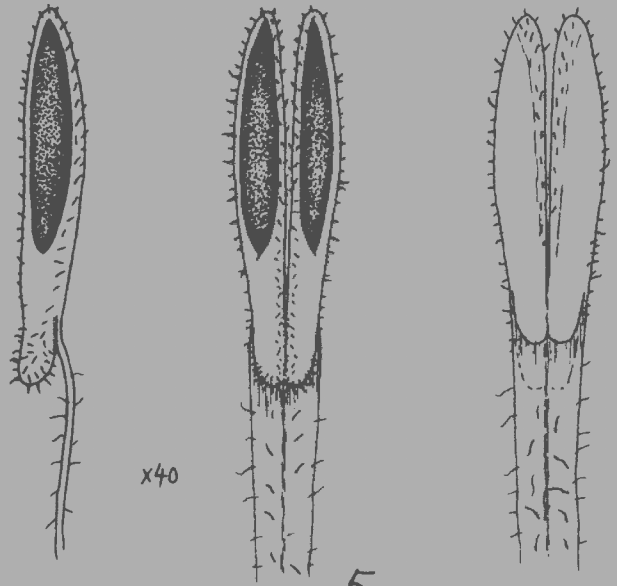
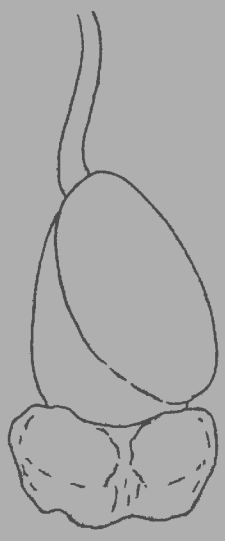
x30



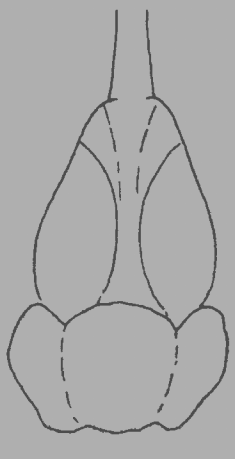
x40

5.



6.

x50



7.

Fig. 18.

11. ACROSTEMON XERANTHEMIFOLIUS (Salisb.) E.G.H.Oliver comb. nov.

Erica xeranthemifolia Salisb. in Trans. Linn. Soc. 6 : 339 (1802).

Blaeria xeranthemifolia (Salisb.) G.Don Gen. Syst. 3 : 805 (1834); Kl. in Linnaea 12 : 246 (1838).

Hexastemon lanatus Kl. in Linnaea 12 : 220 (1838); N.E.Br. in Fl. Cap. 4 : 336 (1909).

Eremia lanata (Kl) Benth. in D.C. Prodr. 7 : 700 (1838).

A lanate prostrate creeping shrublet. Branches moderately stout, more or less divergent, at first white- tomentose, becoming glabrous, the younger branches densely leafy. Leaves 3-nate, densely imbricate, 1.5-2.5mm long, about 0.5mm wide, linear-oblong, obtuse, incurved, glabrous on the upper side, ciliate on the under side and with dense fine white hairs on the margins, with sessile glands on the inner edge. Inflorescences terminal, 1-6 flowered. Peduncles 0.5-1mm long, sparsely ciliate. Bracts 3, adpressed to the calyx, equal or unequal, 2mm long, linear or linear-lanceolate or the middle bract slightly larger and oblanceolate, spathulate, obtuse or acute, all densely fringed with fine white hairs, otherwise glabrous. Calyx divided to the base, segments erect, adhering to the corolla, viscid with sessile glands on the innersurface, 2.5mm long, 1-1.5mm wide, ovate or oblong-ovate, obtuse or acute, densely clothed with long fine white hairs on the margins, with a ciliate area medially between the revolute margins, otherwise glabrous. Corolla 3-3.5mm long, 4-angled, obovoid or elongate-ovoid, inflated at the base, tubular above, shortly 4-lobed, glabrous. Stamens 5, mostly 6. Filaments 3.5-4mm long, linear, glabrous, Anthers far exserted, 1-1.5mm long, linear, narrow, bipartite, dorsifixed near the base, smooth or minutely toothed on the margins, pores elongate, almost equal to the length of the cell. Ovary 2-celled, compressed, ellipsoid, obtuse, glabrous; style 5-9mm long, exserted far beyond the anthers, filiform; stigma simple or minutely capitulate.

Type: Hottentots-Holland, Masson s.n. (BM, holotype).

Variation found in the species of the genus Acrostemon has shown that the genus Hexastemon Kl. cannot be upheld as a genus separate from Acrostemon. This is discussed in the section on the variation and distinction of the genera.

The species was first described in 1802 by Salisbury as Erica xeranthemifolia, basing it on a Masson specimen labelled as having been collected on the Hottentots-Holland Mountains. In 1834 G.Don retained Salisbury's description and name but transferred the species to the genus Blaeria.

In 1838 Klotzsch described two species, the first being Hexastemon lanatus based on an Ecklon & Zeyher specimen, the second, Blaeria xeranthemifolia based on Erica xeranthemifolia Salisb.

In 1838, subsequent to Klotzsch's work, Bentham recognised both of Klotzsch's species as being conspecific and retained the epithet "lanata" but placed the species in his section, Hexastemon, of the genus Eremia G.Don, Eremia lanata (Kl) Benth. which was however a nom. illegit. as the earlier epithet "xeranthemifolia" was available.

In 1909 N.E.Brown retained the species under the name of Hexastemon lanatus Kl. On being removed in this work to the genus Acrostemon, the species must revert to the original epithet of 1802 and become A. xeranthemifolius (Salisb.) E.G.H.Oliver.

A. xeranthemifolius is similar to A. eriocephalus in respect to the habit and the general structure of the flowers. It differs though in a number of characters. The two species can be distinguished by the following characters ;-

	A. xeranthemifolius	A. eriocephalus
1)	Leaves, bracts and calyx lanate on the margins	Leaves, bracts and calyx ciliate over whole surface
2)	Ovary 2-celled	Ovary mostly 1-celled
3)	Corolla glabrous	Corolla puberulous
4)	Stamens 6, sometimes 5	Stamens 4, sometimes 5 or 6
5)	Filaments glabrous	Filaments pilose

From the descriptions of the authors cited under the synonomy of the species, there appears to be some doubt about the validity of the epithet "xeranthemifolius" and the typification of the species. Three points of interest arise from the descriptions.

Firstly, Salisbury desribed the flowers as having only 4 stamens while Brown stated that he found the flowers on Salisbury's type possessed 6 stamens. Most flowers on the herbarium material show 6 stamens with a few having 5.

Secondly, Salisbury described the corolla as being hairy. The other authors, G.Don and Klotzsch, also descr-

ibed the corolla as hairy as they followed Salisbury's description and apparently saw no authentic material. Brown described the corolla as glabrous without making any reference to Salisbury's description, as he stated that he had examined the type. All available material of the species possesses glabrous corollas.

Thirdly Salisbury stated that the type, Masson s.n., came from the Hottentots-Holland Mountains. So far as is known, the species is localised on the dry slopes of the ridge running between Shaw's Mountain and Babylon's Tower near Caledon. Apart from Masson's record, it is not known from the Hottentots-Holland area.

As far as Salisbury's description is concerned, it could reasonably well fit A. eriocephalus which has 3-nate leaves, a lanate calyx, 4 anthers and grows in the Hottentots-Holland area, i.e. on the north side of Sir Lowry's Pass.

However, two characters given by Salisbury do not fit A. eriocephalus, the leaves much incurved and corolla 3.5mm long, but they do fit A. xeranthemifolius.

For the latter species three points of Salisbury's description do not fit, hairy corolla, 4 anthers and the locality.

In his account of his travels Masson stated that he had visited the Hottentots-Holland area on his way to Caledon where he could well have collected A. eriocephalus at Sir Lowry's Pass and later on A. xeranthemifolius on the ridges just south-west of Caledon.

From the above discussion it would seem apparent that Salisbury's type, Masson s.n., was a mixed collection of specimens of both A. eriocephalus and of A. xeranthemifolius, hence the discrepencies in Salisbury's description. However it is surprising that Brown who had examined the type, should not have noticed if the sheet contained a mixed collection. Only an examination of the Masson specimen will clarify this matter.

Specimens examined:

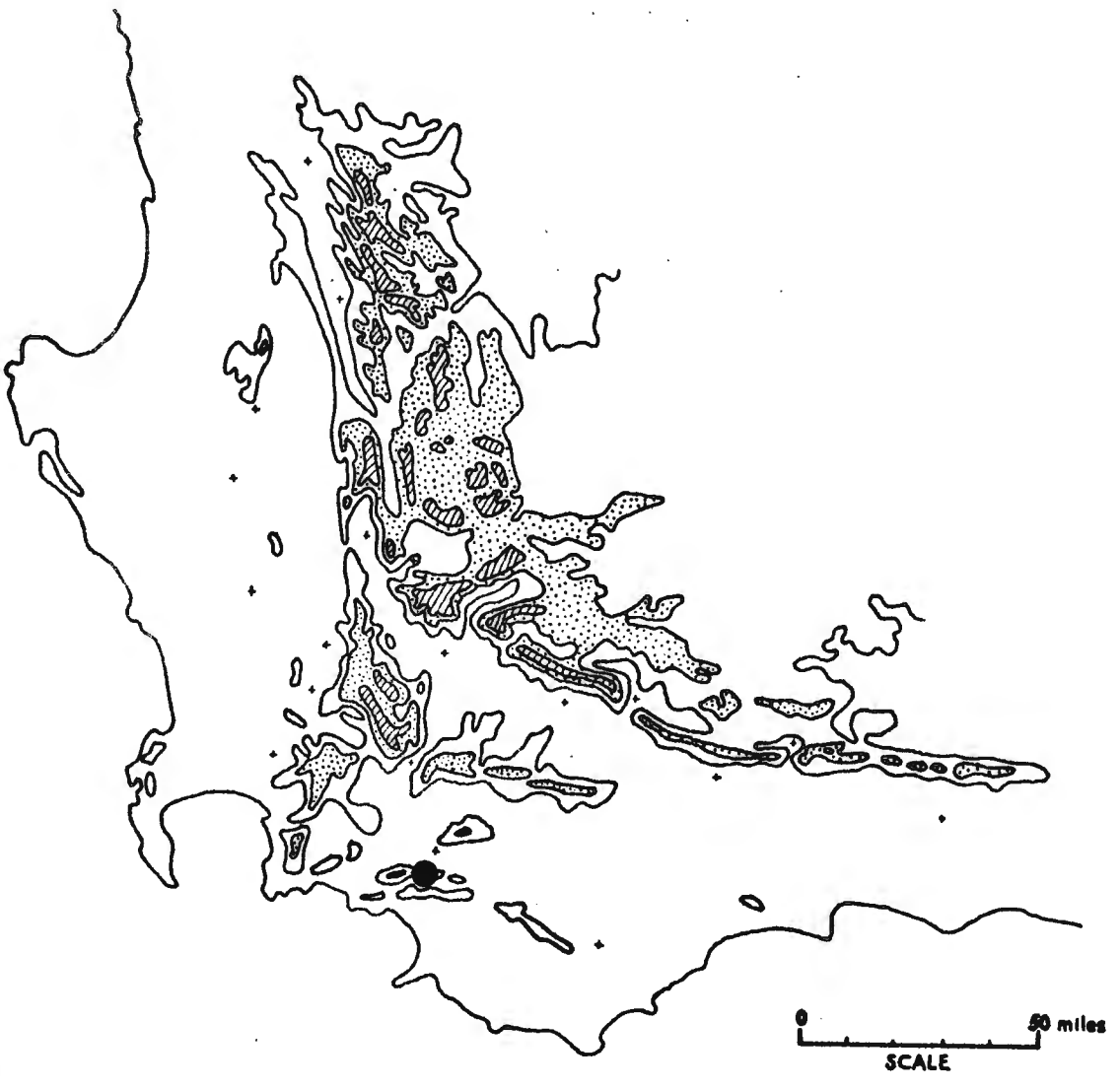
CALEDON: Babylon's Tower, viii, Zeyher 3294 (BOL); Mountain ridges between Babylon's Tower and Caledon, viii, Zeyher 52.8 (BOL); Slopes of Babylon's Tower near Diepgat, viii.1919, L.Guthrie s.n. (BOL 16067); Shaw's Mountain, 1200ft, x.1899, Bolus 9145 (BOL); 24.x.1897, Galpin 3719 (BOL); Stokoe s.n. (BOL, NBG); Shaw's Pass, 3.ix.1962, Van Heerden s.n. (Oliver 1734,

STE); near the top of the pass in sandy places, 2.ix.1963, Oliver 1821 (STE).

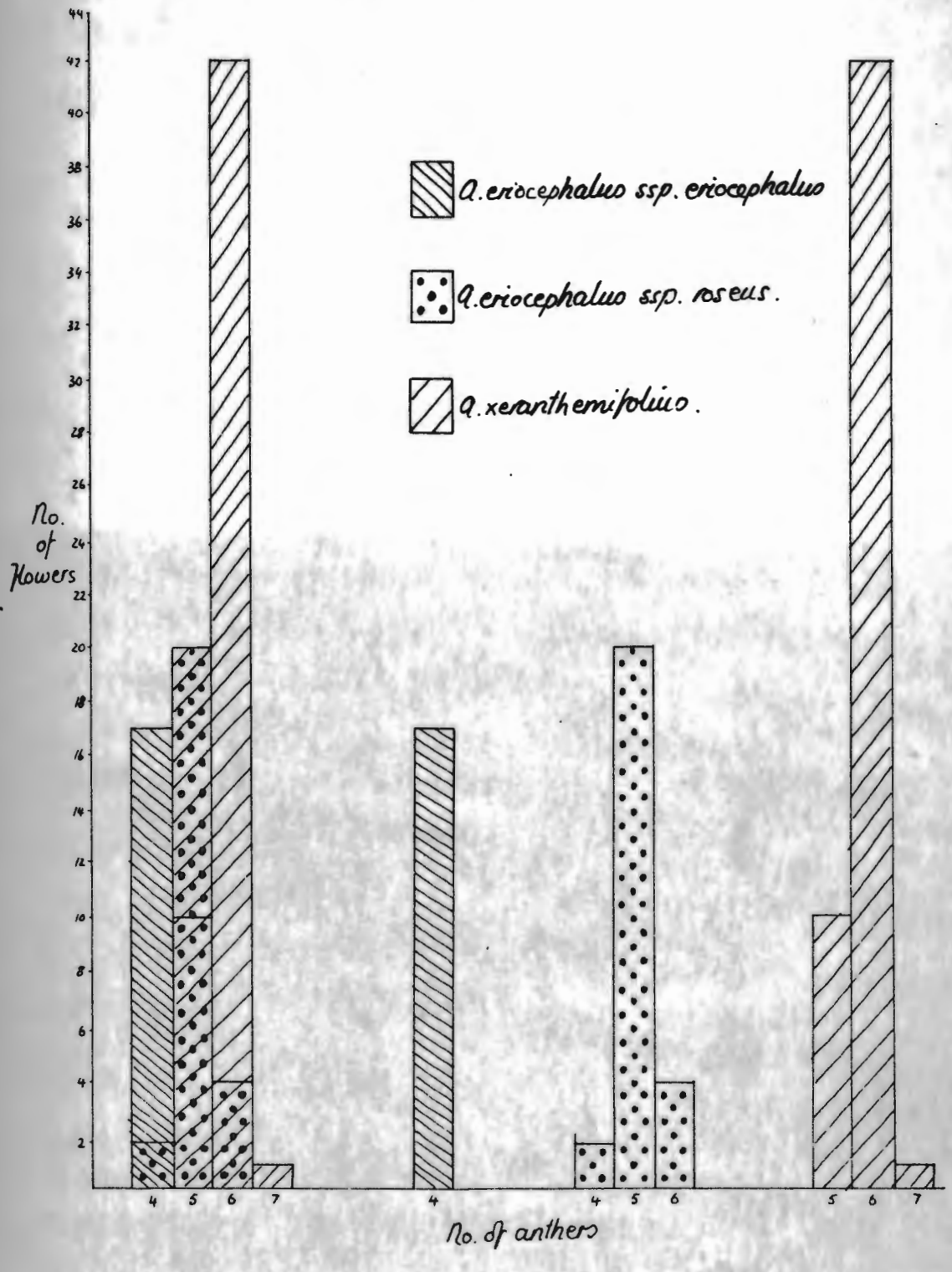
The histogram on the next page shows the variation in the stamen number in the two subspecies of A.eriocephalus compared with the variation in A.xeranthemifolius. The numbers were obtained from Bolus 9145, Stokoe s.n. and Oliver 1821.

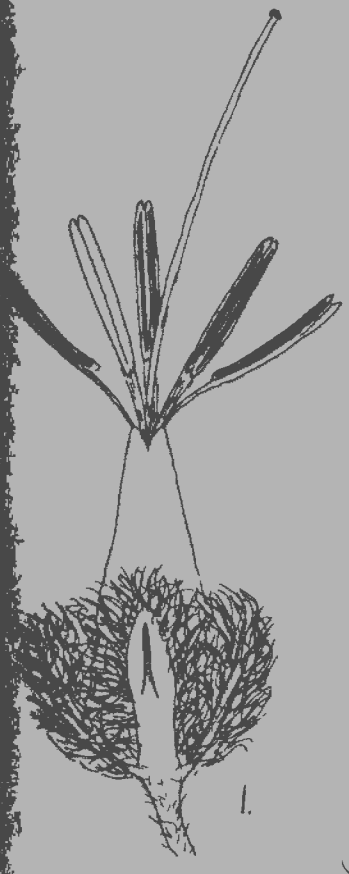
Figure 19.

Oliver 1821; (1) single flower; (2) corolla; (3) lateral bract; (4) middle bract; (5) sepal; (6) leaf; (7) anther (lateral, front and rear views).



Distribution of A. xeranthemifolius.


A. eriocephalus ssp. eriocephalus
A. eriocephalus ssp. roseus.
A. xeranthemifolius.
No. of flowers
No. of anthers



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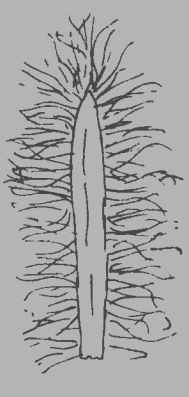
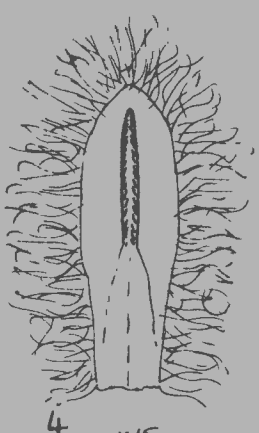
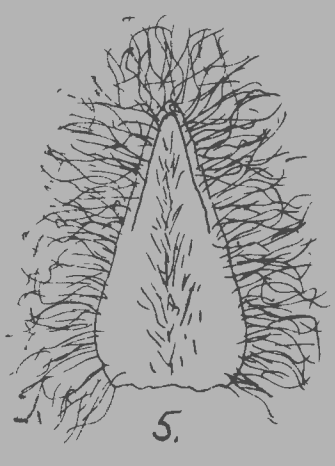
2.



3.



4. x15



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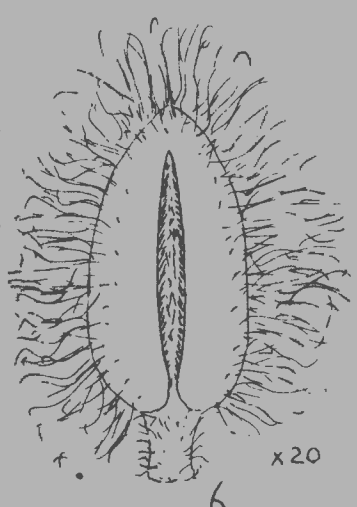
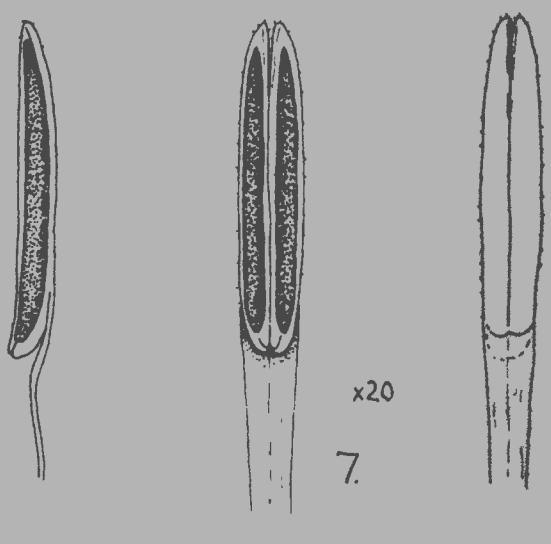


6. x20



7. x20

Fig. 19.

12. ACROSTEMON VISCIDUS N.E. Brown in Flora Cap. 4 : 355 (1909).

Young branchlets pubescent and with spreading minutely gland-tipped hairs, the older branches grey pubescent, usually without gland-tipped hairs. Leaves 3-nate, ascending or somewhat spreading, often shorter than the internodes, 2-4mm long with the petiole, linear, obtuse, the younger pubescent mainly on the upper surface, the older minutely pubescent, ciliate with gland-tipped hairs, viscid. Inflorescences terminal and on short branchlets, 3-6 or more flowered. Peduncles 0.8mm long, bracteate at the apex, puberulous. Bracts 3 unequal, the lateral pair $\frac{1}{2}$-$\frac{3}{4}$ as long as the 1-2mm long middle bract, linear, obtuse or acute, puberulous,and ciliate on the outer surface with stiff gland-tipped hairs. Calyx divided nearly to the base, 1.5- 2mm long, segments linear or linear-lanceolate, acute, puberulous and ciliate with stiff gland-tipped hairs on the back. Corolla 2.5mm long, narrowly ovoid to tubular, sharply 4-angled, minutely puberulous on the outside, lobes minute, rounded and obtuse, erect. Stamens 4,5,6 or 8. Filaments 2mm long, glabrous. Anthers 0.8mm long, partly exserted beyond the corolla, loblong, spurless or rarely with small appendages arising from the top of the filament, minutely toothed on the inner edge, occasionally with a few small hairs at the base of the sells, pores two-thirds the length of the cells. Ovary oblong, 0.5mm long, obtuse or slightly acute, glabrous, occasionally with a few short hairs, 2-celled; style 3mm long, glabrous; stigma capitate.

Type: Ceres flats, 1500ft, i.1892, Guthrie 2181 (BOL, lectotype); Skurfdeberg near Elandsfontein, 4500ft, 18.i.1897, Schlechter 10013 (BOL, PRE, W paratype).

In his treatment of the genus Acrostemon for the Flora Capensis (1909), N.E.Brown described 3 new species, two of which, A. schlechteri and A. viscidus, are retained in the genus in the present work, while the third species, A. concinnus has been referred to the genus Blaeria.

In both cases he cited two syntypes and did not designate holotypes. Lectotypes could however be chosen since material of the type collecting was available to the present author.

