

## THE ALPINE FLORA OF MOUNT WILHELM (NEW GUINEA)

by

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The flora of the higher mountains of New Guinea has been the object of several extensive collecting trips in the past forty years. Until quite recently, however, a serious gap in our knowledge was the very scanty information available from the area between Mount Wilhelmina in the West and Mount Sarawaket and Mount Albert Edward in the East. Recently Mount Wilhelm, the highest mountain in this area and also the highest mountain in the Eastern half of the island, was visited on several occasions when botanical collections were made. The following collections are the most extensive ones and these are the only ones studied for this paper: In medio July, 1956 R. Pullen and myself spent ten days on the mountain with a camp near Lake Aunde as our base. In end July—early August, 1956 J. S. Womersley collected in the same area and some more collections were made in August, 1957 by R. G. Robbins.

On these three occasions the mountain was approached from the East from Keglsugl in the Upper Chimbu Valley, along the valley locally known as Pindaunde. Alpine grassland comes down in this and other valleys to an altitude of ca 11000 feet (ca 3300 m), but on the steeper slopes and on the ridges the forest and shrubbery does not disappear until about 12500 feet (ca 3750 m). Pindaunde, which down to 11000 feet (3300 m) is clearly of glacial origin, has a flat, ill-drained valley floor with peaty grassland, and fairly steep, locally rocky, lateral slopes which are covered with a subalpine forest, towards higher altitudes changing into alpine shrubbery. This shrubbery becomes patchy higher up and finally disappears at ca 12300 feet (ca 3690 m). Above that altitude, individual shrubs occur up to ca 12800 feet (ca 3840 m).

The valley derives its name from the two lakes, Lake Aunde at 11700 feet (3510 m) and Lake Pinde (Piunde) at 12000 feet (3600 m). Vegetation in these lakes is virtually non-existent and the only waterplants encountered were *Callitriche* and *Scirpus*, in the creek flowing from Lake Aunde. *Isoetes*, which could be expected to occur, could not be found.

The alpine shrubbery is a dense low woody vegetation with in the lower altitudes here and there an emergent *Podocarpus* or *Libocedrus*. The closed shrub layer (generally up to ca 5 m high) consists of such genera as *Acronychia*, *Amaracarpus*, *Decaspermum*, *Drimys*, *Elaeocarpus*, *Eurya*,

Olearia, Polyosma, Pygeum, Rapanea, Rhododendron, Saurauia, Schefflera, Symplocos, and Vaccinium. The ground flora comprises such genera as Acaena, Cardamine, Epilobium, Galium, Geranium, Libertia, Oxalis, Rubus, and Trigonotis; groundferns and mosses are quite common. Epiphytes, e.g. Dendrobium, Belvisia, Grammitis, and Hymenophyllum, are also common.

Of the alpine grassland two aspects are quite distinct. Very few species, however, are restricted to one of the two aspects, though their frequency may be quite different. The grassland in the valley is on very wet, badly drained, peaty soil and usually forms a continuous cover; that on the slope is on patchy, shallow, rocky soil and is open, rarely covering more than 50%. Treeferns are most common in the peaty grassland, small shrubs on the rocky slopes. Some species appear to be restricted to altitudes above 12500 feet (3750 m), which is also approximately the upper limit of the peaty grassland.

Amongst the taller herbaceous flora in these grasslands the following genera are prominent: Agrostis, Anaphalis, Anthoxanthum, Brachypodium, Carex, Danthonia, Deschampsia, Deyeuxia, Festuca, Gleichenia, Hierochloa, Poa, and Scirpus; amongst the smaller herbs, Astelia, Centrolepis, Epilobium, Eriocaulon, Euphrasia, Gentiana, Keysseria, Monostachya, Oreomyrrhis, Poa, Potentilla, Ranunculus, and Trachymene. A few species have been found to very close near the summit [which, according to our aneroid-readings, is at 15000 feet (4500 m); the altitude usually noted on maps is 15400 feet (4620 m)], in particular species of Cerastium, Hebe, Lactuca, Styphelia, and Trigonotis.

Woody herbs or small shrubs in the peaty grassland belong to the genera Hebe, Kellera, Styphelia, and Tetramolopium; they are, however, distinctly more common in the grassland on the rocky slopes where in addition the genera Coprosma, Detzneria, Gaultheria, Hypericum, and Vaccinium are found. The fern Papuapteris (Athyrum) is very common on the slopes between 13000 and 14000 feet (3900 and 4200 m).

Individual shrubs and small trees occur outside the alpine shrubbery throughout the grasslands, particularly on the slopes, up to 12800 feet (3840 m). Some species, e.g. *Drimys brassii* A. C. Sm., appear to be restricted to open vegetation, but mostly the species are the same as those occurring in or along the edge of the shrubbery. In sheltered valleys at relatively high altitude (above the closed shrubbery) individual trees of *Podocarpus compactus* Wassch. may reach considerable size. Though there are occasional fires in the grasslands, there is little evidence that these fires affect the alpine shrubbery.

Mount Kerigomna, situated about 15 miles due South of Mount Wilhelm and reaching an altitude of about 11000 feet (3300 m), was also visited by R. Pullen and myself in 1956. As can be seen from the list presented here, this mountain has several species in common with Mount Wilhelm. An extensive grassland on peaty soil is found on this mountain between ca 9500 and 10500 feet (ca 2850 and 3150 m); this grassland is more frequently burnt than those on Mount Wilhelm and these fires clearly enter the subalpine forest along the edges.

In the following list a number of the species collected are recorded.

