

Studies in the Hypoxidaceae. III. The genus *Pauridia*

M. F. THOMPSON*

ABSTRACT

The genus *Pauridia* is revised and two species are recognized: *P. minuta* (L.f.) Dur. & Schinz and *P. longituba* M. F. Thompson. Line drawings, distribution maps and scanning electron micrographs of the pollen are included.

RÉSUMÉ

ÉTUDES SUR LES HYPOXIDACÉES. III. LE GENRE PAURIDIA

Le genre *Pauridia* est révisé et deux espèces y sont reconnues: *P. minuta* (L.f.) Dur. & Schinz et *P. longituba* M. F. Thompson. Des dessins, des cartes de distribution et des photographies du pollen au microscope électronique à balayage accompagnent ce travail.

INTRODUCTION

This small genus of the Hypoxidaceae consists of two species which are endemic to the south-western Cape. The name *Pauridia* comes from the Greek παυρίδος (pauridios) meaning very small. In naming the genus, Harvey (1838) pointed out that this is one of the smallest bulbous plants in the South African Flora. He went on to say that "the flowers (were) show-white and covering the ground like a shower of brilliant little stars". The flowers have been mistakenly described as yellow by Baker (1896 but not 1878), Phillips (1951) and Geerinck (1969). I have seen only one specimen, collected in 1887, annotated "Flowers yellow" (Thode, in STE 8376) and I consider this to be an error. The confusion may have arisen from the fact that Baker (1878 and 1896) included *Romulea minuta* Eckl. in the synonymy of *P. hypoxidoides*, but this is indeed a *Romulea* and is synonymous with *R. rosea* (L.) Eckl. var. *australis* (Ewart) De Vos (De Vos, 1972).

Pauridia minuta had been placed in various families and genera. Having only three stamens it was put into the Triandria, Monogynia (under *Ixia*) by Linnaeus and the Irideae (as *Galaxia*) by Ker-Gawler in 1805. Since Harvey (1838) described the genus in the order Hypoxideae, it has been put into the Amaryllidaceae by Bentham & Hooker (1883), Baker (1896), Marloth (1915), Markötter (1936) and Garside (1950); into the Haemodoraceae by Durand & Schinz (1895), Williams (1901), Nel (1914), Pax & Hoffman (1930) and Phillips (1951). The family Hypoxidaceae, including *Pauridia*, was recognized by Baker (1878), Hutchinson (1959), Airy-Shaw (1966), Geerinck (1969) and Dyer (1976).

After the original description, Harvey notes that "In venturing to remove this little plant from the Irideae to the present order, I have been guided by the habit, which is completely that of *Hypoxis*, the quadrifarious leaves, deflexed pedicels, permanent perianth, the position of the stamens, and the dehiscence of the anthers." Its position in the Hypoxidaceae is confirmed by the close similarity to *Spiloxene*, in the morphology and anatomy of the corm and leaves (Thompson, 1977) and of the flower (Thompson, 1978) and in the development of the ovule and seed (De Vos, 1949).

PAURIDIA

Pauridia Harv., Gen. Pl. ed. 1. 341 (1838); Bak. in J. Linn. Soc. Bot. 17: 125 (1878); Benth. & Hook. f., Gen. Pl. 3: 716 (1880); Pax in Engl. Pflanzenfam.

2 (v): 96 (1888); Dur. & Schinz, Consp. Fl. Afr. 5: 142 (1895); Bak. in Fl. Cap. 6: 172 (1896); N.E. Br. in Gard. Chron. Ser. 3, 94: 24 (1933); Garside in Adamson & Salter, Fl. Cape Penins. 214 (1950); Phill., Gen. ed. 2, 197 (1951); Geerinck in Bull. Jard. bot. nat. Belg. 39: 81 (1969); Dyer, Gen. 2: 956 (1976). Type species: *P. minuta* (L.f.) Dur. & Schinz.