Usually N.E. Brown left a determinavit label on the

specimens he saw and cited. This he did in the case of A. viscidus with Schlechter 10013 and Guthrie 2181. As he based his description on both of these specimens, there was no preference for choosing one or the other.

The Guthrie specimen possesses slightly more and better flowers than the Schlechter specimen. Therefore Guthrie 2181 has been chosen as the lectotype despite the fact that neither of the two determined specimens,of Schlechter 10013 and Guthrie 2181 is a particularly good specimen. There is however an excellent duplicate of the Guthrie 2181 with numerous flowers in the Bolus Herbarium.

A. viscidus is a distinct species in the genus, with A. cereris as its most similar species. The two species are peculiar in the genus for having the sepals clothed with stiff gland-tipped hairs instead of the soft simple hairs found in the other species in the genus.

Brown in his type description stated that A. viscidus possessed only 4 anthers. This was in accordance with his concept of the genus which had a constant number of only 4 anthers.

Recent examination of material of A. viscidus collected subsequent to 1909, has revealed that the anther number may vary considerably, from 4 to 8 even on the same plant. This fact, together with the variation in anther number found in other species of Acrostemon, A. eriocephalus and A. xeranthemifolius, has had important effects on the redefining of the genus.

Two other characters, which have not before been recorded in this species, were found.

The first was quite contrary to the diagnostic characters of the genus Acrostemon in which all the species were regarded as possessing pendulous ovules. Several specimens of A. viscidus were found to have distinctly basal, erect ovules. This point had an important bearing on the placing of the following species, A. cereris, in Acrostemon.

The second character which had not been recorded before had a similar effect. The corolla lobes of several specimens of A. viscidus were found to possess a few small sessile glands on the margins, a character also found in A. cereris.

The anthers of several specimens of the species were

seen to possess minute awns similar to those found in A.cereris.

In its distribution A. viscidus is isolated from the remaining species of the genus. It is confined to the Bokkeveld region in the vicinity of and north of Ceres. The single collecting, Schlechter 384, is of interest as it is the only record of the species out of the Ceres Bokkeveld.

The species is found on the lower mountain slopes in sandy areas which are likely to be wet in winter . However it seems that these areas become hot and dry late in the summer but only after the plants have flowered.

So far the species is known to occur in the region on the Karroo side of the Witsenberg Range, but it has not yet been recorded in the Cedarberg where, in the present author's opinion, identical habitats appear to exist. It does however extend to the edge of the southern Cedarberg at Elandskloof (Leipoldt 3359).

An interesting gap in its distribution occurs between the Gydoberg and the Roodeberg in the Matroosberg series, where it partly circumvents the distribution area of A. cereris.

Specimens examined:

CERES: Ceres flats, 1500ft, i.1892, Guthrie 2181 (BOL); Schurfteberg near Elandsfontein, 4500ft, 18.i.1897,(BOL, Schlechter 10013 (BOL, PRE, W); 3.xii.1963, Oliver 1567 (STE); Hansiesberg, 17,xii.1944, Compton 16693 (NBG); Schurfteberg Pass, 25.xii.1946, Esterhuysen 13369 (BOL); 10.x.1963, Oliver 1562,(STE); Gydoberg, 10.xi.1946, Leighton 2248 (BOL); 10.xi.1946, Compton 18727 (NBG); East base of Witsenberg, 26.xii.1941, Pillans 9620 (BOL); Visgat, between Schurfteberg and Great Winterhoek Mountains, x.1953, Stokoe s.n. (SAM 63943); Mostertsberg, 2000ft, 31.i.1892, Schlechter 384 (NBG); South-east slopes of Bokkeveld Tafelberg, 8.xii.1940, Esterhuysen 3895 (BOL, NBG); 3500ft, 8,xii.1940, Bond 696 (NBG); deKeur, 11.xi. 1946, Compton 18787 (NBG); Flats south-east of Bokkeveld Tafelberg, 4.xii.1963, Oliver 1583 (STE); Heiveldsberg, 5500ft, 30.xii.1963, Oliver 1608 (STE); Flats at Rosendal, 29.xii.1963, Oliver 1592 (STE); Lower east slopes of Schoongesicht, 31.xii.1963, Oliver 1625 (STE);

Between the Grootrivier and Elandskloof, x.1939, Leipoldt 3359 (BOL, NBG); In a kloof at the Ski Club Hut on the Roodeberg, i.1940, Esterhuysen 5026 (BOL).

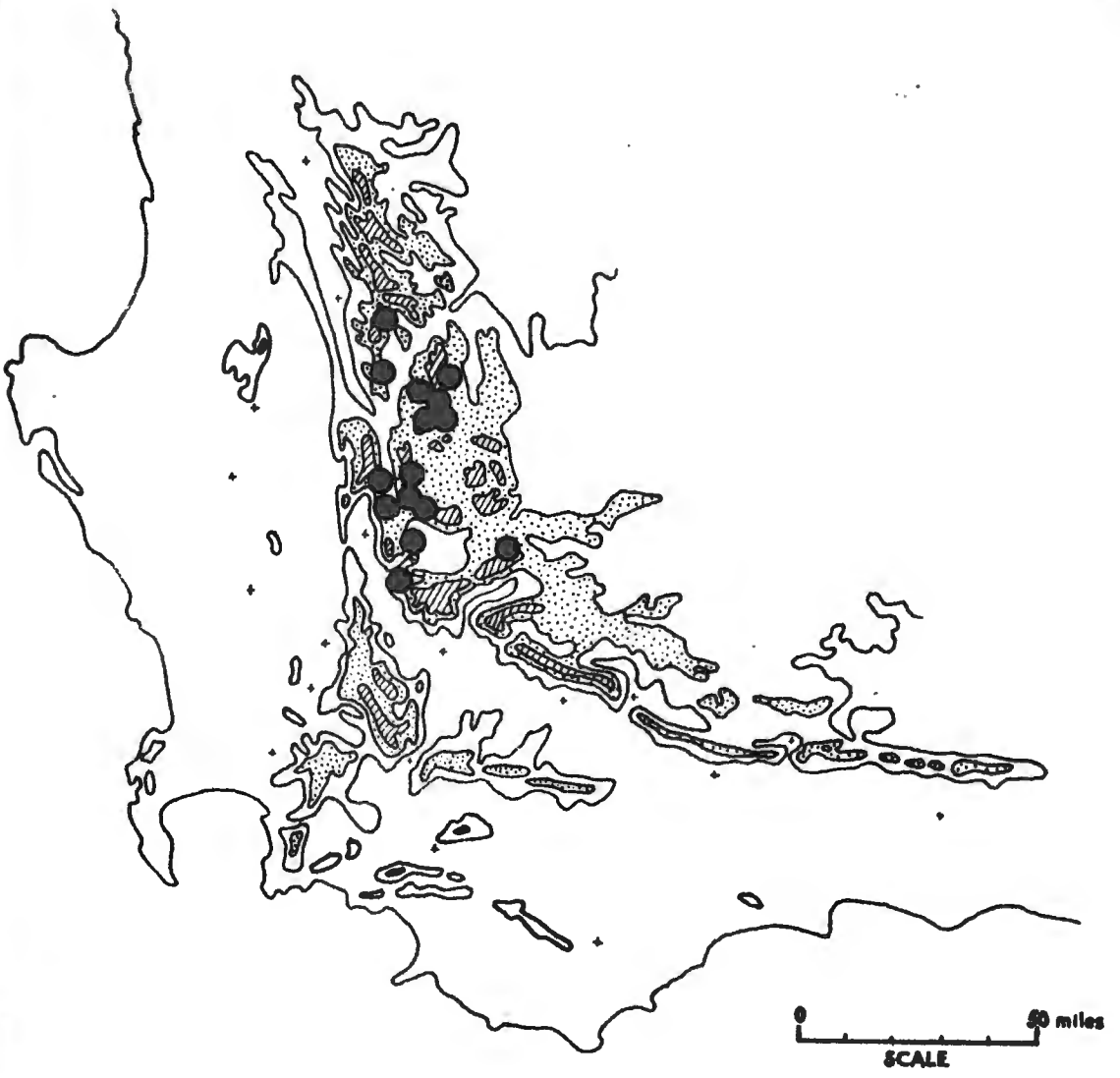
Figure 20.

Schlechter 10013, paratype; (a) muticous anther, (b) section of ovary showing subbasal erect ovules; Oliver 1562; (c) muticous anther, (d) anther with one small appendage (rear view), (e & f) sections of two ovaries showing subbasal erect ovules, (g) corolla lobes showing sessile glands on the margins; Esterhuysen 3026; (h & i) corolla lobes showing subsessile glands on the margins; Pillans 9620; (j) anther with two appendages

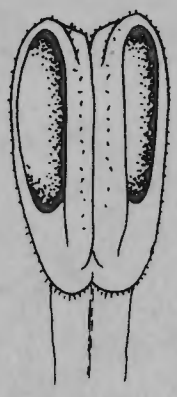
Figure 21.

Schlechter 10013; (1) single flower, (2) corolla, (3) sepal, (4) 3 bracts, (5) gynaecium, (6) anther (lateral, front & rear views).

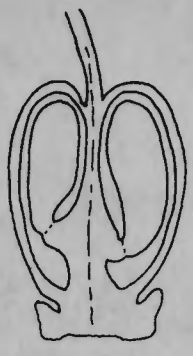
The characters of several specimens examined are shown in the tables at the end of the section on A.cereris. The histogram showing the range of anther number in the two species, A. viscidus and A. cereris, has been compiled from the numbers contained in the tables.



Distribution of A. viscidus.



a



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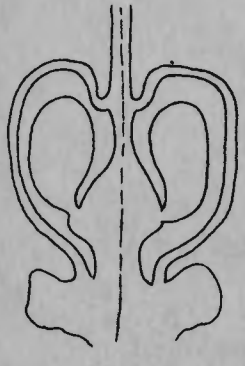
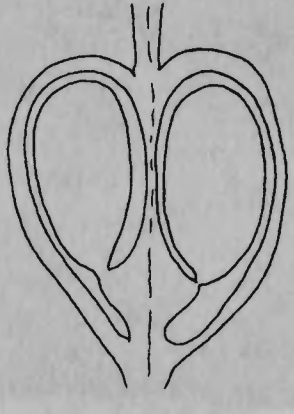


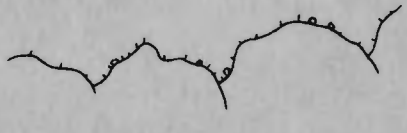
c

d

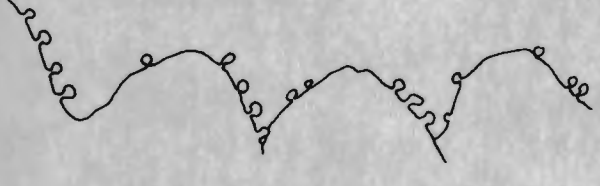
e



f



g



h

i

j

Fig. 20.

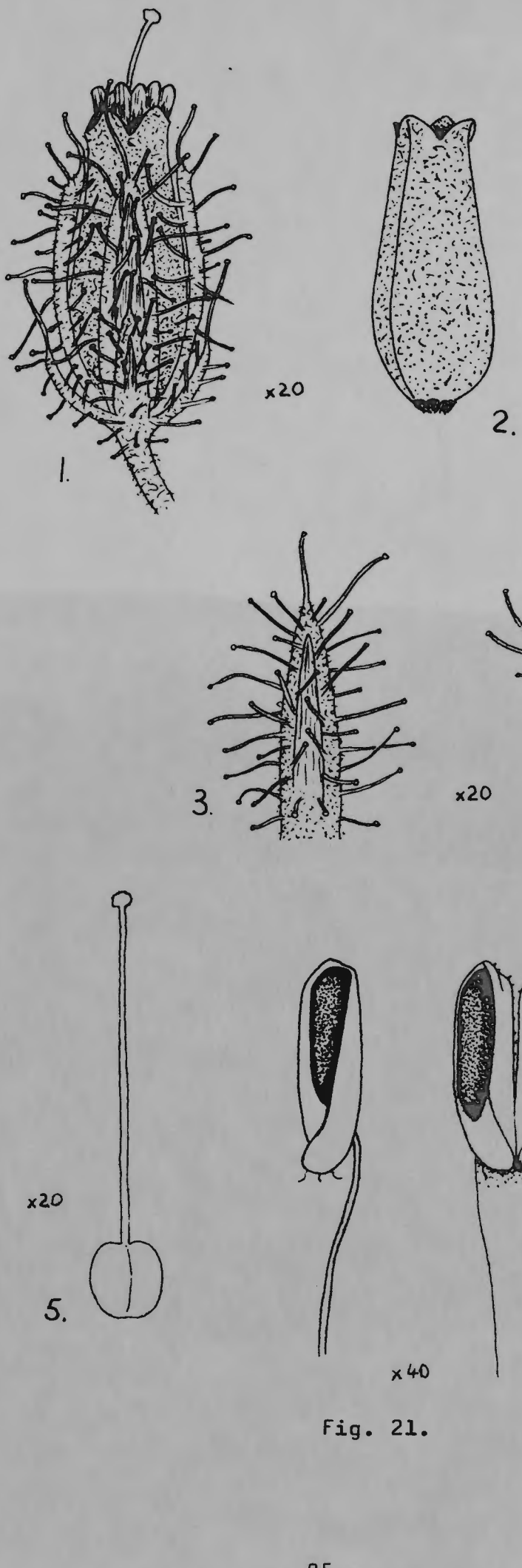


Fig. 21.

13. ACROSTEMON CERERIS (Compton) E.G.H.Oliver comb. nov.
Arachnocalyx cereris Compton in J. S. Afr. Bot. 9 : 143 (1934).

Erect shrublet. Branches rigid, finely pubescent when young, naked when old, intermingled with stiff gland-tipped hairs. Leaves 3-nate, suberect or slightly spreading, 3-6mm long with the petiole, 0.8-1mm wide, linear, convex below, flat above, sulcate, lanceolate, straight or slightly incurved, acute, finely pubescent and ciliate with stiff gland-tipped hairs, becoming more or less glabrous. Inflorescences terminal, globose, 6-10 flowered. Peduncles bracts and calyx reddish, finely pubescent, ciliate with long white rather stiff hairs sometimes tipped by a small gland, intermingled with a few short glandular hairs. Peduncles 2.5-3mm long. Bracts 3, approximate, unequal, linear, lanceolate, the middle one 1.5-2mm long, the lateral bracts 1-1.5mm long. Calyx divided to the base, segments linear-lanceolate, acute, sulcate towards the apex, 2.5mm long and 0.5mm wide. Corolla densely and minutely puberulous, inflated, ovoid, 4mm long and 2mm wide, lobes erect obtuse or sometimes indented at the apex, with small sessile glands on the margins towards the interstices. Stamens 6, 7 or 8. Filaments straight, flat, 4mm long. Anthers shortly exserted, dorsally fixed near the base, oblong, obtise, 1mm long, aristate on the expanded portion of the filament, spreading or decurrent, the anthers and awns minutely toothed on the edges. Ovary 2-celled, subquadrate, obtuse, sparsely pubescent on the top, ovules subbasal and erect; style far exserted, glabrous filiform, 3mm long; stigma simple or slightly capitate.

Type: Ceres Wild Flower Show, 2.x.1933, Compton 4424 (BOL, holotype).

In 1934 Compton described the new genus, Arachnocalyx, with a single species, Arachnocalyx cereris, from a specimen, Compton 4424, obtained at the Ceres Wild Flower Show.

Presumably through the use of Brown's key of 1909, Compton must have come to the decision that his specimen should be placed in the genus Hexastemon Kl. because it possessed 6, 7 and 8 stamens.

Unknown to N.E. Brown and presumably also to Compton, A. viscidus is now known to have 4,5,6 or 8 stamens. If this fact had been included in Brown's key, Compton would

have undoubtedly found that his specimen could be placed in the genus Acrostemon.

In the type description Compton referred to affinities of Arachnocalyx with Hexastemon Kl., Grisebachia Kl. and with Eremia G.Don, but did not mention any relationship with Acrostemon which is the most similar genus.

Compton must have been unfamiliar with A.viscidus, otherwise he would have noticed the striking similarity of his specimen to A. viscidus. He first collected material of A. viscidus in 1944 while he described Arachnocalyx in 1934.

The similarity between Arachnocalyx cereris and A. viscidus is shown by the misidentification of several specimens of the former species as A. viscidus in various herbaria.

Compton stated that his specimen did not fit well into any of the established genera of the Ericaceae. He placed emphasis on the peculiar position of the ovules which were subbasal and erect, a character not found in any genus in the Ericoideae in South Africa. He stated that it would be best to create a new genus rather than try to force it into any existing genus.

While investigating preserved material of A. viscidus, Oliver 1562, it was found that all the ovaries contained erect subbasal ovules identical to those of Arachnocalyx cereris. Arachnocalyx could not therefore be separated off from Acrostemon on this character alone.

As Arachnocalyx cereris closely resembled A. viscidus and as there were no definite characters on which it could be retained as a separate monotypic genus, it was decided to place the single species under Acrostemon with A.viscidus the most similar species.

The similarity between the two species was so close that they were examined in detail to ascertain whether they could be retained as separate species.

The following characters were found after examination to be effective in distinguishing A. cereris from A.viscidus :-

(1) the flower heads are larger and more globose in A.cereris;

(2) the calyx and bracts possess hairs that are longer and less rigid and have fewer glands than in A. viscidus;

(3) the anthers in A.cereris possess small spreading or slightly decurrent awns;

(4) the stigma is truncate to slightly swollen in A.cereris.

The characters of the specimens examined are shown in the tables on the following pages. The histogram showing the range of anther number in the two species, A. viscidus and A.cereris, has been compiled from the numbers obtained from the tables.

Specimens examined:

CERES: Ceres Wild Flower Show from the Ceres Division, 2.x.1933, Compton 4424 (BOL); Plateau at the foot of Shale Peaks, Hex River Mountains, north slopes, 3000ft, 16.xii.1957, Esterhuysen 27454 (BOL); Vlakte on the Shale Peaks, 5000ft,26.xii.1942, Esterhuysen 8489 (BOL); Conical Peak, xii.1940, Stokoe 7687 (BOL); Vlakte on north side of Milner Peak, 4600ft, 14.xii.1948, Esterhuysen 14944 (BOL); Lower slopes of Schurfteberg, easr of Bertsberg, 8.x.1953, Esterhuysen 21875 (BOL).

Figure 22.

Esterhuysen 21875; (1) sections of ovaries showing the subbasal erect ovules; (2) sepal (inner surface); (3) 3 Bracts.

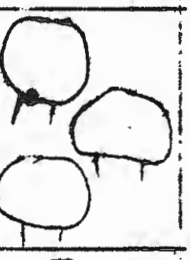
Figure 23.

Compton 4424, holotype; Facsimile of the type drawing by W.F. Barker from J. S. Afr. Bot 9 : 143 (1934).

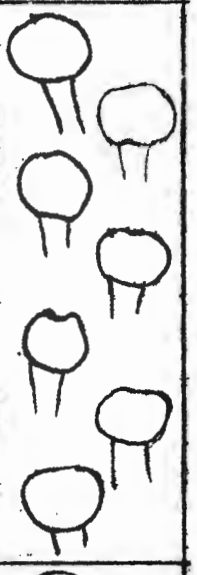
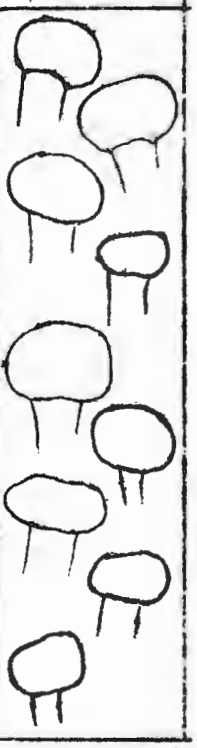
Figure 24.

Compton 4424, holotype; (1) single flower; (2) corolla; (3) corolla lobes showing the subsessile glands on the margins; (4) sepal; (5) middle bract; (6) position of the 3 bracts; (7) gynaecium; (8) anther, (lateral, front and rear views).

