

# THE GENUS *ELYONURUS* Humb. and Bonpl. IN SOUTH AFRICA.

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SYSTEMATIC (By E. P. PHILLIPS).

THE genus *Elyonurus* is known by about twelve species recorded from South and North America, America, Australia, Arabia, Persia and Africa. In the year 1841 Nees described two species (*E. argenteus* and *E. thimodorus*) from the eastern and north-eastern districts of the Cape Province. Stapf in the "Flora Capensis" recognised only one species and reduced the second species to a variety *thymiodora*.

I recently had occasion to examine some fresh specimens collected near Pretoria and which did not conform to the description in the "Flora Capensis." As I suspected it to be different from the plant named *E. argenteus*, an examination of all the material in the National Herbarium was undertaken. The result of that examination is that I recognise three species as occurring in South Africa. The species *E. argenteus* Nees is common in the eastern and north-eastern areas of the Union; the plant typical of the western Transvaal and previously referred to *E. argenteus*, has been named *E. glaber*. It is characterised by the glabrous leaf-sheaths but a form with villous leaf-sheaths is met with and has been designated var. *villosus*. The third species (*E. pretoriensis*) I have only seen from Pretoria; it is characterised by having a *palea* present and the peduncled spikelet invariably bisexual.

Mr. C. E. Hubbard of the Kew Herbarium, to whom some specimens were referred, is not very convinced that the specimens are specifically distinct and due consideration has been given to his views. The distribution of the species as recognised in this paper is distinct; certain morphological characters are constant; the leaf-anatomy as detailed by Mr. Bredell is distinct. For the above reasons there appears every justification for separating the South African plants of *Elyonurus* into three species.

I am indebted to the director of the Royal Botanic Gardens, Kew, for sending me on loan, three herbarium sheets from the Kew Herbarium and to Mr. C. E. Hubbard for comments he made on specimens sent to him.

## KEY TO SPECIES.

1. Pale, present in both spikelets as a hyaline scale; peduncled spikelet invariably bisexual..... 3. *pretoriensis*.  
Pale, absent in both spikelets, very rarely present; peduncled spikelets, male..... 2.
2. Sessile and peduncled spikelets of equal lengths; lower glume of sessile spikelet less than 1 cm. long, 2-toothed or with awns 1-2.25 mm. long, rarely longer..... 1. *argenteus*.  
Sessile spikelet longer than the peduncled spikelet; lower sessile glume of spikelet 1 cm. or more long, rarely shorter, with awns 4-6.5 cm. long, rarely shorter..... 3. *glaber*.



1. *E. argenteus* Nees

Plants 25–100 cm. high, forming dense clumps. Basal leaf-sheaths persistent, somewhat villous. *Blades* green, 10–27 cm. long, 0.5 mm. broad, usually somewhat curled, keeled so that leaf is almost 3-angled in cross-section, ciliate below, glabrous. *Culm* bearing inflorescence 2-noded, hairy at nodes. *Inflorescence* 3–8 cm. long. *Spikelets* of equal lengths. **SESSILE SPIKELET.**—*Lower glume* 5.5–9.5 mm. long, 1.5–2 mm. broad, usually lanceolate, rarely ovate-lanceolate, acuminate, usually 2-toothed, more rarely produced into short awns 1–2.25 mm. long, with a dark band round the margins, with the margins narrowly inflexed and narrowly keeled, long ciliate on the keels, sometimes cilia from tubercules, usually 9-nerved, more rarely 5–7-nerved, villous on the back. *Upper glume* 4.5–7 mm. long, 1–1.5 mm. broad, lanceolate, acute, deeply concave, 3-nerved, keeled on back, shortly ciliate, pubescent on the back. *Lower valve* 3–5 mm. long, 0.75 mm. broad, lanceolate, acute, flattish on the back, 2-nerved, very rarely 3-nerved, ciliate above on hyaline marginal flaps. *Upper valve* 3–5 mm. long, 0.75 mm. broad, lanceolate, concave, 3-nerved, ciliate on hyaline marginal flaps. *Anthers* 3.5 mm. long, linear. *Ovary* ellipsoid; styles free; stigmas about twice as long as styles. *Lodicules* fan-shaped or triangular, truncate. **PEDUNCLED SPIKELET.**—*Peduncle* 2.5–4 mm. long, hollow, obtusely 3-angled, villous. *Lower glume* 3.5–7 mm. long, 1–1.75 mm. broad, lanceolate, long acuminate, sub-acuminate, 2-awned, 2-toothed, or with a small lateral tooth, with one margin narrowly inflexed and narrowly keeled, 5–7-nerved, more rarely 8–9-nerved, ciliate on the keel, with the cilia sometimes from tubercules, pilose or villous on the back. *Upper glume* 3.5–6.5 mm. long, 0.75–1.25 mm. broad, lanceolate, acute or sub-acute, deeply concave, rounded on the back, usually 3-nerved, rarely 4–5- or 7-nerved, keeled, ciliate on hyaline marginal flaps, usually shortly ciliate on keel, pubescent or shortly pilose on back, rarely glabrous. *Lower valve* 2.5–4 mm. long, 0.75–1.25 mm. broad, lanceolate, flattish on the back, 2-nerved, very rarely 3-nerved, ciliate on hyaline marginal flaps. *Upper valve* 3.5–4 mm. long, rarely shorter, 0.5–1 mm. broad, lanceolate, deeply concave, rounded on back, 3-nerved, ciliate on marginal hyaline flaps. *Pale*, a hyaline fimbriated scale (see only in one specimen). *Lodicules* fan-shaped or triangular, truncate. *E. thimiodorus* Nees, *Fl. Afr. Austr.*, 95; *E. argenteus* var. *thymiodora* Stapf in *Fl. Cap.*, vol. 7, p. 333; *E. argenteus* Nees ex *Fl. Cap. l.c. partly*.

