

## THE GENUS *COTULA* (ASTERACEAE) IN NEW GUINEA

### Sertulum Papuanum 21

P. VAN ROYEN and D. LLOYD

B. P. Bishop Museum, Honolulu, Hawaii, U.S.A.

and

University of Canterbury, Department of Botany,  
Christchurch, New Zealand

In the course of studying the *Asteraceae* for a proposed Alpine Flora of New Guinea the first author selected the genus *Cotula* for this separate paper as it showed some variability that was not easily explained. While working on this, Dr. Lloyd's paper on the genus in the New Zealand Journal of Botany 10 (1972) 277, came to his notice and on corresponding with him it turned out that he had studied the New Guinea species already to some extent but had nothing ready for publication. At the same time, Dr. J. Koster of Leiden, Netherlands, was known to work on a study of all *Asteraceae* of New Guinea and it soon transpired that when the manuscript was finished and a copy sent to her that very same day she had put down the first words of her manuscript on this genus. She generously allowed us to go ahead with our publication and after Dr. Lloyd had reviewed the first author's manuscript the paper developed as presented here.

This group of small, mat-forming species has been known in New Guinea to date only by *C. leptoloba* Mattfeld, described from the Wharton Ra. in Papua. Since then, however, it has been collected in several other regions ranging from the Carstensz Mts. in West New Guinea to Mt. Aniata in the southeastern tip of Papua. At first glance the material looked rather homogenous, but on closer look it turned out that at least one species, the material from Mt. Wilhelmina, had to be taken out as new. At this stage, various papers by Dr. Lloyd from Christchurch, New Zealand, drew attention to the group more forcibly and critically. The material available was studied by Dr. Lloyd and he came to the conclusion that at least 4 species should be distinguished, with which the senior author could concur. The differences between the 4 species recognised here are considerable, but the species limits are not well known and the descriptions may need revising when further material is available. Three new species are described below and *C. leptoloba* is redescribed to include the variation observed in specimens from new localities.

#### COTULA\*

[Tournefort *ex* L. Syst. Nat. (1735); Gen. Pl. (1737) 256]; Sp. Pl. (1753) 891; Gen. Pl., ed. 5 (1754) 869; Lour., Fl. Coch. (1790) 493; Less., Syn. Gen. Compos. (1832) 260; DC., Prodr. 6 (1838) 77; Raoul, Choix Pl. N.Z. (1846) 45; Hook., Fl. Tasm. (1856) 191; Handb. N.Z. Fl. (1864) 140; Harvey, Fl. Cap. 3 (1865) 178; Benth. & F. Muell., Fl. Austr. 3 (1867) 458; Benth. & Hook., f. Gen. Pl. 2 (1873) 428; Hoffmann in E. & P., Nat. Pfl. Fam. 4, 5 (1889) 279; Moore, Fl. N.S.W. (1893) 293; Kirk, Students' Fl. (1899) 321; Bailey, Qld. Fl. 3 (1900) 867; Rodway, Tasm. Fl. (1903) 79; Cheeseman, Man. N.Z. Fl. (1906) 350; ed. 2 (1925) 991;

\* The literature given here is limited to that of the Pacific area.