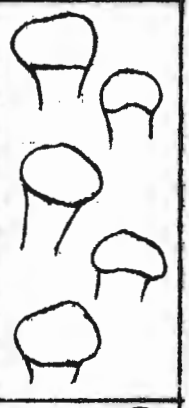
Acrostemon viscidus

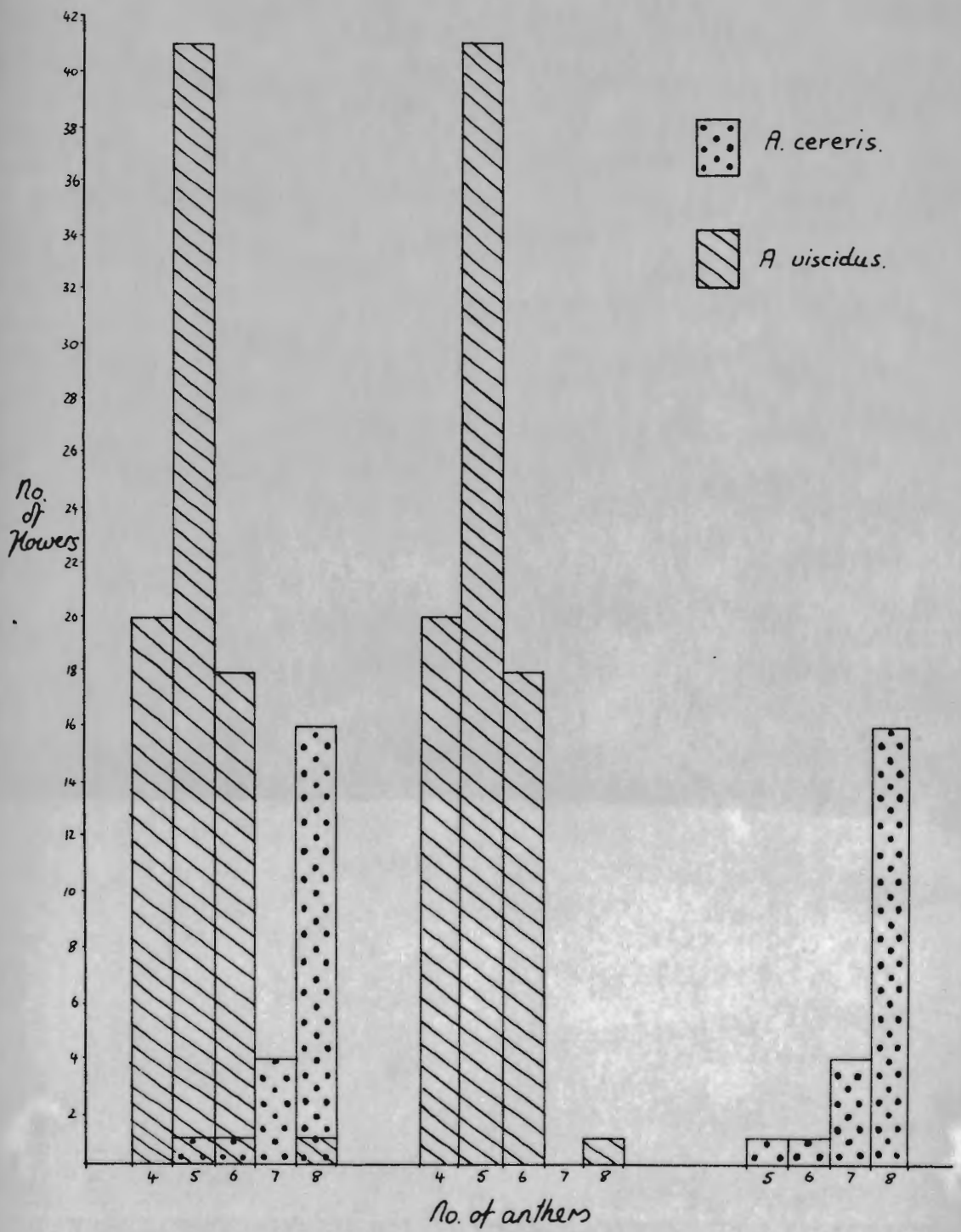
SPECIMEN	CALYX	COROLLA	GLANDS	ANTHERS	STIGMA
Schlechter 10013 paratype	¾	2¾ 1¼	1	5 0	
	¾	2¾ 1	1	4 0	
	¾	2¾ 1¼	1	4 0	
	¾	2¾ 1¼	1	5 0	
	¾	3 1¼	1	5 0	
Leighton 2248	¾	2¾ 1¼	1	6 0	
	1	2¾ 1¼	1	4 0	
	¾	3 1½	0	4 0	
	¾	3 1½	0	4 0	
	¾	2¾ 1¼	1	5 0	
	¾	3 1½	1	4 0	
Pillans 9620	2/3	3 1¼	2	4 Ø	
	2/3	3 1¼	2	5 X	
	2/3	3 1¼	2	6 X	
	½	3 1½	2	6 Ø	
Esterhuysen 3026	2/3	2¾ 1	0	4 0	
	½	2¾ 1¼	0	4 0	
	½	2¾ 1¼	0	4 0	
Schlechter 384	½	2½ 1¼	0	4 0	
	2/3	2¾ 1¼	0	5 0	
	½	2½ 1¼	0	4 0	
	½	2¼ 1	0	4 0	

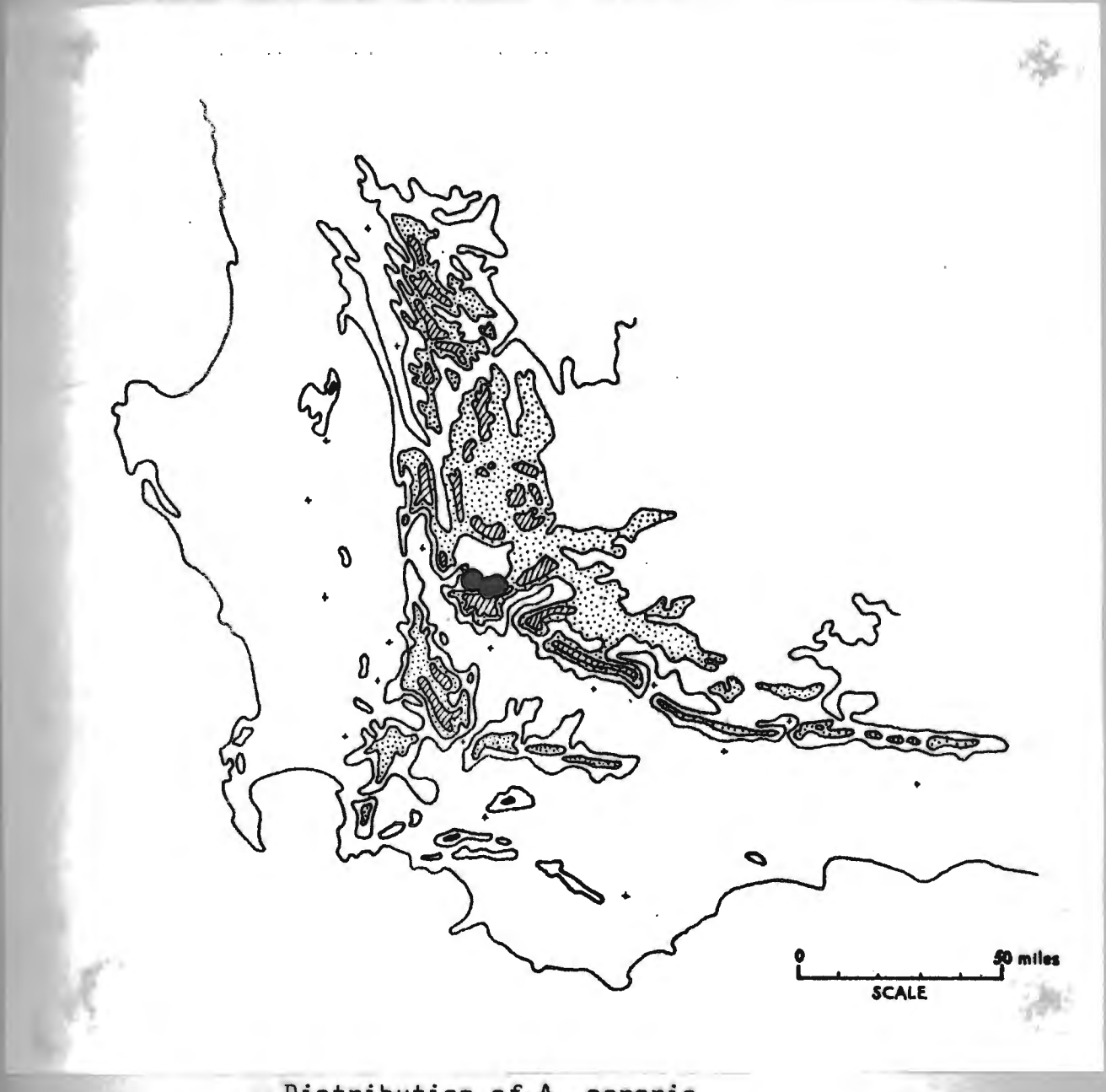
Acrostemon viscidus

SPECIMEN	CALYX	COROLLA	GLANDS	ANTHERS	STIGMA
Leipoldt 3359	2/3	3 1½	0	4 0	
	2/3	2½ 1½	0	5 0	
	2/3	3¼ 1½	0	4 0	
	¾	3¼ 1½	0	5 0	
	¾	3 1½	0	6 0	
	¾	3 1½	0	5 0	
	¾	3¼ 1½	1	5 0	
Stokoe s.n. (SAM 55316)	2/3	2½ 1½	1	5 0	
	2/3	2½ 1¼	1	5 0	
	2/3	2½ 1¼	1	5 Ø	
	2/3	2½ 1¼	1	5 0	
	2/3	2½ 1¼	1	6 Ø	
Oliver 1835	¾	2½ 1½	0	5 0	
	¾	2½ 1½	2	5 0	
	¾	2½ 1½	1	6 Ø	
	¾	2½ 1½	0	6 0	
	¾	2½ 1½	0	5 Ø	
	¾	2½ 1½	1	6 X	
	¾	2½ 1½	1	4 0	
	¾	2½ 1½	2	6 X	
	¾	2½ 1½	1	5 0	

Acrostemon cereris

SPECIMEN	CALYX	COROLLA	GLANDS	ANTHERS	STIGMA
Compton 4424 holotype	2/3	3½ 1¾	2	5 X	
	½	3¾ 2	2	7 X	
	½	3½ 2	2	6 X	
	2/3	3¾ 2	2	7 X	
	½	3¾ 2	2	7 X	
Stokoe s.n. (SAM 55315)	2/3	3½ 1¾	1	8 X	
	2/3	3½ 2¼	1	8 X	
	½	3 1¾	0	8 X	
	½	3¼ 2	1	8 X	
	2/3	3½ 2	2	8 X	
Esterhuysen 20349	½	3 1	2	8 X	
	½	2½ 2	2	8 X	
	½	3 1¾	2	8 X	
	2/3	3¼ 1¾	1	8 X	
	½	3 2	2	8 X	
	½	3 1¾	2	8 X	
Esterhuysen 21875	¾	3 2½	0	7 X	
	¾	3 2¼	1	8 X	
	¾	3 2¼	2	8 X	
	2/3	3¼ 2¼	2	8 X	
	2/3	3¼ 2½	2	8 X	
	2/3	3 2½	2	8 X	


A. cereris.
A viscidus.
No. of flowers
No. of anthers
42
40
38
36
34
32
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
4 5 6 7 8
4 5 6 7 8
5 6 7 8



Distribution of A. cereris.

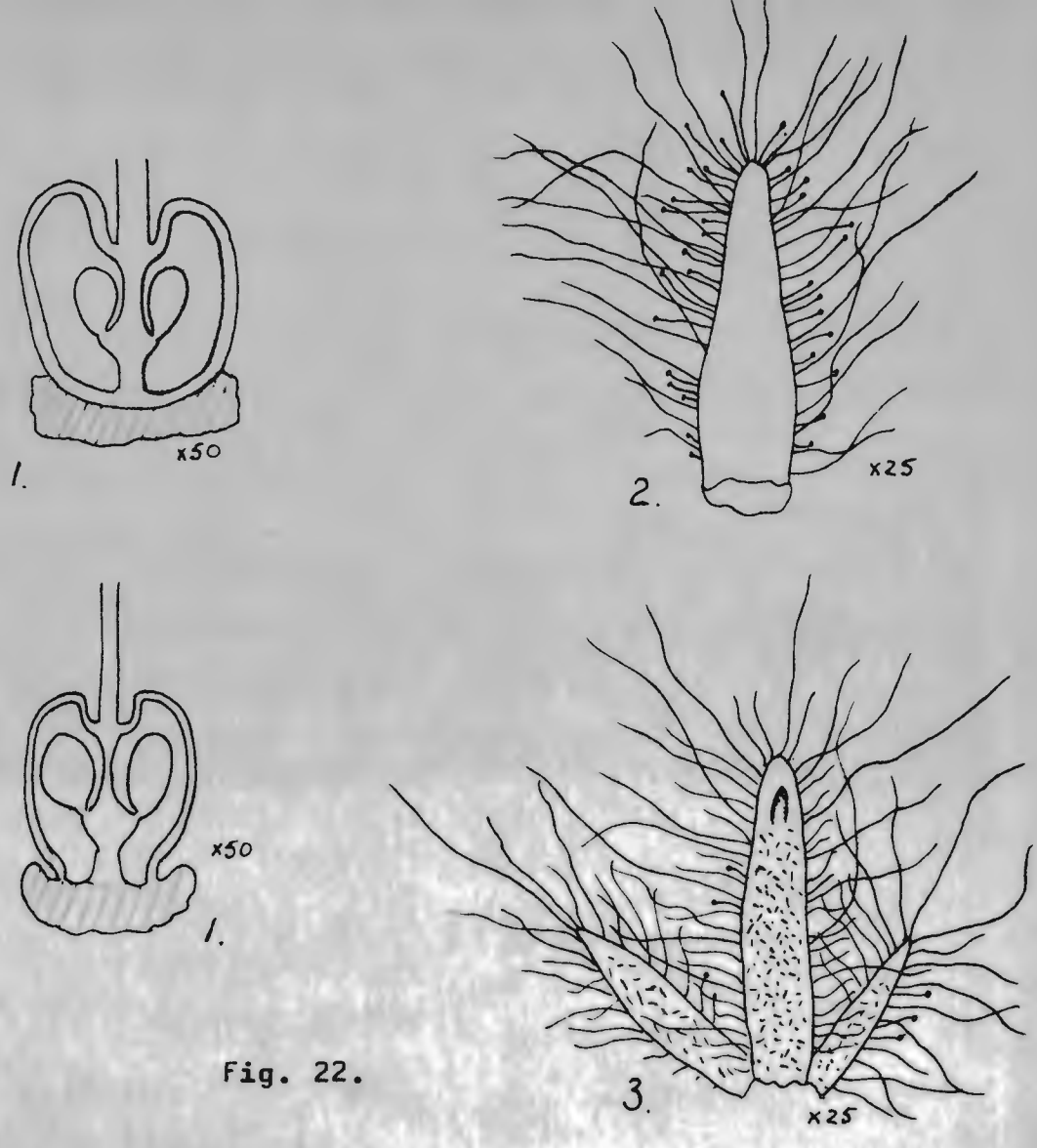


Fig. 22.

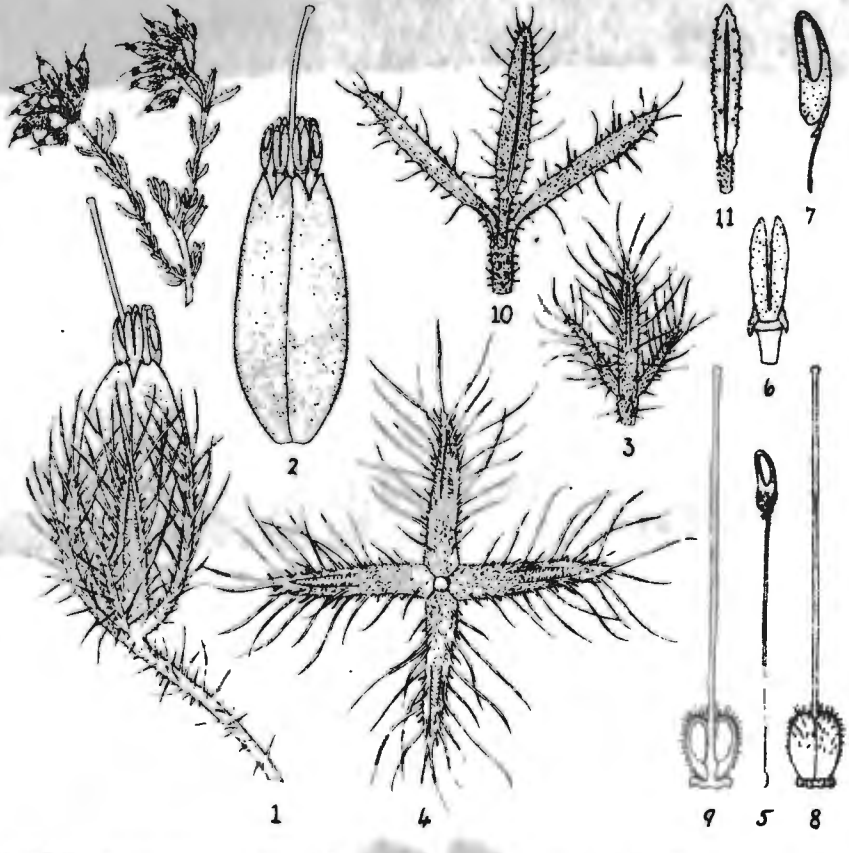


FIG 23 *Arachnocalyx Ceresia* Compton. (Natural size.) 1. Flower × 9. 2. Corolla × 9. 3. Bracts × 9. 4. Calyx, basal view × 9. 5. Stamen × 9. 6. Anther, back view × 18. 7. Anther, side view × 18. 8. Gynaecium × 9. 9. Longitudinal section of gynaecium × 9. 10. Whorl of leaves × 4½. 11. Old leaf × 4½. (*Compton* 4424.) *Del.* W. F. Barker.

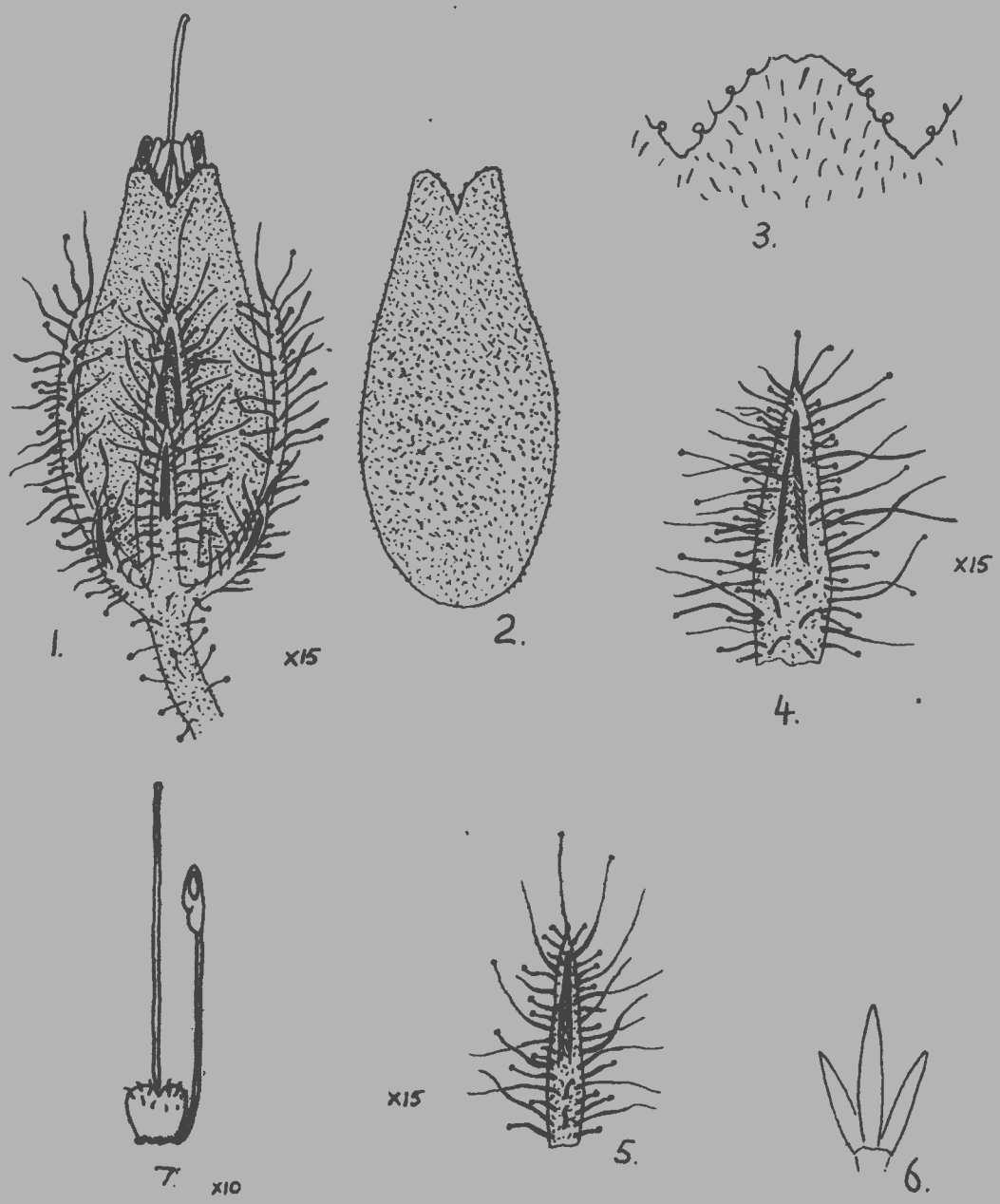


Fig. 24.

BLAERIA CONCINNA (N.E.Br.) E.G.H. Oliver comb. nov.

Acrostemon concinnus N.E.Br. in Fl. Cap. 4 : 351 (1909).

Branchlets pubescent or finely pilose with more or less deflexed hairs. Leaves 4-nate or on lateral flowering branchlets sometimes 3-nate, erect, slightly incurved, 2-3¼mm long with the petiole, linear, obtuse, tuberculate-rugose on the back, thinly pilose with fine white hairs, when young with subsessile glands on the margins. Inflorescences globose, 6-18 flowered. Peduncles bracteate at the apex, pilose, 1-2mm long. Bracts loosely embracing the calyx, 1½-2mm long, the lateral pair equal to or slightly shorter than the middle bract, linear and slightly enlarging upwards, pilose with long white hairs, with subsessile glands on the margins, clammy. Calyx divided almost to the base, thence tapering to the acute apex, ciliate with long white hairs and with subsessile glands on the margins, with a few hairs on the back, clammy. Corolla tubular, distinctly 4-angled, glabrous 3mm long and 1mm wide, lobes erect, about ½mm long, broadly ovate, obtuse. Stamens 4. Filaments glabrous, 2-2½mm long. Anthers half exserted, with decurrent spurs at the base, smooth, minutely toothed on the inner margins of the cells, 1½mm long, pores more than half the length of the cell, spurs subbulate, about one sixth as long as the cells, parallel or slightly incurved towards the filament. Ovary oblong, 4-angled and 4-celled (sometimes by abortion 3-angled and 3-celled), ¾mm long, ovules 2 or more per cell, style much exserted, glabrous, 4mm long, stigma simple.

Type: Swartberg near Caledon, i.1901, Bodkin s.n. (BOL 9228, holotype; PRE isotype.)

N.E. Brown in Flora Capensis erroneously placed this species under the genus Acrostemon. As he did not state the ovule number in the type description, one must assume that he presumed it to be one ovule per cell characteristic of the genus.

Examination of the ovaries of several flowers of the type collection has shown that there are definitely two or more ovules per cell, a character which places the species in the genus Blaeria L. (cf. page 109).

N.E. Brown could not have examined the specimen very

thoroughly. This is surprising as private communications with several people, Levyns, L. Bolus, Compton, Pillans and Salter, have revealed that N.E. Brown was a careful and meticulous observer.

He may, however, have observed one or two flowers with ovaries having single ovules. This could be possible on the grounds of the ovary variation so far found by the present author in the genus Acrostemon. Without examining all the flowers of the type, nothing can be said at this stage about any variations in the ovary of this species.

As only the type exists, a search will have to be made in the future, to gather material for examination of the ovary for any variation which may provide further evidence which will require a revision of the delimitation of the Minor Genera.

The species is apparently endemic to the Swartberg near Caledon.