**CAPE PROVINCE.**—Humansdorp distr.: Witte Elsbosch, 750 ft., April, *Fourcade*, 2542. Albany distr.: Grahamstown, Oct., *Daly* and *Sole*, 108; Howison's Poort, 2,200 ft., Dec., *Galpin*, 3094; Trapp's Valley, Dec., *Daly*, 714. Kingwilliamstown distr.: Amatola Mountain, 4,000 ft., Dec., *Dyer*, 260; Kei Road, 2,000 ft., Febr., *Ranger*, 50. Stutterheim distr.: Blaney Junction, 1,200 ft., Jan., *Galpin*, 5622. Stockenström distr.: Katberg, Dec., *Sole*, 405. Queenstown distr.: Effingham Peak, Katberg, 5,700 ft., Dec., *Galpin*, 8393; Roode Rand farm, 3,550 ft., Nov., *Galpin*, 2510; Hangklip Mountain, 5,400 ft., Febr., *Galpin*, 5859. Komgha distr.: Near Komgha, 2,000 ft., Sept., *Flanagan*, 897. Kentani distr.: Near Kentani, 1,200 ft., Nov., *Pegler*, 1386. Tsolo distr.: Idutywa, 2,500 ft., Jan., *Schltr.*, 6273; Bazeia, *Baur*, 284. Barkly East distr.: Near Barkly East, Febr., *Greyvenstein*, 12. Mount Currie distr.: Hills round Kokstad, Nov., *Goossens*, 222; *Mogg*, 4826.

**ORANGE FREE STATE.**—Ficksburg distr.: Riverhill Farm, high up on mountain slopes, Jan., *Potts in Grey Univ. Herb.*, 3706, 3721. Senekal distr.: Common on upper slopes of mountains near Doornkop, 5,300 ft., Dec., *Goossens*, 709; lava soil on top of mountain at Wonderkop, Dec., *Goossens*, 825.

**BASUTOLAND.**—Drakensbergen, *Stokoe in Nat. Herb.*, 8342; Thabuing, Jan., *Watt and Brandwyk in Nat. Herb.*, 8763; Leribe, *Dieterlen*, 177.

**NATAL.**—Pietermaritzburg distr.: Cedara, Dec., *Phillips in Nat. Herb.*, 20570. Lion's River distr.: St. Ives, Oct., *Mogg*, 5661; Balgowan, Nov., *Mogg*, 3541; near Howick, 3,600 ft., Nov., *Mogg*, 3502. Impendhle distr.: Giant's Castle, 8,000–9,000 ft., Oct.,



Wood, 10543. Estcourt distr.: Mont-aux-Sources, 10,000 ft., Feb., *Bayer and McClean*, 318; Dec., *Schweickerdt in Nat. Herb.*, 20573; Mooi River, Oct., *Mogg*, 3063, 3277. Bergville distr.: Mt. Twinta, Jan., *Doidge in Nat. Herb.*, 20571; Acton Homes, Jan., *Doidge in Nat. Herb.*, 20572.

TRANSVAAL.—Heidelberg distr.: Heidelberg, Dec., *Burt Davy*, 3147. Standerton distr.: Near Standerton, Jan., *Burt Davy*, 3083. Ermelo distr.: Near Ermelo, Jan., *Burt Davy*, 952; Febr., *Henrici*, 1209. Carolina distr.: Vlei on town lands near Carolina, Jan., *Pellissier in Grey Univ. Coll. Herb.*, 4609; Dec., *Burt Davy in Govt. Herb.*, 7364. Middelburg distr.: Botsabelo, Dec., *Fouche in Nat. Herb.*, 20574.

SWAZILAND.—Near Bremersdorp, *Burt Davy*, 3048.

A specimen (*Rehmann*, 5672) collected at Houtbosch, in the Pietersburg district of the Transvaal is probably this species but the material is too poor for any examination.