Subantarct. Is. N.Z. 2 (1909) 416; Ill. N.Z. Fl. 1 (1914) t. 106; Gagnepain in Lecomte, Fl. Gén. Indo-Chine 3 (1924) 577; Black, Fl. S. Austr. (1929) 606; ed. 2 (1965) 880; Ewart, Fl. Vict. (1930) 1166; Mattf., Bot. Jahrb. 68 (1937) 268; Levyns, J. S. Afr. Bot. (July 1941) 131; Philips, J. S. Afr. Bot. 16 (1950) 21; Edgar, Trans. Roy. Soc. N.Z. 85 (1958) 357—377; Allan, Fl. N.Z. 1 (1961) 677; Curtis, Student's Fl. Tasm. 2 (1963) 354; Eichler, Suppl. Black's Fl. S. Austr. (1965) 303; Lloyd, N.Z. Journ. Bot. 10 (1972) 277—372; New Phytolog. 71 (1972) 1181—1194. — *Cenia* Commerson ex Juss., Gen. Pl. (1789) 183; Benth. & Hook. f., Gen. Pl. 2 (1873) 429. — *Leptinella* Cassini, Bull. Soc. Phil. Paris III, 9 (1822) 127—129; Dict. 26 (1823) 66; Opusc. Phyt. 3 (1834) 62; DC., Prodr. 6 (1837) 141; Hooker & Arnott, London J. of Bot. 3 (1841) 310; Hooker, Fl. Antarctica 1 (1844) 25; Fl. Tasm. Spic., London J. of Botan. 6 (1847) 106—125; Fl. N.Z. 1 (1852) 127; F. Muell., Veg. Chatham Isl. (1864) 27. — *Strongylospermum* Less., Syn. Gen. Compos. (1832) 261; DC., Prodr. 6 (1837) 82. — *Otochlamys* DC., Prodr. 6 (1837) 77; Benth. & Hook. f., Gen. Pl. 2 (1873) 428. — *Pleioogyne* Koch, Bot. Zeit. 1 (1843) 37. — *Ctenosperma* Hooker, London J. Bot. 6 (1847) 115. — *Symphomera* Hooker, London J. Bot. 6 (1847) 116. — *Gymnogyne* Steetz in Lehmann, Pl. Preiss. 1 (1845) 431.

Prostrate perennial or decumbent annual plants, usually growing in large patches, mats, or clumps, rooting in the nodes, internodes long or short, slender or stout, the main stem with bifarious or spirally, alternate, axillary brachyblasts or these sometimes absent, most parts of the plants with pellucid glands. *Leaves* 2—3-pinnatifid, sometimes entire or pinnatifid, the margins entire or toothed, petioled or not, base amplexicaulous or only partly so. *Heads* monoecious, dioecious, or gynomonocious, solitary, terminal in the decumbent species, but in the prostrate species one inflorescence and one vegetative shoot branching from the same axil, pedunculate, with scattered bracts on peduncle or none, peduncle narrowing towards head or not, elongating in fruit or only up to the flowering stages. *Phyllaries* in 2 or more subequal whorls, inner ones longer than the outer or not, inner ones elongating after flowering. *Receptacle* conoid, flat, or convex, sometimes hemispherical *Marginal florets* ♀, in one or more whorls, or none, with or without a tubular or compressed corolla, jointed or fused to ovary, inflated or not, 4-toothed at tip, but sometimes teeth obscure or none. *Achene* winged or not, terete or strongly compressed, sometimes 4-sided, dorsally convex, with or without columnar, uniseriate or biseriate hairs alternating with scattered tapered trichomes, pedicellate or not. *Disk florets* ♂, or functionally ♂, or ♂ only. *Corolla* tubular, sometimes winged, sometimes base sheathing and extending over ovary, widened in upper part, 4-, very rarely 3-toothed at tip, teeth erect, sometimes horizontal or reflexed, sometimes anterior lobe of outermost ones expanded into a pseudo-ray. *Stamens* 4, rarely 3. *Ovary* sterile.

**Type species:** *C. coronopifolia* L.

**Distribution:** About 80 species, most of them in South Africa and New Zealand, some in North Africa, Asia, Australia, New Guinea, South America, and the Falkland Is. In New Guinea 4 species, all alpine.

**Notes.** For the subdivision of *Cotula* we refer to Lloyd (1972).

The four New Guinea species belong to section *Leptinella* (Cassini) Hook., series *Oligoleima* (Hook.) Lloyd. In common with the other (Australian) species of this series, they have distinctly compressed achenes with obvious margins and with persistent, short, scarcely inflated corollas attached. The New Guinea species, however, differ from the Australian ones in consistently lacking short shoots and in having uniseriate hairs on the achenes, as in many species of sections *Cotula* and *Strongylosperma*.