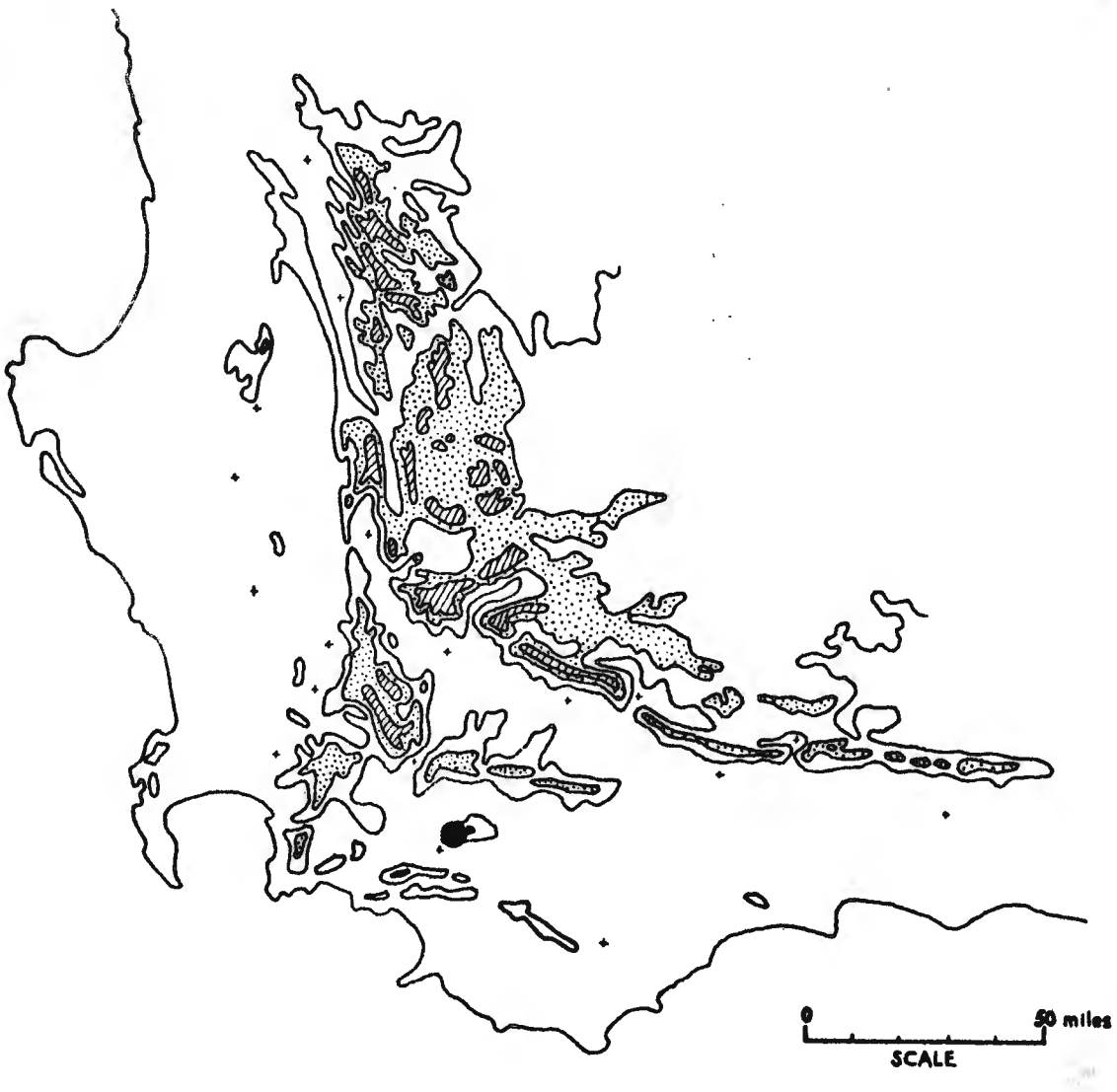
It is of interest to note that on the type, Bodkin s.n. Bolus wrote "cf. Bolus 8098". According to his herbarium register, this Bolus 8098 appears to be a species of the genus Simocheilus which he collected on "mountain slopes west of Swellendam, 800ft, 6.iv.1887". No specimen of Bolus 8098 has as yet, been located and it may only prove to be an erroneous comparison. The Bodkin specimen was first identified as a species of Simocheilus presumably by Bolus.

Specimens examined:

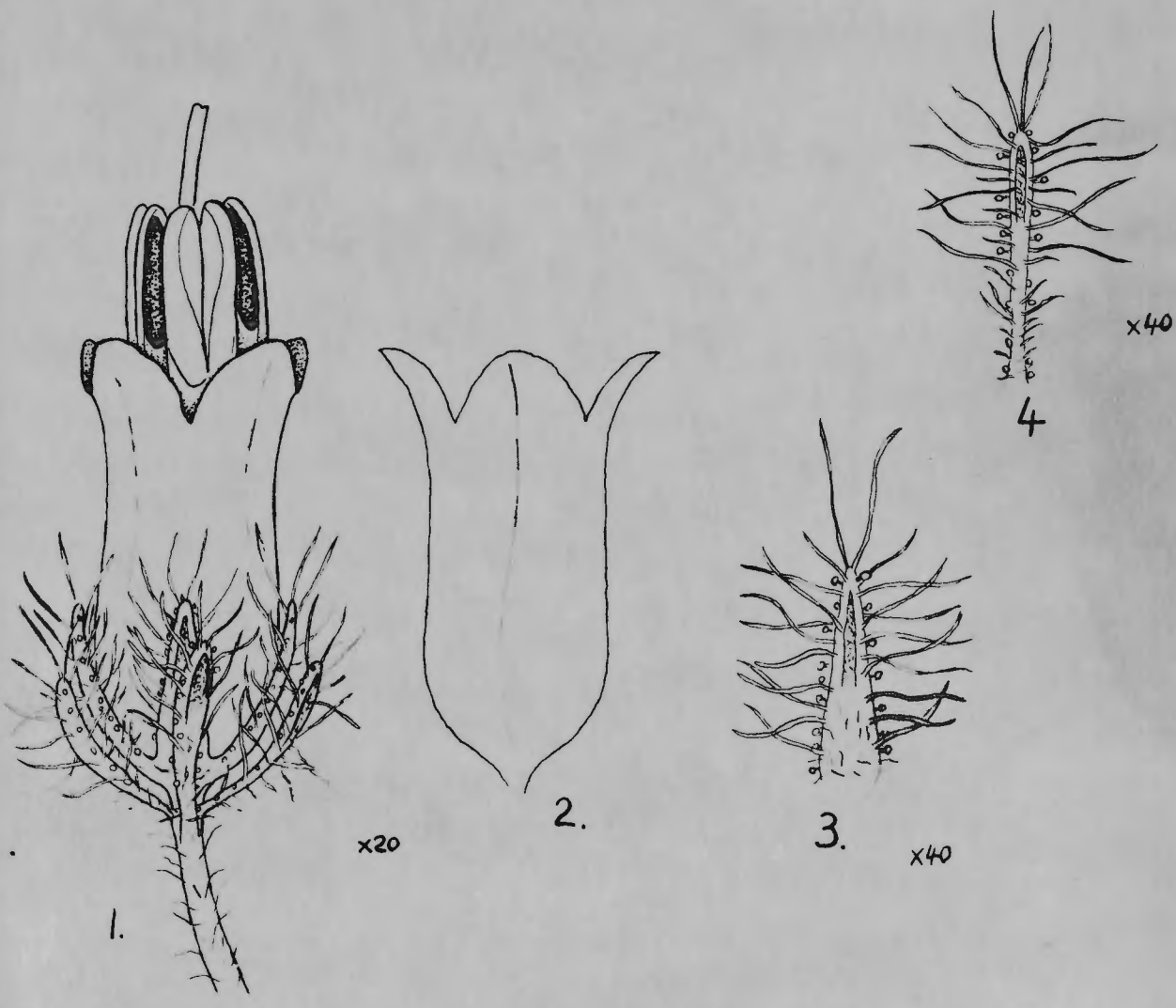
CALEDON: Swartberg, i.1901, Bodkin s.n. (BOL, PRE).

Figure 25.

Bodkin s.n. (BOL 9228); (1) single flower; (2) corolla; (3) sepal; (4) bract; (5) anther (front, rear and lateral views).



Distribution of Blaeria concinna.



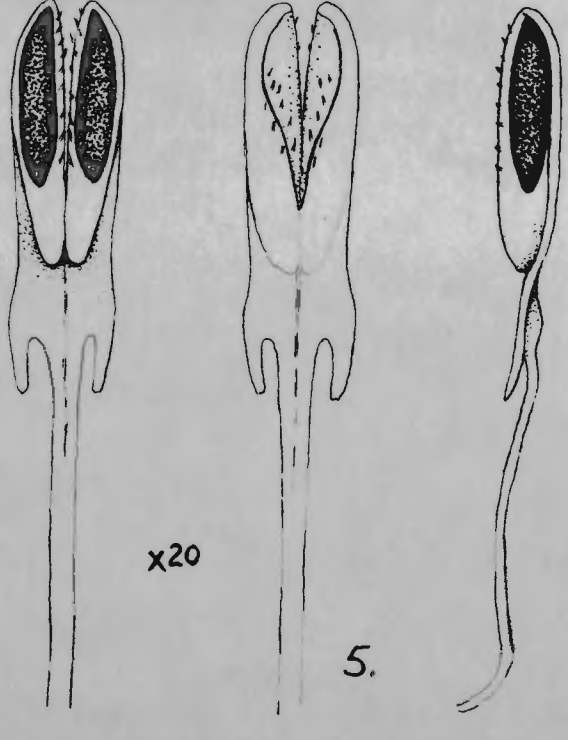


Fig. 25.

SIMOCHEILUS FOURCADEI (L. Guthrie) E.G.H. Oliver comb. nov,

Acrostemon fourcadei L. Guthrie in Ann. Bol. Herb. 4 : 22 (1925).

Shrublets erect, much branched. Branches erect, white-tomentose. Leaves 3-nate. erect, lanceolate-obtuse, flat above, convex below, narrowly sulcate, 1-2mm long, glabrous, with scabrid margins, the younger with ciliate apex and glands on the margins. Inflorescences terminal on short lateral branchlets, 2-6 flowered. Peduncles very short, puberulous. Bracts 3, approximate, adpressed to the calyx, pubescent to ciliate, with glandular margins, almost equal, ½mm long. Calyx 4-angled, lobed to halfway down, ciliate on the margins, sometimes with a puberulent patch between the angles of the tube, puberulous on the angles, sometimes with glandular margins, 1mm long. Corolla slightly exceeding the calyx, tubular , glabrous, ½mm wide, lobes short, erect, obtuse, broad. Stamens 4. Filaments filiform, glabrous, 2mm long. Anthers soon deciduous, exserted, subterminal, 2mm long, ½mm wide, spurless or with small decurrent awns from the top of the filament, pores small. Ovary 2-celled or by abortion 1-celled, elongate obovate, compressed with the upperhalf puberulous, 1mm long, style exserted, filiform, 2½mm long, with a swelling at the base, stigma funnel-shaped, about ½mm in diameter.

Type: Top of the pass between Avontuur and Uniondale, 3500 ft, iii.1922, Fourcade 2093a (BOL holotype; K isotype).

Originally this species was placed in the genus Acrostemon by Miss. L. Guthrie but on the wrong grounds.

The main characters of the species pointed towards its affinities with species of Simocheilus. The possession of a 2-celled, single ovuled ovary could place the species in either of the genera, Acrostemon or Simocheilus.

However, the calyx in the species is lobed only to halfway, which is a character of the genus Simocheilus. The calyx also possesses marked ridges or ribs down the segments, a feature which is not found in the genus Acrostemon but is found in a number of species of Simocheilus.

The species is quite different from the species of Acrostemon in its distribution. It occurs 150 to 200 miles

from the nearest known locality of a species of Acrostemon, A. vernicosus (cf. map, page 53).

The species is thus different morphologically and is geographically isolated from the rest of the genus Acrostemon and has been removed to the genus Simocheilus into which it fits more naturally in the present author's opinion.

Since the description of the species in 1925, three additional collectings have been made. Although it was collected in the same month and year as the type, Fourcade 2079 was not cited by Miss. Guthrie, but was however labelled by her as "Simocheilus n.sp. - seems to suit the genus Simocheilus best, but the corolla is very little longer than the calyx". Fourcade 2901 was similarly collected before publication but was not cited. The third specimen, Compton 23492, was collected long after the original publication of the species.

These latter specimens, which were not cited, possess two important characters which were not recorded in the type description and do not occur in the type specimen.

The anthers of the type are muticous, whereas the anthers of the above three specimens are minutely or distinctly aristate. There is, though, variation in the degree of the aristation found in Fourcade 2079. In some flowers the awns are almost absent. (fig 26).

This variation and the fact that the aristate and the muticous forms occur in the same area, tends to discount the feasibility of establishing an aristate variety of the species. It seems likely that the type specimen may only be a local muticous form of the more widespread aristate specimens.

The young leaves, bracts and sepals are variously edged with sessile or subsessile glands which are absent in the type. The puberulent area between the angles of the calyx may or may not be present.

Specimens examined:

UNIONDALE; Top of pass between Uniondale and Avontuur, 3500 ft, iii.1922, Fourcade 2093a (BOL; PRE); Hills near Avontuur, 3000ft, iii.1922, Fourcade 2079 (BOL); 3000ft, i.1924, Fourcade 2901 (BOL; NBG).

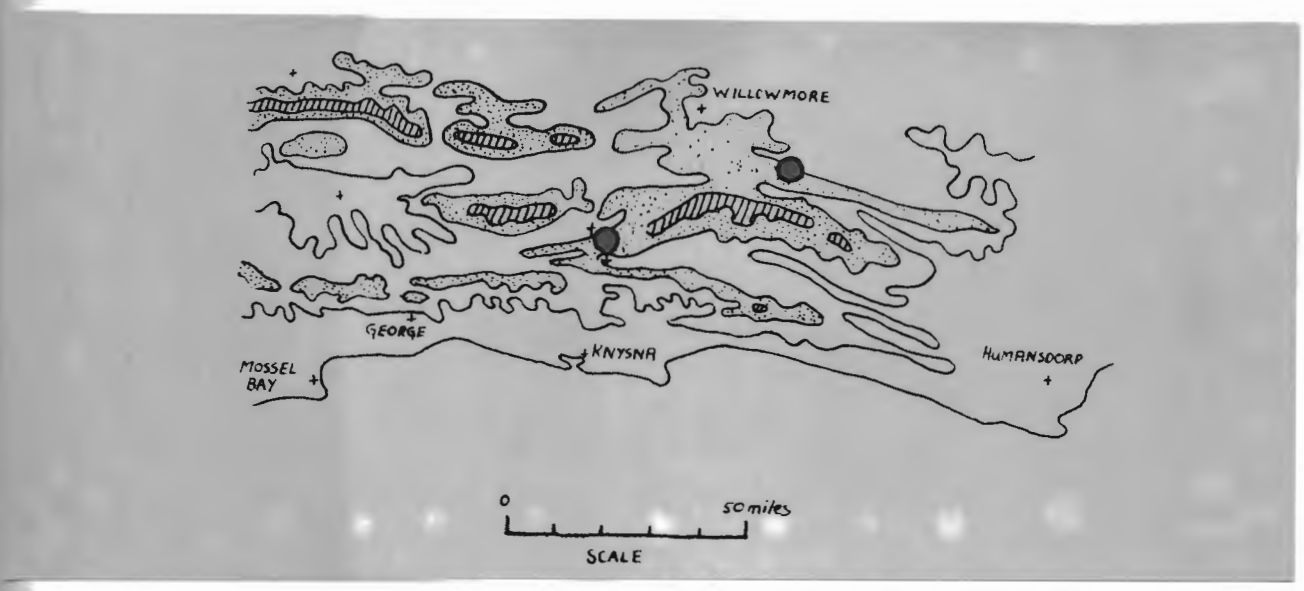
WILLOWMORE: Baviaanskloof, 14.iv.1952, Compton 23492 (NBG).

It was subsequently found that this was the case in most of the other species investigated. However this criterion was found not to be reliable in both A. viscidus and A schlechteri.

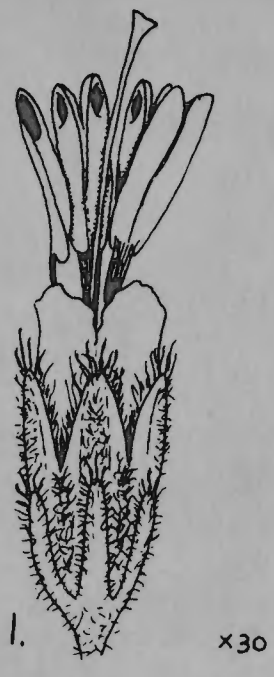
The following is the technique which was found to be most effective and which was applied to all the material.
(1) Fix inflorescences for 24 hours in fresh acetic-alcohol (1:3 or if desired 1:6) after the buds have been opened to expose the anthers. If necessary store in 70% alcohol; this is inadvisable as the alcohol removes the colour from the anthers.

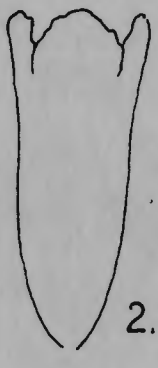
Figure 26.

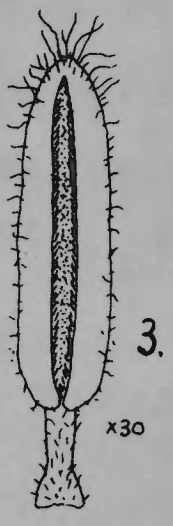
Fourcade 2093a, holotype; (1) single flower; (2) corolla; (3) leaf; (4) calyx; (5) Middle and lateral bract (inner surface); (6) gynaecium; (7) anther (front, lateral and rear views); (8) variation in anther appendages.

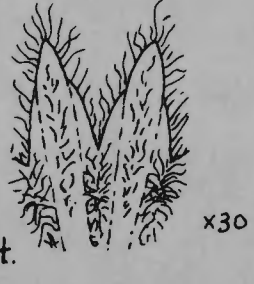


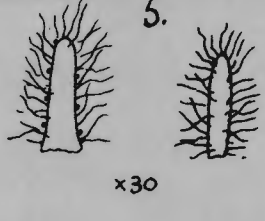
Distribution of Simocheilus fourcadei.

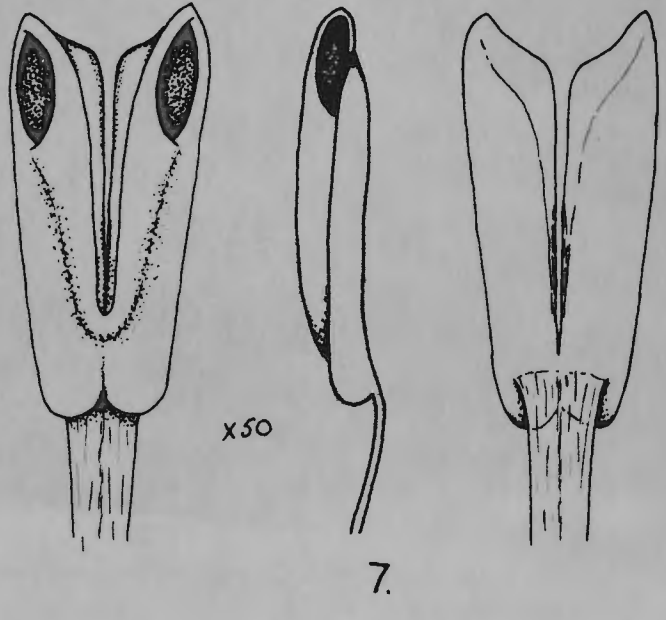












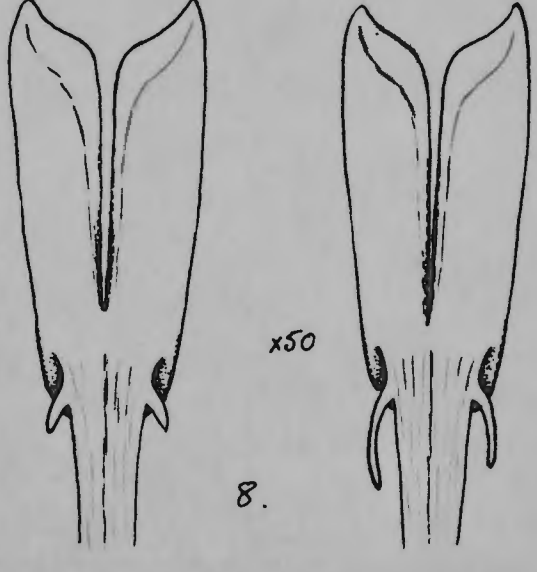


Fig. 26.

GENERIC DISCUSSION.

Variation and the Distinction of Genera.

The genus Acrostemon was established by Klotzsch in 1838 naming it thus because of the sharp-pointed stamens of his original three species.

At that stage the genus was simple and concise. It was based on a corolla of 4 segments, a villous fully lobed calyx of 4 segments, 4 exserted stamens and a 2-celled ovary with a single pendulous ovule in each cell.

Since 1838 species have been added to the genus until in Flora Capensis of 1909, the genus consisted of nine species. In this work the number of new species has increased while certain existing species have been amalgamated, giving a total of thirteen species in the genus.

With the addition of new species and of more material of the older existing species, a revised circumscription of the genus was found necessary, Other genera of the Ericaceae have similarly been expanding with the additions of more material. If intermediates are found, the distinction between once close and yet distinct genera becomes even more critical.

Several genera were examined in this work as they showed close similarities with Acrostemon, namely Simocheilus Kl., Syndesmanthus Kl., Arachnocalyx Compton and Hexastemon Kl.

Hexastemon Kl.

The genus Hexastemon was established by Klotzsch in 1838 with the single species, H. lanatus. The genus was regarded as differing from Acrostemon in only one character, the possession of 6 stamens instead of the 4 as in Acrostemon. In all other respects it was very similar to A. eriocephalus.

Investigation of certain species of Acrostemon has revealed an important variation in the number of stamens. Brown in Flora Capensis originally described A. viscidus as having only 4 stamens. Examination of several subsequent collections has shown that the species may have 4,5,6 or 8 stamens, even in the same population,

The new record of A. eriocephalus subsp. roseus has produced material with 5 and 6 stamens as opposed to the typical subspecies with only 4 stamens.

There is thus a complete overlap in the number of stam stamens between Acrostemon and Hexastemon allowing no character for the separation of the two genera. The genus Hexastemon has therefore been incorporated in Acrostemon.

Arachnocalyx Compton.

Compton's monotypic genus Arachnocalyx was investigated as it showed a marked superficial resemblance to A. viscidus. Compton distinguished this new genus on its 6,7 or 8 stamens and erect subbasal ovules. As stated above, variations in the number of stamens occur in A. viscidus and cover the range of stamen number encountered in Arachnocalyx. This is supplemented by the variations seen in A. eriocephalus subsp. roseus.

The nature of the attachment of the ovule seemed an important character in distinguishing Arachnocalyx. However the ovaries of several specimens of A. viscidus, including the paratype, Schlechter 10013, proved to contain single subbasal erect ovules in each cell. This pointed to a much closer similarity between A. viscidus and Arachnocalyx than had previously been suspected.

It was decided that the overlap between A. viscidus and Arachnocalyx was so complete in the generic distinguishing features that the genus should be included under Acrostemon.

The point does arise whether A. viscidus should be removed from Acrostemon and be placed in Arachnocalyx as the two species both possess the unusual character of a basal erect ovule. However, there is material of A. viscidus which clearly shows a basal erect ovule and some material which possesses the pendulous ovule found in the other species of Acrostemon. Thus the different specimens of the one species, A. viscidus, possess characters of the ovary of both genera, Acrostemon and Arachnocalyx. As a result of the overlap in the structure of the ovule attachment, A. viscidus should be retained in the genus Acrostemon with the monotypic Arachnocalyx.

The above two genera, Hexastemon and Arachnocalyx, were easy to compare with Acrostemon as both genera were monotypic. However, the genera Simocheilus and Syndesmanthus proved much more complex as they are both large genera with more species in each than in Acrostemon.

The main differentiating characters between the 3 genera may be tabulated as shown in the table below, In this table the characters of Simocheilus and Syndesmanthus are taken from Flora Capensis (1909) while the characters of Acrostemon are those as emended in this work. The main differentiating characters are underlined.

