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NOTES ON SOME PLANTS OF SOUTHERN AFRICA  
CHIEFLY FROM NATAL: VI\*

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**ABSTRACT.** These notes concern Scrophulariaceae only. The hitherto monotypic genus *Glumicalyx* is augmented by the transfer to it of *Zaluzianskya alpestris*, *Z. flanaganii*, *Z. goseloides* and *Selago (Walafrida) apiculata*: *S. nutans* becomes a synonym of *G. alpestris*. A new species, *G. lesuticus*, is described. The genus is revised, with discussion of, and key to, related genera: *Polycarena* and *Phyllopodium* are tentatively retained as distinct. A new genus *Strobilopsis*, allied to *Glumicalyx*, is described with one species *S. wrightii*. *Tetraselago* Junell is accepted and *Selago longituba*, *S. nelsonii* and *S. wilmsii* (incl. *S. aggregata*) are transferred to it.

**221–227** *Glumicalyx* Hiern in Hook., Ic. Pl. 28: tab. 2769 (Nov. 1903) et in Dyer, Fl. Cap. 4:2:369 (July 1904); Dalla Torre & Harms, Gen. Siphon. 461 (1904); Phillips, Gen. S. Afr. Pl. 553 (1926) et ed. 2, 678 (1951); Marloth, Fl. S. Afr. 3, 1:129 (1932); Junell in Svensk Bot. Tidskr. 55:172 (1961); Dyer, Gen. S. Afr. Fl. Pl. 1:562 (1975).

Type species: *G. montanus* Hiern.

*Inflorescence* racemose, terminal, cone-like, nodding in flower, erect and elongated in fruit. *Bracts* broad, sharply differentiated from leaves, adnate to pedicel, free from calyx. *Calyx* unequally 5-lobed, rarely the 2 anterior lobes obsolete, split nearly or quite to base at least on anticous face, delicate in texture. *Corolla* glabrous, thick-textured, leathery when dry; tube 3–25 mm; lobes oblong to suborbicular, 2–4 mm long, entire, yellow, orange or orange-red on upper surface (margins excepted). *Stamens* 4, all fertile, didynamous; filaments of anticous pair arising just within the mouth, those of posticous pair becoming free from corolla at lower level and below that decurrent to base of tube (or nearly to base in *G. apiculatus*); anthers synthealous, equal or unequal. *Nectary* a small dorsal gland at base of ovary. *Ovary* bilocular, with 10 to numerous ovules in each loculus on axile placenta. *Style* filiform, sometimes with some glandular hairs near base; stigma linguiform with marginal papillae, occasionally slightly bifid at apex. *Capsule* septicidal; seeds irregularly faceted, reddish brown.

Perennial herbs or dwarf shrubs, woody at least at base, stems with deflexed hairs. Leaves all or mostly cauline, opposite below, alternate above, glandular punctate.

\* Continued from Notes R.B.G. Edinb. 34:286 (1976).

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The genus *Glumicalyx* was based on a single species, *G. montanus*, from the high Drakensberg, and it has remained monotypic for over 70 years. Shortly after collecting this species in 1969, we made the chance observation that the plant known as *Walafrida apiculata* was remarkably similar. Dissection showed that there were several ovules in each loculus and, hence, that its position in *Walafrida* was quite incorrect. It was clearly a second species of *Glumicalyx*. Further search suggested that three species of *Zahuzianskya* (*Z. alpestris*, *Z. flanaganii* and *Z. goseloides*) were also allied, and so it proved. Finally *Selago nutans* came to light, but this we reduce to a synonym of *Z. alpestris*. Further collecting in the Drakensberg has greatly extended our knowledge of these plants and has led to the discovery of one more species. *Glumicalyx* is therefore presented here as a genus of six species. It is of great interest because of its geographical distribution and because of its role as a link between tribe *Manuleeae* and tribe *Selagineae* (family Selaginaceae of some authors), a role first emphasised by Junell in 1961. Both these aspects are discussed in more detail below.

**THE POSITION OF GLUMICALYX.** At the time when Hiern originally described *Glumicalyx*, great weight was attached to the aestivation of the corolla in the family classification. Unfortunately, either Hiern's observation of this character was at fault or he examined an unusual flower; he described the aestivation as having the lateral lobes overlapping the upper ones. In consequence, Hiern placed *Glumicalyx* next to *Digitalis*, and this position was accepted by Dalla Torre & Harms (1904) and maintained without comment by Phillips (1926, 1950) and by Dyer (1975). Junell recognized that *Glumicalyx* belongs to *Manuleeae*, though he did not discuss aestivation. In any case the synstecous anthers alone are sufficient to remove it from the *Digitaleae*.

We have examined numerous buds of *G. montanus* without finding the pattern of aestivation described by Hiern: almost always both the lateral lobes are overlapped by the two upper lobes, very rarely one upper lobe has its lower edge within a lateral lobe.

The other species of the genus also have the upper lobes overlapping the laterals. Thus, although the overriding importance of this character has now been rejected, *Glumicalyx* does show a predominant pattern fully in keeping with its being placed in *Manuleeae*, of which it has the characteristic anthers.

In 1961 Junell published (in *Svensk Bot. Tidskr.* 55:168-192) the results of his study of ovary structure undertaken to test Wettstein's reduction of Selaginaceae to a tribe of Scrophulariaceae. He made the interesting discovery that a few species of *Selago* had 4 ovules in each ovary; each loculus contains 2, attached in the middle of the axile placenta and one of them turned upwards the other downwards. He created the new genus *Tetraselago* for these species. The Scrophulariaceae that he studied included *Glumicalyx montanus* and it proved to be important in his conclusions. In brief, Junell suggested the derivation of the *Tetraselago*-type of ovary from one like that of *Glumicalyx montanus*, which has noticeably fewer ovules than that of most related Scrophulariaceae. His argument was derived from the observation that in *Glumicalyx montanus* the uppermost ovules are turned upwards, the lower ones downwards; thus if the uppermost of the downwards ovules and the lowest of the upwards ones alone remained, the *Tetraselago* condition (where the ovules are central on the placenta) would be almost attained. Fig.

8 of Junell's paper shows the series of ovary forms and the first of these is a repetition of his illustration of *Glumicalyx*.

Our own observations on the ovary of *G. montanus* confirm those of Junell. The fertile part of the placenta is central, with a short sterile part both above and below. It is only the uppermost ovules that are turned upwards, about three-quarters are turned downwards. Of the new species now added to *Glumicalyx*, *G. apiculatus* has even fewer ovules than *G. montanus*, but they are arranged in the same pattern: the uppermost are turned upwards, the remainder downwards. The other species have more numerous ovules and serve to emphasize the link between *Glumicalyx* and the other genera of *Manuleeae*.

The rather few counts that we have made suggest that in each loculus the number of ovules in *G. lesuticus* is c. 85; in *G. flanaganii* 50; in *G. alpestris* 65; and in *G. goseloides* 60, in an ovary from a large inflorescence and 35 in an ovary from a small inflorescence on the same plant. Variability is also indicated by a count of 35 in cultivated *G. montanus*.

At this point mention must be made of another plant in this affinity, described below as a new genus, *Strobilopsis*. In the ovary it differs from *Glumicalyx* by having 2-6 ovules in each loculus, only the upper part of the placenta being fertile, and only the uppermost 1 or 2, at the most 4, ovules developing into seeds. Here, perhaps, we have a hint that further sterilization on the ovular side would lead to the normal *Selago* condition of a single apical ovule in each loculus.

The relationship between *Strobilopsis* and *Glumicalyx* recalls that between *Oftia* and *Teedia*. *Oftia*, for long referred to Myoporaceae, has been accepted as a member of Scrophulariaceae allied to *Teedia* by Hartl (see Beitr. Biol. Pfl. 42:145-149, 1966), and Dalhgren & Rao (in Bot. Notiser 124:451-472, 1971). *Teedia* has numerous ovules, but *Oftia* has only two, and these are from the upper inner angle of each loculus. *Strobilopsis* differs from *Oftia* in its syntheous anthers, inflorescence and seed structure. The similarity of ovular arrangement is therefore an instance of convergence rather than of close affinity.

This study of *Glumicalyx* and the discovery of *Strobilopsis* both confirm Junell's conclusions that *Manuleeae* and *Selagineae* are closely related and that Wettstein was correct in reducing Selaginaceae to a tribe of Scrophulariaceae.

RELATIONSHIP OF GLUMICALYX TO OTHER GENERA OF MANULEEAE. Since three of the species now referred to *Glumicalyx* had previously been placed in *Zaluzianskya*, it was naturally with this genus that most detailed comparisons were made. The full differences are shown by the generic diagnoses given below; the most obvious are that in *Glumicalyx* the inflorescence is nodding at flowering time, only becoming erect in fruit, and the bracts are sharply differentiated from the leaves: in *Zaluzianskya* it is always erect, and the bracts are not sharply differentiated from the leaves. In *Glumicalyx* the bract is carried up on the pedicel but is not adnate to the lower part of the calyx as it is in *Zaluzianskya*. In *Zaluzianskya* as the flower bud ripens, the corolla lobes start to spread at the base, but the tips, which are the widest part, remain inflexed and overlapping until anthesis: thus the ripe bud has a drumstick appearance. This is never found in *Glumicalyx*.