#### KEY TO THE SPECIES

- 1a. Leaves linear, entire or rarely with 1 or 2 teeth along margin 1. *C. wilhelminensis*
- b. Leaves always pinnate . . . . . 2
- 2a. Disk florets few, c. 5. Creeping rhizomes with numerous slender internodes. Leaves up to 15 mm long, few leaves clustered at tip toward flowering nodes. Appendage of anther with hairs along margin . . . . . 2. *C. altilitoralis*

- b. Disk florets many, 15 or more. Creeping rhizomes with few stout internodes alternating with clustered leaves around flowering node. Appendage of anther with or without hairs . . . . . 3
- 3a. Leaves and phyllaries glabrous. Pinnæ distinctly flattened. Achenes hard
3. *C. sarawaketensis*
- b. Leaves and phyllaries with obvious to dense covering of uniseriate hairs. Pinnæ terete or slightly flattened. Achenes soft . . . . . 4. *C. leptoloba*

**1. *Cotula wilhelminensis* van Royen, n. sp. — Fig. 1.**

Herba parva perennis repens est, rhizomatis ramosis cum caulibus floriferis approximatis, foliis 9—16 × 0.9—1.4 mm linearibus integris vel rare cum 1 vel 2 dentis 0.05—1.5 mm longis elliptici-oblongis, nervis pinnatis glabris eis lateralibus connectentibus et nervam intramarginalem formantibus, inflorescentiis terminalibus paullo foliis superantibus, pedunculo 8—12 mm longo tereti sparse breviter glanduloso-piloso et cum pilis simplicibus paucis interspersis, bractea una paullo inframediali lineari 3.5—5 mm longa, phyllariis 10—12 in 2 seriibus irregularibus imbricatis, bracteis 2.5—2.8 mm longis late ovati-oblongis rotundatis glabris sparse pellucidi-punctatis marginibus scariosis, floribus femineis 5 corollis conoideis compressis et in latere angusto cum 2—3 adenis angustis alatis pedunculatis, achaeniis glabris cum marginibus angustis alatis, floribus disci 6—8 bisexualis sed in usu masculis corollis infundibuliformibus 1.9—2.2 mm longis glabris in apice 3- vel 4-lobatis, staminibus 3 vel 4, antheris ovoidei-ellipsoideis glabris in apice cum appendici rotundato.

Up to 3 cm high herb growing in dense mats, with scattered pellucid dots on many parts of the plant. *Rhizomes* creeping, branched, forming flowering shoots at relatively close distances, with scattered remnants of leaves along lower parts of shoots, glabrous. *Leaves* linear, 9—16 by 0.9—1.4 mm, acutish, entire or rarely with 1 or 2 elliptic-oblong, 0.05—1.5 mm long teeth, and then usually with a large tooth on one side and sometimes a much smaller along the same side of the margin nearer to the tip, pinnatinerved with 9—18 lateral nerves on either side of midrib, lateral nerves all joined and forming distinct, straight, intramarginal nerves; herbaceous, erect to patent, glabrous; sheath up to 3 mm wide, clasping the stem, long persistent but ultimately caducous. *Inflorescences* terminal, slightly surpassing the leaves, monoecious with ♀ and ♂ florets (of which the latter functionally ♂) in one head, all florets shortly stalked. *Peduncle* terete, 8—12 mm long, slightly widened below head; bract 1, slightly below middle, linear, 3.5—5 by c. 0.8 mm, acute, glabrous. *Heads* yellow, campanulate, 2.5—3.5 by 2—3 mm. *Receptacle* almost flat. *Phyllaries* 10—12, in 2 irregular imbricate series, broadly ovate-oblong, 2.5—2.8 by 1.2—1.5 mm, rounded, at base slightly saccate, margins scariosus, nerves 3 or 4, all arising from base, or nervation pinnatinerved and lateral nerves archingly joined to straight intramarginal nerves, glabrous, with scattered pellucid dots. *Marginal florets* ♀, 5. *Corolla* conoid, c. 0.7 by 0.5 mm, 2-tipped, compressed, on the narrow sides with 2 or 3 globose stalked glands. *Styles* 0.1—0.2 mm long, stigma 2-lobed, lobes oblong, c. 0.05 mm long, glabrous. *Achene* ellipsoid-ovoid or -obovoid, 2—2.2 by 0.9—1 mm, convex-concave compressed, with narrow winglike margins, glabrous. *Disk florets* ♀, functionally ♂, 6—8, pedicels shorter than in ♀ florets. *Corolla* narrowly infundibuliform, 1.9—2.2 mm long, 3- or 4-lobed at tip, glabrous, lobes triangular-ovate, c. 0.2 by 0.2 mm, rounded, glabrous. *Stamens* 3 or 4, 1.2—1.5 mm long; anthers ovoid-ellipsoid, c. 0.5 mm long, at tip with a 0.2—0.3 mm long rounded appendage, glabrous. *Style* 1—1.1 mm long; stigma 2-lobed, each lobe semi-orbicular with membranous margins, finely papillate. *Abortive achene* ellipsoid-oblong, 0.2—0.3 mm long, glabrous.