2. *E. glaber* Phillips sp. nov. *Affinis E. argenteus sed foliis basin versus glaber differt. E. argenteus* Nees ex *Fl. Cap.*, vol. 7, p. 332 partly.

*Culmi* 42–70 cm. alti. *Folia* 15–36 cm. longa, 2–3 mm. lata, carinata, basin versus glabra. *Racemi* 7–14 cm. longi, *Spiculae* sessiles hermaphroditae, 1–1.4 cm. longae. *Gluma* inferior, lanceolata, 6–8-nervata, profunde 2-fida, dense villosa. *Spiculae* pedunculatae 0.65–1 cm. longae. *Pedunculus* 2.5–4 cm. longus, villosus. *Gluma* inferior 6–9.5 mm. longa, lanceolata, acuminata vel profunde 2-fida, pilosa vel villosa.

BASUTOLAND.—Likhoele, March, *Dieterlen*, 1097.

ORANGE FREE STATE.—Draaifontein (no precise locality), *Rehmann*, 3658. Senekal distr.: Near Senekal, Dec., *Goossens*, 956. Heilbron distr.: Heilbron, Jan., *Goossens*, 444. Hoopstad distr.: Wesselsbron, Jan., *Goossens*, 1243. Kroonstad distr.: Kroonstad, Sept., *Pont*, 498.

CAPE PROVINCE.—Vryburg distr.: Armoed's Vlake, Febr., *Viljoen in Nat. Herb.*, 77; *Theiler in Nat. Herb.*, 20675; Klipvlakte, Nov., *Burt Davy*, 11131.

TRANSVAAL.—Marico distr.: Derby Station, Nov., *Burt Davy in Govt. Herb.*, 7168. Bloemhof distr.: Kameelpan, near Christiana, Jan., *Theron*, 628; Christiana, Mch., *Burt Davy in Govt. Herb.*, 14126; Cawood's Hope, Mch., *Burt Davy*, 12953. Wolmaransstad distr.: Boskuil, May, *Sutton*, 114. Ventersdorp distr.: Ventersdorp, Mch., *Pole Evans*, 3139. Potchefstroom distr.: Welverdiend Station, Mch., *Burt Davy*, 14569. Johannesburg distr.: Turffontein, Mch., *Bryant*, D. 48; Johannesburg, July, *Hitchcock*, 24141. Pretoria distr.: Near Pretoria, Febr., *Skea*, 3, 71; *Liebenberg*, 3241 (typus), 3211; *Mogg in Nat. Herb.*, 20577; Onderstepoort, *Du Toit*, 28. Waterberg distr.: Springbok Flats, Oct., *Burt Davy*, 7067.

Var. *villosus* Phillips, *Folia* basin versus pilosa vel villosa.

ORANGE FREE STATE.—Bothaville distr.: Bothaville, Jan., *Goossens*, 1182.

CAPE PROVINCE.—Kuruman distr.: Near Kuruman, Dec., *J. W. Mogg*, 7627.

TRANSVAAL.—Bloemhof distr.: Near Christiana, *Nelson*, 65. Vereeniging distr.: "Weltevrede," Dec., *Cronje*, 55. Johannesburg distr.: Johannesburg, *Moss*, 6852, (a hyaline pale was found in *Moss*, 6852); Elsburg, Jan., *Rogers*, 12135. Benoni distr.: Benoni, Sept., *Bradfield*, T.187. Pretoria distr.: Premier Mine, Oct., *Moss*, 5451; near Pretoria, Dec., *MacDonald in Govt. Herb.*, 5441; Hartebeestnek, Nov., *Burt Davy*, 758; Wonderboom, near Pretoria, *Rehmann*, 4491.

Plants 42–70 cm. high, forming dense tufts; new shoots from nodes on a very short rhizome. Basal leaf-sheaths persistent, reddish, glabrous. *Blades* bright or dark green,