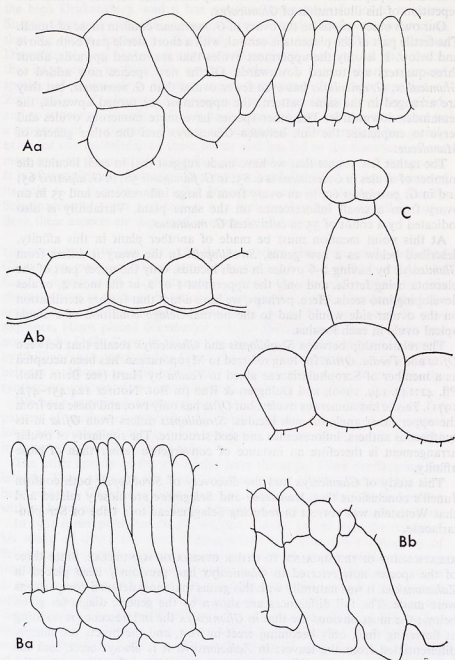


FIG. 1. Structure of epidermis of corolla lobes. A, *Glumicalyx montanus*: a, upper epidermis; b, lower epidermis. B, *G. alpestris*: a, upper epidermis, b, lower epidermis. C, *Zaluzianskya* sp. aff. *Z. maritima*; upper epidermis. All  $\times 300$ .

Another striking difference between *Glumicalyx* and *Zaluzianskya* is in the colouring of the corolla. In *Zaluzianskya* the commonest pattern is that the lobes are scarlet, deep red, maroon or almost brown on the outside, white within. In some species the inner surface of the lobes is greenish white, cream or yellow, and some have either an orange centre to the limb or the outline of a bright red star around the mouth; in one of the Cape annuals, *Z. villosa*, the lobes are white inside and almost white (perhaps greenish) outside: our personal knowledge of this group of species is at present sketchy. In *Glumicalyx* the outside of the lobes is more or less pale buff, or rarely dull purple, additional colour being what shows through from the inside: this is creamy-yellow, orange or orange-red except for the margins, which are usually white, sometimes dull purple.

These quite different patterns of coloration are reflected in structure. In surface view the coloured epidermal cells of the centre of the lobe of *Glumicalyx* can be seen to be decidedly smaller than the uncoloured cells of the lobe margin. When the corolla lobe is sectioned, the coloured cells are seen to be vertically elongated and have dense contents (fig. 1 A,B). This tissue somewhat resembles the columnar epithelium of the osmophore of *Gloxinia perennis* (see S. Vogel in Österr. Bot. Zeitschr. 113:337, 1966). Its detailed structure and function await investigation.

In *Zaluzianskya* the main colour of the corolla is present in the cell-sap of normal epidermal cells, mostly on the lower surface of the lobes, and these coloured cells do not differ in size or shape from the uncoloured cells adjoining them (fig. 1C).

The differences in inflorescence, nodding in *Glumicalyx* erect in *Zaluzianskya*, taken together with those of floral form and pigmentation, strongly suggest that the pollination biology of these two genera is quite distinct. This is underlined by the fact that many of the species of *Zaluzianskya* open at night, as reflected in the name of the generic synonym *Nycterinia*.

*Zaluzianskya* is a much larger genus than *Glumicalyx*. There are perhaps 40 species ranging from the Cape Peninsula to Rhodesia, with a single outlier on Mt Elgon in E Africa. The species are very poorly understood and our own field work has so far been confined to Natal and adjacent areas: even here it will clearly be some time before we can offer a synopsis of the genus.

*Glumicalyx* is almost as closely allied to *Manulea*, which is probably a more variable genus than *Zaluzianskya*. Some of the species have dull yellow or dull orange coloration all over the upper surface of the thickish corolla lobes and there is a similar area of cells with dense contents but these are not markedly columnar as in *Glumicalyx*. If the genus as we find it at present is correctly delimited, this is clearly not a constant feature, but other species may have orange patches of similar tissue round the mouth. The Natal species have compound inflorescences of racemes of cymes: those species that more resemble *Glumicalyx* in having simple condensed inflorescences come from further south, and when the inflorescence is subcapitate it is always erect and the bracts, adnate only to the base of the pedicel, are much narrower than in *Glumicalyx*.

Existing diagnoses and keys for the genera of *Manuleae* in Southern Africa are by no means satisfactory and we have therefore thought it worthwhile to give brief comparative descriptions and a new key here. These are

based on our own observations of the material available to us, but unfortunately that has not covered all species: some further revision may therefore ultimately be needed. A few prefatory notes are necessary.

*Phyllopodium* was reduced to *Polycarena* by Levyns (in Journ. S. Afr. Bot. 5:35-38, 1939). It is true that the character of the calyx, regular in *Phyllopodium* bilabiate in *Polycarena*, is unreliable. It is also true that Hiern's additional character of a unilocular ovary in *Phyllopodium* seems to be quite fictitious. Nevertheless the union of these two genera was perhaps premature and we prefer to keep them distinct, relying on slightly different characters of the calyx and those of the seed: some species have clearly been misplaced. We list the species we have examined under each genus, with notes on their placing when necessary. *Tetrasselago* is included as it cannot be run into Selaginaceae in any existing key. New combinations and a description of the genus are given below (nos. 229-232). *Sutera* is also included in the key, but a concise diagnosis of this large genus cannot yet be given.

*Glumicalyx*: inflorescence capitate or oblong-capitate, nodding at first, becoming more or less elongated and erect in fruit; bract adnate to pedicel, free from calyx, sharply differentiated from leaves; calyx split nearly or quite to base, at least on the anticous face; corolla thick-textured, leathery when dry, glabrous, the lobes oblong to suborbicular, entire, upper surface (margins excepted) yellow, orange or orange-red; stamens 4; ovules 10 or more in each loculus; seeds irregularly angled (faceted), reddish-brown.

*Strobilopsis*: inflorescence erect, oblong-capitate; bract adnate to pedicel, scarcely so to extreme base of calyx, sharply differentiated from leaves; calyx with anticous lobe free nearly to base; corolla membranous, lobes broadly elliptic, entire, creamy, an orange patch with clavate hairs at base of upper lip; stamens 2-4; ovules 2-6 on upper part of each placenta; seeds more or less flattened with a reticulate pattern of smooth ridges, light brown.

*Manulea*: inflorescence a raceme of cymes or simple raceme, congested or lax but always erect; primary bracts small, adnate (sometimes very shortly so) to base of pedicel of racemose flowers or peduncle of axillary cymes, free from calyx, sharply differentiated from leaves; calyx usually more or less deeply and equally 5-lobed; corolla tube with stout hairs outside, unicellular clavate hairs inside associated with the filaments or position of the filaments, lobes entire or bifid, upper surface coloured; stamens 4; ovules many in each loculus; seeds more or less terete, transversely wrinkled, blue when ripe, or sometimes chalk-white (only when immature?).

*Zaluzianskya*: inflorescence an erect lax or congested raceme; bract adnate to pedicel and calyx, not sharply differentiated from leaves; calyx bilabiate, "gusseted" in flower, expanded in fruit; corolla membranous, papery when dry, tube nearly always glandular-pubescent outside, lobes entire, notched or bifid, always broader at the top than at the base, permitting formation of "drumstick" buds, upper surface often white, lower coloured pink, red, maroon or brown, throat glabrous or with a circlet of stout unicellular hairs; stamens 4, or very rarely 2; ovules many in each loculus; seeds irregularly angled (faceted), pale.



*Polycarena*: inflorescence racemose, sometimes congested, always erect; bract adnate to pedicel and calyx, (usually only teeth of anticus lip tree), not sharply differentiated from leaves; calyx bilabiate; corolla membranous, tube glabrous or glandular-pubescent outside, lobes entire, orange patch with unicellular hairs at base of upper lip; stamens 4; ovules many in each loculus; seeds more or less 3-angled or 3-winged, testa delicate, transparent, loosely enveloping seed.

Species examined:

- Polycarena capensis* (L.) Benth. (Dümmer 1798, Kraaifontein, E).  
*P. capillaris* (L.f.) Benth. (Schlechter 5271, Berg River near Piquetberg, E).  
*P. giloides* Benth. (Scott Elliot, Tulbagh, E).  
*P. parvula* Schltr. (Schlechter 8534, Zuurfontein, E, iso.).  
*P. rariflora* Benth. (Schlechter 10822, Brandewynrivier, E).  
*P. silenoides* Benth. (Schlechter 8614, Pakhuisberg, E).  
*P. tenella* Hiern (Schlechter 8723, Koudeberg, E, isosynotype).  
 See also under *Phyllopodium* for species better placed there.

*Phyllopodium*: inflorescence racemose, sometimes congested, always erect; bract adnate to pedicel and lower half or less of calyx, not sharply differentiated from leaves; calyx more or less bilabiate, at least the posticus lobes a third or more of the total calyx length; corolla membranous (leathery in the aberrant *P. krebsianum*), tube glabrous outside, lobes entire, orange patch with unicellular hairs at base of upper lip; stamens 4, or very rarely 2 and then flowers possibly always cleistogamous; ovules many in each loculus; seeds irregularly angled or wrinkled, testa opaque, pale.