*Type specimen:* Brass & Meyer-Drees 10034 (L).

*Distribution:* New Guinea.

WEST NEW GUINEA. 2 km E of Mt. Wilhelmina summit, 3800 m, Brass & Meyer-Drees 10034.

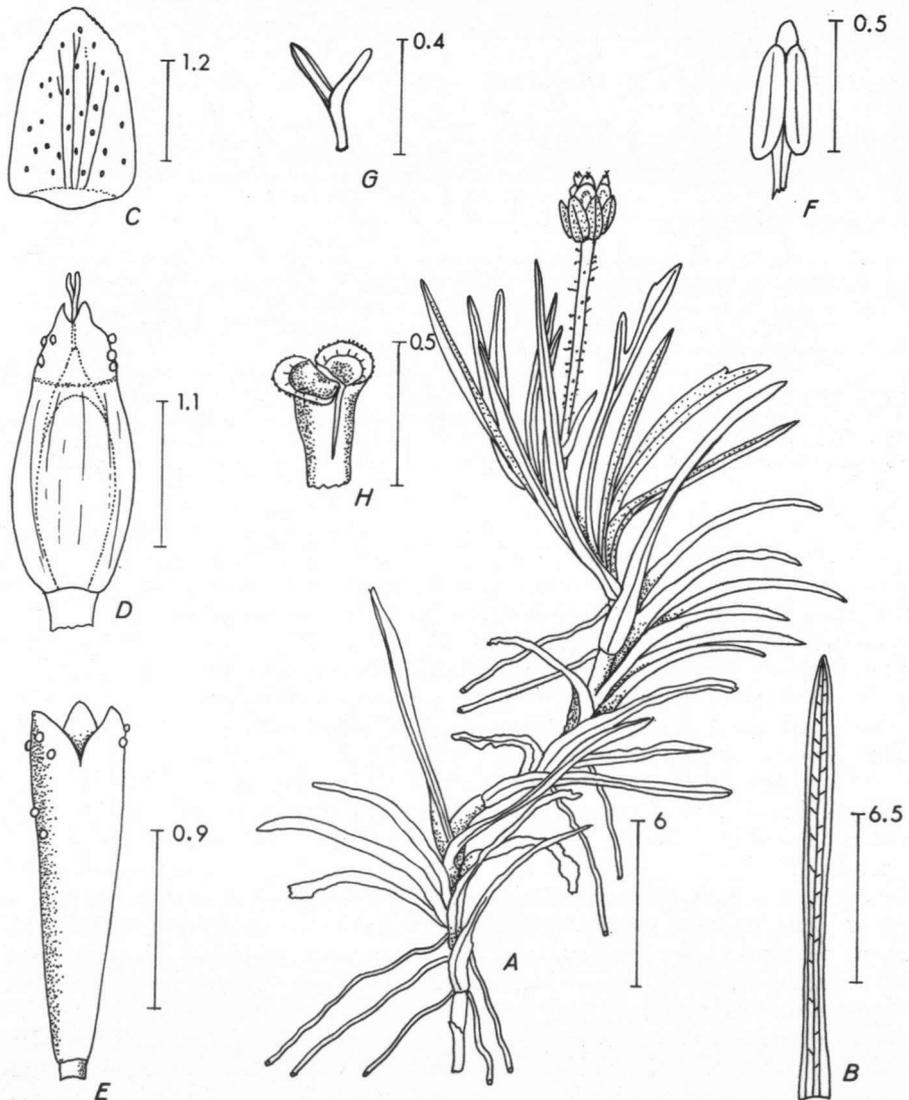


Fig. 1. *Cotula wilhelminensis* (Brass & Meyer-Drees 10034, type). — A. habit. — B. leaf, upper side. — C. outer phyllary. — D. marginal floret. — E. disk floret. — F. anther. — G. stigmas of marginal floret. — H. stigmas of disk floret.