Small glabrous geophytes. Corm globose, covered with reticulate bristly tunics. Leaves rosulate, semi-terete to broadly linear, outermost leaf forming a tubular membranous sheath. Flowers few to several per corm. Scape solitary, axillary, one-flowered rarely forked and two-flowered, bearing two opposite, filiform, bracts; pedicel long or short. Perianth white to pale pink, regular with a short or long tube, lobes spreading, narrowly ovate. Stamens 3, arising from the perianth throat opposite the inner perianth segments; anthers basifix, non-versatile, 2-thealous, splitting longitudinally. Ovary 3-locular, conical; ovules many, axile; style simple; stigma 6-lobed, three lobes long, linear, erect, variously connate, 3 alternate lobes short, recurved, channelled. Capsule ovoid to obconic, crowned with the persistent perianth, indehiscent, thin-walled, disintegrating; seeds globose, shiny, verrucose.

Endemic to the south-western Cape.

Key to the species

Perianth tube shorter than the lobes; 2-4 mm long... 1. *P. minuta*
Perianth tube at least twice as long as the lobes; 8-30 mm long..... 2. *P. longituba*

1. *Pauridia minuta* (L.f.) Dur. & Schinz, Consp. Fl. Afr. 5: 142 (1895); Garside in Adamson & Salter, Fl. Cape Penins. 214 (1950); Geerinck in Bull. Jard. bot. nat. Belg. 39: 81 (1969), excl. *Fabricia minuta* Thunb. from syn. Type: Cape, Thunberg. sheet no. 974 (UPS, microfiche!).

Ixia minuta L.f., Suppl. 92 (1782); Thunb., Diss. Acad. (Ixia) 2: 139, t. 1 (1783); Prodr. 9 (1794); Fl. Cap. ed. 1, 216 (1811).

Galaxia minuta Ker-Gawl. in Konig & Sims, Ann. 1: 241 (1805); Gen. Irid. 71 (1827).

P. minuta N.E.Br. (comb. superfl.) var. *muirii* N.E.Br. in Gard. Chron. 94: 24 (1933). Type of var. Riversdale Div., J. Muir s.n. (K!).

P. hypoxidoides Harv., Gen. Pl. ed. 1. 342 (1838), as 'hypoxidoides', Bak. in J. Linn. Soc. (Bot.) 17: 126 (1878); in Thiselton-Dyer, Fl. Cap. 6: 172 (1896), excl. *Romulea minuta* Eckl. from syn. Type: as for *P. minuta*.

Corm globose, about 5-8 mm in diam., covered with reticulate fibers ending in a sharp point. Leaves rosulate, included in a sheath, glabrous, linear-terete to broadly linear-canaliculate 1-10 cm long 0.5-5 mm

broad. *Peduncles* axillary, 1(-2)-flowered, exserted from the leaf-sheath. *Pedicels* 2-30 mm long. *Bracts* 2, opposite, filamentous, membranous, 1-10 mm long. *Flowers* regular bell-shaped, white to pale pink, tips and reverse side of the outer perianth segments green; perianth tube 1-4 mm long; outer lobes spreading, at least twice as long as the tube, ovate-lanceolate, slightly hooded at the tip with small papillae in the hood, the inner segments smaller and not hooded. *Stamens* 3, inserted on the perianth tube opposite the inner perianth segments; filaments, short, 0,4-1 mm; anthers, 2-thecous, 1-3,5 mm long, basifix with the filaments continuous with the connective and the thecae free at the base. *Ovary* conical, 3-locular, placentation axile, ovules numerous; style short 0,2-1,5 mm; stigma 1-4,5 mm, 6-lobed with three long connate lobes and three small recurved appendages at the base. *Fruit* ovoid-obconic, crowned with the persistent perianth, indehiscent, the seed escaping by the disintegration of the wall. *Seeds* globose, black, shiny, verrucose. *Pollen grains*, longest axis 20-22 μ , anaperturate, 2-sulcate, ellipsoidal to irregularly spheroidal, irregularly granular-pitted. FIGS 1 (map 1) & 2.

Pauridia minuta occurs mainly on flats and lower slopes in clayey sandy-loam soils between Saldanha Bay and Riversdale extending inland to Ceres (Fig. 1, map 1).