	Simocheilus	Acrostemon	Syndesmanthus
Bracts	0, 1 or 3	mostly 3, or 1	0, 1 or 3
Calyx	oblong, obconic campanulate or tubular. 4-toothed.	obconic, oblong campanulate or tubular, 4-lobed or sometimes 4-toothed.	obconic, obconic-oblong, campanulate, tubular-oblong, 3 or 4-toothed.
Corolla		No differences	
Stamens	4	3,4,5,6,7 or 8	3 or 4
Ovary	2-celled often 1 in the fruit. 1 ovule per cell	mostly 2-celled sometimes 1, 3 or 4. 1 ovule per cell	1-celled 1 ovule in cell

Syndesmanthus Kl.

The genus Syndesmanthus described by Klotzsch in 1838, was known to differ from Acrostemon only in having a 1-celled ovary and a tubular calyx.

Examination of material of A. eriocephalus has provided ovaries with characteristics of both genera. A. eriocephalus subsp. eriocephalus has been shown to possess 1-celled ovaries with a single ovule and very rarely a 2-celled ovary. This would place the subspecies in the genus Syndesmanthus. A. eriocephalus subsp. roseus, on the other-hand, showed a constantly 2-celled ovary. This condition would place this subspecies in the genus Acrostemon.

A. utriculosus was placed by N.E.Brown in Syndesmanthus. An examination of the type specimen showed that the ovaries were either 1 or 2-celled with a single ovule per cell.

Owing to its general similarity to A. vernicosus the species was placed under Acrostemon on the possession of the 2-celled ovary.

An examination of preserved material of A. glutinosus provided interesting and important results on the relationships of Acrostemon. The species is very closely related to A. utriculosus and may with further collecting prove to be identical. Numbers of flowers were examined and it was found that they exhibited a significant ovary variation. Most of the ovaries examined were found to be 1-celled with a single ovule. The position of the single ovule was oblique as in Syndesmanthus (fig. 27a). However, the erect position was not infrequent (fig. 27b).

Several flowers possessed 2-celled ovaries with single ovules. A complete variation was obtained between the 1-celled oblique ovary and the 2-celled erect ovary (fig. $\frac{27}{a-f}$). A variation range in a different form is shown in fig. 27 g-i) where a second carpel is produced separately and shows various stages of development and fusion with the mature carpel. The full development and fusion of the second carpel with the first, would produce a 2-celled ovary.

The variation in this species clearly shows that the ovary character alone cannot be relied upon to place the species in either of the two genera, Acrostemon or Syndes- with any certainty. In this work it was decided to place the species with A. utriculosus and A. vernicosus in the genus Acrostemon.

The only other distinguishing character between the two genera is the presence or absence of a tubular calyx. Syndesmanthus should have a calyx joined for half or more than half its length while Acrostemon should have a calyx joined only up to twothirds of its length or not at all. Fig. 28 shows some variation in the degree of fusion of the sepals in some species of Acrostemon. In some species the segments are fused almost up to halfway as in A. barkerae, A. schlechteri and A. glutinosus. Most of the species of Syndesmanthus have the calyx fused for more than half its length but one species, S. viscosus, shown in fig. 29(5), possesses a calyx joined to the same degree as some of the species of Acrostemon. The character of the fusion of the calyx could be used to separate the genera but on the small degree of intergradation noted above this might not be upheld.

Simocheilus Kl.

From the table of characters it can be seen that the genus Simocheilus has only one character which can be used to separate it from Acrostemon, the possession of a fused calyx. Fig. 29(1-4) shows some variation in the degree of fusion of the calyx in some species of Simocheilus, S. bicolor, S. quadrisulcus, S. klotzschianus. Again it can be seen that there is very little difference between the degree of fusion of the species Acrostemon and those of Simocheilus.

As regards the ovary, Simocheilus and Acrostemon are identical with a 2-celled ovary with a single ovule per cell.

It appears from the investigations carried out in Acrostemon and from the examination of material of Simocheilus and of Syndesmanthus that a certain degree of intergrading occurs in the differentiating characters between the three genera to an extent where it becomes difficult to distinguish and place species into any one of the genera. In the present work the genera have been kept separate as a matter of convenience and because a thorough investigation of Simocheilus and of Syndesmanthus was not possible for a true appraisal of the relationships and the distinction of the three genera.

For a final revision of the genus Acrostemon and its related genera, further work is necessary on Simocheilus and on Syndesmanthus.

In the Ericoideae the characters of the ovary, i.e. the number of cells and the number of ovules per cell, are the prime distinguishing factors in the delimitation of the genera. These characters are then coupled with differences in the number of sepals, petals and stamens.

In this work it has been found that the ovary characters used by Brown are unreliable for defining the genus and the whole concept of Acrostemon has had to be changed.

The ovary in the genus always contains a single ovule per cell and is mostly 2-celled but may consist of 1, 2, 3 or 4 cells.

A. eriocephalus, A. utriculosus and A. glutinosus have been mentioned as having 1-celled ovaries, thus relating them to the genus Syndesmanthus.

A. barkerae and A. hirsutus possess 3 and 4-celled ovaries, a character in common with the genus Blaeria. The latter genus differs only in having numerous ovules per cell. For this reason A. concinnus which possesses a 4-celled ovary with 4 ovules per cell, has been transferred to Blaeria.

Other genera such as Eremia, Philippia, Grisebachia, Coilostigma and Erica, also have 3 and 4-celled ovaries but the number of ovules and other floral characters can be used to distinguish them from Acrostemon.

The genus Acrostemon encompasses an extensive variation in the ovary complement and shows reduction in members of floral parts. If a relatively large number of floral parts can be regarded as the primitive condition, a series of reductions can be traced through the larger genera of the Ericoideae from the most "primitive" genus, Erica, which has the greatest number of parts in any one floral whorl, to some of the Bredasdorp species of Syndesmanthus, S. venustus N.E.Br., S. globiceps N.E.Br., S. pumilus N.E. Br., which have 3 petals, 3 sepals, 3 stamens and a 1-celled ovary with 1 ovule.

Reduction can be traced in the number of stamens and in the ovary complement, in the petals and in the sepals and often in the size of the flowers.

In Acrostemon the reduction series can be seen in A. barkerae and A. hirsutus to A. eriocephalus and A. glutinosus in the ovary complement; in A cereris, A. viscidus and A. xeranthemifolius and A. eriocephalus to A. schlechteri in the number of stamens; and within A. schlechteri only in the petal number.

In the ovary complement of A. glutinosus an interesting condition was recorded. Some extraordinary variants were found in preserved material from Vogelvlei. One ovary obtained, consisted of two cells each with a single ovule and an extra portion of ovary tissue on one side. A section revealed that it was most probably a third and infertile carpel.

Fig. 27j shows an ovary exhibiting very interesting aberrations. In the middle of the nectary disc there is a single well developed carpel containing a single ovule. Around the edge of the disc are placed the four stamens (shown in black in fig. 27k). Extra structures occur on the disc between the stamens and the single carpel. These are similar to the infertile carpel shownin fig. 27h and

thus have been taken as representing three reduced free carpels. Their position relative to the axis of the fertile carpel suggests that this is correct (fig. 27k).

These aberrant forms suggest that the ovary of A. glutinosus could have been derived from a 4-celled ovary by a series of reductions

As a result of the additions to the genus Acrostemon since Flora Capensis as recorded in this work, the generic description of the genus has had to be emended considerably to encompass the additions and variations.

The genus can now be based on a 3 or in one species 1 bracteate peduncle; a lanate or ciliate calyx of 4 segments divided from halfway to the base; a corolla of 4 segments, occasionally 3, fused; 4 exserted stamens, sometimes 3,5,6, 7 or 8; ovary with 2 cells, sometimes 1,3 or 4, with a single pendulous or basal, erect ovule per cell. The main alteration to the description lies in the number of cells to the ovary, the number of stamens and the degree of fusion of the calyx.

A. glutinosus. Figure 27.

Oliver 1837; (a-f) series from 1-celled to 2-celled condition; (g-i) ovaries showing reduction of 1 carpel; (j & k) ovary showing 3 reduced carpels; (l-n) ovaries and sections of ovaries showing 1 and 2 cells; (o) section of an ovary showing a third reduced carpel.

Figure 28.

Calyces in species of Acrostemon; (1) A. equisetoides, Oliver 1826; (2) A. stokoei, Esterhuysen 23137; (3) A. hirsutus, Stokoe s.n. (SAM 69004); (4) A. hirsutus, Esterhuysen 14097; (5) A. barkerae, Lewis 2698; (6) A. stokoei var. cofusus, Parker 4881; (7) A. glutinosus, Oliver 1837; (8) A. schlechteri Oliver 1831; (9) A. cereris, Esterhuysen 21875.

Figure 29.

Calyces in species of Simocheilus; (1) S. bicolor, Esterhuysen 14489; (2) S. klotzschianus, Lavis s.n.; (3) S. quadrisulcus, Stokoe 8596; (4) S. sp. incert. Marloth 3534.

Calyces in Syndesmanthus; (5) S. viscosus, Muir s.n. (BOL 13475).

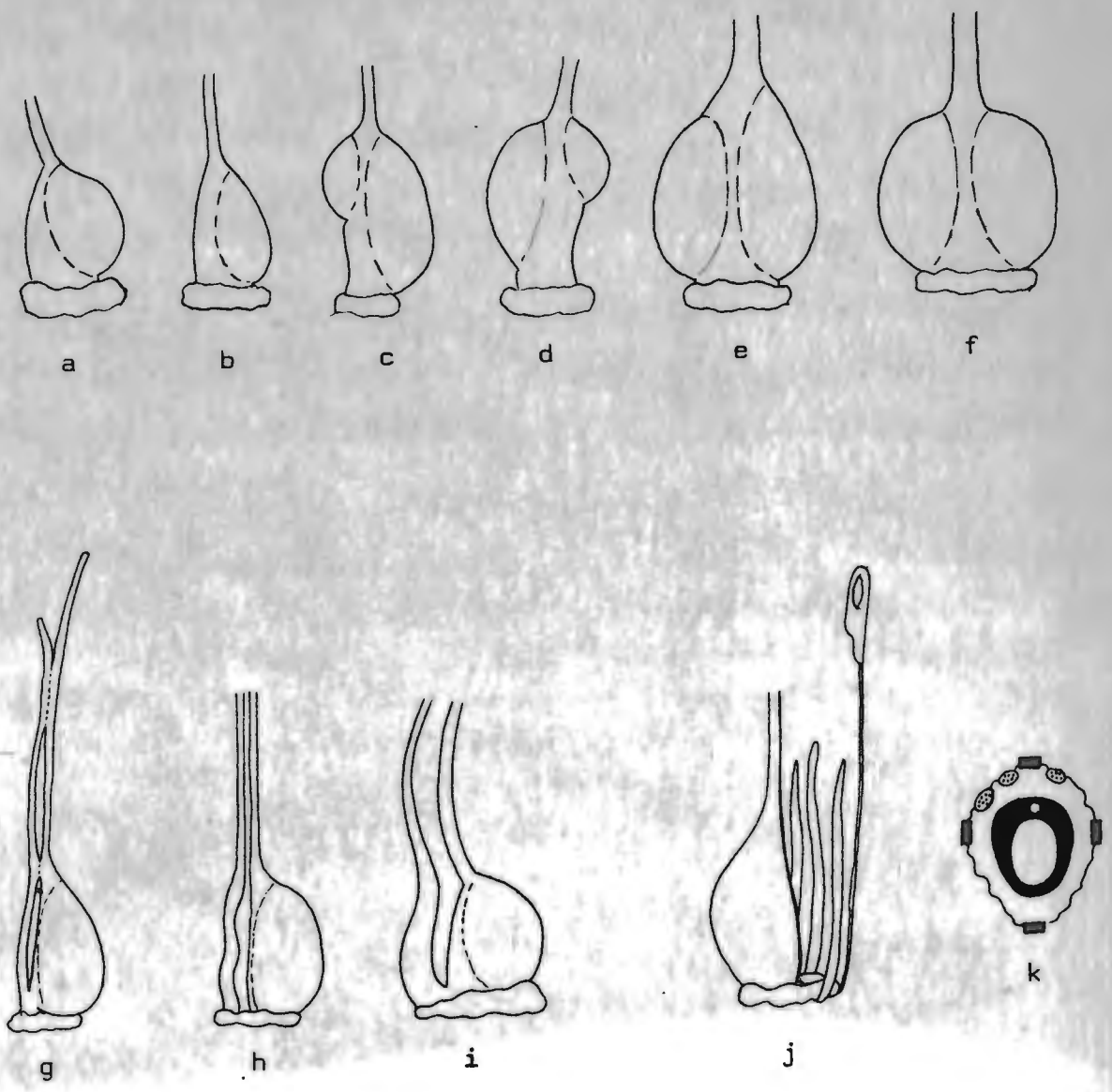
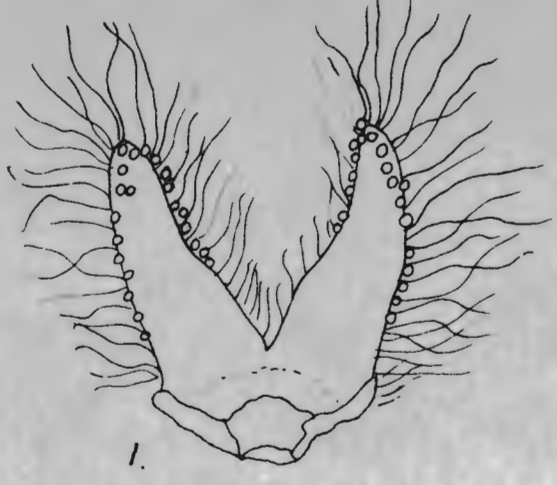


Fig. 27.



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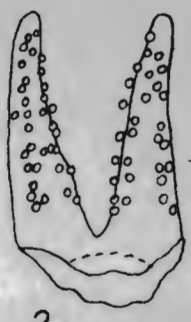

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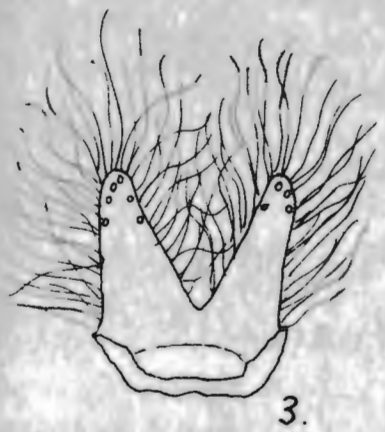

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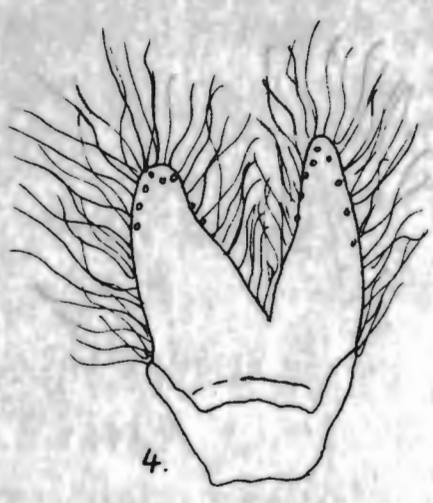

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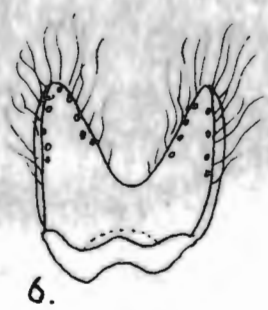

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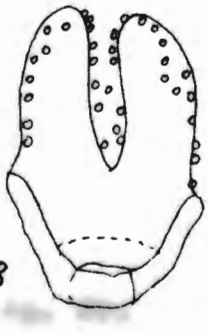

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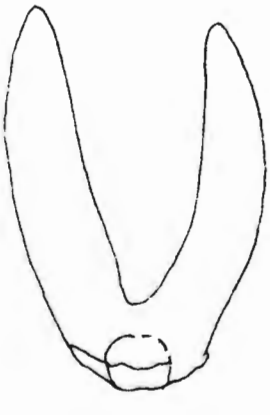
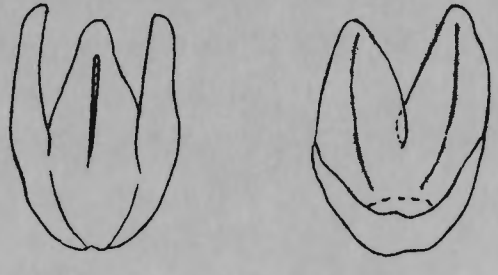
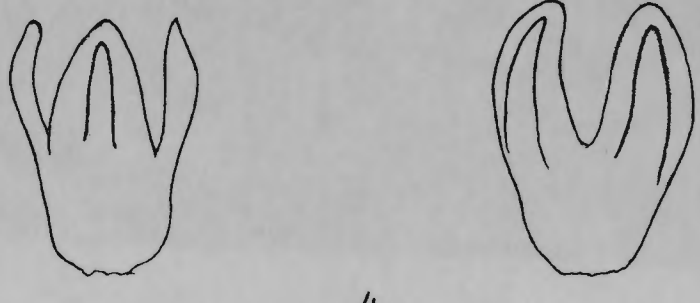


Fig. 28.





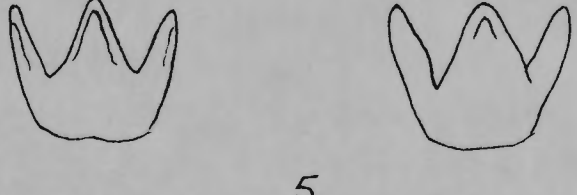


Fig. 29.

Treatment of Minor Genera of Ericaceae by Phillips.

In revising the Ericaceae for his Genera of South African Flowering Plants, Phillips drastically reduced the number of genera.

He stated that Klotzsch monographed twenty-four genera of which number Brown in Flora Capensis retained thirteen and reduced the remainder to one or other of Klotzsch's remaining genera and recognised in all twenty-three genera. He stated that Brown relied upon differences in the ovary complement and the anther number for differentiating his genera.

It is Phillips' belief that in general appearance all the species of the twenty-two Minor Genera agree more among themselves than do the species of Erica. This is correct only as far as the general appearance goes, but for basic structure and number of floral parts Erica is remarkably constant inview of the large number of species, in having 4 free sepals, 4 petals, 8 stamens and 4 cells to the ovary with numerous ovules. On the otherhand, much variation in structure and number of floral parts exists in the much fewer number of species in the Minor Genera.

The present author agrees to some extent with Phillips' opinion that the number of ovules per cell is more important a character than the number of cells where variation can occur in single species. However, the present author has noted that Coccosperma hexandrum (Kl) Druce possesses ovary cells with different numbers of ovules, even on the same plant.

With the concept of the similarity of the Minor Genera to each other, Phillips upheld only 8 genera among the South African Ericaceae, including Erica, and reduced the remaining 15 genera to synonomy. He grouped the genera as follows :-

(1) Vaccinium L.

(2) Erica L.

(3) Blaeria L. (Philippia Kl.; Ericinella Kl.; Thamnus Kl.; Coccosperma Kl.)

(4) Eremia G.Don (Platycalyx N.E.Br.; Hexastemon Kl.; Arachnocalyx Compton; Grisebachia Kl.; Acrostemon Kl.; Simocheilus Kl.; Thoraccosperma Kl.; Aniserica N.E.Br.)

(5) Sympieza Licht.

(6) Scyphogyne Brogn. (Syndesmanthus Kl.; Anomalanthus Kl.; Eremiopsis N.E.Br.; Lepterica N.E.Br.)

(7) Salaxis Salisb. (Coilostigma Kl.)

(8) Lagenocarpus Kl.

It is the opinion of the present author that Phillips' grouping of the genera is completely artificial and does not reflect the correct relationships between the genera, which have been reduced to synonomy.

In the the fourth generic "group" Eremia, he placed Acrostemon, Hexastemon, Arachnocalyx and Simocheilus, all of which have been shown in the present work to be very closely related, while Syndesmanthus which is also very similar to the above genera has been placed in a competely different generic "group" simply on the possession of a 1-celled ovary. Also in the fourth group Aniserica is included and this genus shows closer resemblances to the genus Sympieza which is alone in his fifth group. Aniserica contains two species, A. gracilis N.E.Br. and A. macrocalyx Salter, which have a 4-lobed calyx and 2-lobed corolla. Sympieza is distinguished from Aniserica only by having a 2-lobed calyx.

The two genera Coccosperma and Salaxis have been found by the present author to be inseparable from each other on a thorough examination of material from the Cape Peninsula, yet Phillips placed them in entirely different "groups". The only character which could separate the two genera was the number of ovules per cell. Salaxis has one ovule per cell while Coccosperma has 2 ovules per cell. Variation as stated above in C. hexandrum, Salter 5884 and Oliver 889, showed complete intergrading between the two genera.

With the addition of new and well collected material, a reconsideration of the generic boundaries will certainly be necessary in a future revision of the group of Minor Genera. However the problem of generic distinction will have to be worked out carefully and thoroughly. Certain genera will undoubtedly be reduced to synonomy as has been shown to be unavoidable in this present work, when large variation ranges are brought to light.

PHYTOGEOGRAPHY.

The genus *Acrostemon* is endemic to the South-Western Cape Region of South Africa (map i). It is distributed well within the area characterised by the "Cape Flora" as construed by Marloth (1908).

It can be seen from map ii that the species are mostly confined to the mountainous regions in the South-West Cape. Eight species in the genus are found in the higher mountain ranges which run in a north-south direction, while the remaining five species do not, *A. barkerae* occuring on the Worcester flats and *A. schlechteri*, *A vernicosus*, *A. glutinosus* and *A. utriculosus* occuring on the Bredasdorp coastal plains and hills.

Map iii shows the distribution of the species according to the average annual rainfall. Both the physiographic and the rainfall maps have a very similar shape, as the rainfall distribution in the South-Western Cape is governed by the mountain ranges. Again it can be seen that most of the species are confined to the areas of higher rainfall with the exception of *A. barkerae* and the four species in the Bredasdorp area.

It can thus be said that the species distribution is correlated with the mountain habitat and the rainfall.

However, most of the species do not occur at high altitudes in the mountains but rather at the middle and the lower levels between 500 and 3000ft where the rainfall is approximately 25-50ins per annum. The exception here is *A. cereris* which occurs at higher altitudes in the Hex River Mountains. In these mountains though, it occurs on the northern slopes which are moist only at the upper level. The rainfall is therefore considered as an important factor in the distribution of the species.

The distribution of *A. barkerae* can similarly be dependent on higher rainfall. The species occurs in the Stettynskloof area and in the Worcester Karroo which is recorded on the rainfall map as having less than 15ins of rain per annum. It is recorded from large hills in the Worcester Karroo and is thus not strictly confined to the open flats. On the southern slopes of these hills there could well be some localised moister areas which are too small to be recorded on the rainfall map. Similar cond-

itions were found by Levyns (1964) on the southern slopes of the hills of the Ladismith Karroo.