15–36 cm. long, 2–3 mm. broad (when fresh), keeled on back, with 5–6 nerves on either side of the mid-rib, ciliate at juncture with the sheath, otherwise glabrous. *Ligule* a narrow lacerated rim, about 0.5 mm. broad. *Culms* simple, rarely branched, 2–5-noded, with the nodes reddish and slightly swollen; upper internode 15–26 cm. long. *Inflorescence* 7–14 cm. long. *Sessile spikelet* longer than the peduncled spikelet, very rarely as long. **SESSILE SPIKELET.**—*Lower glume* 1–1.4 cm. long, rarely less than 1 cm. long, 0.15–0.175 cm. broad, lanceolate, usually acuminate, produced into two ciliate awns 4–6.5 mm. long, rarely shorter than 4 mm., with the margins narrowly inflexed, narrowly keeled and long ciliate on the keels, 6–8-nerved, villous on the back. *Upper glume* 5.5–7.5 mm. long, 0.1–0.125 cm. broad, lanceolate, usually subacuminate, acute, deeply concave, 3-nerved, keeled on the back, pilose, more rarely pubescent on the back. *Lower valve* 5–6 mm. long, 0.75–1.25 mm. broad, lanceolate, flattish on the back, 2-nerved, ciliate above on hyaline marginal flaps. *Upper valve* 4–4.75 mm. long, 0.75–1 mm. broad, lanceolate, concave, rounded on the back, 3-nerved, ciliate above on hyaline marginal flaps. *Anthers* 2.5–3.5 mm. long, linear. *Ovary* ellipsoid; styles free; stigmas twice as long as the styles. *Lodicules* fan-shaped or triangular, truncate, somewhat fleshy. **PEDUNCLED SPIKELET.**—*Peduncle* 2.5–4 mm. long, hollow, villous. *Lower glume* 6–9.5 mm. long, 1–1.25 mm. broad, lanceolate, usually long acuminate, rarely 2-awned and then awns 1.5–3.5 mm. long, with one margin narrowly inflexed and narrowly keeled on same margin, rarely both margins narrowly keeled, 5-nerved, rarely 6-nerved, ciliate on the keel, pilose or villous on the back. *Upper glume* 5–8 mm. long, 0.75–1 mm. broad, lanceolate, acuminate, more rarely awned, concave, rounded on the back, 3-nerved, ciliate on hyaline marginal flaps, sparsely pilose on the back or pubescent with a few long hairs. *Lower valve* 5–6.5 mm. long, 0.75–1.25 mm. broad, lanceolate or linear-lanceolate, usually flattish on the back, more rarely slightly concave, 2-nerved, ciliate on hyaline marginal flaps. *Upper valve* 3.5–5 mm. long, 0.5–1 mm. broad, lanceolate, concave, rounded on back, 3-nerved, ciliate on upper margins. *Anthers* 2.75–3.5 mm. long, linear. *Lodicules* triangular or fan-shaped, truncate, somewhat fleshy. **Var. villosa.** Leaf sheaths pilose or villous.

3. **E. pretoriensis** Phillips sp. nov. Affinis *E. argenteus* sed spiculus pedunculatis hermaphroditis differt.

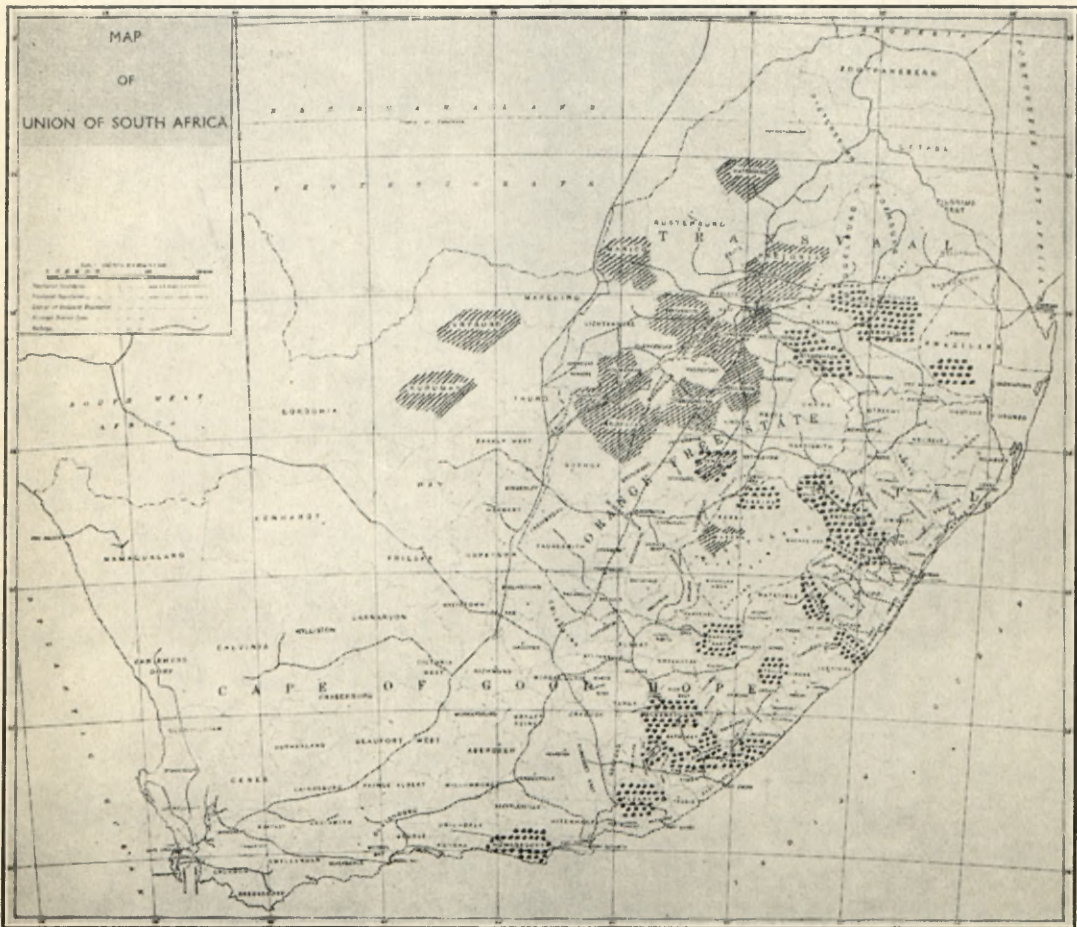
*Culmi* ad 42 cm. alti. *Folia* ad 19 cm. longa, 3.5–4 mm. lata, carinata, basin versus ciliata, villosa; ligulae ad marginem breviter dense ciliatam redactae. *Racemi* 7.5–9.5 cm. longi. *Spiculae* sessiles hermaphroditae, 1.05–1.25 cm. longae. *Gluma* inferior, lanceolata, 6–9-nervata, profunde 2-fida, dense villosa. *Spiculae* pedunculatae hermaphroditae, 0.65–1 cm. longae. *Gluma* inferior, lanceolata, 5–9-nervata, acuminata, pilosa vel villosa. *Pedunculus* 1–3.5 mm. longus, villosus.