Species examined:

- Phyllopodium bracteatum* Benth. (Schlechter 2351, George, E).  
*P. capitatum* (L.f.) Benth. (Harvey 237, C.B.S., E).  
*P. cuneifolium* (L.) Benth. (Burt Davy 7894, Port Alfred, E).  
*P. diffusum* Benth. (Sim 1322, Kingwilliamstown, NU).  
*P. heterophyllum* (L.f.) Benth. (Schlechter 5297, Hopefield, E).

species described in *Polycarena*, but in our opinion better placed in *Phyllopodium*:

- Polycarena namaensis* Thellung (Dinter 6626, Halenberg, S.W.A., E).  
*P. pubescens* Benth. (Bolus 657, Ookiep, S.W.A., E).  
*P. selaginoides* Schltr. ex Hiern (Schlechter 8322, Droogerivier, E, iso.).  
*P. transvaalensis* Hiern (Schlechter 4125, Wilge River, E, isosynotype), but seeds anomalous.

# KEY TO GENERA OF MANULEEAE

- |    |   |                |
|----|---|----------------|
| 1a | Bract always free from pedicel and calyx . . . . .  | 2              |
| 1b | Bract adnate to pedicel, or to pedicel and calyx, or to peduncle of axillary cyme . . . . . | 3              |
| 2a | No basal rosette of leaves . . . . .  | <i>Sutera</i>  |
| 2b | Basal leaf rosette usually present . . . . .  | <i>Manulea</i> |
| 3a | Bract adnate to pedicel, always free from calyx or attached only at extreme base . . . . .  | 4              |
| 3b | Bract adnate to pedicel and at least lower part of calyx . . . . .                          | 6              |

- |    |   |                     |
|----|---|---------------------|
| 4a | Stamens 2 or 4; ovules 6 or less in each loculus  | <i>Strobilopsis</i> |
| 4b | Stamens 4; ovules 10 or more in each loculus  | 5                   |
| 5a | Inflorescence capitate or oblong-capitate, nodding in flower, elongating and becoming erect in fruit, throat glabrous; seeds irregularly angled, reddish brown when ripe                              | <i>Glumicalyx</i>   |
| 5b | Inflorescence often branched, or if congested then not nodding; clavate hairs inside inflated part of corolla tube associated with the filaments; seeds transversely wrinkled, usually blue when ripe | <i>Manulea</i>      |
| 6a | Ovules 2 in each loculus  | <i>Tetraselago</i>  |
| 6b | Ovules at least 10 in each loculus  | 7                   |
| 7a | Corolla lobes always broader near the tips than at the base, often notched or bifid, usually pink, red, maroon or brown outside   | <i>Zaluzianskya</i> |
| 7b | Corolla lobes broadest in the middle or at the base, always entire, variously coloured inside, always with orange patch with unicellular hairs at base of upper lip                                   | 8                   |
| 8a | Bract adnate nearly to the top of the calyx; testa delicate, translucent, loosely enveloping seed   | <i>Polycarena</i>   |
| 8b | Bract adnate to lower half or less of calyx; testa opaque, tightly enveloping seed  | <i>Phyllopodium</i> |

THE SPECIES OF *GLUMICALYX* AND THEIR DISTRIBUTION. The species of *Glumicalyx* can be arranged in a series from the one showing most affinity with *Zaluzianskya* (*G. goseloides*) to the one that comes closest to Selagineae (*G. apiculatus*). The full sequence is *G. goseloides*, *G. alpestris*, *G. flanaganii*, *G. lesuticus*, *G. montanus* and *G. apiculatus*. The series runs smoothly for decreasing length of corolla tube and for decreasing elongation of the fruiting head; the first four species all have numerous ovules, (35–)50–85 per loculus; these decrease to 20–25 in *G. montanus* and 10–12 in *G. apiculatus*. Only *G. goseloides* has the unequal anthers characteristic of *Zaluzianskya*.

At the other end of the series, the superficial resemblance of *G. apiculatus* to some species of *Selagineae*, which resulted in its being described in that group, is great enough to make the mistake a likely one: the resemblance is enhanced by a character of the stamens. In *Zaluzianskya* and in all the species of *Glumicalyx*, except *G. apiculatus*, the filaments of the posticous pair of stamens are decurrent as a ridge on the inner surface of the corolla tube from the point where they become free right down to the base of the corolla. In *G. apiculatus* the posticous filaments become free about two-thirds along the tube and the filaments are decurrent for half the distance to the base and then merge into the corolline tissue. This condition is often found in *Selagineae*.

With 6 well-defined species, *Glumicalyx* is, perhaps, the best example that has yet been recorded of a "Drakensberg" genus (fig. 3). It is endemic to the region that Weimarck (in Lunds Univ. Årsskr. N.F. Åfd. 2, 37(5):77, 1941) named the Drakensberg Centre, a term adopted by Nordenstam (in Op. Bot. 23:67, 1969) in a rather more restricted sense, which we prefer. This is synonymous with the Eastern Mountain Region named earlier by Phillips (see Ann. S. Afr. Mus. 16:14. 1917). However the Weimarck-Nordenstam terminology seems preferable, both because it is more expressive and because



it forms part of a wider system. Furthermore the recognition of centres rather than strictly delimited regions seems more useful in the present state of knowledge.

*Glumicalyx* ranges from the Witberge [c. 30° 45' S] in Aliwal North division in the Cape to Platberg [c. 28° 15' S] near Harrismith in the Orange Free State, a north to south range of some 160 miles only. It seems likely that it is spread over the greater part of the vast Lesotho plateau, but, not unexpectedly, it is best known from the more easily accessible areas of the Drakensberg escarpment. The six species show no distinct geographical isolation from one another, and more than one is frequently found in a single area. Both *G. alpestris* and *G. apiculatus* occur on the Witberge at the southern extremity of the generic range: in the Naude's Nek area *G. montanus* also comes in: at Sani Top *G. alpestris*, *G. lesuticus* and *G. montanus* may be found in close proximity, while *G. goseloides* is at a lower altitude in the Sani Pass: at Witzieshoek *G. montanus*, *G. alpestris* and *G. goseloides* are all found along the road that leads to the Sentinel footpath.

*G. alpestris* is the most widespread and covers the full range of the genus from the Witberge to Platberg, *G. goseloides* is also wide-ranging on the main Drakensberg escarpment from the Natal-Transkei border through to Witzieshoek; it is usually a plant of somewhat lower altitudes than the other species and is the only one yet known from the Drakensberg outliers Mt Insizwa and Mt Ngeli. *G. montanus* is known from Naude's Nek to Witzieshoek, while *G. lesuticus* seems to be restricted to the Lesotho plateau but is widespread there. Only *G. apiculatus* has, on our present knowledge, a restricted range: it is known only from the Witberge, the Kraal Berg near Barkly Pass and Doodmans Krans at the meeting point of Lesotho, the Cape and Griqualand East.

*G. montanus*, *G. alpestris* and *G. lesuticus* do not show any marked ecological differentiation, and if their evolution has been in relation to habitat preferences these will need very careful study for their elucidation. It seems highly probable that they have not evolved in strict geographical isolation, and it is interesting that the only putative hybrids we have found were between *G. alpestris* and *G. goseloides*, which usually do not grow in the same place but had come together along the side of a new-made road (see no. 226). We have no other record of their growing close to one another.

#### KEY TO SPECIES OF GLUMICALYX

- |    |  |                             |
|----|--|-----------------------------|
| 1a | Stamens all fully exerted at anthesis . . . . .  | 2                           |
| 1b | Two stamens included or just visible in mouth at anthesis . . . . .                    | 5                           |
| 2a | Leaves shortly pubescent . . . . .   | 224. <i>G. flanaganii</i>   |
| 2b | Leaves glabrous, or with some hairs on lower margins and over main vein . . . . .      | 3                           |
| 3a | Calyx of 5 equal spatulate lobes, free to the base or rarely briefly connate . . . . . | 222. <i>G. montanus</i>     |
| 3b | Calyx of 3-5 lobes clearly fused below . . . . .                                       | 4                           |
| 4a | Corolla tube up to 4 mm long . . . . .   | 221. <i>G. apiculatus</i>   |
| 4b | Corolla tube at least 7 mm long . . . . .  | 223. <i>G. lesuticus</i>    |
| 5a | Corolla tube up to 16 mm long, lobes oblong . . . . .                                  | 225. <i>G. alpestris</i> *  |
| 5b | Corolla tube at least 20 mm long, lobes suborbicular . . . . .                         | 227. <i>G. goseloides</i> * |

\* Hybrids between these species are known: see no. 226.

**221. *Glumicalyx apiculatus* (E. Mey.) Hilliard & Burt, comb. nov.**

Type: Cape, summit of the Wittebergen, 7000–7500 ft., *Drège* (E, K, PRE fragment).

Syn.: *Selago apiculata* E. Mey., *Comm.* 256 (1837); Walp., *Rep.* 4:151 (1845); Choisy in DC., *Prodr.* 12:16 (1848).