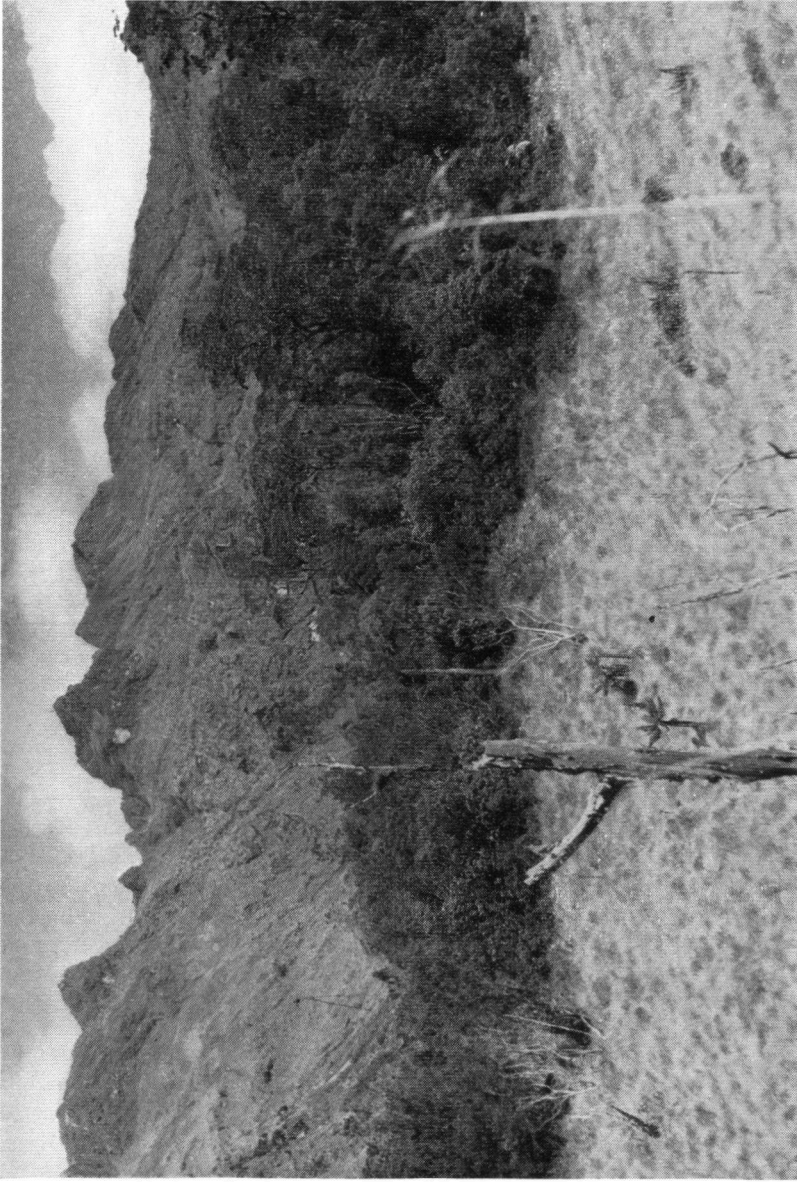


Plate 1. Pindaunde Valley at ca 11400 feet (ca 3420 m) ; view West towards the summit area of Mount Wilhelm. In the foreground peaty grassland with some treeferns (*Cyathea*). Behind the grassland subalpine forest. The emergent trees mostly *Podocarpus compactus* Wassch.

The list does not pretend to be complete; several groups in need of revision have been neglected completely. All specimens cited are in the Canberra Herbarium, where the first set of the Hoogland & Pullen (H & P) and Robbins (R) collections is kept; the first set of the Womersley (NGF) collections is in Lae and the Canberra set is incomplete.

Some identifications by † A. H. G. Alston (Pteridophyta p.p.), S. T. Blake (Cyperaceae except *Carex*), Ding Hou (*Centrolepis*), E. Nelmes (*Carex*), and H. Sleumer (*Ericaceae*) have been included.

### Schizaeaceae

***Schizaea fistulosa*** Labill. *H & P* 5694, 12500' (3750 m). Found in one small area, on fine rock scree. Madagascar, Borneo, Australia, New Zealand, New Caledonia, Fiji, Antarctic South America; new for New Guinea.

### Gleicheniaceae

***Gleichenia bolanica*** Ros. *H & P* 5763, 13200' (3960 m); *NGF* 8934, 11500' (3450 m). Locally common on rocky slope (*H & P*); near edge of Lake Aunde (*NGF*). Endemic, also known from Doorman-top, Mt. Wilhelmina, Mt. Sarawaket, and the Owen Stanley Range.

***G. squamosissima*** Copel. *H & P* 5705, 12500' (3750 m); *NGF* 8854, 11870' (3560 m). Locally common in peaty grassland and on open rocky slope. Endemic, also known from Mt. Wilhelmina, Mt. Kerigomna (*H & P* 5615), Mt. Sarawaket, and the Owen Stanley Range.

### Hymenophyllaceae

***Hymenophyllum foersteri*** Ros. *H & P* 5709, 11700' (3510 m); *NGF* 8850, 11870' (3560 m). Epiphytic in alpine shrubbery. Endemic, also known from Mt. Sarawaket.

### Aspidiaceae

***Papuapteris linearis*** C. Chr. [*Polystichum lineare* (C. Chr.) Copel.]. *H & P* 5769, 13300' (3990 m); *NGF* 8859, 11870' (3560 m); *R* 696, 13000' (3900 m). On rocky slopes and in alpine grassland, common from ca 13000—14000' (ca 3900—4200 m). The fronds are used by the natives of the Chimbu and Middle Wahgi Valleys for their headdresses. Native name (Chimbu): Binga. Endemic, also known from the Owen Stanley Range.

### Blechnaceae

***Blechnum archboldii*** C. Chr. *NGF* 8945, 11500' (3450 m). Near side of waterfall, near Lake Aunde. Endemic, also known from Mt. Kerigomna (*H & P* 5526) and the Owen Stanley Range.

### Grammitidaceae

***Grammitis locellata*** (Bak.) Copel. *H & P* 5659, 11700' (3510 m). Epiphytic in alpine shrubbery. Endemic, also known from Mt. Sarawaket and the Owen Stanley Range.