**Ecology:** In mossy bog of alpine grassland, 3800 m. Fl. fr. Sept.

**Notes.** Closely related to *C. altitoralis* but differing from all other New Guinea species by the entire, linear, glabrous leaves that rarely have 1 or 2 lateral teeth.

At first glance this species can be confused with *Abrotanella papuana* S. Moore, but that species has no pellucid dots on the leaves. Moreover, the latter are often truncate at their

very tip. Also the tips of the phyllaries are usually pilose in *A. papuana* and glabrous in the present species. The midrib of the leaves of *A. papuana* is grooved above, that of *C. wilhelmensis* never so.

## 2. *Cotula altitoralis* van Royen & Lloyd, *n.sp.* — Fig. 2.

Herba perennis parva repens, internodis longis gracilibus, rhizomatibus cum pilis dispersis denique glabris, foliis pinnatifidis 10—15 × 3—6 mm, pinnis 2—4 in latere quoque spatulatis ad ellipticis 1.5—3.5 mm longis plerumque cum 1 vel 2 dentibus distalibus loba apicali simulantibus vel pinnatis, foliis disperse subadpresse villosis pilis 0.4—0.6 mm longio, petiolis 3—8 mm longis ocreatis in basi latioribus et amplexicaulis in apice et cum pilis dispersis vel glabris, inflorescentia terminali quam folia brevioribus, pedunculo tereto 2.5—4 mm longo subdense et proxima apicem cum bractea grandi c. 2.5 × 0.7 mm oblongi-spatulata, phyllariis c. 10 in serie unica oblongis vel oblongi-ellipticis c. 2.5 × 1 mm in apice truncati-rotundis to undulato extra cum pilis antrorsis dispersis, floribus marginalibus femineis c. 8 in seriebus duobus indistinctis, corollis conoidi-cylindricis in basi inflatis in apice truncatis vel indistincte bilobatis glabris in lateribus angustis cum adnatis globosis pedunculatis paucibus, achaeneis obovoideis compressis c. 1.5 × 0.6 mm cum bordinis angustis aliformatibus in parte apicali cum pilis paucis, floribus disci bisexualis sed in usu masculis c. 5, corollis anguste infundibuliformis 1.2—1.5 mm longis 4-nervis 4-lobatis glabris, lobis extra cum adnatis globosis paucis, 4 staminibus, antheris ellipticis c. 0.1 mm longis in apice cum appendici membranaceo.