*Walafrida apiculata* (E. Mey.) Rolfe in Dyer, *Fl. Cap.* 5:1121 (1912).

Tufted perennial herb, woody at the base, eventually developing a thick woody stock; stems 6–25 cm long, many from the crown, erect, simple, pubescent with both acute and gland-tipped hairs, hairs sometimes nearly confined to 2 vertical bands, leafy. *Leaves* opposite becoming alternate upwards, c.  $5\text{--}13 \times 3\text{--}4$  mm, diminishing slightly upwards, broadly or narrowly elliptic, subacute, base slightly narrowed with a distinct pulvinus, bases connate when leaves opposite, margins crenate-serrate in upper half, leathery, glabrous. *Inflorescences* globose initially, less than  $1 \times 1$  cm, solitary, scarcely elongating in fruit. *Bracts*  $3\text{--}5 \times 2\text{--}4$  mm, broadly elliptic to ovate, abruptly acute, margins entire, ciliate with long acute hairs and short-stalked glands, inside glandular-puberulous and with a few long hairs, leathery. *Calyx*  $2\text{--}5\text{--}3\text{--}5$  mm long, membranous, obscurely bilabiate, lobing variable, always with 3 posticous segments fused for c.  $\frac{2}{3}$  their length, 2 anticous segments nearly equalling the posticous ones, or minute, or wanting, free nearly or quite to the base anticously, margins ciliate (fig. 2A). *Corolla* tube 3–4 mm long, c. 1.5 mm broad, creamy; limb bilabiate, c. 4 mm diam., lobes elliptic, orange-yellow inside, pale outside. *Stamens* all exerted, anthers equal. *Capsule*  $3 \times 2\text{--}5$  mm, seeds few (10–12 ovules in each locus).

CAPE. Barkly East distr., base of Doodmans Krans, c. 2500 m, *Galpin* 6812 (BOL, K, PRE, mixed with *G. montanus*); Kraalberg, near Barkly Pass, c. 2400 m, *Rattray* in herb. *Galpin* 7313 (PRE).

*G. apiculatus* bears a strong superficial resemblance to *G. montanus*, strong enough to deceive so experienced a collector as Galpin, for the sheets *Galpin* 6812 at BOL, K and PRE are a mixture of the 2 species. This seems to be the rarest species of the genus; it is the only one we have not yet seen growing. Flowering has been recorded in January and March.

**222. *Glumicalyx montanus* Hiern in Hook., Ic. Pl. 28, tab. 2769 (Nov. 1903) and in Dyer, Fl. Cap. 4:2369 (1904).**

Type: Orange River Colony (Orange Free State), on the slopes of Mont aux Sources, 7000–8000 ft., Jan. 1894, *Flanagan* 2018 (BOL).

Tufted perennial herb becoming woody at the base; stems mostly 15–35 cm long, many from the crown, decumbent then erect, simple, or very rarely with short sterile (?) axillary shoots, pubescent with both acute and gland-tipped hairs, sometimes nearly confined to two vertical bands, leafy. *Leaves* opposite, becoming alternate upwards,  $5\text{--}20 \times 2\text{--}8$  mm, scarcely diminishing upwards, oblong-elliptic to obovate, tips obtuse to rounded, base narrowed with a distinct pulvinus, bases connate when leaves opposite, margins crenate-serrate, leathery, glabrous except for minute gland-tipped hairs on lower margins. *Inflorescences* globose initially, up to c.  $1\text{--}5 \times 1\text{--}5$  cm, usually solitary, rarely subtended by smaller spikes on very short axillary shoots, elongating in fruit. *Bracts*  $5\text{--}6 \times 4\text{--}5\text{--}10$  mm, suborbicular, tips rounded or abruptly apiculate, backs minutely glandular-puberulous, margins entire or

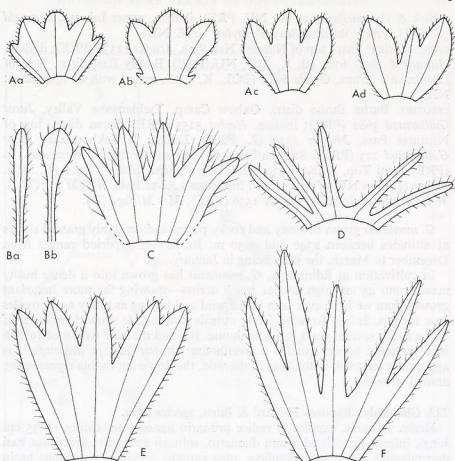


FIG. 2. Calyx form in *Glumicalyx*. A, *G. apiculatus*, variation in calyx: a-c, Drège (type), d, Galpin 6812. B, *G. montanus*, variation in calyx segments: a, Hilliard & Burt 6707; b, Marais 1322. C, *G. flanaganii*, Hilliard 5418. D, *G. lesuticus*, Hilliard 5451. E, *G. alpestris*, Hilliard 5450. F, *G. goseloides*, Thode STE 6342. All  $\times 6$ .

lacinate, with long delicate hairs. *Calyx* 3.5–4.5 mm long, segments narrowly to broadly spatulate (fig. 2B), free or connate at the very base, delicately membranous, ciliate with acute and gland-tipped hairs. *Corolla* tube 4–6 mm long, c. 1.5 mm broad, creamy; limb bilabiate, c. 4–5 mm diam., lobes oblong to elliptic, creamy to pale yellow above, creamy below. *Stamens* all exserted, anthers equal. *Capsule* c. 4.5  $\times$  3 mm, seeds many (c. 20–25 ovules in each loculus, perhaps only half of which develop).

ORANGE FREE STATE. Bethlehem distr., Golden Gate National Park, Generaal-skop, Roberts 3198 (PRE, mixed with *G. alpestris*). Witzieshoek distr., road to Sentinel, Hilliard & Burt 8638 (E, NU).

NATAL. Bergville distr., Mont aux Sources, Prescott s.n. (BOL); Royal Natal National Park, W slope of the Sentinel, Trauseld 148 (PRE); MnWeni area, Esterhuysen 21664 (BOL); Cathedral Peak area, upper Tsanatalana valley, Schelpe 7231 (K, BOL); Ndedema area, Esterhuysen 28504 (BOL); Cleft Peak, Edwards 1158 (NU). Estcourt distr., Giant's Castle Game Reserve,

*Killick & Vahrmeijer* 4029 (K, NH, PRE); ibidem, upper Injasuti, *Trauseld* 526 (NU, PRE); ibidem, *Bruyns-Haylett* 30 (E, NU).

CAPE. Maclear distr., top of Naude's Nek Pass, *Acocis* 12336 (PRE); ibidem, *Hilliard & Burt* 6707 (E, K, MO, NU, PRE). Barkly East distr., base of Doodman's Krans, *Galpin* 6812 (BOL, K, PRE, mixed with *G. apiculatus*; NH).

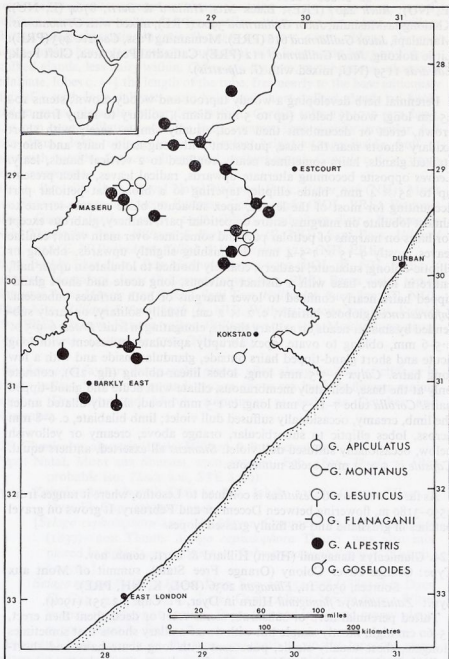
LESOTHO. Butha Buthe distr., Oxbow Camp, Tsehlanyane Valley, *Jacot Guillarmod* 3682 (PRE); ibidem, *Herbst* 5255 (PRE). Berea distr., top of Nsututse Pass, *Marais* 1322 (K, PRE). Lehaha la Sekhonyana, *Jacot Guillarmod* 223 (PRE). Sehlabathebe, *Guillarmod, Getliffe & Mzamane* 110 (PRE). Sani Top, *Hilliard* 5392 (E, NU); ibidem, *Hilliard* 5311 (E, NU). Ridge  $1\frac{1}{2}$  miles NW of entrance to Bushman's River Pass, *Wright* 338 (NU). Without precise locality, *Stokoe* 1556 (PRE); *Mrs Milford* (K).

*G. montanus* grows in stony and rocky places and on thinly grassed slopes at altitudes between 2340 and 3050 m. Its flowering period ranges from December to March, the peak being in January.

In cultivation at Edinburgh, *G. montanus* has grown into a dense bushy mass about 45 cm high and as much across—showing far more luxuriant growth than we have ever seen in the wild and having as many as 35 ovules in a loculus. It has flowered freely outside although it showed no signs of doing so for several years in a greenhouse. It stood the mild winter of 1975-6 in a sheltered border outside a greenhouse without damage although it is apparently cut back to the base in the wild, the flowering shoots representing annual growth.