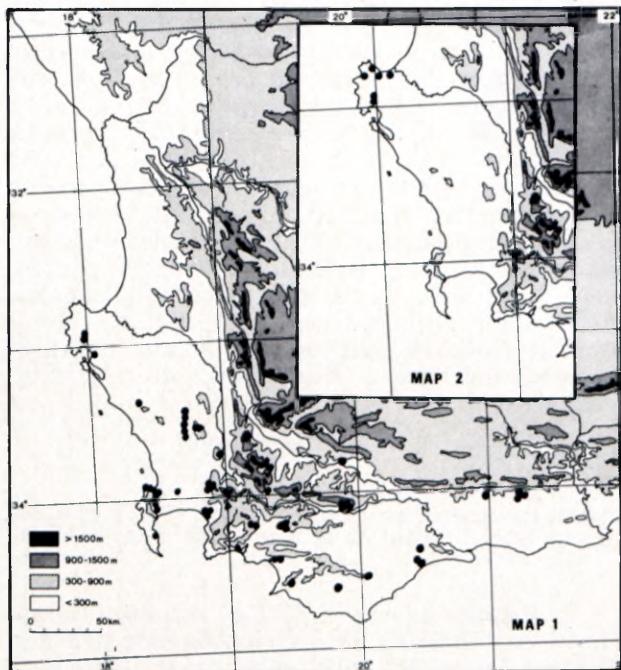


FIG. 1.—Map 1, distribution of *Pauridia minuta*; Map 2, distribution of *P. longituba*.

CAPE.—3217 (Vredenburg): Witklip Farm, 5 km S of Vredenburg (-DD), Thompson 21 B (NBG); Witklip, 3 km S of Vredenburg (-DD), Thompson 93 (STE); 5,8 km from Vredenburg on road to Saldanha on farm Witklip (-DD), Thompson 278 (STE). 3318 (Cape Town): Langebaan, Basson's Farm (-AA), Axelson 413 (NBG); Muishondklip (-AA), Thompson 3816 (STE); Langebaan, Meeuklip (-AA), Thompson 3818 (STE); Darling, Versveld Reserve (-AD), Negin 4.8 (NBG); between Mamre and Darling (-AD), Salter 2404 (BOL); 1,6 km from Malmesbury on road to Klipheuwel (-BC), L. Bolus s.n. (BOL); Malmesbury, Constable Hill (-BC), M. Macnae s.n. (BOL); Kenilworth near Cape Town (-CD), H. Bolus 2815 (BOL; BM; PRE); northern end of Lion Mountain (-CD), Burchell 8448 (K); Camp Ground (-CD), Dümmer 1399 (E); Kenilworth Race Course (-CD), Esterhuysen 31957 (BOL); flats towards Maitland (-CD), Guthrie 448 (CT);