Small, creeping, perennial herb forming dense mats, with long, slender internodes, rooting at most nodes. Roots infrequently branching. *Rhizomes* creeping, shortly ascending at the tip, internodes scattered antrorse hairy, in the older parts becoming glabrous or subglabrous, scattered branching at the flowering nodes only. *Leaves* pinnatifid, 10—15 by 3—6 mm, limb 3—8 mm long, elliptic in outline, pinnae 2—4 on either side, close together, flattened, spatulate to elliptic in outline, 1.5—3.5 mm long, acute or apiculate and black or brown at the thickened tip, decurrent at base, without or with 1 or 2 distal teeth, teeth falcate-ovate, 0.5—1 mm long, acute; all pinnae and teeth 1-nerved, subdensely pellucid-punctulate, leaf subcoriaceous, patent, often with overhanging or upcurved tips, scattered, subappressed, antrorse villose with white 0.4—0.6 mm long hairs. *Petioles* linear, 3—8 mm long, flat, sheath-like widened and amplexicaulous in basal part, scattered villose or glabrous; sheath long persistent but ultimately caducous. *Inflorescences* terminal, shorter than leaves, monoecious with ♀ and ♂ florets (of which the latter functionally ♂) in one head. *Peduncle* terete, 2.5—7 mm long, subdensely antrorse villose; near head sometimes with one oblong-spatulate, c. 2.5 by 0.7 mm large bract, apiculate, 1-nerved, pellucid-dotted, scattered villose. *Heads* yellow, widely campanulate, c. 3 by 4 mm. *Receptacle* almost flat. *Phyllaries* c. 10, in one or two irregular imbricate series, oblong or oblong-elliptic, c. 2.5 by 1 mm, truncate-rounded and crinkled-wavy at tip, pinnatinerved, with a wide, marginal, transparent part around a thicker bullate-warty central part, with a few scattered antrorse hairs. *Marginal florets* ♀, yellow, c. 8, in 2 indistinct series, pedicels cylindric, c. 0.5 mm long, glabrous. *Corolla* persistent, conoid-cylindric, 0.5—0.8 mm long, inflated at base, slightly compressed, at tip truncate or indistinctly 2-lobed, glabrous, on the narrow margins with a few globose stalked glands. *Style* c. 0.4 mm long; stigma 2-lobed, lobes c. 0.1 mm long, glabrous. *Achene* obovoid, compressed, c. 1.5 by 0.6 mm, with narrow winglike margins, with a few antrorse hairs on these margins. *Disk florets* ♂, functionally ♂, c. 5, pedicels shorter than in ♀ florets. *Corolla* 1.3—1.5 mm long, infundibuliform, narrowed just below the lobes and about halfway, 4-nerved, glabrous, lobes triangular-ovate c. 0.2 mm long, acutish, 1-nerved, glabrous with a few globose glands on outside. *Stamens* 4, c. 1.5 mm long; anthers elliptic, c. 0.1 mm long, at tip with an elliptic membranous appendage, hairy along margin. *Style* 1—1.2 mm long; stigma 2-lobed, lobes semi-orbicular, fimbriate. *Abortive achene* ellipsoid, c. 0.4 mm long, glabrous, jointed with corolla.



Fig. 2. *Cotula altitoralis* (Brass & Meyer-Drees 9975, type). — A. part of plant. — B. apical part of leaf, upper side. — C. phyllary. — D. apical part of marginal floret, frontal view. — E. ibidem, lateral view. — F. apical part of disk floret. — G. anther. — H. stigma.

Type specimen: Brass & Meyer-Drees 9975 (L).

Distribution: New Guinea.

WEST NEW GUINEA. 4 km NE. of Mt. Wilhelmina summit, 3660 m, Brass & Meyer-Drees 9975.

Ecology: Forming mats on open shores of a lake, 3660 m. Fl. & fr. Sept.

Note. This species differs from the other three in New Guinea by being smaller in all parts, particularly in the more slender rhizomes and shorter peduncles and petioles, and in having generally longer internodes and fewer male florets.

### 3. *Cotula sarawaketensis* van Royen & Lloyd, *n.sp.* — Fig. 3.

Herba parva perennis est, internodiis brevibus crassis, rhizomatibus glabris, foliis pinnatifidis 5—15(—30) × 3—5 mm, pinnis 1 vel 2 in latere quoque oblongis vel spatulatis 1—2 mm longis, loba terminali ad pinnas laterales simulantibus, foliis glabris, petiolis ligulatis 2—10 mm longis saepe cum