### 223. *Glumicalyx lesuticus* Hilliard & Burt, species nova.

Herba perennis, caudice et radice primario lignescens; caules 10-35 cm longi, inferne lignosi, ad 5 mm diametro, solitarii aut multi, erecti aut basi decumbentes plerumque simplices, raro surculis brevibus axillaribus basin versus praediti, pilis longis acutis et glandulis breviter pedicellatis pubescentes (pilis interdum ad lineas duas restrictis), foliati. *Folia* opposita sursum alterna; radicalia (si adsint) usque ad  $25 \times 4$  mm, lamina elliptica petiolo lato plano brevior, apice subacuta, marginibus crenato-serratis vel lobulatis (petiolo integro), coriacea, pilis in marginibus petioli et interdum supra venis exceptis glabra; caulina plerumque  $9-15 \times 1.5-4$  mm sursum paulo diminuta oblonga vel elliptico-oblonga, subacuta, coriacea, in dimidio superiore grosse dentata vel serrata, inferne integra, basi distincte pulvinato, pilis longis, acutis et brevibus glandulosis ad margines inferiores fere restrictis vel lamina utrinque pubescente. *Inflorescentiae* plerumque solitariae, raro infra basi capitulis minoribus in ramulis axillaribus praesentibus, statu frutescente elongatae. *Bracteae*  $6-9.5 \times 2.5-6$  mm, oblongae, vel ovatae, apice abrupte apiculatae, extra pilis longis acutis et brevibus glandulosis, intus glandulosis et pilis longis paucis praeditae. *Calyx*  $3-3.5$  mm longus; lobi lineari-oblongi, basi tantum connati, tenuiter membranacei, pilis aliis acutis aliis glandulosis ciliati. *Corollae* tubus  $7-11.5$  mm longus, c. 1.5 mm latus, sub limbo leviter dilatatus, cremeus interdum sordide violaceo-suffusus; limbus bilabiatus, c. 6-8 mm diametro; lobi elliptici vel suborbiculares, superne aurantiaci, inferne cremei vel flavescentes interdum sordide violaceo-suffusi. *Stamina* omnia exserta, antheris aequalibus. *Capsula* c.  $5 \times 2$  mm; semina numerosa.

FIG. 3. Map of distribution of species of *Glumicalyx*.

LESOTHO. Sani Top, 2850 m, 2 i 1974, *Hilliard* 5451 (holo. NU; iso. E). Sani Top, *Hilliard* 5313, 5336, 5397 (E, NU), *Hilliard & Burt* 8791, 8813, 8813A (E, NU); *Ruch* 2407 (PRE); Black Mts, *Hilliard & Burt*, 8764 (E, NU). Khalong-la-Mashulu, *Jacot Guillarmod* 5900 (PRE), mixed with *G. montanus*. Mamalapi, *Jacot Guillarmod* 616 (PRE). Meniaming Pass, *Coetsee* 493 (PRE). Little Bokong, *Jacot Guillarmod* 112 (PRE). Cathedral Peak area, Cleft Peak, *Edwards* 1159 (NU, mixed with *G. alpestris*).

Perennial herb developing a woody taproot and woody crown; stems 10–35 cm long, woody below (up to 5 mm diam.), solitary to many from the crown, erect or decumbent then erect, usually simple, rarely with short axillary shoots near the base, pubescent with long acute hairs and short-stalked glands, hairs sometimes nearly confined to 2 vertical bands, leafy. *Leaves* opposite becoming alternate upwards, radical leaves, when present, up to  $25 \times 4$  mm, blade elliptic, tapering to a broad flat petiolar part accounting for most of the length, apex subacute, blade crenate-serrate to almost lobulate on margins, entire on petiolar part, leathery, glabrous except for hairs on margins of petiolar part and sometimes over main veins; cauline leaves mostly  $9\text{--}15 \times 1.5\text{--}4$  mm diminishing slightly upwards, oblong or elliptic-oblong, subacute, leathery, coarsely toothed to lobulate in upper half, entire in lower, base with a distinct pulvinus, long acute and short gland-tipped hairs nearly confined to lower margins or both surfaces pubescent. *Inflorescences* globose initially, c.  $2 \times 2$  cm, usually solitary, or rarely subtended by smaller heads on axillary shoots, elongating in fruit. *Bracts*  $6\text{--}9.5 \times 2.5\text{--}6$  mm, oblong to ovate, apex abruptly apiculate, pubescent with long acute and short gland-tipped hairs outside, glandular inside and with a few long hairs. *Calyx*  $3\text{--}3.5$  mm long, lobes linear-oblong (fig. 2D), connate only at the base, delicately membranous, ciliate with acute and gland-tipped hairs. *Corolla* tube  $7\text{--}11.5$  mm long, c.  $1.5$  mm broad, slightly dilated under the limb, creamy, occasionally suffused dull violet; limb bilabiate, c.  $6\text{--}8$  mm across, lobes elliptic to suborbicular, orange above, creamy or yellowish below, occasionally suffused dull violet. *Stamens* all exserted, anthers equal. *Capsule* c.  $5 \times 2$  mm, seeds numerous.

As far as we know *G. lesuticus* is confined to Lesotho, where it ranges from 2550–3180 m, flowering between December and February. It grows on gravel patches in grassland and on thinly grassed slopes.

**224. *Glumicalyx flanaganii* (Hiern) Hilliard & Burt, comb. nov.**

Type: Orange River Colony (Orange Free State), summit of Mont aux Sources, 9500 ft., *Flanagan* 2036 (BOL, K, NH, PRE).

Syn.: *Zaluzianskya flanaganii* Hiern in Dyer, Fl. Cap. 4, 2: 351 (1904).

Tufted perennial herb or subshrub, stems erect or decumbent then erect, 15–60 cm high, mostly simple but with dwarf axillary shoots that sometimes elongate, these usually sterile, pubescent with long acute hairs and short-stalked glands, closely leafy. *Leaves* opposite, subopposite or alternate above, mostly  $15\text{--}37 \times 5\text{--}16$  mm, decreasing in size upwards, roughly half the length petiolar, blade narrowly to broadly ovate or oval, obtuse to subacute, coarsely crenate-serrate to almost lobulate on margins, at base narrowed into the flat petiolar part, expanded and half-clasping, thick-textured, both



surfaces pubescent with long acute hairs and short-stalked glands or, more usually, upper surface thinly pubescent, hairs confined to margins and main veins below. *Inflorescences* turbinate initially, c. 2.5–3 cm long, mostly solitary, sometimes subtended by smaller spikes on short leafy axillary shoots, spikes elongating in fruit. *Bracts* 8–15 × 2.5–5 mm, oblong, abruptly acute, entire, bracts and margins pubescent with long acute hairs and short-stalked glands, less hairy within. *Calyx* 4.5–6.5 mm, membranous, obscurely bilabiate, lobes c.  $\frac{1}{3}$ – $\frac{1}{2}$  the length of the tube, free nearly to the base anticusally (fig. 2C), with long delicate acute hairs and short-stalked glands on backs and margins, glandular-puberulous within. *Corolla* tube 13–17.5 mm long, c. 2 mm broad, dilated under the limb, creamy; limb slightly irregular, 6–8 mm diam., lobes oblong to suborbicular, bright orange inside, buff to brownish outside. *Stamens* all exserted, anthers equal. *Capsule* c. 6 × 3 mm seeds numerous.

NATAL. Bergville distr., Royal Natal National Park, *Oliver* 346 (NH); Mont aux Sources, gorge in Beacon Butress, *Galpin* 10363 (BOL, PRE). Estcourt distr., Giant's Castle, *Symons* 265A (PRE). Underberg distr., Bushman's Nek, Thamathu Pass, *Hilliard & Burt* 8909 (E, NU); Sani Pass, *Hilliard* 5329, 5418 (E, NU); ibidem, *Killick & Vahrmeijer* 3752 (NH, PRE).

CAPE. Barkly East distr., Ben Mcdhui, *Galpin* 6792 (BOL, K, NH, PRE).

LESOTHO. Mamelali, *Jacot Guillarmod* 21395, 617 (PRE). Berea distr., top of Nsututse Pass, *Marais* 1323 (PRE). Sani Top, *Hilliard & Burt* 8792 (E, NU). Black Mts, *Hilliard & Burt* 8776 (E, NU). Without precise locality, *Staples* 270 (PRE). Oxbow, Fanana valley, *Williamson* 369 (K). Mokhotlong distr., Temrock Peak, *Liebenberg* 5709 (NH, PRE).

*G. flanaganii* favours damp rocky places, often along the foot of cliffs or in stream gullies, between 2400 and 3350 m above sea level. It flowers mainly between December and March, sometimes as early as October and November.

## 225. *Glumicalyx alpestris* (Diels) Hilliard & Burt comb. nov.

Type: Natal, Mont aux Sources, 2700–3000 m, Feb. 1893, *Thode* 71 (B†; probable iso. *Thode* s.n., STE 8300).

Syn.: *Zaluzianskya alpestris* Diels in Bot. Jahrb. 23:480 (1897); Hiern in Dyer Fl. Cap. 42:350 (1904).