Although species such as A. eriocephalus, A. viscidus and A. xeranthemifolius, occur in regions shown on the map as having a high rainfall, i.e. 25-40ins per annum, the present author has observed that these species grow in habitats which are locally drier than the surroundings. A. eriocephalus occurs in dry sandy areas on the Houw Hoek Pass, and on the lower northern side of Sir Lowry's Pass, where the accompanying vegetation is sparse and open and of a drier type. The locality of A. eriocephalus subsp. roseus on the Schurfteberg, Robertson, is similarly dry and sandy with sparse scattered vegetation. A. xeranthemifolius is confined to the ridge between Babylon's Tower and Shaw's Mountain where habitat conditions almost identical to those of A. eriocephalus are found.

The habitats of A. viscidus have been mentioned in the section dealing with this species. They are similar to the habitats of the above two species.

The Bredasdorp species occuring on the coastal plains and low hills, could owe their distribution in this region to the limestone substrate which dominates the coastal plains.

No work has been done on calcicole and calcifuge plants in the Cape Flora of which most of the species are known to occur on acid soils. Many species in the Bredasdorp limestone hills grow in pockets of sand in the bed rock. The sand, derived from Table Mountain Sandstone, has collected in these pockets through the action of wind, and could retain a low pH if drainage occurs through the porous limestone. In this case the limestone substrate has no relation to the distribution of the species in the area.

The rainfall is low in the area but due to the proximity of the localities to the sea, it is probably more evenly distributed throughout the year and the temperature is probably less variable. This is concurrent with the observations of Muir (1929) on the distribution of endemic species on the Riversdale coastal flats. Muir does not discuss the ecological factors affecting the distribution of the plants on the limestone hills in any great detail. No definite conclusions were reached by him.

It is of interest to note here that the Bredasdorp

species all flower more or less at the same time of the year, i.e. near the middle and towards the end of summer when the area is at its driest.

Weimarck (1941) in his work on the Phytogeography of the Cape Flora, lists several groups of species based on their distribution. All the species of Acrostemon fall into his endemic series.

Eleven of the species can be classified in his group 8, the South-Western Endems, where the Breede and Berg rivers are the absolute limits. If his four subcentres in this group are accepted, the species can be classified as follows :-

(2) French Hoek - A.hirsutus, A. equisetoides, A. barkerae and A. glandulosus.

(3) Kogelberg : Hottentots-Holland - A. stokoei, A. eriocephalus, A. xeranthemifolius (with the Klein River Mountains included here).

(4) Bredasdorp - A. schlechteri, A. vernicosus, A. glutinosus and A. utriculosus.

No species of Acrostemon occur on the Cape Peninsula.

Weimarck includes the Klein River Mountains, Hermanus, in his Bredasdorp subcentre. The flora of these mountains has a close similarity with the flora of the Bredasdorp Mountains. However in the Ericaceae, the present author has found that numbers of species in the Betty's Bay and Kleinmond area also occur in the Klein River Mountains. It would therefore be difficult to place these mountains in either of the two subcentres. In the above classification, the mountains have been included in the Hottentots-Holland subcentre on the distribution of the species of Acrostemon.

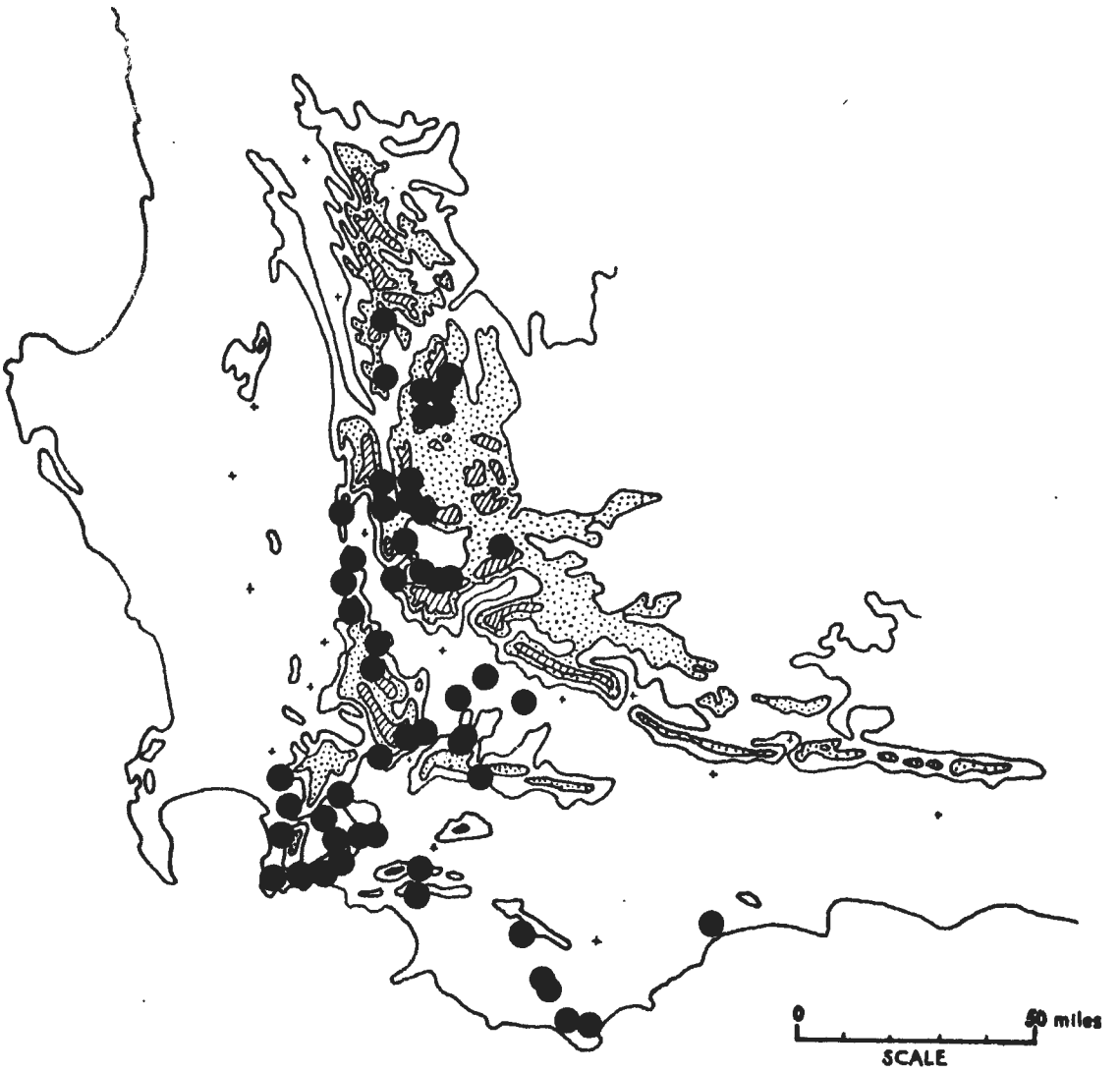
The two remaining species in the genus, A. viscidus & A. cereris, fall into Weimarck's group 9, the North-Western Endems, as they occur north of the Breede and Berg Rivers.

On the whole the genus Acrostemon fits in well with the groupings proposed by Weimarck.

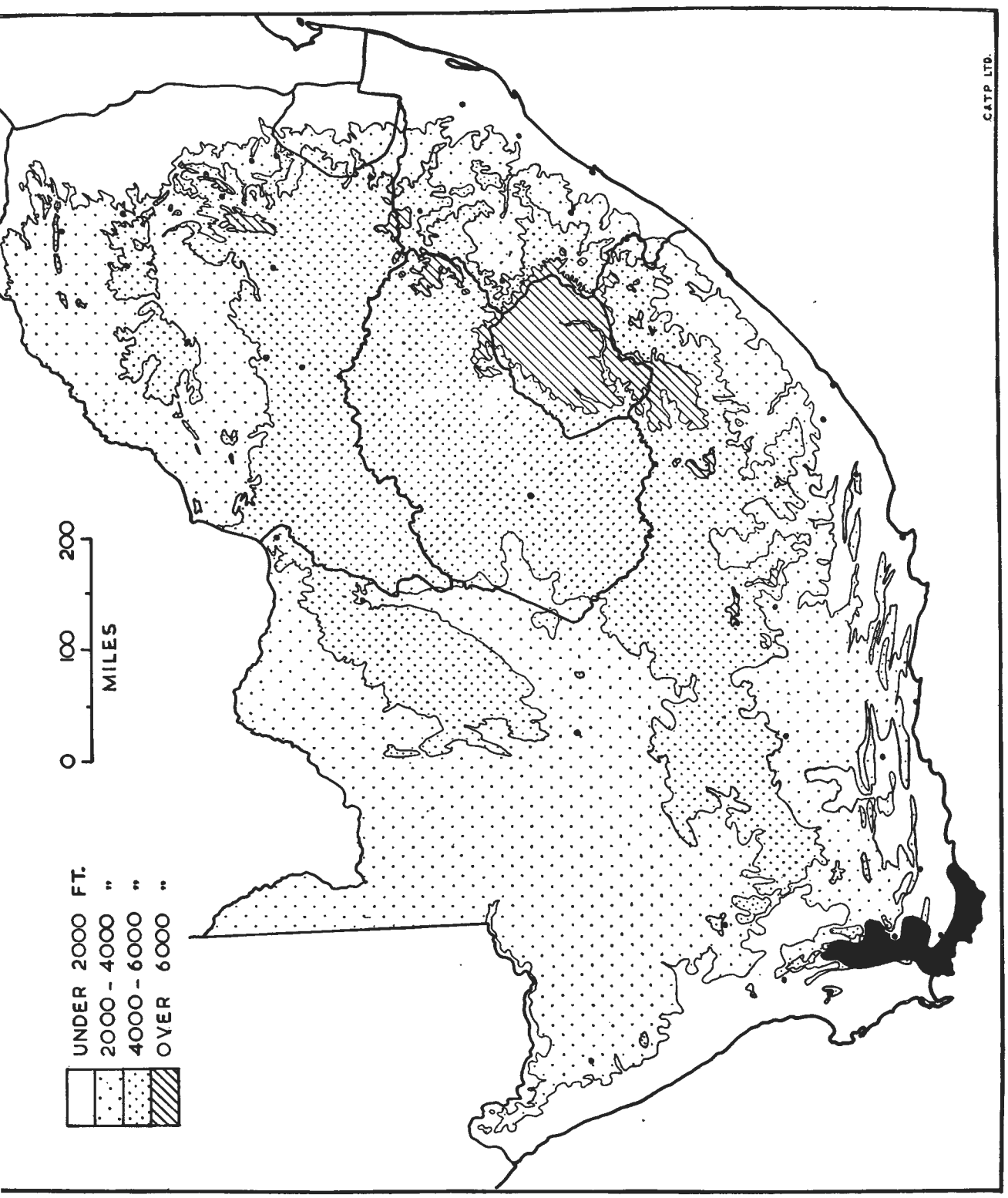
Weimarck mentions the richness in endemics of the Bredasdorp subcentre and he attributes this phenomenon to the occurence of limestone in the area and the past climatic conditions. It has already been mentioned that one cannot be certain that the occurence of the limestone is an important factor influencing the species distributions

in the area without a considerable amount of investigation into the ecology of a number of species. The influencing past climatic conditions occured when plant communities were isolated on the limestone hills by intrusions made by the sea onto the coastal flats.

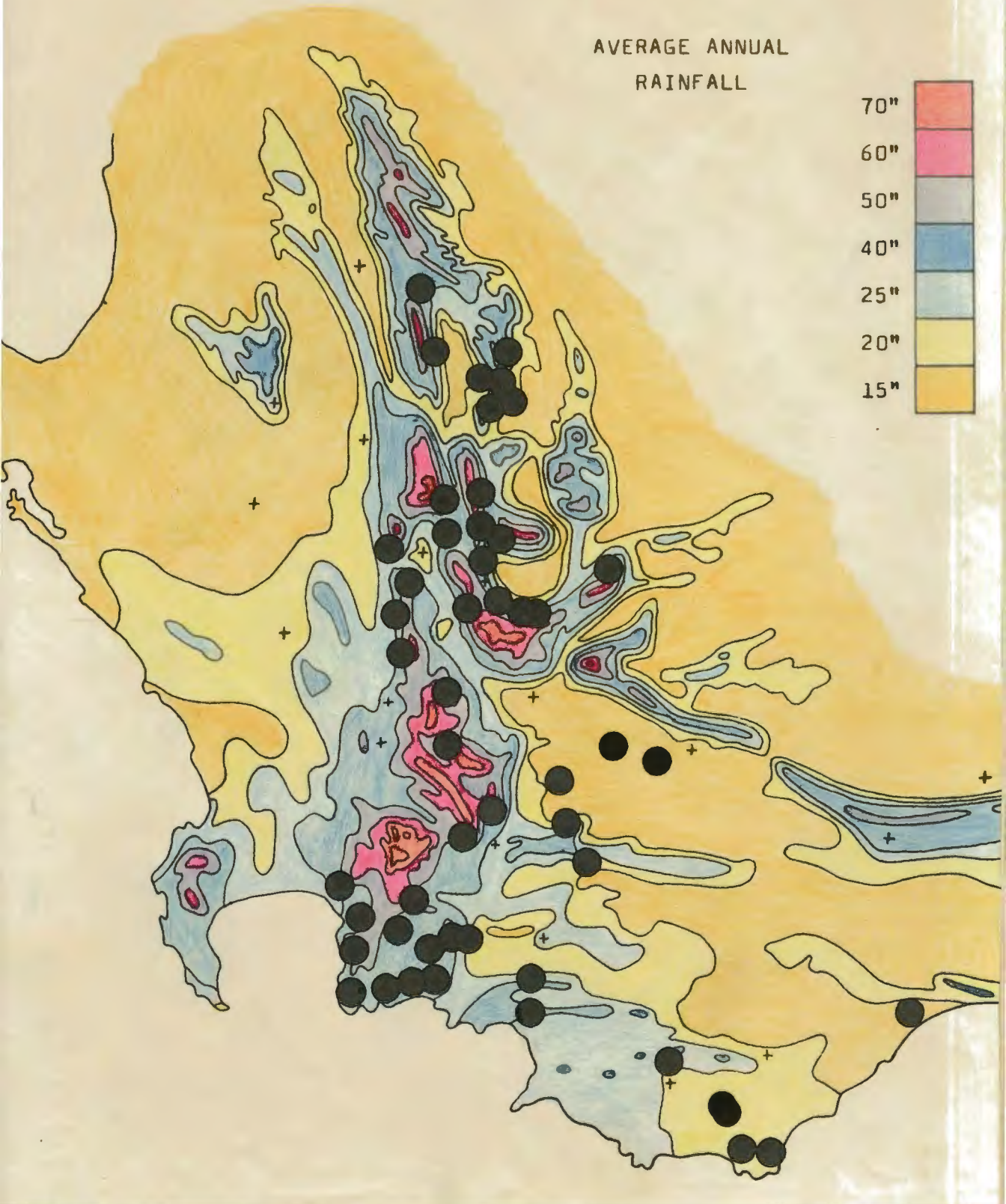
The species of Acrostemon from this area provide additional evidence infavour of the richness of endemics in the Bredasdorp area. The genus Syndesmanthus similarly shows a large concentration of endemic species in the Bredasdorp Division with ten out of the nineteen species being found there.



Map ii. Distribution of the genus Acrostemon.



Map i.
Distribution of the genus Acrostemon.



Map iii.

Distribution of Rainfall

and the

Distribution of the genus Acrostemon.

CYTOLOGY

The cytology of the Ericaceae has been confined mainly to the Northern Hemisphere Rhododendraceae of which 374 species have so far been investigated. Only 61 other species of Ericaceae have been studied cytologically. Some work has been done on the northern Minor Genera and 10 species of Erica (Darlington & Janaki-Ammal, 1950).

As far as the South African Ericoideae are concerned, only 2 out of the 800 species have previously been investigated cytologically, Erica curvirostris Salisb. and Erica sessiliflora L. (Callan, 1941). These were only recorded incidently in a study of hybridisation in Gaultheria.

It was decided, as a preliminary to the study of the chromosomes in the South African Ericoideae, to investigate the cytology of the genus Acrostemon Kl. both for determining a workable technique and the feasibility of chromosome study in the group.

Callan (1941), who has worked on the Ericoideae, used the technique of staining sections of root tips and of anthers. Hagerup (1928) in his study of the Bicornes stained sections of young anthers obtained from buds.

As the technique of embedding and of sectioning had to be mastered before any proper investigation could be undertaken and as the anther squash method had never been attempted in the Ericoideae before, the latter method was decided upon for the investigation.

Attempts were made to obtain root tips from three sources :-

1) mature plants in the natural habitat or ones transplanted to cultivation,
2) seeds germinated in pots or in culture media,
3) rooted cuttings.

Due to the woody nature of Ericaceous shrublets, it was impossible to obtain root tips from mature plants either in the natural habitat or in cultivation. Seeds of the species were not available as the Minor Genera produce very little seed. Cuttings of one species of Acrostemon were tried but proved unsuccesful.

Consequently it was decided to concentrate on the cytological investigation of the anthers and pollen tubes.

1. ANTHER SQUASH TECHNIQUE.

The source of buds for this investigation was entirely from plants growing in the natural habitat.

No work has previously been carried out on the Ericaceae in this field. The investigation, thus, had to start as a search for suitable material and ways of handling it. The technique employed was the general one given by Darlington & La Cour (1950) and by Smith (1949).

Material of *Acrostemon stokoei* var, *confusus* from the Highlands Forest Reserve, Caledon Division, was the first to be investigated. Acetic-alcohol was prepared the day before. Inflorescences were cut off with as little unwanted vegetative material as possible, placed in phials of fixative in the field, and brought back to the laboratory for examination. A thorough examination of the material revealed no traces of chromosomes or even nuclei. This indicated that the fixation was ineffective.

In the buds the corolla is firmly closed over the anthers and it was found the buds were filled with a bubble of air. Therefore, the fixative had not penetrated the buds to bathe the anthers, but had instead gradually permeated the basal tissues of the bud and only then entered the anthers.

An easily accessible population of *A. stokoei* was located near Houw Hoek. In order to produce rapid and thorough fixation two precautions were taken :-

(1) the fixative was kept in tightly stoppered bottles and was mixed just before use;

(2) the buds of the inflorescences were opened with a needle under a Leitz dissecting microscope to allow the fixative to enter the interior of the buds.

On examination of this material the precautions proved successful and the chromosomes were found after the right bud stage had been located. After numerous squashes it was found that the right bud stage could be judged fairly accurately. The inflorescence in species of *Acrostemon* is a condensed raceme. In any one inflorescence there is a range from almost open buds to very young buds. The anthers, when mature, are a deep maroon-red colour. The coloration begins to appear when the pollen mother cells mature. After fixation most of the coloration is removed, mainly from the younger anthers. The correct stage for division was obtained when anthers just showing a pink tinge were squashed.

It was subsequently found that this was the case in most of the other species investigated. However, this criterion was found not to be reliable in both A. viscidus and A. schlechteri.

The following is the technique which was found to be the most effective and which was applied to all the material.

(1) Fix inflorescences for 24 hours in fresh acetic-alcohol (1:3 or if desired 1:6) after the buds have been opened to expose the anthers. If necessary store in 70% alcohol; this is inadvisable as the alcohol removes the colour from the anthers.
(2) Select the right stage bud and dissect out the anthers in a drop of acetocarmine on a microscope slide and cut off the filaments.
(3) Transfer the anthers to a drop of acetocarmine on a fresh slide.
(4) Drain off most of the acetocarmine with a wedge of fine blotting paper or filter paper.
(5) Macerate the anthers with a freshly cleaned needle. This should be carried out under a dissecting microscope to ensure that all spore mother tissue is separated as much as possible from the anther walls.
(6) Add fresh acetocarmine and a clean slip.
(7) Warm gently over a flame and add more acetocarmine to the edges of the coverslip.
(8) Examine for dividing cells.
(9) Record chromosome plates by drawings with a camera lucida or, if available, by photomicrography.

One step, which is usually recommended by workers, is left out of the above schedule. No pressure must be applied to the coverslip once it is on the preparation. Any pressure will cause the cells to burst. Slight pressure of the coverslip which developes as the acetocarmine evaporates, is all that the cell walls can tolerate. This is also true for the maceration. If the usual flat squashing needle is used, the cells tend to break up. A rounded needle is sufficient for breaking up the material.

This weakness of the walls of the pollen mother cells proved to be a problem in these investigations, The cells often tend to adhere. Excessive maceration damages the cell walls, while too little leaves the cells in masses. Hydrolysis with hydrochloric acid is often employed to separate cells. This was not attempted as it would prove

difficult with such small amounts of delicate material and would also hinder the effect of the acetocarmine. The only method used to produce reasonably separated cells was careful teasing out of the anthers under the dissecting microscope.

Acetocarmine was found to give good results in the material investigated. No other stains were tried as the acetocarmine was simple and effective. The chromosomes stain up readily against a very pale background. Only after a few days did the cytoplasm of the cells mounted in the acetocarmine show signs of staining and obscuring the chromosomes.

It is known that plants vary in the time of day when reduction division takes place. It was most fortunate that the correct time of day was chosen for the first investigation, i.e. of A.stokoei. Flowers were fixed between 11 a.m. and 12 noon. Subsequent fixations were carried out at the same time and the results were satisfactory in most cases. In those cases where no results were obtained, the time at which fixation was carried out could have been incorrect.

As regards time at which fixation was carried out, difficulty was experienced when gathering material in the field. It was not convenient in some cases to be at the locality between 11 a.m. and 12 noon, especially when some of the localities were 100 miles from Cape Town.

An experiment was thus carried out on material of Acrostemon eriocephalus from Robertson, to decide whether material could be fixed in the laboratory. Twigs of budding material were picked and immediately placed in plastic bags. On arrival at the laboratory the ends of the twigs were recut under water and placed in jars of water. The following day buds from these twigs were fixed between 11 a.m. and 12 noon. These fixed buds yielded results as good as the material fixed in the field.

As no knowledge of the state of buds was at hand for species being investigated for the first time, another set of buds, which were older or younger, could easily be fixed if the first set were found to be at the wrong stage.

For future cytological investigations in the Ericaceae, this method of collecting will prove most useful, especially as many species grow at high altitudes where it would be extremely difficult to transport the equipment necessary for fixation.

In his work on the Bicornes, Hagerup (1928) discusses the time before flowering at which the buds possess anthers undergoing meiotic divisions. In Erica tetralix L. he gives a time of three to four weeks before flowering which is similar in Calluna vulgaris Salisb., but in Erica cinerea L. and Erica arborea L. he gives no exact time. However, in Erica carnea L. reduction division takes place about six months before flowering and this is found in other non-Ericaceous families of the Bicornes (Hagerup 1928).

The present author found that the species of the genus Acrostemon investigated have had reduction division taking place about one month before flowering.

SPECIES INVESTIGATED : DISCUSSION:

1. Acrostemon stokoei L. Guthrie var. confusus E.G.H. Oliver.

The first material was collected and fixed in the field in the Highlands Forest Reserve, Caledon. The material proved to be of no use because of the poor penetration of the fixative.