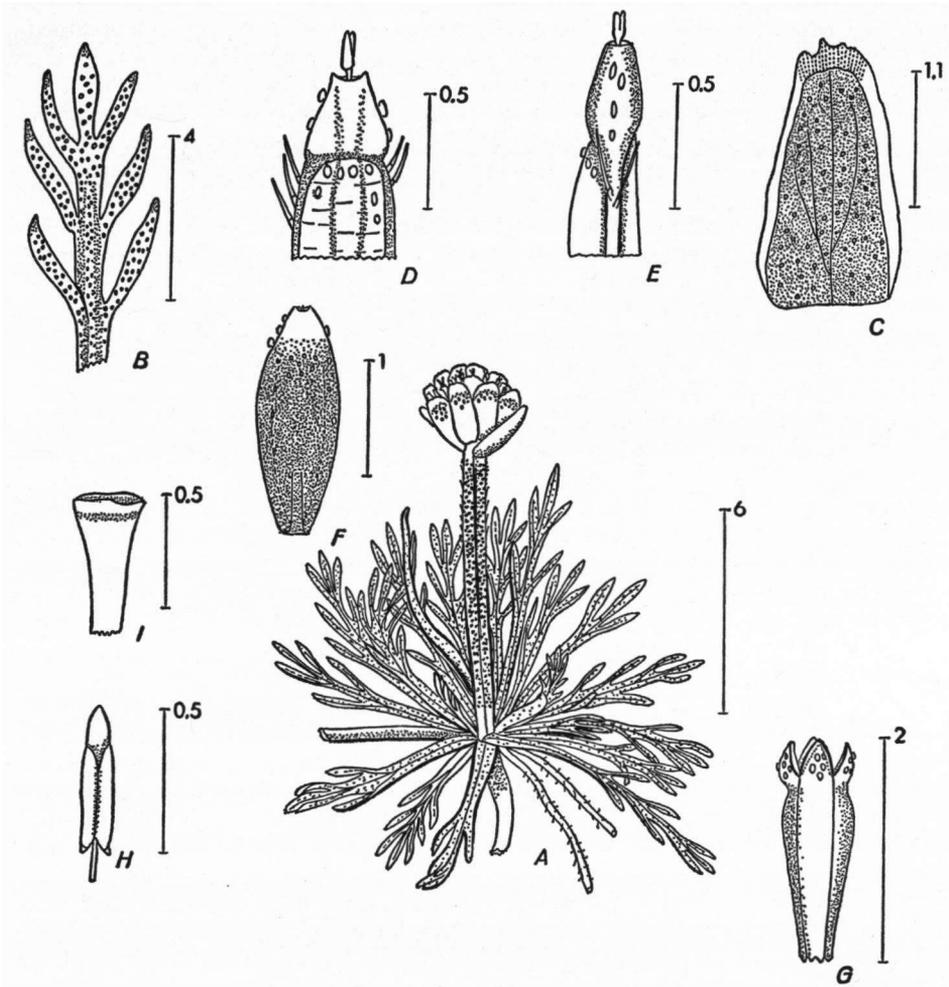


Fig. 3. *Cotula sarawaketensis* (van Royen NGF 20030, type). — A. part of plant. — B. apical part of leaf, upper side. — C. phyllary. — D. apical part of marginal floret, frontal view. — E. ibidem, lateral view. — F. fully ripe achene of marginal floret. — G. apical part of disk floret. — H. anther. — I. stigma.

nervo medio elevato et in basi in foliis juvenalibus sublatori subplexicauli glabris, inflorescentiis terminalibus folia excedentibus, pedunculo anguloso 8—15 mm longo cum pilis adpressis dispersis plerumque in costis pilis minusque 0.2 mm, bractea terminali oblonga naviculari c. 2.5 × 1 mm obtusa in basi subauriculata minime cristata glabra cum costa elevata, phyllariis c. 15 in seriebus duobus eis exterioribus ovati-oblongis c. 2.5 × 1.2 mm in apice rotundatis et scariosis, illis interioribus, plus orbicularibus, floribus marginalibus femineis c. 25 seriebus duobus, corollis conoideis in basi inflatis subcompressis in apice truncatis vel 2—4 lobatis glabris in alis angustis cum adenibus globosis paucis, quando maturis acheneis duris et intra subcristatis, floribus disci bisexualis sed in usu masculis c. 18, corollis infundibuliformibus 1.5 mm longis 4-lobatis glabris, lobis extra cum adenibus globosis paucis, staminibus 4 c. 1.5 mm longis, antheria linearibus c. 0.5 mm longis in apice cum appendice oblongo membranaceo glabro cellululis in basi subcaudatis.