### Lycopodiaceae

***Lycopodium macgregorii*** Bak. *H & P* 5713, 11700' (3510 m); *NGF*

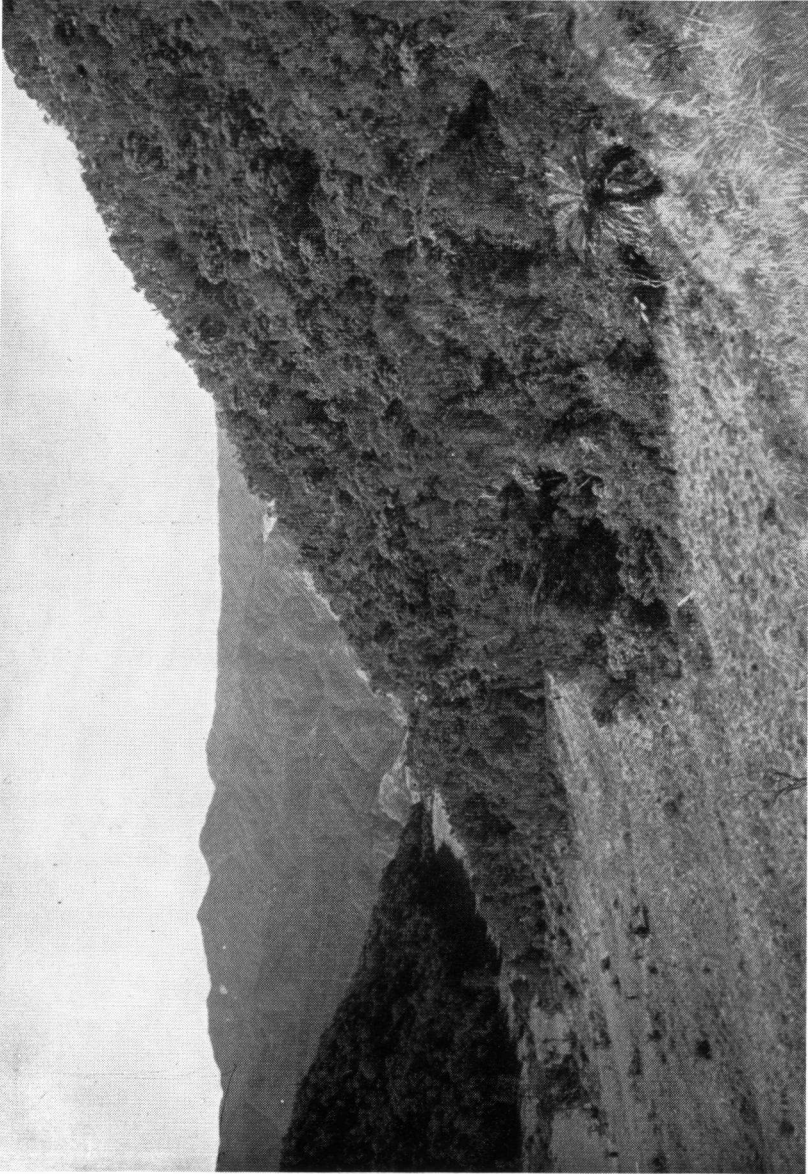


Plate 2. Looking eastward along Pindaunde Valley from the slope on the South side, from about 11800 feet (ca 3540 m). Peaty grassland in the valley floor down to ca 11000 feet. Alpine shrubbery at this altitude: no emergent trees. Mt. Otto in the distance.

8876, 11870' (3560 m). Epiphytic in alpine shrubbery. Endemic, also known from Mt. Sarawaket and the Owen Stanley Range.

**L. papuanum** Nessel. *NGF 8844*, 11870' (3560 m). Near Lake Pinde. Endemic, also known from the Owen Stanley Range.

**L. scariosum** Forst. *H & P 5748*, 11700' (3510 m); *NGF 8954*, 11500' (3450 m). On wet soil between rocks. Widespread, in New Guinea also known from the Owen Stanley Range.

### Podocarpaceae

**Podocarpus brassii** Pilg. *H & P 5773*, 12000' (3600 m); *NGF 8866*, 11870' (3560 m). A fairly common tree in the subalpine forest and alpine shrubbery. Endemic, widespread.

**P. compactus** Wassch. *H & P 5650*, 11700' (3510 m); *5703*, 12500' (3750 m); *NGF 8852*, *8861*, 11870' (3560 m). Fairly common, emergent tree in subalpine forest; *H & P 5703* was collected in an open stand in a sheltered valley (cf. Plate 3). Endemic, widespread.

### Winteraceae

**Drimys brassii** A. C. Sm. *H & P 5702*, 12500' (3750 m); *5757*, 13200' (3960 m); *NGF 8965*, 13500' (4050 m); *R 689*, 12000' (3600 m). Fairly common on rocky slopes. Endemic, also known from Mt. Wilhelmina.

#### **Drimys montis-wilhelmi** Hoogl., sp. nov. — Fig. 1.

Arbor parva, ca 4 m alta, 6 cm diametro, ubique glabra. Ramuli subteretes vel rimis nonnullis humilibus praediti, ultimi ca 1—1.5 mm diametro; nigrescentes.

Folia alternata. Petiolus 2—4 mm longus, rugulosus, supra canaliculatus. Lamina subcoriacea, obovato-oblonga, ca (15—)20—30 mm longa, (7—)9—13 mm lata; basi obtusa, decurrens; apice obtusa vel rotundata; margine integra, subrecurvata; ca 6—8-nervata, costa supra subimpressa, subtus prominente, nervis venisque distinctis, utrinque prominulis, nervis anastomosantibus, venatione reticulata.

Flores ♂ solitarii vel usque ad 5-fasciculati, axillares, pedicellis gracilibus, 8—13 mm longis, saepe transverse applanatis. Sepala 3, submembranacea, orbicularia vel ovata, plerumque unum latius quam alia; ca 5—6 mm longa, 3.5—5.5 mm lata. Petala (2—)3, anguste obovato-oblonga, ca 10 mm longa, 3.2 mm lata, submembranacea, costa distincta, nervis lateralibus paucis subdistinctis. Torus ca 1 mm alta. Stamina 23—31, ± 3-seriata, exteriora 2.0 mm, interiora 3.6 mm longa; filamenta subteretia, 0.7—0.9 mm diametro; loculi convergentes, apice contingentes, ca 0.7 mm longi. Carpella 3 vel 4, sterilia, ovoidea, ca 2.0 mm longa, carina stigmatum subapicali ca 0.2 mm alta.

**Typus:** *Hoogland & Pullen 5674*, near Lake Aunde, E. slope of Mount Wilhelm, Bismarck Range, Terr. of New Guinea (Eastern Highlands District); a single tree in dense low forest (= alpine shrubbery); alt. ca 3500 m (11700 feet); collected 19 July 1956. Sepals pale green; petals white; filaments white, anthers yellow; ovaries green. Holotype in CANB, isotypes in LAE, L, A, BM, BRI, US, MEL, K, G, BO, PNH, BISH, NSW, P, B.