TRANSVAAL.—Pretoria distr.: Meintjes Kop, Pretoria, Oct., *Lansdell in Govt. Herb.*, 16066; near Pretoria, *Burt Davy*, 726; Brooklyn, near Pretoria, *Mogg*, 12276; Zoo grounds, Pretoria, *Mogg in Nat. Herb.*, 20576 (typus).

Plants up to 42 cm. high, forming dense clumps. New shoots arising from nodes on a short rhizome with very short internodes. Basal leaf-sheaths persistent, slightly flushed with pink, keeled, ciliate, densely villous. *Blades* glaucous green, up to 19 cm. long, 3.5–4 mm. broad (when fresh), distinctly keeled on the back, with about 8 lateral nerves on either side of the mid-rib, ciliate on the basal portion, otherwise glabrous. *Ligule* a very narrow membranous rim, about 0.5 mm. broad, minutely lacerated. Culm bearing inflorescence 2-noded, rarely branched; nodes reddish, somewhat unequally swollen; upper internode 13–16 cm. long, glabrous. *Inflorescence* 7.5–9.5 cm. long. *Peduncled and sessile spikelets* of equal lengths or one or the other slightly longer. **SESSILE SPIKELET.**—*Lower glume* 1.05–1.25 cm. long, 0.175–0.225 cm. broad, lanceolate, more rarely ovate-lanceolate, produced into 2 awns 3.5–6.5 mm. long, with the margins narrowly inflexed, narrowly keeled, ciliate on the keels, usually densely villous, more rarely pilose on the back. *Upper glume* 6.5–7 mm. long, 1.25–2.25 mm. broad, lanceolate, acute, deeply concave, 3-nerved,



keeled on back, shortly ciliate on hyaline marginal flaps, shortly pilose on the back, more rarely pubescent. *Lower valve* 5–6 mm. long, 1.25 mm. broad, lanceolate, acute, flattish on the back, 2-nerved, shortly ciliate on hyaline marginal flaps. *Upper valve* 4–5 mm. long, 1 mm. broad, lanceolate, concave, rounded on the back, 3–5-nerved, minutely ciliate on hyaline marginal flaps. *Pale* a hyaline fimbriated or ciliated scale 0.5–1 mm. long. *Anthers* 3 mm. long, linear. *Ovary* ellipsoid; styles free; stigmas twice as long as the styles. *Lodicules* fan-shaped or quadrate, truncate above. **PEDUNCLED SPIKELET.**—*Peduncle* 1–3.5 mm. long, hollow, villous. *Lower glume* 0.65–1 cm. long, 1.25–1.75 mm. broad, lanceolate, long acuminate, sometimes with a minute lateral tooth, with one margin narrowly inflexed and keeled, 5–9-nerved, long ciliate on keel, pilose or villous on back. *Upper glume* 5–6.5 mm. long, 1–1.25 mm. broad, lanceolate, acute or sub-acute, deeply concave, rounded on the back, 3-nerved, ciliate on hyaline marginal flaps, sparsely pubescent or shortly pilose on the back. *Lower valve* 2.5–5.5 mm. long, 1 mm. broad, lanceolate, deeply concave, flattish on the back, 2-nerved, ciliate from hyaline marginal flaps. *Upper valve* 2–5 mm. long, 1 mm. broad, lanceolate, acute, concave, rounded on back, 3-nerved, ciliate on hyaline marginal flaps. *Pale* 0.5–1 mm. long, a hyaline ciliated or fimbriated scale. *Ovary* ellipsoid; styles free; stigmas twice as long as the styles. *Stamens* 2.25–3.5 mm. long, linear. *Lodicules* fan-shaped, truncate.



Distribution of *E. glaber* Phill. and *E. argenteus* Nees.