[*Selago cephalophora* auct.; E. Meyer, Comment. Pl. Afr. Austr. 256 (1837)—non Thunb. *Selago cephalophora* Thunb. was also misplaced in Selagineae and is now *Polycarena cephalophora* (Thunb.) Levyns.]

*Selago nutans* Rolfe in Journ. Linn. Soc. 20:354, 358 (1883) et in Dyer, Fl. Cap. 5:1:159 (1912). Type: Cape, Aliwal North distr., Wittebergen, in valleys at 4500 ft, *Drège* (K) and in rugged grassy places at 7000–7500 ft, *Drège* (K).

Perennial herb, woody at the base and with a woody taproot; stems solitary in young plants, many from the crown in older, decumbent then erect, 10–45 cm long, simple, pubescent with long acute hairs and sessile glands, leafy. *Radical leaves* 12–30 × 4–11 mm, oblanceolate, obtuse, base petiole-like, crenate-serrate in upper part, thick textured, hairy mainly on margins, particularly in lower part, sometimes over the main vein as well,

rarely all over; *cauline leaves* sometimes opposite below, bases connate, alternate upwards,  $11-40 \times 1.5-4$  mm, oblong or elliptic-oblong tapering below, sessile, otherwise as radical leaves. *Inflorescences* turbinate initially, c. 2-3 cm long, solitary or, in luxuriant specimens, with smaller subsidiary heads in the upper leaf axils, elongating in fruit. *Bracts*  $6-12 \times 3-6$  mm, broadly elliptic to ovate, obtuse to subacute, membranous, margins entire, they and the backs ciliate with long acute hairs and short-stalked glands, sparsely pubescent inside. *Calyx* 4-7 mm long, membranous, obscurely bilabiate, lobes  $\frac{1}{2}$  or less the length of the tube, free to the base antically, or sometimes shortly connate at base (fig. 2E), long cilia on margins and backs, short-stalked glands as well, minutely glandular-puberulous within. *Corolla* tube 12-16 mm long, 1 mm broad, widening slightly under the limb, creamy; limb bilabiate, 7-8 mm across, lobes narrow, oblong, eventually strongly reflexed, orange to deep brick red inside, buff outside or sometimes dull violet. *Stamens* with anthers subequal, one pair included, one pair exerted. *Capsule* c.  $5.6-5 \times 2.5$  mm; seeds numerous.

ORANGE FREE STATE. Harrismith distr., Harrismith, *Sankey* 212 (BOL, K); Platberg, *Hilliard & Burt* 8703 (E, NU). Bethlehem distr., Golden Gate National Park, Generaal's Kop, *Roberts* 3198 (PRE, mixed with *G. montanus*). Witzieshoek, road to Sentinel, *Hilliard & Burt* 8614 (E, NU); approach road to Rest Camp, *Hilliard & Burt* 8664, 8666 (E, NU).

NATAL. Bergville distr., Mponjwane Mt, *Thode* s.n. (STE 8299); Cathedral Peak, *Schelte* (NU); Cathedral Peak area, upper Tsanatalana valley, *Schelte* 7230 (BOL); Estcourt distr., Giants Castle Game Reserve, Langalibalela Pass, *Trauseld* 496 (K, NU, PRE); ibidem, Bushman's Pass, *West* 1706 (NH); ibidem, Giant's Castle, *Symons* 265 (PRE); ibidem, Giant's Castle Pass, *Wright* 1360 (NU); Kamberg, Gladstone's Nose, *Wright* s.n. (NU). Underberg distr., Thamatuwe Pass, *Killick & Vahrmeijer* 3998 (PRE).

CAPE. Barkly East distr., Doodman's Krans Mt, *Galpin* 6799 (BOL, K, NH, PRE); Saalboom Nek, *Acocks* 20175 (K, PRE); Kraalberg near Barkly Pass, *Rattray* in herb. *Galpin* 7314 (BOL). Maclear distr., top of Naude's Nek Pass, *Acocks* 12335 (PRE).

LESOTHO. Butha Buthe distr., Oxbow area, *van Rensburg* 51 (NU); ibidem, *van Rensburg* 5808 (PRE); ibidem, *Roberts* 3532, 3621 (PRE). Caledon River Pass, *Thode* s.n. (STE 6341); ibidem, *Thode* 43 (BOL, K). Pone Valley, Mothae Mts, *Coetzee* 823 (PRE). Berea, Mamalapi, *Marais* 1293 (K, PRE). Cleft Peak, *Edwards* 1159 (NU, mixed with *G. lesuticus*). Blue Mt Pass, *Williamson* 520 (K). Leribe plateau, *Dieterlen* 772 (K). Lehaha-la-Sekhonyana ( $28^{\circ} 19' E 29^{\circ} 23' S$ ), *Jacot Guillarmod* 213 (PRE). Mateka, *Bruce* 355 (PRE). Makhaling Valley, *Ruch* 1602 (PRE). Sani Top, *Hilliard* 5450 (E, NU); ibidem, *Hilliard & Burt* 8814, 8815, 8797 (E, NU). Sehlabathebe, *Guillarmod, Getliffe & Mzamane* 242 (PRE).

*G. alpestris* grows in short turf, around rock sheets or in bare gravel or silt patches over a wide altitudinal range, roughly 1800 to 3350 m, flowering between December and March but mainly in January. It shows considerable variation in stature and luxuriance, mostly in response to growing conditions, as our own field observations show. A specimen collected by *Acocks* (no. 23873, Faskally, below Mt Newton, Barkly East div., PRE) at an altitude of only c. 1700 m on a grassy streambank is particularly luxuriant, being far

more richly branched than any other plant we have seen. However, it shows no deviation in floral detail. Variation as a result of possible hybrid influence is discussed below.

## 226. *Glumicalyx alpestris* x *goseloides*

ORANGE FREE STATE. Witzieshoek, road to Sentinel, c. 2200 m, loose gritty soil along new-made road, 25 xii 1975, *Hilliard & Burtt* 8617 (E, NU).

A road has been built from Witzieshoek nearly to the foot of The Sentinel. Above the turn-off to the Witzieshoek Rest Camp at about 2200 m, the road traverses the backs of the mountains above Royal Natal National Park, and here both the road cuttings and the spoil tipped down the mountainside have provided a fresh habitat for colonization. There were thousands of plants of *G. alpestris*, rather fewer of *G. goseloides*. We noticed that some plants looked odd and suspected that they might be intermediates between *G. alpestris* and *G. goseloides*: accordingly we sampled the population over about quarter of a mile.

Subsequent measurements (table 1) revealed that the plants of *G. goseloides* were normal for that species; those we regarded as *G. alpestris* had flowers slightly larger than normal for that species; the plants we had put down as possible hybrids had flowers tending to be intermediate in their measurements between the putative parents.

TABLE 1. Floral measurements (in mm) of *G. alpestris*, *G. goseloides*, and hybrid.

	Bract	Calyx	Calyx cleft	Corolla tube
<i>G. alpestris</i> (other localities)	6-12 × 3-6(-7)	4-5-7	2-3	12-16
<i>G. alpestris</i> (Sentinel road)	(8-)10-14 × 3-6.5	5.5-9	1.5-3.75	15-19
<i>G. alpestris</i> × <i>goseloides</i>	10-19 × 5-9	5.5-8	3-5.5	16-25
<i>G. goseloides</i> (Sentinel road)	14-15 × 7-8	7-8.5	3.75-5	21-25
<i>G. goseloides</i> (other localities)	12-19 × 7-17	5-7-8	3.5-5.5	20-29

The corolla lobes of *G. alpestris* are oblong and reflexed in flower, those of *G. goseloides* are suborbicular and spreading; the hybrids had spreading broadly elliptic lobes. It was also noticeable that hybrid plants often showed richly branched inflorescences: perhaps a sign of hybrid vigour. The figures given above strongly suggest that the Sentinel road population of *G. alpestris* had been affected by introgression from *G. goseloides*, the longer-than-normal corolla-tube being particularly notable. It is of interest, therefore, that several plants of *G. alpestris* in this area also showed richly branched inflorescences, a feature seldom apparent in the species as we have seen it elsewhere, or as represented in the herbarium.

**227. *Glumicalyx goseloides* (Diels) Hilliard & Burt, comb. nov.**

Type: Natal, Estcourt distr., Injasuti valley, 1800–2100 m, *Thode* 70 (B†).

Syn.: *Zaluzianskya goseloides* Diels in Bot. Jahrb. 23:480 (1879); Hiern in Dyer, Fl. Cap. 4, 2:351 (1904).