Rondebosch Common (-CD), Heginbotham 5 (NBG); Cape Observatory near Rondebosch (-CD), MacOwan 2615, Herb. Norm. 291 (BM; SAM); Camp Ground (-CD), Page s.n. (CT); Greenpoint (-CD), Ecklon 4130 (BOL); Greenpoint (-CD), Thode (STE 8376); Rondebosch Common (-CD), Thompson 1001 (STE); Thompson 3812 (STE); Camp Ground (-CD), Wolley-Dod 2558 (BOL); Kalabaskraal (-DA), Strauss 102 (NBG); Thompson 103 (STE); between Malmesbury and Kalabaskraal (-DA), Thompson 999 (STE); Cape Town/Malmesbury divisional boundary on main road E. of Kalabaskraal (-DA), Thompson 3814 (STE); Paarl Mountain (-DB), Jordaan 1261 (STE); Malmesbury, Paardekop (-DB), Pillans s.n. (BOL 19850); Van Niekerk 370 (PRE); Langverwacht, Kuils River (-DC), Oliver 4846 (PRE; STI); Stellenbosch Flats (-DD), Bos 50 (STE); Stellenbosch (-DD), Duthie 464 (BOL; STE-U); Stellenbosch Flats (-DD), Duthie 464a (STE-U); alluvial flats, Stellenbosch (-DD), Garside 457 (K); Stellenbosch Flats (-DD), Garside 4937 (BOL); Duthie Reserve, Stellenbosch (-DD), I. Kruger DR69 (STE-U); Elsenberg (-DD), Marloth 2639 (PRE); Stellenbosch (-DD), C. E. Moss sub Herb. Rogers 4288 (K); Stellenbosch Flats (-DD), Thompson 726 (STE); Stellenbosch Flats (-DD), Wordsell s.n. (K). 3319 (Worcester): Gydw Pass, Ceres (-AB), Leipoldt s.n. (BOL); Villiersdorp (-CD), Salter 610 (BOL); near Robertson (-DD), Oldenland s.n. p.p. (BM). 3418 (Simonstown): Grootkop, Simonstown (-AB), Compton 18000 (NBG); Diep River (-AB), Marloth 7442 (PRE); Bergvliet Farm, Constantia (-AB), Purcell (SAM; 90863); Purcell (SAM 90862); Strand (-BB), Gerstner 6160 (PRE); Somerset West (-BB), Parker 3505 (K; BOL; NBG); Mrs Solly sub Marloth 5645 (PRE); Harmony Flats, Strand (-BB), Thompson 86 (STE). 3419 (Caledon): Houw Hoek (-AA), L. Bolus s.n. (BOL); Schlechter 7587 (3M; E; K; PRE); Caledon Baths (-AB), H. Bolus s.n. (10-); Marloth 14189 (PRE); Purcell s.n. (SAM 46271); Caledon, hill between village and baths (-AB), Guthrie s.n. (BOL 19849); near Caledon (-AB), Compton 7207 (NBG); Caledon, Happy Valley near Greyton (-AB), Compton 10677 (NBG); Esterhuysen 5077 (BOL); Paardeberg Mountains, Kleinmond (-AC), Stokoe (SAM 63797); Papiesvlei 300 (-AD), Schlechter 2281 (PRE); Schlechter 10444 (BM; E; K; PRE); 5ml N.W. Riviersonderend (-BB), Heginbotham s.n. (NBG 64954); foothills of the Riviersonderend Mountains (-BB), Lewis 3022 (SAM); Wilman 546 (BOL); Baardskeerdersbos, Uilenkraal road at turn-off to Awila (-CB), Thompson 1194 (STE; PRE); Haasvlakte S.E. of Elim (-DB), Thompson 1737 (STE). 3420 (Bredasdorp): Wydgelee (-AD), Barker 7953 (NBG); De Hoop Nature Reserve (-AD), Lewis 5127 (NBG); C. van der Merwe 2066 (STE); Heidelberg (-BB), Esterhuysen 17281 (BOL); near Bredasdorp (-CA), Taylor 118 (BOL). 3421 (Riversdale): Oakdale near Riversdale (-AA), Muir 187 (PRE); Muir sub Bolus 5371 (PRE); Riversdale (-A), Muir s.n. (BOL 18402); Muir s.n. (K). Without locality; Cheadle 813 (PRE); Drege s.n. (BM); Ecklon 104 (BM); Ecklon 1828 (BM); Harvey 1742 (E); Hooker 1845 (K); Masson s.n. (BM); Wolley-Dod 1060 (BM; K); Zeyher 96 (BM).

There is considerable variation in leaf width in *P. minuta* from a filiform (c. 1 mm) semi-terete form (Fig. 2a, h) to a broad (5 mm wide) carinate form (Fig. 2c, g). The forms grade into one another and do not appear to be linked to the distribution or to other characters. I do not consider the forms to be of varietal status. The arrangement of the vascular bundles in the filiform type is not like that of the truly terete leaf of other Hypoxidaceae (Thompson, 1976). Even in the narrowest leaf there is a large keel-bundle with at least one small bundle on either side (Fig. 2h).

In 1833 N. E. Brown described the variety, *P. minuta* var. *muirii*, from the Riversdale District, stating that it "seems to differ from the type only in its smaller size and more eastern locality". Similar plants (Fig. 2b) have been found in the Malmesbury District (Thompson 103, 3814, Strauss 102), while in the Caledon District equally small plants, but with broader leaves occur (Compton 10677, Lewis 3022). I do not recognize the variety as the locality is not confined to the Riversdale District and the size is probably a reflection of the habitat.

Where the species occurs in shallow pockets on rock surfaces (Compton 18000, Thompson 21B, 93, 278, 3816, 3818) the leaves are longer than the scape at the time of flowering. In fruit the bend at the node