Using A. C. Smith's key (*J. Arn. Arb.* 24, 1943, p. 24) one comes

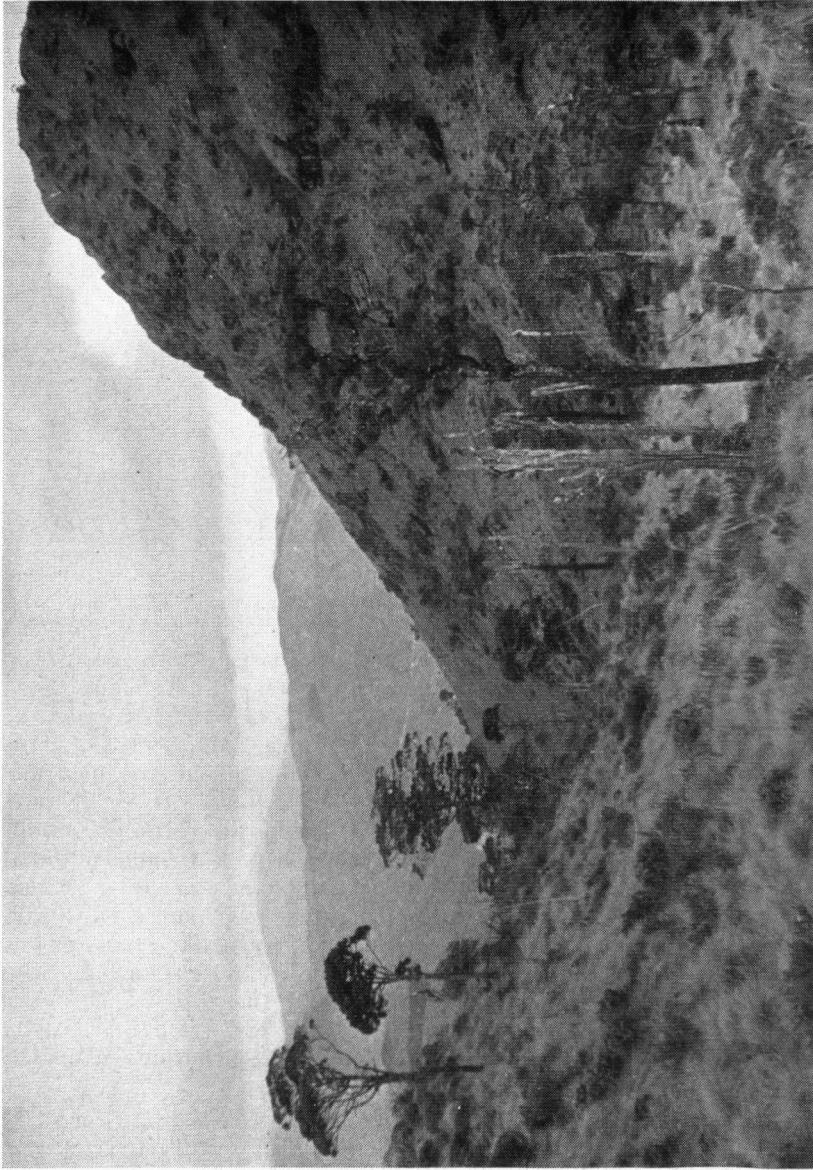


Plate 3. Sheltered valley at ca. 12500 feet (ca. 3750 m) with well developed trees of *Podocarpus compactus* Wassch. The shrubs in the grassland are mostly *Coprosma* sp.

to *D. rubiginosa* A. C. Sm., from which the present species differs by the following characters: the smaller leaves, longer pedicels, larger flowers, number of sepals, and number of petals.

*D. rosea* Ridl. *H & P* 5733, 11100' (3330 m); *NGF* 8894, 8300' (2490 m). In subalpine forest. Endemic, also known from Mt. Carstensz and the Wahgi-Sepik Divide (*NGF* 5199).



Fig. 1. *Drimys montis-wilhelmi*, a. habitus,  $\times 1$ , b. leaf,  $\times 3$ , c. flower and flowerbuds,  $\times 8$ , d. stamen,  $\times 12$ , e. carpels,  $\times 10$  (*Type collection*).

### Cruciferae

*Cardamine altigena* Schulz. *H & P* 5716, 11700' (3510 m). Along creek on peaty ground. Endemic, also known from Mt. Wilhelmina and Mt. Sarawaket.



**Caryophyllaceae**

**Sagina papuana** Warb. *H & P* 5683, 11700' (3510 m); *NGF* 8873, 11870' (3560 m). On wet ground on creek bank and in alpine bog. Philippines (Luzon), in New Guinea also on Mt. Wilhelmina, Mt. Albert Edward, and widespread in the Finisterre and Sarawaket Mts.

**Cerastium keysseri** Mattf. *H & P* 5788, 5791, 14700' (4410 m). Sheltered in crevices. Endemic, also known from Mt. Wilhelmina and Mt. Sarawaket.

**Oxalidaceae**

**Oxalis magellanica** Forst. *H & P* 5681, 11700' (3510 m); *NGF* 8841, 11870' (3560 m). In dense shade in alpine shrubbery. Southern Australia, New Zealand, and Antarctic South America; in New Guinea also known from Mt. Kerigomna (*H & P* 5569) and Mt. Sarawaket.

**Onagraceae**

**Epilobium detznerianum** Diels. *H & P* 5676, 11700' (3510 m); *NGF* 8962, 11500' (3450 m). Inside alpine shrubbery. Endemic, also known from the Upper Asaro Valley (*H & P* 5390, *NGF* 6103) and Mt. Sarawaket.

**E. keysseri** Diels. *H & P* 5671, 11700' (3510 m); *NGF* 8940, 11500' (3450 m). Common in peaty grassland. Endemic, also known from Mt. Hagen (*H & P* 6013) and Mt. Sarawaket.

**E. papuanum** Ridl. *H & P* 5687, 12000' (3600 m); *NGF* 8827, 11870' (3560 m). Common along small creeks; on steep slope of alpine grasslands. Endemic, also known from Mt. Carstensz.

**Haloragaceae****Haloragis microphylla** Hoogl., sp. nov.

Frutex ramosus. Rami angulis decurrentibus multilineati, erecto-pilosi, subscabri, ramulis patentibus, saepe unilateralibus.

Folia decussata vel (inflorescentia versus) terna verticillata, subcoriacea, breviter petiolata. Petiolus ca 0.5 mm longus, pilis paucis subadpressis. Lamina ovata, ca 3—5 mm longa, 1.5—2.5 mm lata, apice subacuta, basi rotundata; supra nitens, pilis brevibus, glabrescens; subtus opaca, pilis paucis longioribus persistentibus, marginem versus glabra; margine 2-dentata, reflexa.