Stems one or several from the crown, erect or decumbent then erect to c. 45 cm, usually simple, occasionally forking once or twice above or below, sometimes with a few short, slender (sterile?) branches near the base, pubescent with short gland-tipped and long acute hairs, closely leafy. *Leaves* opposite below becoming alternate upwards, mostly 20–65 × 4–15 mm, decreasing in size upwards; radical leaves (often wanting at flowering) elliptic, obtuse, narrowed to a petiole-like half-clasping base; stem leaves oblong to elliptic-oblong, scarcely narrowed below, sessile, clasping, obtuse to subacute at apex, entire or obscurely toothed to crenate or serrate on margins, thick-textured, upper surface pubescent with acute and gland-tipped hairs, lower similar or hairs confined to main veins and margins. *Inflorescence* turbinate initially, c. 3–6 cm long, rapidly becoming oblong, nearly always solitary, rarely with subtending heads, elongating in fruit. *Bracts* 12–19 × 7–17 mm, ovate, acute and apiculate or obtuse, entire, pubescent outside with acute and gland-tipped hairs, minutely glandular-puberulous inside. *Calyx* 5–7(–8) mm long, thin, membranous, obscurely bilabiate, lobes free nearly to the base or fused up to  $\frac{1}{3}$ – $\frac{1}{2}$  their length, free to the base anticously (fig. 2F), delicate hairs on bracts and margins, many gland-tipped. *Corolla* tube 20–29 mm long, c. 1.25 mm broad, slightly dilated under the limb, creamy; limb nearly regular, 7–9 mm diam., lobes suborbicular, orange to orange-red inside, creamy outside. *Stamens* with anthers markedly unequal, pair with long vertical anthers included, pair with short horizontal anthers exerted. *Capsule* c. 7–8 × 3–4 mm, seeds numerous.

ORANGE FREE STATE. Witzieshoek, Elands River valley, *Flanagan* 2034 (BOL, NH); road to Sentinel, *Hilliard & Burt* 8637 (E, NU).

NATAL. Bergville distr., Royal Natal National Park, *Trauseld* 254 (PRE); ibidem, *Bottomley* s.n. (PRE); ibidem, *Oliver* 485 (NH); Cathedral Peak area, Umlambonya Buttress, *Schelpé* 994 (NU); ibidem, *Killick* 1593 (BOL, NH); ibidem, Mnweni area, *Esterhuysen* 21647 (BOL); ibidem, *Esterhuysen* 10225, 15478 (BOL); Ndedema river, *Hilliard & Burt* 6915 (E, NU); Organ Pipes Pass, *Schelpé* 493 (NU). Estcourt distr., Giant's Castle, *Symons* 88 (PRE). Impendhle distr., Loteni river, *Wright* 1344 (NU). Underberg distr., Drakensberg Garden, *Hilliard & Burt* 7741 (E, NU); ibidem, *Brayshaw* 226 (NH); Sani Pass, *Hilliard & Burt* 8757 (E, NU). Alfred distr., Mt Ngeli, *Hilliard & Burt* 5813 (E, NU); ibidem, *Tyson* 1323 (BOL).

TRANSKEI. Mt Ayliff distr., Mt Insizwa, *Hilliard & Burt* 7300 (E, NU); ibidem, *Strey* 10819 (E, NH, NU, PRE).

*G. goseloides* grows in the boulder beds of mountain streams and in other bare gravelly areas, with a wide altitudinal range from 1600 to 2800 m above sea level. It also has a wide flowering period, October to July, but the peak is December and January.

See above for hybridization with *G. alpestris*.

**228. *Strobilopsis* Hilliard & Burt, genus novum et *Glumicalyci* Hiern et *Manulea* L. affine, ab ambobus ovulis 2–6 in quoque loculo ex parte**

superiore placentae axilis orientibus, seminibus 1-2 (raro -4), argute distinguuntur. A *Glumicalyce* etiam inflorescentia erecta et corollae lobis area aurantiaca barbata basi notatis, a *Manulea* inflorescentia conoidea bracteis magnis navicularibus etiam recedit.

Species unica, Nataliae et Lesotho incola.

***Strobilopsis wrightii* Hilliard & Burt, species nova. Fig. 4.**

Herba perennis e basi ramosa. *Folia* inferne opposita, superne alterna, c. 15-25 × 2-4 mm, sursum decrescentia, linearia-oblonga vel anguste elliptica, apice subacuta, basi vix angustata, sessilia, leviter decurrentia, marginibus dimidio superiore distincte vel obscure serratis, glanduloso-punctata, subglabra pilis longis albis et glandulis breviter stipitatis in marginibus inferioribus exceptis. *Inflorescentia* terminalis, solitaria vel aliis paucis parvis in ramis brevibus axillaribus basi praedita, c. 15-20 × 10-13 mm, globosa vel oblongo-cylindrica, statu frutescente vix elongata. *Bractee* c. 5-7 × 4-6 mm, a foliis argute distinctae, late ovatae vel suborbiculares, naviculares, abrupte acutae, integrae, pilis et glandulis marginalibus exceptis glabrae, ad pedicellum munitum adnatae, e calyce liberae. *Calyx* 2 mm longus, campanulatus, ad medium 5-lobus, lobo postico aliis minore et fere ad basin fissus, glandulis stipitatis externe et ad margines praeditus. *Corollae* tubus 3.5-4 mm longus, cylindricus, sursum ampliatus, extra parce glanduloso-puberulus; limbus bilabiatus, lobis duobus superioribus oblongo-ellipticis basi aurantiacis et pilis clavatis instructis, c. 2.5 × 3 mm, antico c. 3 × 2 mm, laterilibus paulo minoribus cremeis ut videtur pallide purpurea-tinctis. *Stamina* 4, vel antica abortis 2, ad duas partes supra basin tubi inserta, filamentis posticis ad basin decurrentibus; antherae synthecae, anthesi valde exsertae. *Ovarium* 1 mm longum, biloculare, ovulis 2-6 in quoque loculo in parte superiore placentae axilis, superioribus tantum in seminibus maturescentibus; stylus 4.5 mm longus (stigma inclusus) basi minute glandulosus superne in stigma linguiforme marginibus papillosum exsertum transeuns. *Capsula* c. 2.5 × 2 mm, bivalva. *Semina* in quoque loculo 1-4, c. 1.5 × 1 mm, ambitu elliptica, facie interiore plana exteriore convexa, reticulo prominulo rugosa, testa opaca alba deinde fusca ad endospermum arte applicata, funiculo crasso a semine disjungente.

NATAL. Mpendhle distr., Whiterocks, summit of Little Berg, c. 2100 m, growing in damp soil, 9 i 1967, Wright 388 (holo. E; iso. NU).

LESOTHO. Sehlabathebe, 2300-2500 m, solitary plant on roadside approach to Aponogeton pool, flowers cream, 4-14 i 1973, Guillarmod, Getliffe & Mzamane 31 (PRE).

Perennial herb; stems up to 25 cm, pubescent with long acute white hairs and short-stalked glands. *Leaves* opposite below, alternate above, sessile, c. 15-25 × 2-4 mm, narrowly elliptic to linear-oblong, subacute, scarcely narrowed at base and with a distinct pulvinus, decurrent in two ridges, distinctly or obscurely serrate in upper half, thick-textured, gland-dotted, glabrous except for long white hairs and short-stalked glands on lower margin and sometimes a few glands on midrib below. *Inflorescence* terminal, capitate, solitary or with a few smaller heads on short leafy axillary shoots below the main one, globose or oblong-cylindric, c. 15-20 × 10-13 mm, scarcely elongating in fruit. *Bracts* c. 5-7 × 4-6 mm, sharply differentiated

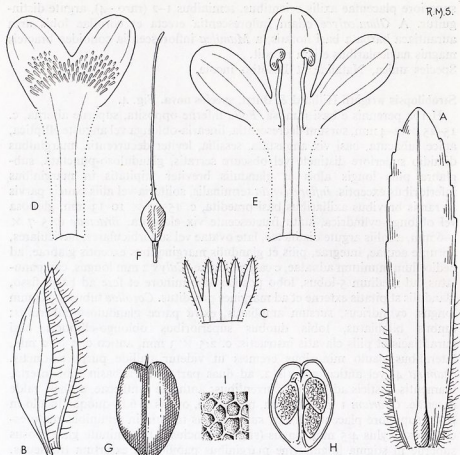


FIG. 4. *Strobilopsis wrighti* Hilliard & Burt (all from Wright 388): A, leaf  $\times 4$ ; B, bract  $\times 9$ ; C, calyx (dissected)  $\times 9$ ; D, E, corolla in L.S.  $\times 9$ ; F, gynoecium  $\times 9$ ; G, capsule  $\times 9$ ; H, capsule in L.S.  $\times 9$ ; I, part of seed coat (much enlarged).

from the leaves, broadly ovate to suborbicular, abruptly acute, boat-shaped, entire, glabrous except for marginal hairs and glands, adnate to minute pedicel, free from calyx. *Calyx* 2 mm long, 5-lobed to about half-way, the posticous lobe smaller and separated nearly to the base, stalked glands present on margins and outside. *Corolla* tube 3.5–4 mm long, cylindric, widening upwards, sparsely glandular-puberulous outside; limb bilabiate, creamy apparently with a mauve tinge; 2 upper lobes oblong-elliptic, c.  $2.5 \times 3$  mm, with an orange blotch with clavate hairs at base, anticous lobe c.  $3 \times 2$  mm, 2 laterals slightly smaller. *Stamens* 4, or 2 when the anticous pair are wanting, arising about two-thirds up the tube, exserted at anthesis; anthers syntheous. *Ovary* 1 mm long, bilocular, with up to 6 ovules in each loculus on the upper part of the placenta, only the upper ones developing; style, including the ligulate marginally papillose exserted stigma, 4.5 mm long. *Capsule* c.  $2.5 \times 2$  mm, 2-valved; seeds 1–4 in a loculus, c.  $1.5 \times 1$  mm, elliptic in outline, flat on inner face, convex on outer, wrinkled with raised



reticulum, testa opaque, white eventually blackish brown, closely enveloping seed; funicle massive, fleshy, separating from seed.