An examination of the anatomy of certain specimens was undertaken in order to find out whether anatomical characters would support the taxonomic characters on which the genus was divided into three species. The specimens examined were *Galpin*, 3094 (*E. argenteus* Nees); *Mogg in National Herbarium*, 20576 (*E. pretoriensis* Phill.); and *Mogg in National Herbarium*, 20577 (*E. glaber* Phill.). Only the leaf and root anatomy of these grasses were examined.

### E. PRETORIENSIS Phill.

#### LEAF SURFACE (Fig. 1).

The structure and arrangement of the epidermal cells can be studied when parts of the epidermis are torn from the underlying tissues and placed in water under the microscope. The abaxial or dorsal epidermis consists of long cells with intervening short cells opposite the parenchymatous tissues of the leaf. Opposite the primary and secondary veins, the cells differ in being more thick-walled, narrower, and of three types: (1) short rod-like cells; (2) medium-sized cells with the side walls constricted at the middle; and (3) elongated cells. The walls of all the long cells are undulated. On the adaxial or ventral surface only two types of cells can be distinguished, namely more or less elongated cells and short cells, the latter only being present opposite the primary and secondary vascular bundles. The cells on the adaxial surface are always shorter than corresponding cells on the abaxial surface, and the cell walls are only slightly or not at all undulated. On the abaxial surface the stomata develop in four rows, two near each leaf margin but on the adaxial surface they are distributed in two or more rows between the veins over the entire surface.

#### LEAF ANATOMY (Fig. II).

In cross section the following tissues of the leaf can be distinguished: (a) the abaxial epidermis of closely packed regular cells with thickened outer tangential walls and which are usually small and much lignified opposite the mid-rib, the primary, and secondary veins; (b) the adaxial epidermis of regular, relatively thin-walled cells between which many stomata can be seen in cross section. The row of epidermal cells underlying the mid-rib are usually bigger and more thin-walled than the rest and act as motor cells, whereas those opposite the primary veins are smaller and thick-walled; (c) the ground tissue made up of thin-walled cells and in which lie (d), the vascular bundles. According to the extent of development, three types of vascular bundles can be distinguished, viz. the primary, secondary and tertiary bundles. The structure of the bundles is uniform throughout. All the primary bundles, except the mid-rib, have a sclerenchymatous tissue (stereome) developed towards the adaxial and abaxial surface. The secondary bundles are provided with an abaxial stereome only, whereas the tertiary bundles have no stereome associated with them. The stereome strands are very strongly developed and give the leaf a hard texture. The number of bundles usually averages 32, but in very broad-leaved specimens as many as 40 were found. Two or three tertiary bundles are present between the mid-rib and the first secondary bundles and 5-7 bundles between the mid-rib and first primary bundle.

#### ROOT ANATOMY (Fig. III).

In cross section the following tissues can be distinguished: One layer of irregular more or less dome-shaped epiblem cells some of which grow out to form root hairs. Those cells usually disintegrate as soon as the root hairs die off only leaving remnants of some of



the cell walls in their place. Underlying the epiblem is the exodermis, which consists of one layer of more or less elongated cells with a marked tertiary thickening on the outer tangential walls. Underlying the exodermis are two or more rows of thick-walled cells which form a definite mechanical tissue, the sclerenchyma. The sclerenchyma surrounds and protects the inner thin-walled cortical layers (cortex). Adjoining the cortex on the inside is a single layer of well-differentiated cells, the endodermis which have a marked tertiary thickening on the inner tangential walls. Inside the endodermis are the vascular bundles with big vessels in the xylem and in the centre is the pith made up of thin-walled cells.

### **E. ARGENTEUS** Nees

#### **LEAF SURFACE** (Fig. IV).

The structure and arrangement of the cells of the abaxial epidermis resemble that of *E. pretoriensis* (Fig. I). On the adaxial surface the cells are irregular in outline and some of them bulge out to form an outgrowth on the outer tangential wall. Many hairs develop from this surface from between the relatively thin-walled cells.

#### **LEAF ANATOMY** (Fig. V).

The structure of the leaf is very similar to that of *E. pretoriensis* (Fig. II). Two tertiary bundles are present between the mid-rib and the first secondary bundle and not more than five bundles are present between the mid-rib and the first primary bundle. The number of motor cells varies from 5-14 and the primary bundles are provided with a well-developed stereome which gives the leaf a hard texture.

#### **ROOT ANATOMY.**

The structure of the root is the same as described under *E. pretoriensis* (Fig. III) but a sclerenchyma with slightly thick-walled cells is present in old roots only.

### **E. GLABER** Phill.

#### **LEAF SURFACE.**

The arrangement of the epidermal cells on both abaxial and adaxial surfaces is similar to that of *E. pretoriensis*. On both surfaces the stomata are arranged in two or more rows between the veins and the cells are extremely thin-walled on the adaxial surface.