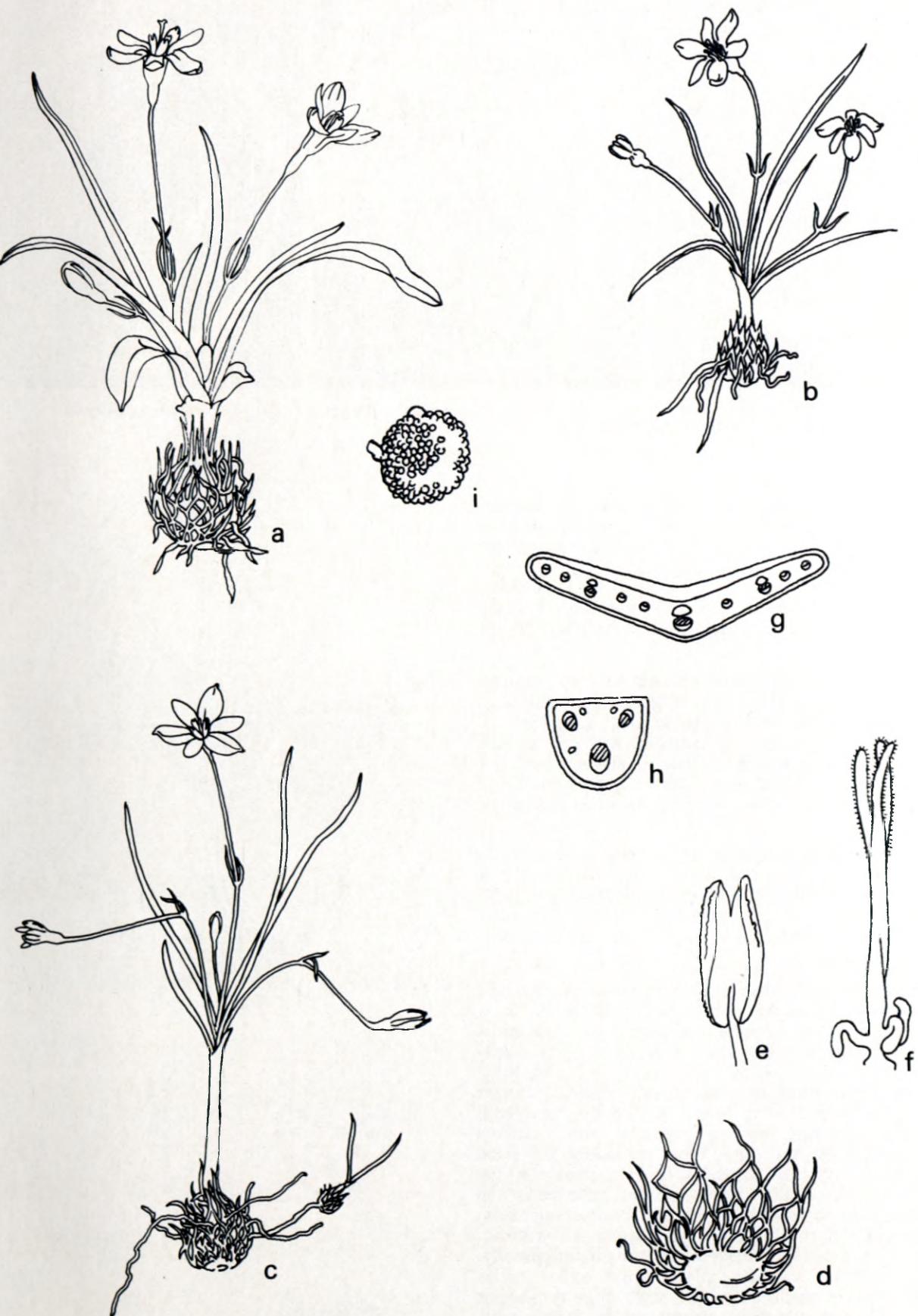


FIG. 2.—*Pauridia minuta*. a, plant with broad leaves (*Thompson 3810*), $\times 2$; b, small plant from near Malmesbury (*Thompson 3814*), $\times 2$; c, plant with terete leaves (*Thompson 3812*), $\times 2$; d, corm tunic, $\times 4$; e, anther, $\times 10$; f, stigma, $\times 15$; g, diagrammatic cross-section of broad leaf; h, diagrammatic cross-section of terete leaf; i, seed, $\times 30$.