Inflorescentiae, ramulos laterales terminantes, simplices, ca 2—6 cm longae, foliatae foliis ternis verticillatis apicem versus minoribus; rariter compositae, ca 6 cm longae, 5 cm latae, ramulis binis vel ternis.

Flores solitarii. Bractee basi inflorescentiae ca 4.0 mm longae, 2.0 mm latae, apicem versus 1.5 mm longae, 0.7 mm latae. Pedicelli nutantes, ca 0.5 mm longi, glabri, basi bracteis minutis mox deciduis. Ovarium ovoideum, ca 0.9 mm longum, 0.8 mm diam., quadrangulatum, 8-costatum; costis angularibus prominentibus, pilis paucis brevibus; costis medianis (hyopsepalis) humilibus, glabris. Sepala 4, subcoriacea, ovata, ca 1.2 mm longa, 0.8 mm lata, glabra. Petala 4, obovato-oblonga, ca 3.2 mm longa, 1.5 mm lata, induplicata, apice incurvulata, intus glabra, extus pilis paucis secundum costam, margine membranacea. Stamina 8, filamentis tenuissimis

0.4 mm longis; antherae subcylindricae, quadrangulatae, ca 2.0 mm longae, 0.6 mm diametro, apice et basi truncatae. Styli 4, sessiles, verrucosi.

**Typus:** *Hoogland & Pullen 5631*, near Lake Aunde, E. slope of Mount Wilhelm, Bismarck Range, Terr. of New Guinea (Eastern Highlands District); common on forest (= shrubbery) — grassland edge; alt. ca 3500 m (11700 feet); collected 18 July 1956. Holotype in CANB, isotypes in LAE, L, A, BM, BRI, US, MEL, K, G, BO, PNH, BISH.

**Paratypes:** *NGF 8922*, 11500' (3450 m); *R 1172*, 12000' (3600 m).

The species is closely related to *H. fruticosa* Went f., from which it is clearly distinct by the much smaller and closer leaves and the more compact inflorescences.

### Callitrichaceae

**Callitriche verna** L. *H & P 5652*, 11700' (3510 m). In creek, slow-flowing water. Widespread; the collection agrees with the aquatic form described as *C. papuana* Merr. & Perry.

### Thymelaeaceae

**Kelleria papuana** Domke. *H & P 5698*, 12500' (3750 m); *NGF 8855*, 11870' (3550 m); *8970*, 13500' (4050 m). Common on open rocky slope, also in peaty grassland. Endemic, also known from the Wahgi-Jimmi Divide (*NGF 5306*) and Mt. Sarawaket.

### Pittosporaceae

**Pittosporum pullifolium** Burk. *H & P 5632*, 11700' (3510 m); *NGF 8830*, 11870' (3550 m). Very common in alpine shrubbery. Endemic, widespread.

### Theaceae

**Eurya brassii** Kob. var. *erecta* Kob. *H & P 5756*, 13200' (3960 m); *NGF 8853*, 11870' (3550 m); *R 1164*, 12000' (3600 m). On open rocky slope and (*NGF*) on slope in coniferous forest. Endemic, var. *erecta* also known from Mt. Wilhelmina, var. *brassii* known from Mt. Giluwe (*R 1098*) and the Owen Stanley Range. Plate 6.

**Eurya pullenii** Hoogl., sp. nov. — **Fig. 2.**

Arbor parva, ca 4 m alta, 5 cm diametro, ramulis angulatis, pubescentibus.

Folia coriacea, juventute subtus pubescentia, ovata, 17—20 mm longa, 8—10 mm lata, apice obtusa, emarginata, basi rotundata vel subcordata, margine serrulata; costa nervique supra impressi, costa subtus valde prominens, nervi paucim prominentes; petiolus 1—2 mm longus, pubescens.

Flores ♀ axillaris, usque ad 5-fasciculatae, pedicellis 4—5 mm longis, glabris. Bracteae lanceolatae, sessiles, ca 1.5 mm longae, hirsutae glandulosae; bracteolae 2, rotundatae, sessiles basi pedicellum dimidio amplectentes, ca 1.6 mm longae, 2.2 mm latae, glabrae, margine pauci-glandulosae. Sepala 5, subaequalia, imbricata, rotundata, ca 3.0 mm longa, 3.5 mm lata, omnia glabra, 2 exteriora marginibus glandulosis, tertium margine laterali uno glanduloso, uno membranaceo, 2 interiora marginibus membranaceis. Petala 5, subaequalia, imbricata, obtusa, ca 4.8 mm longa, 3.2 mm lata, tubus ca 1.8 mm longus. Ovarium ovato-globosum, glabrum,

ca 2.0 mm longum, 2.2 mm diametro, triloculare, multiovulatum; styli 3, 0.8 mm longi, recurvati, subtus laeves, supra papilloso. Fructus globosus, ca 7 mm diametro, pedicello gracili 5—6 mm longo.

**Typus:** *Hoogland & Pullen 5639*, near Lake Aunde, E. slope of Mount Wilhelm, Bismarck Range, Terr. of New Guinea (Eastern Highlands District); fairly common in forest (= alpine shrubbery); alt. ca 3500 m (11700 feet). Sepals deep purple; petals white; ovary pale yellow; fruits black. Holotype in CANB, isotypes in LAE, L, A, BM, BRI, US, MEL, K, G, BO, PNH.