#### **LEAF ANATOMY.** (Fig. VI).

In cross section the same tissues are observed as in *E. pretoriensis* and *E. argenteus*. The cells of the abaxial surface differ from those of the adaxial surface in being more thick-walled on the outer tangential walls. One or two tertiary veins are present between the mid-rib and the first secondary vein and not more than six bundles are found between the mid-rib and the first primary vein. Usually 3 or 4 motor cells are present opposite the mid-rib. The cells of the sclenchymatous tissues are relatively thin-walled, with the exception of those opposite the mid-rib, and the leaf has a soft texture.

#### **ROOT ANATOMY** (Fig. VII).

The cortical tissues, viz. epiblem, exodermis and cortex have thin-walled cells and a sclerenchymatous tissue is never differentiated.

Anatomically the three species of this genus differ in many respects. The anatomical differences which were found to be constant in the parts studied, are as follows :—

In *E. pretoriensis* and *E. argenteus* the stomata on the abaxial surface are usually arranged in four rows (two rows near each margin), whereas the stomata are arranged in



many rows between most of the veins in *E. glaber*. In *E. pretoriensis* the cells of the adaxial epidermis are relatively thick-walled; in *E. glaber* extremely thin-walled and irregular; and in *E. argenteus* thin-walled with some bulged out on the outer tangential walls. In *E. pretoriensis* and *E. argenteus* the motor cells seem to be restricted to the region of the epidermis underlying the mid-rib, but it is possible that all the big cells on the entire adaxial surface of *E. glaber* are motor cells because the leaves of this grass have the margins inrolled during hot days.

The space between the motor cells and the mid-rib is filled with parenchymatous tissue which appears to be different. In *E. pretoriensis* a group of cells consisting of two or three rows of cells is present, whereas only one row of cells is present in *E. argenteus* and *E. glaber*.

In *E. glaber* and *E. argenteus* one or two tertiary bundles are found between the mid-rib and the first secondary bundle, whereas the presence of two or three tertiary bundles is a fairly common feature in *E. pretoriensis*.

The structure of the vascular bundles is uniform throughout. The leaf texture in *E. pretoriensis* and *E. argenteus* is much harder than that of *E. glaber* owing to a much better developed stereome in the two former.

In the roots certain differences are apparent in the epiblem, exodermis and sclerenchyma. The epiblem cells of *E. argenteus* and *E. pretoriensis* are usually thick-walled and more or less persistent, whereas this layer is always relatively thin-walled in *E. glaber*. The tertiary thickening of the exodermis cells in *E. argenteus* and *E. pretoriensis* is an outstanding anatomical feature of these species. In *E. pretoriensis* the thickened exodermis is always associated with an adjoining tissue of well-differentiated sclerenchymatous cells and although this tissue may be distinguished from the adjoining tissues in *E. argenteus* in very old roots, it never forms a well-developed mechanical tissue. As a result of this lignification of the epiblem, exodermis, and underlying cortex cells, these cell layers are persistent throughout life and form a protecting sheath round the central cylinder which is always present in *E. argenteus* and *E. pretoriensis*, even though the thin-walled cortical cells may disintegrate. In *E. glaber* the exodermis remains relatively thin-walled throughout life and a well-differentiated sclerenchyma is never formed with the result that the cells of epiblem, exodermis and cortex usually break up at an early stage leaving the central cylinder unprotected or with a few crusts of dead cells round it.

The result of the examination is that the leaf and root anatomy of the South African species of *Elygonurus* may be used to determine the species. While it is probable that slight variations will be found under different environmental conditions, I am of opinion that the main anatomical features will remain constant for each species.