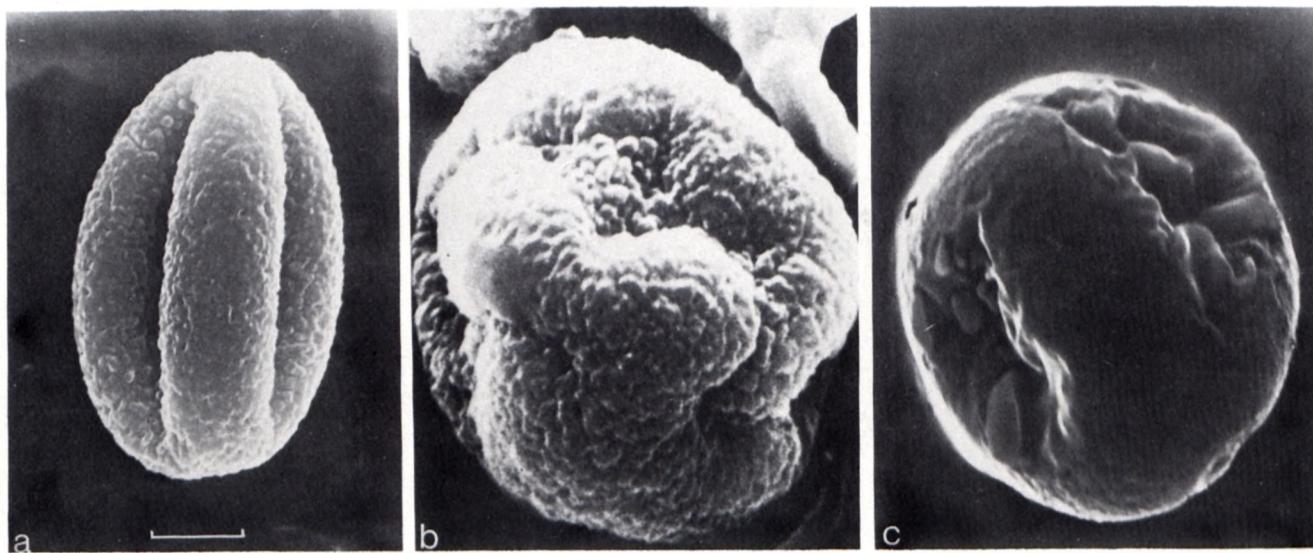


FIG. 3.—*Pauridia minuta* pollen. a, ellipsoidal, 2-sulcate grain (Thompson 1194); b & c, spheroidal grains (Thompson 3810; 1001). Scale=5 μ .

between the peduncle and pedicel is not as angular as usual, but rather forms a sharp curve. The upward curve below the fruit is more marked giving the scape a curled or sigmoid appearance. This may be due to the fleshy nature of the scape in wet conditions. The shallow pockets are generally water-logged during the winter growing season, but completely dry in summer.

The pollen in *P. minuta* appears to vary from an ellipsoidal, regularly 2-sulcate grain (Fig. 3a) to a spheroidal shape with irregular sulci (Fig. 3b, c). These variations are not correlated with size or leaf width. Erdtman (1952) records 1-sulcate grains for the Hypoxidaceae. Further details and comparisons of pollen within the family will be given in a later paper.

2. *Pauridia longituba* M. F. Thompson in Jl S. Afr. Bot. 38: 163 (1972); Mason, Western Cape Strandveld Flowers t.14, fig. 5 (1972). Type: S.W. Cape, shallow soil on granite boulders two miles south of Vredenburg, Thompson 92 (STE, holo!; PRE!; NBG!).

Corm globose, about 6–7 mm in diam., covered with rigid reticulate fibres. Leaves included in a sheath, glabrous, linear-canaliculate, ± 1 mm wide, over-topping the flowers. Peduncles many, one-flowered, short. Pedicel very short, 0–2 mm long. Bracts two, opposite, setaceous, unequal, longer than the pedicel, the longer up to 10 mm long. Flowers regular, white; perianth tube narrow cylindric, 8–30 mm long; lobes spreading 1/3–1 the length of the tube, ovate-lanceolate, subacute, the inner slightly smaller. Stamens three, inserted in the throat of the perianth-tube opposite the inner segments; filaments short 0.4–1.5 mm; anthers basifix, 1.5–2.75 mm long, 2-thealous, splitting longitudinally. Ovary ovoid, 3-locular, placentation axile, ovules numerous in each chamber; style slightly shorter than the perianth tube; stigma up to 5 mm long, 6-lobed, three long connate lobes and three small appendages at the base. Fruit indehiscent, often partially enclosed in the leaf sheaths. Seeds globose, black, shiny, verrucose. Pollen grains, longest axis 28–30 μ , anaperturate, ellipsoidal, irregularly granulated.