The second batch of material was collected on the Houw Hoek Pass, Caledon Division, in March. Material of the buds was fixed in the field. A number of squashes was made before buds of the right stage could be located. If too young the anthers contained a mass of undefined pollen mother cells, if too old, a large amount of loose mature pollen tetrads occured. The correct stage was judged by the faint coloration of the anthers.

Several counts were made, giving, without doubt, a haploid number of 12 in all cases. (fig 32). Counts were obtained from first metaphase and second metaphase plates, both of which gave equally good results when the chromosomes were not clumped.

A third batch of material was collected on Viljoen's Pass, Elgin. The material was fixed in the laboratory. The investigation on this material was made in order to check the chromosome count obtained from the previous material. A count of $n = 12$ confirmed the first results. From this it could be presumed that the technique being applied to the material was satisfactory in giving the required results.

2. Acrostemon eriocephalus (Kl) N.E.Br.

The material of this species was obtained from the Schurfteberg, south-west of Robertson. As the exact locality and the time of flowering were not known beforehand, a chance had to be taken on finding suitable material in August.

Fortunately some budding material was available and this was fixed in the laboratory. Investigation showed that only a few buds were near the right stage and only one countable chromosome plate was obtained. This gave a clear n = 12 for the species. Attempts at recording the plate photographically were unsuccessful. This material was similar in all respects to that of A. stokoei in its cytological behaviour.

It was subsequently found that the population from Robertson was an unusual taxonomic variant of the species and it was decided to investigate a more typical population.

At Sir Lowry's Pass the species flowers later, in October. However, the species had begun to flower earlier than usual due to the early onset of Spring. As a result no suitable material for cytological investigation was obtained.

3. Acrostemon xeranthemifolius (Salisb) E.G.H. Oliver.

An excursion was made in August to Shaw's Pass, south-west of Caledon, in the hope of obtaining some budding material of the species. Unfortunately most of the material was already in flower, but some buds that appeared to be suitable, were taken and fixed in the laboratory.

An examination showed that division was taking place in some of the material. Chromosome plates were seen in several preparations, but were difficult to observe clearly. The pollen mother cells were more clumped than in the other species investigated. Dividing cells were lying superimposed on non-dividing cells and it was impossible to separate them. This made clear observation of the chromosomes impossible. A general survey of dividing cells showed that there were single chromosome plates in each cell. This would indicate that the cells were in the first phase of meiotic or mitotic division. Even under the poor conditions, however, it could be seen that there were more than twelve chromosomes per plate. No definite count could be made on the available material but the

chromosome number for the species appeared to be between 15 and 18. It was not possible to record a figure of the chromosome plates because of the lack of clarity.

4. Acrostemon viscidus N.E.Br.

Material of this species was gathered on the Schurfteberg Pass, north of Ceres, in October and fixed in the laboratory. A number of preliminary squashes was necessary in order to establish the correct bud stage as the anther colour was not indicative of the stage of division in this species. It was found that the correct stage at which division was taking place was relatively earlier than for the other species, the anthers being minute and very difficult to handle.

When the correct bud stage had been located, good results were obtained. There were a number of easily countable chromosome plates both in first meiotic metaphase and in second meiotic metaphase.

A clear count of n = 12 was obtained from the above plates and several are shown in fig.34.

5. Acrostemon equisetoides Kl.

The population at Tulbagh Waterfall was found flowering earlier than usual in August. No counts could be made on the material which was fixed in the laboratory because all the buds obtained, contained mature pollen tetrads.

6. Acrostemon glutinosus E.G.H. Oliver.

On the hills overlooking Vogelvlei, west of Bredasdorp, the species was in very early stages of flowering in March. A thorough search was made to obtain material that appeared to be sufficiently old. On being brought back to the laboratory, the material was kept for a day longer than usual so as to allow the buds to develop further. This was found to be successful as more dividing cells were produced.

Extreme difficulty was experienced with this species. The buds of the inflorescence are completely covered by a clear mass of semi-hard sticky matter reminiscent of a commercial polystyrene fixing cement.

At first it was found impossible to open the buds to allow the fixative to penetrate to the anthers, as the glutinous matter closed over the open buds and adhered to

the needles.

The most successful treatment of the buds was to soak the inflorescence for up to a minute in absolute alcohol to soften the glutinous matter and render it less sticky. The buds were then opened with needles soaked in alcohol and with the buds kept soaked. The alcohol then entered the buds with the needles. The buds were then transferred to the fixative where the absolute alcohol and the fixative soon mixed. Fixation was much quicker and more effective by this method.

The buds were found to be older at the right stage for meisis than in the other species. The anthers were distinctly pink at this stage.

Several chromosome plates were obtained and the count was found to be n = 13 (fig. 36).

7. Acrostemon schlechteri N.E.Br.

A large population at Cape Agulhas was visited to obtain young buds. Most of the plants were in full flower and very few buds were available. The buds proved to be young enough on examination, but showed no signs of division. and no meiotic figures were seen. Fixation had been effective as nuclei were clearly visible.

No count was obtained for this species.

8. Acrostemon vernicosus E.G.H. Oliver.

Material of this species was collected on the limestone hills in the vicinity of de Hoop, Bredasdorp. At first it was thought that the material was too advanced. However, closer examination of several populations showed that there was a gradation in the flowering of the plants, some of which possessed numerous fully-developed flowers, while others were still in young bud stages.

It appeared on first cytological examination that the material would produce no active cells. Anthers were found to be of two sizes, either too young with nucleate pollen mother cells or too old with mature pollen. No intermediate stages could be located.

Some of the older buds showed signs of chromosomes but at a very late stage of division. However, a squash of what appeared to be an advanced bud, provided one anther chamber of dividing cells in late second telophase which, although not the perfect stage, was easily countable and

produced three chromosome plates with a count of n = 12 shown in fig. 35.

The inactivity of most of the buds for this species was probably due to the incorrect time of fixation which must have been different from the time suitable for the fixation of the other species investigated in this work.

As a comparison was being made in this work between the genus Acrostemon and its related genera, an attempt was made to investigate the cytology of one species from each of the genera, Simocheilus and Syndesmanthus.

The problem was finding material which was known to belong to either of these genera. As the genera can be recognised only when in full bloom, it was impossible to gather material at the right stage without knowing the exact localities beforehand. Thus only one species could be investigated cytologically in the time available.

Syndesmanthus paucifolius Benth.

Ample material was gathered in the Palmiet River valley, Caledon Division, and was fixed in the laboratory in the same manner as for the species of Acrostemon. The squash procedure was identical with that used in the previous investigations.

Examination of squashes showed that the material was actively dividing at the same bud stage as in Acrostemon, i.e. when the anthers exhibited a slight pink coloration. The chromosomes were very clumped and were impossible to count accurately. Numerous squashes were made in which active cells were present, but in each case the chromosomes were superimposed in small groups. A tentative count of n = 12 was made, but with some doubt.

CHROMOSOME NUMBER AND MORPHOLOGY.

The taxonomically useful characteristics of the karyotype of species are the most easily observable differences involving chromosome number and the gross morphology of the chromosomes where these are large enough for satisfactory microscopical examination.

In the cytological investigations carried out in this work, the chromosome numbers listed in the table below were obtained for the species investigated :-

A. stokoei L. Guthrie var. confusus E.G.H. Oliver	n = 12
A. viscidus N.E.Br.	n = 12
A. eriocephalus (Kl) N.E.Br.	n = 12
A. vernicosus E.G.H. Oliver	n = 12
A. glutinosus E.G.H. Oliver	n = 13
A. xeranthemifolius (Salisb.) E.G.H. Oliver	n = c 15-18
Syndesmanthus paucifolius Benth.	n = c 12

Except for the two species, A. glutinosus and A. xeranthemifolius, the species investigated in the genus Acrostemon possess a haploid number of 12 chromosomes.

Of the species of Ericoideae listed by Darlington & Janaki-Ammal (1950) all ten species of Erica have n = 12; two of which are South African. However, the only other genus listed, Calluna vulgaris Salisb., has a number of n = 8.

In the group with haploid numbers other than 12, A. glutinosus poses a problem in having a clearly different chromosome number. In fig. 36C the chromosomes are in second metaphase. The two separate chromosomes apparently belong to the lower plate. Here the haploid count is 13.

In fig. 36D the chromosomes are at second anaphase, the distinct plates being at two different levels and are shown separated by the dotted line, and the haploid count is 13. In fig. 36A the chromosomes are most probably at the begining of second anaphase and starting to drift apart. The single countable plate contains 24 chromosomes and must therefore be 12 pairs. However, one pair of chromosomes appears to be absent. In fig. 36B the chromosome plate is in a similar state of division, but in this case at the begining of first anaphase. The exact number of chromosomes is difficult to determine. There appear to be 23 large mosomes and 3 smaller bodies which may or may not be chromosomes. The count is either 12 or 13.

It therefore seems that the chromosome count must be 13 and not 12, as in the other species, if some of the plates contain 13 chromosomes.

A. xeranthemifolius appears to have a different chromosome number, but this is uncertain at the present. The species was placed in the monotypic genus Hexastemon Kl. which has on morphological grounds been included in the genus Acrostemon. The possession of a different chromo-

some complement does not necessarily exclude the species from the genus Acrostemon. A precise count and investigation of the chromosomes may produce more information regarding the relationships of this species.

The gross morphology of chromosomes is often useful in taxonomic studies. Because of the characteristic features of chromosomes in some species, it is possible to distinguish as individuals every chromosome of the complement. Where this is the case the karyotype can be of considerable taxonomic value, because related species, while possessing chromosomes of the same number, are often found to show constant differences in their gross morphology. (Heslop-Harrison, 1960).

It was not possible in this work on the chromosomes of species of Acrostemon to prepare any idiograms of the chromosome complements in the manner of those given in a number of modern treatments of genera and groups of genera (Crepis, Babcock et al, 1947; Nicotiana, Goodspeed, 1954).

In most of the chromosome plates obtained in this work, little or no distinct structure could be seen. The chromosomes were small and with no definite shape. Some, however, showed a constriction and two arms, (fig. 36B), but this seemed to be of no value.

The only published chromosome figures of Ericoideae are those of Hagerup (1928) shown in fig. 30. These do not show any differences in morphology and are similar to some of the plates obtained for Acrostemon.

2. INVESTIGATION OF POLLEN TUBE NUCLEI.

Mention of the use of pollen tube nuclei for the studying of chromosome numbers and morphology was made by Darlington and La Cour (1950). As an alternative method to the pollen mother cell squash, it was decided to attempt this technique.

Schnarf (1939) listed all investigated species of Angiosperms with respect to the pollen nuclei, whether there are two or three nuclei in each pollen grain at anthesis. He listed Erica tetralix L. and several species of Rhododendron as having two nuclei in the pollen grain at anthesis but did not mention the division of the generative nucleus.

Angiosperms may be grouped according to whether the generative nucleus divides in the pollen grain or in the pollen tube. If the division takes place in the pollen grain, the resulting two male nuclei pass down the pollen tube while in the latter group, the generetive nucleus passes into the tube where it divides. As the pollen tube is usually of a delicate texture and thin walled, this has proved an ideal way of studying chromosomes. Most of the work in this field has been carried out on Tradescantia, also on Lilium, Amaryllis and Tulipa (Conger, 1953).

It is most surprising that more workers do not employ this technique in plants where the generative nucleus does divide in the pollen tube. Conger (1953) states "Tradescantia pollen tubes are grown routinely in this laboratory and experiments have one hundred or more analyzable metaphase nuclei on each slide". Bishop (1949) in his work on Tradescantia says "In one lot of twenty-seven cultures, an average of forty-three countable metaphases per cover glass was obtained with the maximum at 121 metaphases". These seemed to be excellent results and gave added encouragement for attempting this method in the Ericaceae and its feasibility was investigated.

References in bibliographies produced a number of papers dealing with the subject of the culture of pollen tubes, among them were Beatty (1937), Newcomer (1938), Swanson (1940), Sax & O'Mara (1941), Bishop (1949) and Conger (1953).

The method appears to have been developed by Beatty (1937) and Newcomer (1938) and subsequent papers have been based on one or other of their works. The procedures of

Bishop (1949) and also to some extent of Conger (1953) were found to be the most useful and easily applied.

The species used in the investigation was Acrostemon viscidus N.E. Br. from the Schurfteberg Pass north of Ceres. Branches of the species were cut and chosen where a large number of flowers were in a late bud stage. When flowers of Acrostemon species and many Ericaceae open, the anthers part almost immediately and shed their pollen. It is almost essential to obtain bud stages which will open at the required time. The material was placed in water in the laboratory and the flowers allowed to develop. A continuous supply of fresh pollen was thus available for a period of up to ten days before the buds showed signs of collapsing.

A problem arose as to the procedure of using pollen from flowers that had been picked for up to ten days to know whether the pollen was in perfect condition. Only a series of tests with the perfectly fresh and the "old" pollen could show whether there were any significant difference in their behaviour and the results obtained. Insufficient time and material prevented any investigations of this aspect.

Two different methods were employed in the culture programmes. The first was used by Conger (1953) based on Beatty (1937) and Newcomer (1938). The second was advocated by Bishop (1949). Both methods use film-culture, but apply the film to different surfaces and use different moist-chambers.

Conger stated that his technique was for the growing of Tradescantia pollen grains. It was most important for a worker to know what variations were necessary for any other material under investigation. However, any method of culture would be satisfactory if it ensured :-

(a) that the fresh pollen is kept dry before sowing, i.e. kept in a desiccator if necessary,

(b) that no time is lost between sowing the dry pollen on the culture medium and placing it in a moist-chamber,

(c) that sown and growing pollen preparations are kept moist all the time,

(d) that no contamination is allowed in the colchicine and the culture medium or from fumes.

Conger's method briefly involved :-

(a) making a culture medium of 12gms of sucrose, 1.5gms of agar, 0.01gms of cochicine in 100ml of distilled water;

(b) spreading the medium evenly on slides and allowing it to harden;

(c) immediately scattering fresh dry pollen evenly over the medium;

(d) immediately placing the slide in a moist-chamber;

(e) examining the slides at varying intervals by placing a drop of acetocarmine and a cover slip on the growing pollen grains.

It was important to obtain thin culture films on the slides since it was found that the pollen tubes grew in different planes and thus were difficult to observe. Difficulty was experienced in spreading an even thin film over the slide. More often than not it was blotchy and uneven. Several variations of the technique were tried to counteract this.

General observations by workers have shown that pollen nuclei begin to divide about 9 - 10 hours after germination of the pollen tube and that most divisions will have taken place from 15 - 18 hours after sowing.

The pollen was, therefore, sown late in the afternoon to provide the best working time in the following mid-morning. From early morning, at intervals of an hour, 2 slides were taken out at random, fixed, stained and examined for dividing nuclei. A series of fifteen slides was prepared by this method and kept in a moist-chamber.

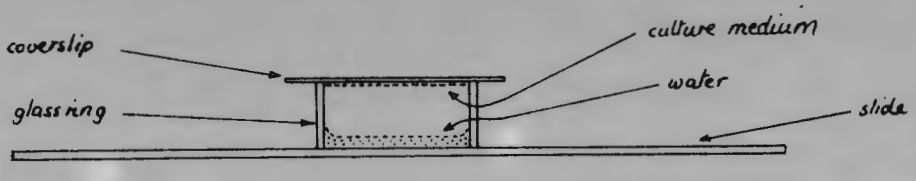
The results were poor and the slides had little to show. The germination was 75% on good slides and less than 5% on poor slides. There was also a great variation in the length of pollen tube on the better slides. No explanation can be given for this phenomenon. After 19 hours the cultures showed better germination, but no signs of any chromosomes or even nuclei. No exact time could be given as the optimal time for investigation. The varying thickness of the culture medium allowed the pollen tubes to grow at all angles and to twist about. This did not facilitate the microscopic examination.

A disadvantage found with this method was the rapid growth of fungi on the sucrose culture medium. This was

most probably caused by the open nature of the slides on to which spores could freely settle.

It was decided to investigate the second culture method as the flower buds showed that they would not last for a repetition of the first method.

The second method followed Bishop's use of a van Tieghem Cell as the moist-chamber for each culture slide. The culture medium was placed in this case on the under surface of the coverslip. Fig.30 illustrates the arrangement of the van Tieghem Cell used.



van Tieghem Cell.

Fig.

The culture medium in this case was identical with the first except that lactose was used instead of sucrose.

The coverslips were dipped into the medium and allowed to drain off. This provided a much thinner and more even film. The fresh dry pollen was scattered on the culture film and the coverslip was immediately placed on the glass ring. A few drops of water placed in the bottom of the cell prevented the medium from drying out. The extra culture medium above the ring provided a seal to the moist-chamber and held the coverslip on the ring.

A series of ten such cultures slides was made. These could then be examined individually at leisure. This was much more satisfactory than the first method.

At hourly intervals from 12 hours after sowing, the coverslip with the most actively growing pollen tubes was removed. The pollen was fixed and stained with acetocarmine on a fresh slide. After all the coverslips had been fixed and stained, they were examined thoroughly and compared.

In this second series of preparations germination was very much better, with most of them showing over 75% germination. There was also little or no fungal contamination of the medium. The use of the van Tieghem Cell considerably reduced the exposure or the medium to the open air. In the Conger method sucrose was used in the medium. Bishop gives two reasons for his preference for lactose :-

(1) preliminary tests seemed to indicate that it produced better germination and growth than the sucrose medium;

(2) it was much simpler to prevent fungal and bacterial contamination with a lactose medium.

The culture film on each coverslip was sufficiently thin to cause the pollen tubes to grow in the same plane, a fact which greatly facilitated the examination of the slides.

The pollen grains in Ericaceae occur in the form of tetrads. As a result, four pollen tubes are produced from each tetrad on germination. The tubes were found to emerge from slits on the furthest extension of each member of the tetrad. Fig. 37 shows the arrangement of the tetrad and the germination of the pollen tubes.

First examination of the slides produced no results; no chromosomes or even nuclei were noticed as it was expected that they would be relatively large, i.e. similar to the chromosomes of other plants illustrated in the papers involving this technique. More careful examination of the slides revealed that some of the older slides possessed stained nuclei in the pollen grains and that some of the grains actually contained minute clumps of chromosomes. This showed that the generative nucleus in the genus Acrostemon must divide in the pollen grain and not in the pollen tube.

Under magnifications of 1000 to 2000 it was possible to count them. The chromosomes were rather clumped, but were distinguishable and the best set found is shown in fig.37A . This metaphase plate consists of a haploid number of 12 chromosomes. This confirms the count of n = 12 obtained for the same material by means of the pollen mother cell squashes. However, in this case the chromosomes are smaller most probably because of the action of the colchicine in the culture medium.

An interesting point was the finding of a single plate

of chromosomes at the base of one of the pollen tubes. This plate was just countable and is shown in fig. 37B giving a count of n = 12.

As most of the chromosome plates were situated in the pollen grains, it can be assumed that this single plate in the pollen tube was an aberrant form and contrary to the rule. No reasonable explanation can be given for this occurence. The chromosomes could perhaps move into the tube after dividing in the pollen grain.

In this technique acetocarmine was used as the combined fixative-stain. The results were satisfactory as the chromosomes took up the stain readily and were contrasted against the pale background of the cell contents. The preparations could easily be left for a day or two with no excess staining. If, however, they were left longer, the cytoplasm began to stain up and the contrast was greatly reduced, making detailed examination difficult.

Aceto-orcein was tried as an alternative stain to the acetocarmine. The resulting slides were unsatisfactory as the orcein stained the exine of the pollen grains to such an extent that the cell contents became obscurred. Aceto-lacmoid was likewise tried, but had very little staining effect. It was decided, as acetocarmine produced good results, not to use the more elaborate and time-consuming Feulgen technique.

No distinct chromosome morphology could be studied in the chromosomes obtained by this method. This was due to the contracting action of the colchicine contained in the culture medium. It would be of interest to investigate pollen tubes which had been cultured in a colchicine-free medium to ascertain what structure the chromosomes would show. Similarly, it would be of interest to know whether the colchicine had induced nuclear division in the pollen grains instead of in the pollen tubes.

The fact that the nucleus divides in the pollen grain is most unfortunate as the material of mature pollen is easily procurable and numerous preparations could be made for chromosome counts. This method would give results more satisfactorily and easily than the pollen mother cell squashes. However it should not be abandoned after only its first application is found to be not entirely satisfactory. Further investigation of pollen tube division could be made in the Ericaceae as a useful alternative

method for the study of chromosome numbers.

In this technique it is of interest to note the function of the sugar in the culture medium. Bishop points out that lactose is a non-nutrient sugar as far as pollen grains are concerned. It may be used with equal results as sucrose. Pollen tube growth is very rapid and thus with the lactose no external nutrient appears to be necessary for the rapid growth. The lactose acts purely as an external osmoregulator.

CHROMOSOME FIGURES.

Figure 31.

Chromosomes of species of Erica as illustrated by Hagerup (1928).

Figure 32.

A. stokoei var. confusus, Oliver 1579; (a-d) second metaphase, x1000; (e-f) first metaphase, x1000; (g) one plate from second metaphase, x2000.

Figure 33.

A. stokoei var. confusus, Oliver 1843; (a-c) first metaphase, x1000; (d-e) second metaphase, x2000.

Figure 34.

A. viscidus, Oliver 1562; (a) second metaphase, x2000; (b-d) one plate each from second metaphase, x2000.

Figure 35.

A. vernicosus, Oliver 1835; (a) second metaphase, x2000; (b) second anaphase, x2000.

Figure 36.

A. glutinosus, Oliver 1837; (a) second anaphase, x2000; (b) first anaphase, x2000; (c) second metaphase, x2000; (d) second anaphase, x2000.

Figure 37.

A. viscidus, Oliver 1562; (a) pollen tetrad with single plate at first metaphase, x2000; (b) plate at base of a pollen tube, first metaphase, x 2000; (c) germinating pollen tetrad, x400.

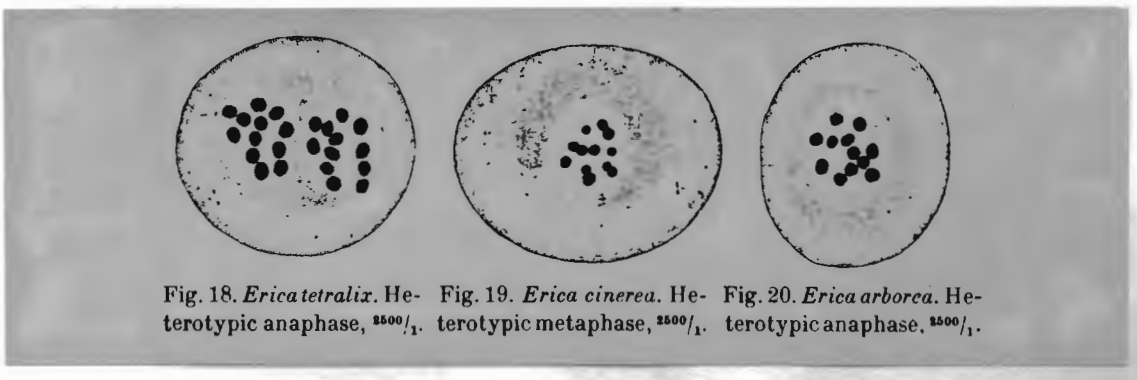


Fig. 18. *Erica tetralix*. Heterotypic anaphase, $^{2500}/_{1}$.