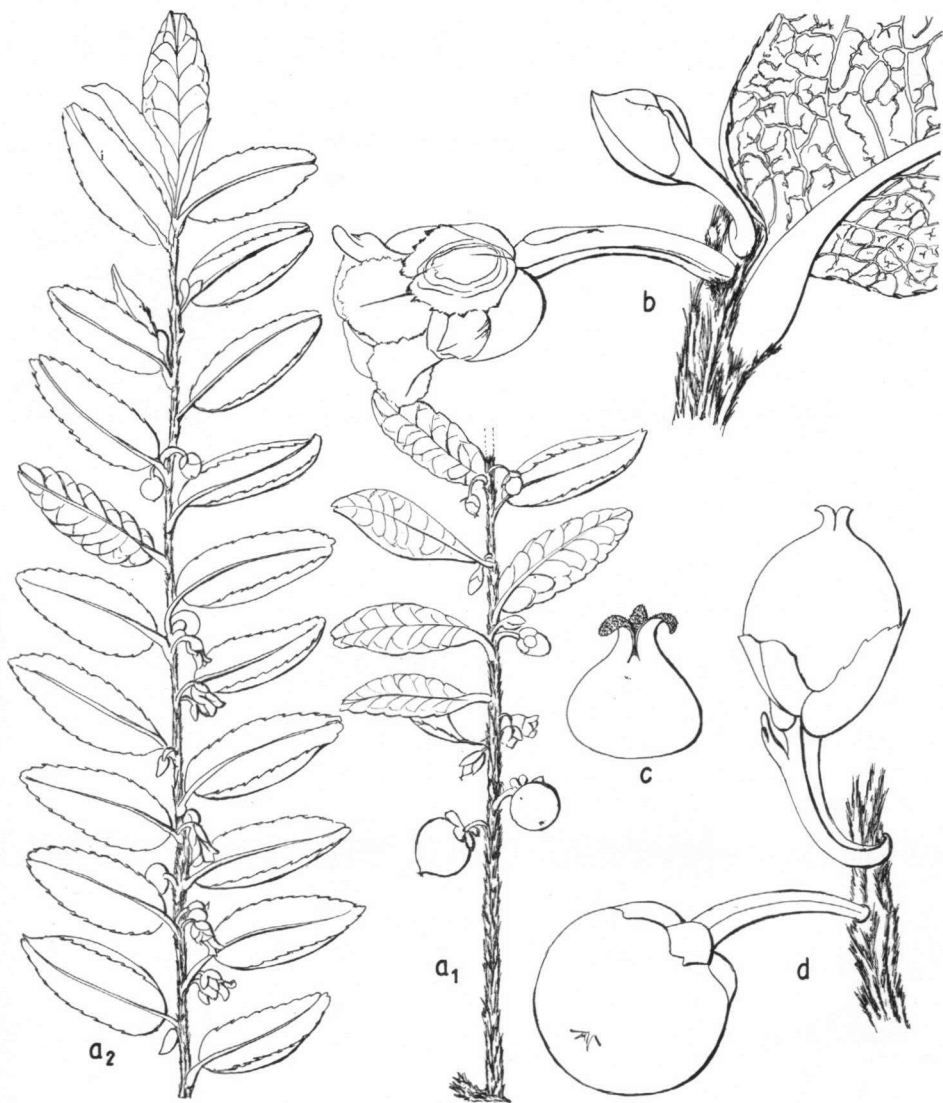


Fig. 2. *Eurya pullenii*, a. habitus,  $\times 1$ , b. flower and flowerbud,  $\times 6$ , c. ovary,  $\times 6$ , d. fruits,  $\times 6$  (Type collection).

Using De Wit's revision of the genus (Bull. Bot. Gard. Btzg III, 17, 1947, pp. 329—375) the specimen cannot be placed satisfactorily. Using his key, one comes to *E. greenmanniana*, from which the species differs by: the different indumentum on the ultimate branchlets and on the lower side of the leaves; the obtuse, distinctly emarginate apex of the leaves; the inflorescences being generally 3- or 4-flowered; the much longer pedicels; the sepals not being ciliate; the flowers of about twice the size.

The species has been named in honor of Mr Royal Pullen, my companion during a collecting trip in the central highlands of New Guinea, June to September, 1956.

### Hypericaceae

*Hypericum macgregorii* F. Muell. *H & P* 5750, 12300' (3690 m); *NGF* 8874, 11870' (3560 m); 8913, 11500' (3450 m); *R* 1168, 12000' (3600 m). Common in alpine grasslands (often slightly peaty) on gentle slopes. Endemic, also known from the Owen Stanley Range.

### Rosaceae

*Acaena anserinifolia* (Forst.) Domin. *H & P* 5743, 11100' (3330 m); *NGF* 8949, 11500' (3450 m); *R* 711, 11700' (3510 m). Fairly common, on forest edge and in subalpine forest. New Zealand, S.E. Australia; in New Guinea also known from Mt. Wilhelmina, Mt. Kerigomna (*H & P* 5560), Mt. Sarawaket, and the Owen Stanley Range.

### Umbelliferae

*Oreomyrrhis papuana* Buw. *H & P* 5682, 11700' (3510 m); *R* 728, 11000' (3300 m). Fairly common, in patches, in peaty grassland. Endemic, also known from Doorman Top and Mt. Wilhelmina.

*O. pumila* Ridl. *H & P* 5784, 14500' (4350 m). On rocky slope. Endemic, also known from Mt. Wilhelmina, Mt. Carstensch, Mt. Sarawaket.

*Trachymene saniculifolia* Stapf. *R* 719, 12000' (3600 m). In alpine grassland. Philippines, North Borneo; in New Guinea also known from Mt. Kerigomna (*H & P* 5554), Mt. Sarawaket, and the Owen Stanley Range.

#### *Trachymene tripartita* Hoogl., sp. nov. — Fig. 3.

Herba perennis, omnino glabra. Caudex pauciramosa rosulas nonnullas proferens.

Foliorum vagina 4—8 mm longa, 2 mm lata, in petiolum attenuata. Petiolus 7—30 mm longus, semper longior quam lamina. Lamina tripartita, 5—8 mm longa, 5—8 mm lata, basi late cuneata, lobis subaequalibus vel lobo centrali paulo majori, apice obtusis, mucronatis.

Umbellae singulae e rosulis; pedunculus florifer foliis subaequalis vel paulo brevior, fructifer foliis duplo maior, striatus vel subsulcatus; bractae involucrantes 5—7, lineari-lanceolatae, 3—4 mm longae, usque ad 0.7 mm latae, apice obtusae, subadpressae; 5—10-florae, floribus uni- vel obscure biseriatis.

Flores pedicellis tempore florendi 1—2 mm longis, post anthesin auctis, ad 7 mm longis, incurvatis. Calycis denti minuti. Petala rotundata, ca 1.0 mm longa, 0.8 mm lata. Stamina filamentum lineari, basin versus grada-

tim latiori, ca 0.4 mm longo; antherae loculis ca 0.3 mm longis, 0.15 mm latis. Ovarium ca 0.7 mm longum, 1.0 mm latum; styli ca 0.4 mm longi. Mericarpia ad 2.0 mm longa, 1.7 mm lata, aequaliter evoluta, jugis intermediis circiter 0.7 mm a commissura remota; carpophorum indivisum, 4-apiculatum, sulcatum.