FIG. 4.—*Pauridia longituba*. a, whole plant, $\times 2$; b, diagrammatic cross-section of leaf; c, flower slightly enlarged; d, stigma, $\times 10$; e, anther, $\times 10$; f, seed, $\times 30$. Thompson 3815.

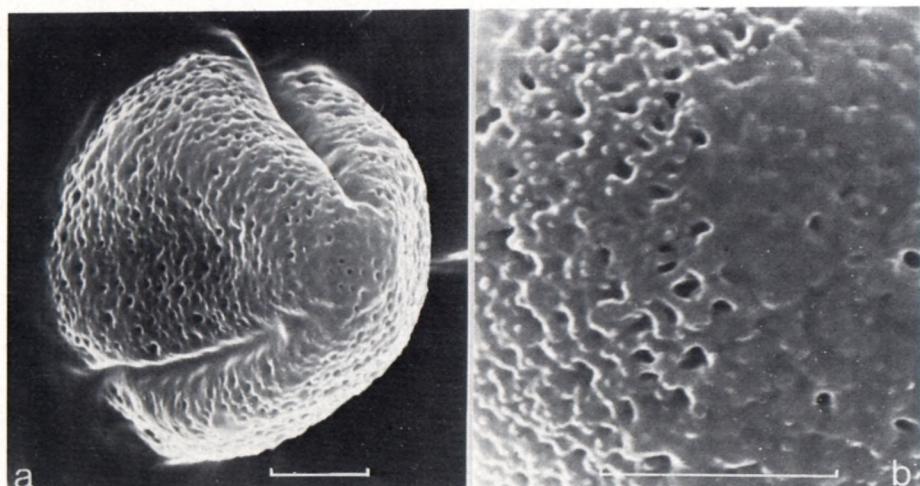


FIG. 5.—*Pauridia longituba* pollen. a, short equatorial view showing the two sulci; b, surface of grain after acetolysis. Thompson 95. Scale=5 μ .

Pauridia longituba is confined to shallow pockets of soil on granite outcrops in the Vredenburg district (Fig. 1, map 2). Flowering is in late May to early June.

CAPE.—3217 (Vredenburg): between St Helena Bay and Stompeus Bay (-DB), Hiemstra 115 (NBG); Vredenburg, near Witklip beacon (-DD), Thompson 3815 (STE); Witklip Farm (-DD), Thompson 21A (NBG); Thompson 89 (STE; PRE); Thompson 92 (STE; PRE; NBG); Paternoster (-DD), Thompson 95 (STE; PRE; K). 3218 (Clanwilliam): Titusklip (-CC), Axelson 212 (NBG); 6,6 miles from St Helena Bay on road to Veldrift (-CC), Thompson 290 (STE).

Vegetatively *P. longituba* is very similar to forms of *P. minuta*. The cross section of the leaf is like that of the terete form (Fig. 4a, b). Apart from the obvious modifications connected with the elongation of the perianth tube and style (Fig. 4c, d), the floral vascular anatomy is like that of *P. minuta* (Thompson, 1978).

Pauridia longituba is restricted to the granite outcrops, which are characteristic of the Vredenburg/St Helena Bay area. The plants occur only in pockets of soil on the rocks and I have never found any in the deeper soils around the lower edges of the boulders. The plants and flowers vary in size depending on the amount of soil in the pockets.

Although not restricted to the granite, *P. minuta* can occur in similar habitats in the Langebaan area. At only one known locality do the two species occur together (Thompson 21A, 21B). In this habitat, the *P. minuta* plants are of the form mentioned under that species, but no intermediates between the two species were found.

The pollen grains are slightly larger than those of *P. minuta*. The two sulci are wide set (Fig. 5a). The surface is irregularly granular-pitted and even on acetolysis does not show distinct sculpturing (Fig. 5b).

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UITTREKSEL

Die genus *Pauridia* is hersien met die erkenning van twee species: *P. minuta* (L.f.) Dur. & Schinz en *P. longituba* M. F. Thompson. Tekeninge, verspreidingskaarte en fotos geneem met die skandeer elektron mikroskoop van die stuifmeel is ingesluit.

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