Fig. 19. *Erica cinerea*. Heterotypic metaphase, $^{2500}/_{1}$.

Fig. 20. *Erica arborea*. Heterotypic anaphase, $^{2500}/_{1}$.

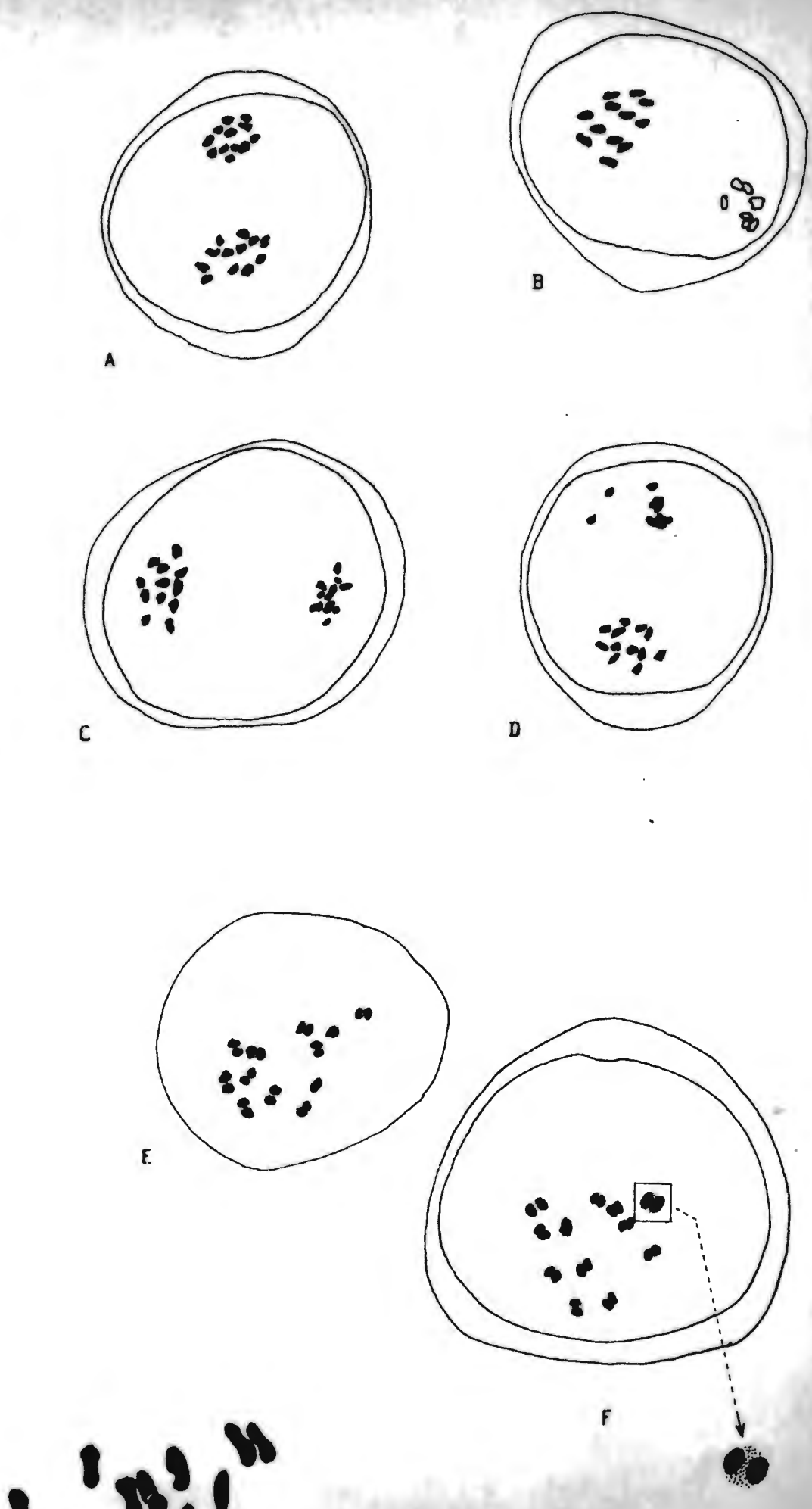


Fig. 32.

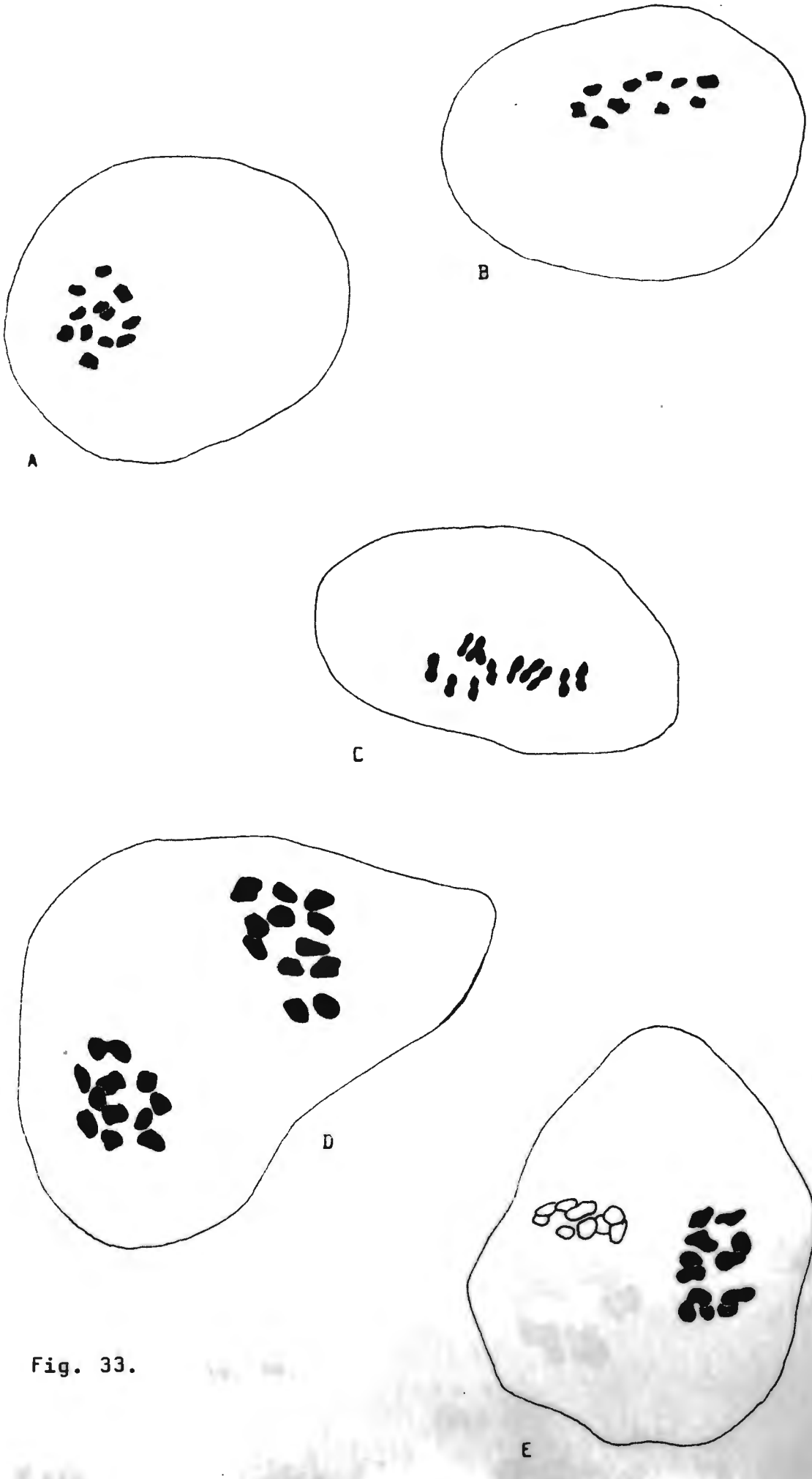
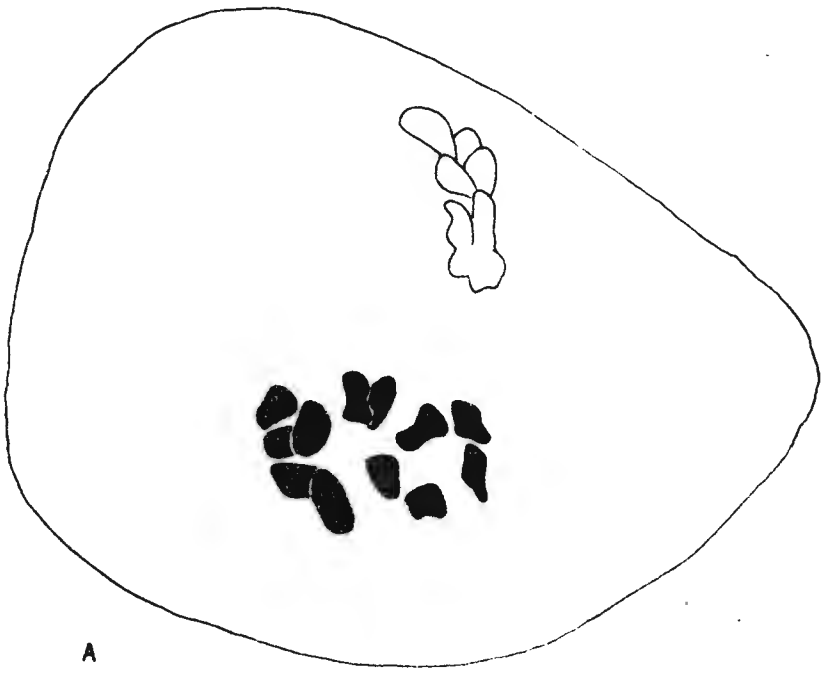
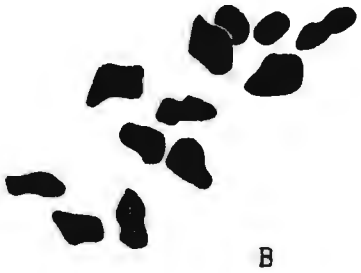


Fig. 33.



A



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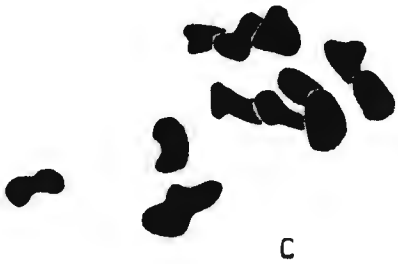

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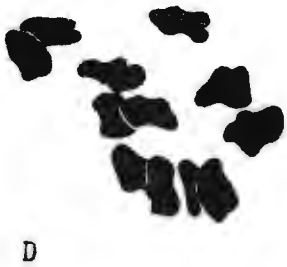


D

Fig. 34.

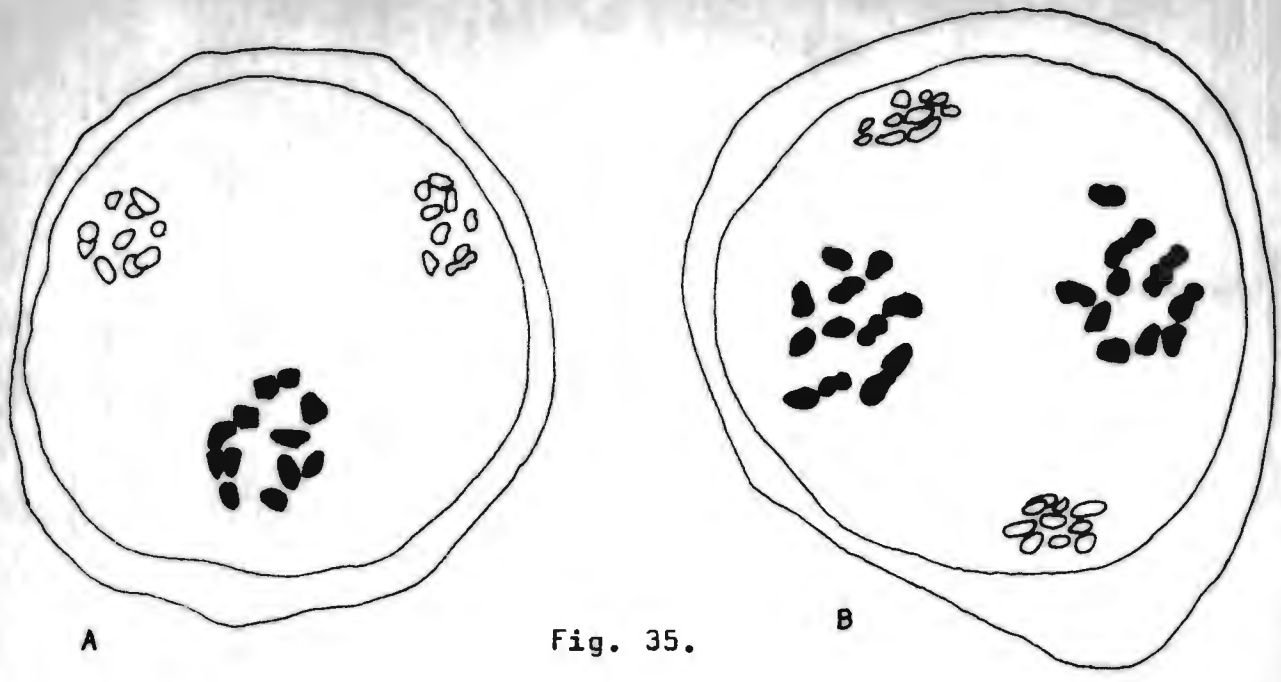
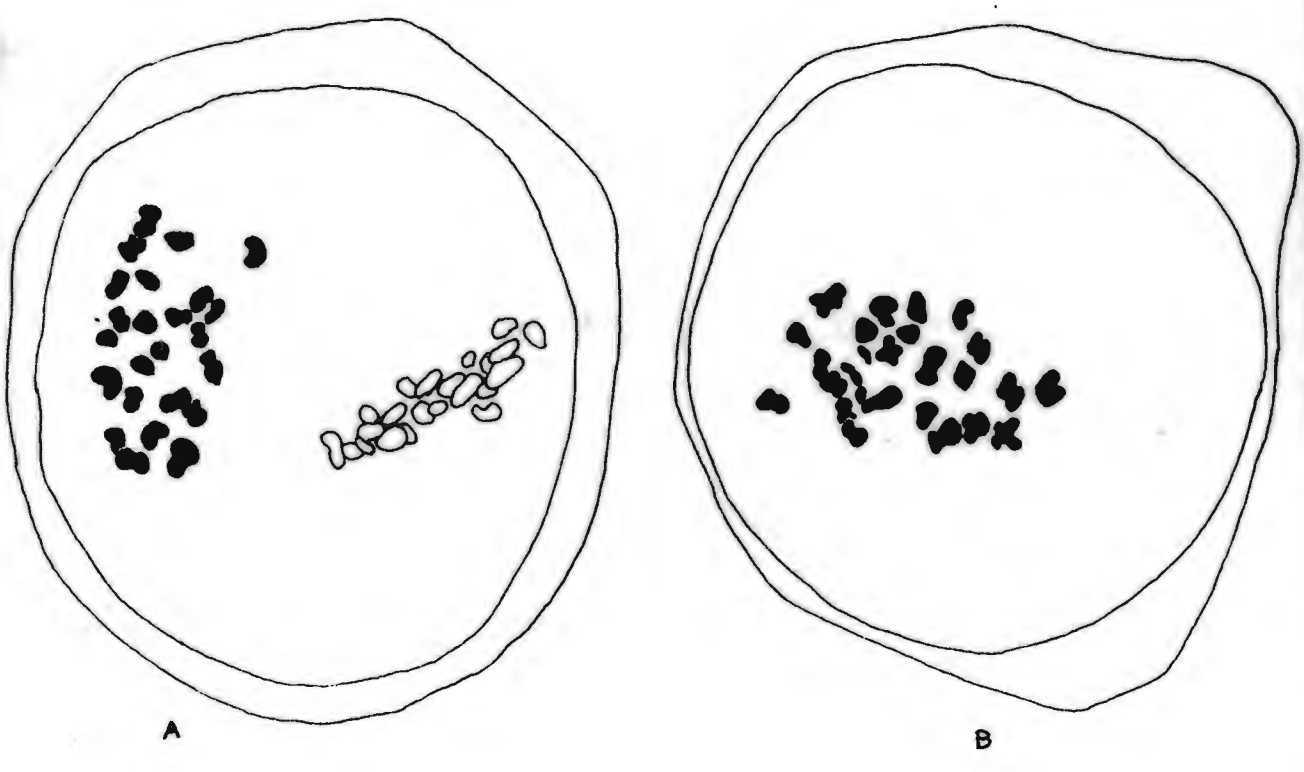


Fig. 35.



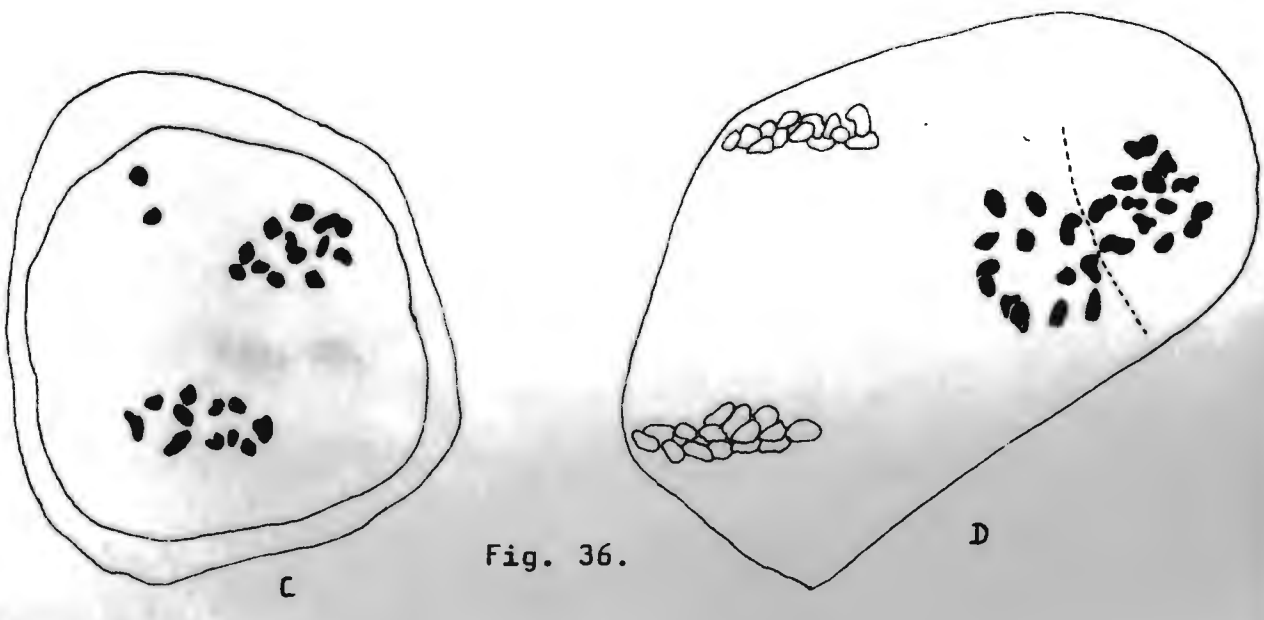


Fig. 36.

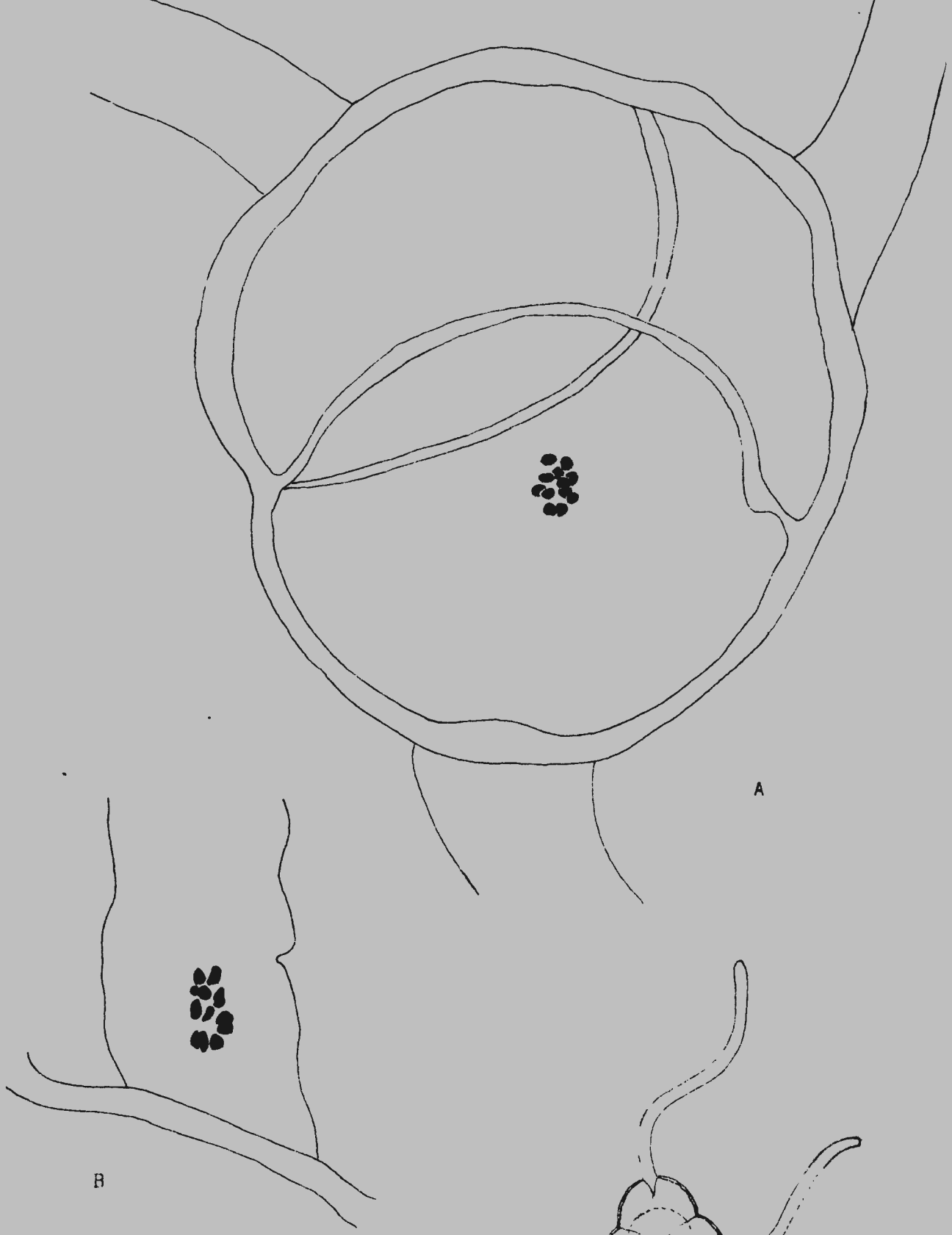


Fig. 37.

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