**Typus:** *Hoogland & Pullen 5965*, above (S of) Lake Aunde, E. slope of Mount Wilhelm, Bismarck Range, Terr. of New Guinea (Eastern Highlands District); on open rocky slope, fairly common; alt. ca 3750 m (12500 feet). Holotype in CANB, isotypes in LAE, L, A, BM, BRI. Paratype: *R 743*, 12000' (3600 m); bog in tussock grassland.

This new species appears to be most closely related to *T. novoguineensis* (Domin) Buw., and is very clearly characterised by the tripartite leaves, the lobes of which are completely undivided.

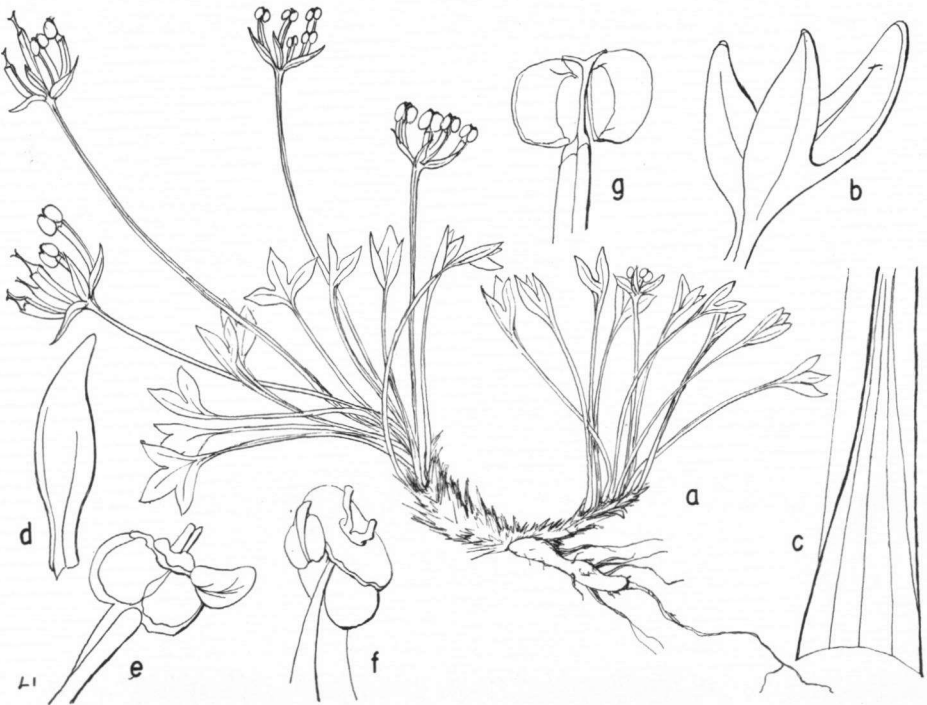


Fig. 3. *Trachymene tripartita*, a. habitus,  $\times 1$ , b. leaf-blade,  $\times 10$ , c. leaf-sheath,  $\times 10$ , d. involucral bract,  $\times 10$ , e., f. flower with only one petal still present,  $\times 15$ , g. fruit,  $\times 15$  (*Type collection*).

### Ericaceae

***Gaultheria mundula*** F. Muell. *H & P 5751*, 12300' (3690 m); *NGF 8921*, 11500' (3450 m); *R 1161*, 12000' (3600 m). Common in alpine grassland on gentle, rocky slope. Endemic, also known from the Wahgi-Sepik Divide, Mt. Sarawaket, the Rawlinson Range, and the Owen Stanley Range.

***Rhododendron keysseri*** Foerst. *H & P 5685*, 12000' (3600 m); *5734*,

11100' (3330 m). Common on edge of alpine shrubbery. Endemic, also known from Mt. Sarawaket.

**R. yelliotii** Warb. *H & P 5735*, 11700' (3510 m). On edge of alpine shrubbery; several shrubs on seepage area on W. shore of Lake Aunde (Plate 4). Endemic, also known from the Finisterre Mts., Mt. Sarawaket, and the Owen Stanley Range.

### Dipsacaceae

**Triplostegia glandulifera** DC. *H & P 5588*. Not found on Mount Wilhelm, but on nearby Mt. Kerigomna at 10800 feet (3240 m), common in moss-cushions in open shrubbery. S.E. Asia, Celebes; in New Guinea also known from Mt. Sarawaket and the Owen Stanley Range.

### Compositae

**Anaphalis lorentzii** Laut. *H & P 5672*, 11700' (3510 m). Fairly common in peaty grassland. Endemic, also known from Mt. Wilhelmina.

**A. mariae** F. Muell. *H & P 5647*, 11700' (3510 m); *NGF 8836*, 11870' (3550 m); *8930*, 11500' (3450 m). Common in peaty grassland, particularly common towards edge of alpine shrubbery. Endemic, also known from Mt. Carstensz, Mt. Wilhelmina, Finisterre Mts, Mt. Sarawaket, and the Owen Stanley Range.

**Erechthites arguta** (A. Rich.) DC. *H & P 5649*, 11700' (3510 m); *NGF 8875*, 11870' (3550 m). In peaty grassland. Southern Australia, New Zealand; in New Guinea also known from Mt. Sarawaket.

**Ischnea elachoglossa** F. Muell. *H & P 5783*, 13500' (4050 m). Amongst low shrubs on fairly steep slope. Endemic, also known from the Owen Stanley Range.

**Keysseria trachyphylla** (Mattf.) Mattf. *H & P 5718*, 11700' (3510 m); *NGF 8969*, 13500' (4050 m); *R 687*, 12000' (3600 m). Common in peaty grassland; also (*NGF*) on exposed ridges. Endemic, also known from Mt. Wilhelmina and Mt. Kerigomna (*H & P 5547*).

**Lactuca** spp. *H & P 5786, 5787*, 14700' (4410 m). Two dwarf species with sessile, solitary flowerheads, common on fine gravel between rocks.

**Tetramolopium alinae** (F. Muell.) Mattf. *H & P 5648*, 11700' (3510 m); *NGF 8973*, 13500' (4050 m); *R 1173*, 12000' (3600 m). Fairly common in peaty grassland, also forming cushion-like mats among rocks at high altitudes. Endemic, also known from ?Mt. Carstensz and the Owen Stanley Range.

**T. piloso-villosum** (S. Moore) Mattf. *H & P 5697*, 12500' (3750 m); *R 690*, up to 14000' (4200 m); *1174*, 12000' (3600 m). Common on open rocky slope. Endemic, also known from Mt. Carstensz.