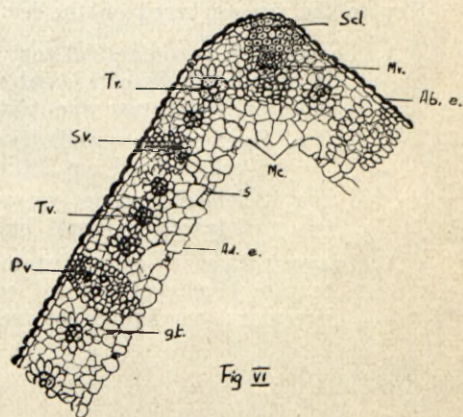
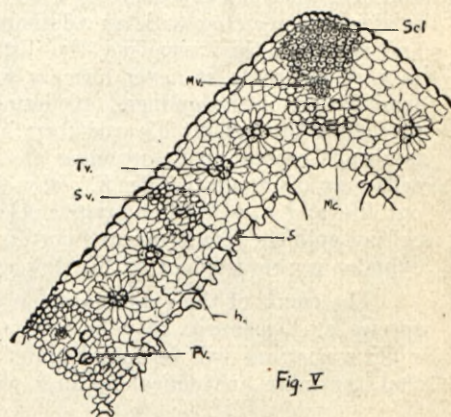
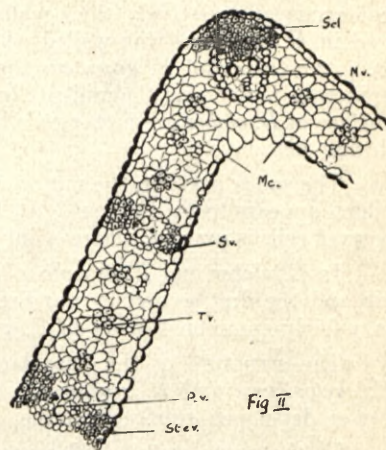
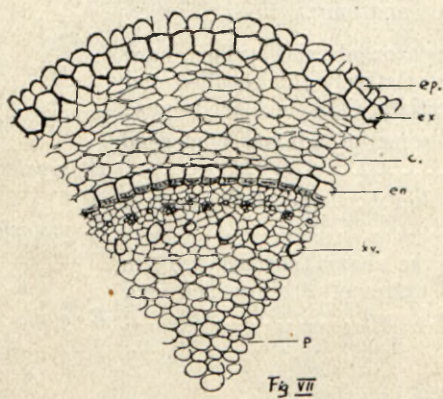
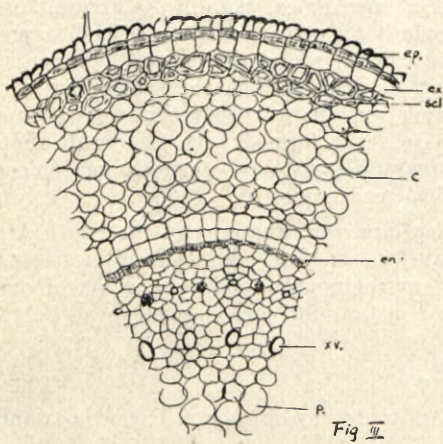
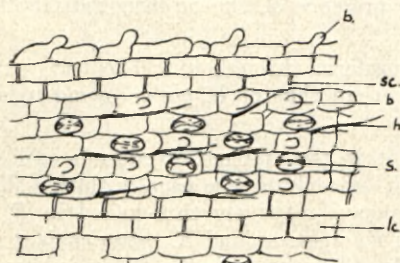
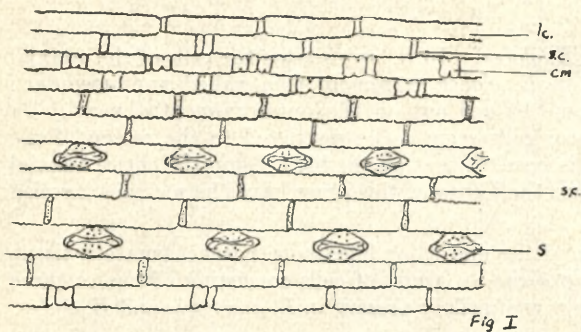
#### REFERENCE.

Goossens, A. P. and Theron, J. J. (1934): "An Anatomical Study of *Themeda triandra*," S. Afr. Journal Sc., Vol. XXXI.

Key to the species based on the leaf and root anatomy.

- A<sub>1</sub> Leaves with two marginal rows of stomata on abaxial surface, hard in texture; cells of adaxial epidermis relatively thick-walled and more or less regular; roots with a tertiary thickened exodermis:
  - a<sub>1</sub> Sclerenchyma well developed; some of adaxial epidermal cells bulged out..... *E. argenteus*.
  - a<sub>2</sub> Sclerenchyma not very well developed; none of the cells of adaxial epidermis bulged out..... *E. pretoriensis*.
- A<sub>2</sub> Leaves with many rows of stomata over the abaxial surface; soft in texture; cells of adaxial epidermis extremely thin-walled and irregular; exodermis not tertiary thickened..... *E. glaber*.







## EXPLANATION OF FIGURES.

*Fig. I*: Surface view of abaxial epidermis of *E. pretoriensis*; *Fig. II*: T.S. of leaf of *E. pretoriensis*; *Fig. III*: T.S. of root of *E. pretoriensis*; *Fig. IV*: Surface view of adaxial epidermis of *E. argenteus* Nees; *Fig. V*: T.S. of leaf of *E. argenteus*; *Fig. VI*: T.S. of leaf of *E. glaber*; *Fig. VII*: T.S. of root of *E. glaber*.

*Ab. e*, abaxial epidermis; *Ad. e*, adaxial epidermis; *b*, epidermal cell bulged out on the outer tangential wall; *c*, cortex; *cm.*, cell constricted at middle; *en.*, endodermis; *ep.*, epiblem; *ex.*, exodermis; *gt.*, ground tissue; *h.*, hair; *lc.*, long cell; *Mc.*, motor cells; *Mr.*, mid-rib; *p*, pith; *Pv.*, primary vein; *rc.*, rod-like cell; *s.*, stoma; *sc.*, short cell; *Scl.*, sclerenchyma; *ster.*, Sterome; *Sv.*, secondary vein; *Tv.*, tertiary vein.