This new genus differs from *Glumicalyx* in the fewer ovules, restricted to the upper part of the placenta, in its erect inflorescence, in the hairy palate of the corolla and in seed structure. It is not possible to stretch the limits of *Glumicalyx* to include such diversity. From *Manulea* distinguishing features, additional to the fewer ovules, are the delicate unequally divided calyx and the large concave bracts. For further discussion see above under *Glumicalyx* (pp. 157, 160).

*Strobilopsis wrightii* is known from only two specimens: Wright 388, the holotype, has flowers with only two fertile stamens: Guillarmod, Getliffe & Mzamane 31 has four. There is no other obvious difference and, until more is known of the species, we can only assume that this is intraspecific variability. The plant is evidently rare: Mr Wright collected it in 1967 but has failed to find it again: Guillarmod, Getliffe & Mzamane record in their field note "solitary plant": both habitats are over Cave Sandstone. One suspects that in both cases an odd outlier of an unlocated central population has been found.

**229-232** *Tetraselago* Junell in Svensk. Bot. Tidskr. 55,1:190 (1961). Type species: *T. natalensis* (Rolfe) Junell.

Tufted woody perennial herbs up to 1 m; stems pubescent. *Leaves* numerous, all cauline, alternate, linear to narrowly elliptic, up to  $30 \times 5$  mm, reduced in size in upper part, toothed towards apex, attenuate to base, glandular punctate, with axillary leaf-tufts on short shoots. *Inflorescence* corymbose, branches arising near top of stem, occasionally with lateral flowering branches lower down; ultimate branchlets of inflorescence with a few empty bracts (reduced leaves) at base and then about 6-10 racemose flowers. *Bracts* adnate to pedicel and to lower part of calyx. *Calyx* more or less equally 5-toothed to rather less than halfway. *Corolla* pale violet; tube 3-8 mm; limb slightly bilabiate, lobes 5, spreading. *Stamens* 4, didynamous, the anterior pair arising in throat of corolla, the posterior pair arising a little lower down and having filaments decurrent on surface of tube to the base; anthers synthecous. *Ovary* oblong, bilocular; style long, filiform passing smoothly into the marginally papillose linguiform stigma: ovules 2 in each locus from middle of axis, on thick funicles, one turned upwards the other downwards. *Fruit* a loculicidal capsule. Seeds dull black, pitted, c. 0.75 mm long.

Four species in eastern Transvaal, Swaziland and Natal.

Junell demonstrated that some species hitherto included in *Selago* have two ovules in each locus. It is not merely that there are two ovules instead of one, though this prevents the plants being keyed into *Selaginaceae* at all: the important difference is that the two ovules are central on the axile placenta, one turning up, the other turning down: in *Selago* each locus has a solitary ovule pendulous from the upper inner angle. A better understanding of *Selaginaceae* is furthered by the separation of species with this distinctive placentation from the rest of *Selago*, and we therefore accept Junell's genus *Tetraselago*. Junell diagnosed this merely in terms of the ovary structure;

but the plants do have a distinctive facies derived from the association of corymbose inflorescence, toothed leaves and axillary leaf-tufts: features common enough individually in *Selago*, but not in association. Furthermore, the fruit of *Tetraselago* is a dehiscent capsule, not two indehiscent nutlets as in *Selago*.

When establishing *Tetraselago*, Junell transferred only the type species *T. natalensis*, but indicated that *Selago aggregata*, *S. longituba* and *S. wilmsii* were all congeneric. To these we add *S. nelsonii*, but we are unable to separate *S. aggregata* from *S. wilmsii*. Indeed *S. nelsonii* is also not very easy to separate from *S. wilmsii* in words, but the usually smaller inflorescences and smaller thicker leaves suggest that it is properly recognised as a distinct species.

#### KEY TO SPECIES OF TETRASELAGO

- |    |   |                           |
|----|---|---------------------------|
| 1a | Corolla tube 8 mm long . . . . .  | 229. <i>T. longituba</i>  |
| 1b | Corolla tube 3-5 mm long . . . . .  | 2                         |
| 2a | Leaves of main stem c. $30 \times 3$ mm . . . . .   | 230. <i>T. natalensis</i> |
| 2b | Leaves of main stem usually less than 20 mm long, if more, then<br>c. 5 mm wide . . . . .         | 3                         |
| 3a | Corolla tube 3-4 mm long; leaves with blunt tip and blunt<br>teeth, less than 3 mm wide . . . . . | 231. <i>T. nelsonii</i>   |
| 3b | Corolla tube 4.5-5 mm long; leaves sharply acute with acute<br>teeth, up to 5 mm wide . . . . .   | 232. <i>T. wilmsii</i>    |

#### 229. *Tetraselago longituba* (Rolfe) Hilliard & Burt, **comb. nov.**

Type: E Transvaal, Barberton, 2800-3000 ft, July-August, *Galpin* 398 (K).  
Syn.: *Selago longituba* Rolfe in Dyer, Fl. Cap. 5, 1:151 (1901).

Only known to us from this area.

#### 230. *Tetraselago natalensis* (Rolfe) Junell in Sv. Bot. Tidskr. 55, 1:190 (1961). Lectotype: Natal [Pinetown distr.], hillside near Botha's Railway Station, 2-3000 ft, 29 iv 1892, *Medley Wood* 4863 (K, E).

Syn.: *Selago natalensis* Rolfe in Dyer, Fl. Cap. 5, 1:151 (1901).

Since Rolfe quoted several specimens under *Selago natalensis*, it seems desirable to choose a lectotype. The species is not uncommon in the Natal Midlands.

#### 231. *Tetraselago nelsonii* (Rolfe) Hilliard & Burt, **comb. nov.**

Lectotype: E Transvaal, Houtbosch [Woodbush], *Nelson* 439 (K).  
Syn.: *Selago nelsonii* Rolfe in Dyer, Fl. Cap. 5, 1:152 (1901).

Rolfe also quoted *Rehmann* 6208, 6209, 6210; *Schlechter* 4449 is conspecific. All are from the Woodbush area.

**232. *Tetraselago wilmsii* (Rolfe) Hilliard & Burtt, comb. nov.**

Type: E. Transvaal, Lydenburg distr., Paardeplaats, *Wilms* 1163 (K, iso. E).  
Syn.: *Selago wilmsii* Rolfe in Dyer, Fl. Cap. 5, 1:151 (1901).

*Selago aggregata* Rolfe in Dyer, Fl. Cap. 5, 1:152 (1901). Types: E Transvaal, Lydenburg distr., Paardeplaats, *Wilms* 1165a (K, E); near Lydenburg, *Wilms* 1165 (K, E); Natal, near Greytown, *Wilms* 2193 (K).

The species has not been re-collected in Natal and as some of Wilms's other specimens labelled Greytown have aroused suspicion, the occurrence of this species in Natal requires confirmation. Otherwise it is known only from the eastern and south-eastern Transvaal.

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**BOOK REVIEW**

**Chemotaxonomy of Plants.\*** Any attempt to integrate the unsympathetic disciplines of chemistry and biology has to take account of the varied tasks and interests of the organic chemist on the one hand and the taxonomist on the other, and at the same time offer something to both. The current success of chemical taxonomy is that it does just that. Like North Sea oil, it has come at a time when taxonomy is running out of fuel, and it comes to organic chemists like a second wife, to revive their flagging interest. The information offered by both micromolecules, and the larger proteins and nucleic acids is now becoming increasingly incorporated into taxonomic decision-making. Data are relatively easily obtained for many of the chemicals and many plants can often be screened in the course of experiments. But the pitfalls to the taxonomist are that he is not always sure how to handle this new array of information, what weight (if any) he should give it and what sense to make of conflicting data. Often he has little knowledge of the chemicals he is studying, with scant idea of, and worse still little interest in, their biosynthetic pathways and relationships. Yet this information is vital if the taxonomist is to make the best use of the chemical data now available to him. Of course, the organic chemist has all the background training necessary to understand this, but all too frequently considers taxonomy as a discipline essentially devoid of research and principally a matter of 'getting your names right.' The laborious collection and sifting of data, the experience and art of taxonomic judgement and significance of nomenclature, seem not to be understood. Indeed, if this were not the case, there would be far fewer papers in organic chemistry journals purporting to show taxonomic relationships, based on the distribution of one or a few inadequately sampled chemicals. Any book on chemical taxonomy must therefore try and bridge the gap between chemistry and taxonomy and attempt to educate both taxonomists and chemists at the same time. Philip Smith's 'Chemotaxonomy of Plants', though written primarily for the biology undergraduate succeeds in this task very well indeed.

The first three chapters set out to introduce the taxonomist to chemistry and chemotaxonomic investigation and he includes a very interesting chapter on the origins of

\* The Chemotaxonomy of Plants by P. M. Smith. Contemporary Biology Series published by Edward Arnold Ltd. 1976. 313 pages. £13 hardback, £6.50 paper.