### Boraginaceae

**Trigonotis abata** Johnston. *H & P 5661*, 11700' (3510 m). In dense alpine shrubbery, on base of trees. Endemic, also known from Mt. Wilhelmina.

**T. cf. papuana** Johnston. *H & P 5790*, 14700' (4410 m). A compact cushion, possibly representing a high altitude form of this species, which



Plate 4. Open low shrubbery of *Rhododendron yelliottii* Warb. on the West side of Lake Aunde. The creek in the background flows from Lake Pinde into Lake Aunde.

is endemic, known from Mt. Wilhelmina, Mt. Sarawaket, and the Owen Stanley Range.

### Scrophulariaceae

**Detzneria tubata** Diels. *H & P 5704*, 12500' (3750 m); *NGF 8858*, 11870' (3560 m); *R 691*, 12500' (3750 m). On rocky slopes and in peaty grassland. Endemic, also known from Mt. Sarawaket.

**Euphrasia rectiflora** Pennell. *H & P 5692*, 12500' (3750 m); *NGF 8967*, 13500' (4050 m). On open rocky slope; on damp ground on steep mountain side. Endemic, also known from Mt. Wilhelmina and Mt. Hagen (*R 358*).

**Hebe albiflora** Pennell. *H & P 5673*, 11700' (3510 m); *R 1166*, 12000' (3600 m). Common in alpine shrubbery. Endemic, also known from Mt. Hagen (*R 233*), Mt. Giluwe (*R 426*), Mt. Kerigomna (*H & P 5549*), and Mt. Sarawaket.

**H. ciliata** Pennell. *H & P 5789*, 14700' (4410 m); *R 692*, up to 14600' (4380 m). Fairly common on open rocky slope. Endemic, also known from Mt. Wilhelmina. The specimens are shorter and more compact than those from Mt. Wilhelmina, but agree with Pennell's description in all important details; they probably represent a high altitude form of the species.

### Liliaceae

**Astelia papuana** Skotts. *H & P 5782*, 12000' (3600 m); *NGF 8842*, 11870' (3560 m). Very common in peaty grassland. The plants are used by the natives over a wide area in the central highlands in their headdresses; the native name "Waiamaia" is the same in the Sina Sina, Chimbu, and Mount Hagen areas. Endemic (if specifically distinct from *A. alpina* R. Br.) and apparently common on several of the higher mountains.

### Iridaceae

**Libertia pulchella** (R. Br.) Spreng. *H & P 5724*, 11100' (3330 m); *NGF 8863*, 11870' (3560 m); *R 698*, 11500' (3450 m). Fairly common in the subalpine forest and on its margin. New Zealand, S.E. Australia; in New Guinea also known from Mt. Kerigomna (*H & P 5562*), Mt. Sarawaket, and the Owen Stanley Range.

### Centrolepidaceae

**Centrolepis philippinensis** Merr. *H & P 5755*, 12600' (3780 m); *R 1283*, 12500' (3750 m). On rocky slope. Borneo, Philippines, Celebes; in New Guinea also known from the Arfak Mts, Mt. Giluwe (*R 431*), and Mt. Hagen (*R 360*, *1039*).

### Cyperaceae

**Carex philippinensis** Nelmes. *H & P 5719*, 11500' (3450 m). In peaty grassland. Philippines, Java; in New Guinea also known from the Arfak Mts., Mt. Wilhelmina, Mt. Sarawaket, and the Owen Stanley Range.

**Schoenus maschalinus** R. & S. *H & P 5688*, 12000' (3600 m). On wet rock. Southern Australia, New Zealand; in New Guinea also known from Mt. Wilhelmina and Mt. Sarawaket.

**Scirpus fluitans** L. *H & P 5653*, 11700' (3510 m). In the creek flowing from Lake Aunde, together with *Callitriche verna* L. Cosmopolitan.





Plate 5. South slope of the valley near Lake Aunde. Peaty grassland, and a small patch of shrubbery, in the valley. A large area of alpine shrubbery on the slope, up to ca 12200 feet (ca 3660 m).



Plate 6. *Eurya brassii* Kob. var. *erecta* Kob. (*H & P 5756*), on steep slope at 13200 feet (ca 3960 m).

**Gramineae**

**Anthoxanthum angustum** (Hitche.) Ohwi. *H & P 5761*, 13200' (3960 m). On rocky slope. Borneo; in New Guinea also known from the Owen Stanley Range.

**Brachypodium sylvaticum** (Huds.) P. B. var. **pubifolium** (Hitche.) Jansen. *H & P 5752*, 12300' (3690 m). In peaty grassland along creek. Philippines; in New Guinea also known from Mt. Wilhelmina, Mt. Sarawaket, and the Owen Stanley Range.

**Danthonia archboldii** Hitche. *H & P 5754*, 12600' (3780 m); *NGF 8957*, 11500' (3450 m); *R 712*, 1180, 12000' (3600 m). In peaty grassland and on rocky slope. Endemic in New Guinea, also known from Mt. Wilhelmina, the Owen Stanley Range, and Mt. Dayman.

**D. schneideri** Pilg. *H & P 5720*, 11500' (3450 m). In peaty grassland along creek. Endemic, also known from the Owen Stanley Range.

**D. semiannularis** (Labill.) R. Br. *R 686*, 12000' (3600 m). In alpine grassland. Widespread in Southern Australia; in New Guinea also known from Mt. Carstensz and the Owen Stanley Range.

**D. vestita** Pilg. *H & P 5758*, 13200' (3960 m); *R 694*, 14600' (4380 m). On rocky slope. Endemic, also known from Mt. Sarawaket and the Owen Stanley Range.

**Festuca papuana** Stapf. *H & P 5767*, 13500' (4050 m); *NGF 8972*, 13500' (4050 m). On gentle rocky slope. Endemic, also known from the Owen Stanley Range.

**Poa callosa** Stapf. *H & P 5655*, 11700' (3510 m); *5768*, 13500' (4050 m); *R 1279*, 13000' (3900 m). In peaty grassland and on gentle rocky slope. Endemic, also known from Mt. Carstensz and the Owen Stanley Range.

**P. crassicaulis** Pilg. *H & P 5746*, 11500' (3450 m); *NGF 8919*, 11500' (3450 m); *R 707*, 12000' (3600 m). In peaty grassland. Endemic, also known from Mt. Sarawaket and the Owen Stanley Range.