Small, creeping, perennial herb forming dense mats, with short stout internodes, rooting at some nodes. Roots infrequently branching. *Rhizomes* creeping with upturned tip with many clustered leaves, glabrous. *Leaves* light green, pinnatifid, 5—15(—30) by 3—5 mm, limb 2.5—7 mm long, ovate-elliptic in outline, pinnae 1—4 on either side, relatively distant, oblong or spatulate, flattened, often falcate, 1—3 mm long, acute or acutish and thickened at tip, decurrent at base, rachis often prominent above, terminal lobe similar to the lateral pinnae; all pinnae 1-nerved, subdensely pellucid-punctulate; leaf subcoriaceous, patent, often with overhanging or upcurved tips, glabrous. *Petioles* strapshaped, 2—10 mm long, often with raised midrib, almost glabrous, slightly widened at base, subamplexicaulous in the younger leaves. *Inflorescences* terminal, longer than leaves, monoecious with ♀ and ♂ florets (of which the latter functionally ♂) in one head. *Peduncle* angular, 8—15 mm long, subdensely pellucid-punctulate, with scattered, antrorse, appressed hairs, hairs less than 0.2 mm long, immediately under head with one oblong, boatshaped, c. 2.5 by 1 mm large, obtuse, at base subauricled, slightly crested, glabrous bract, and in basal part with one linear, 6—9 by c. 0.5 mm large, acutish, glabrous, bract-like leaf with distinctly raised midrib. *Heads* light green, campanulate, 2.5—4 by 3.5—5.5 mm. *Receptacle* almost flat. *Phyllaries* c. 15, in 1 or 2 imbricate series, outer ones ovate-oblong, c. 2.5 by 1.2 mm, rounded and irregularly scarious along tip, pinnatinerved, with a narrow marginal transparent part around a thicker central part, glabrous, scattered pellucid-punctate, inner phyllaries more orbicular, otherwise similar to outer ones. *Marginal florets* brownish yellow, ♀, c. 25, in 2 series, pedicels c. 0.2 mm long, glabrous. *Corolla* persistent, conoid, inflated at base, slightly compressed, at tip truncate or 2—4-lobed, glabrous, on the narrow wings with a few globose stalked glands. *Style* c. 0.2 mm long, stigma 2-lobed, lobes oblong, c. 0.2 mm long. *Achene* ellipsoid-obovoid, compressed, c. 1.5 by 0.7 mm, with narrow wing-like margins, with a few antrorse hairs along apical part of these margins and a few globose glands along apical part, when fully ripe slightly wrinkled, texture hard and equal over entire achene, slightly crested on inner side. *Disk florets* brownish yellow, ♂, c. 18, pedicels shorter than in the ♀ floret. *Corolla* infundibuliform, c. 1.5 mm long, gradually narrowing from above the middle to the base, disk-like widened at very base, 4-nerved, glabrous, lobes ovate-triangular, c. 0.3 by 0.3 mm, acutish, margin thickened, on outside with a few globose glands. *Stamens* 4, c. 1.5 mm long; anthers linear, c. 0.5 mm long, at tip with an oblong, membranous, glabrous appendage, cells slightly caudate at base. *Style* c. 1.8 mm long; stigma funnelshaped, truncate, glabrous. *Abortive achene* cylindrical, c. 0.4 mm long, glabrous, jointed with corolla.

*Type specimen.* van Royen NGF 20030 (L).

*Distribution:* New Guinea.

EAST NEW GUINEA. Mt. Wilhelm, Lake Tekeh Pangwa, E. side, 3850 m, van Balgooy 797; Sarawaket Mts., Mt. Bangeta, 4115 m, van Royen NGF 20020; Mt. Piora, 3050 m, Henty & Carlquist NGF 16616; Mt. Aniata, 2960 m, Cruttwell 1080; Mt. Ganaina, 2700 m, Cruttwell 1279.

*Ecology:* In open places of alpine grasslands, roadsides, along small rivulets, at 2700—4115 m. Fl. & fr. June—January.

*Note.* *C. sarawaketensis* shares its habit and dark florets with *C. leptoloba*, but differs from the latter species in almost lacking uniseriate hairs on the rhizomes, leaves, and phyllaries, and in having broader pinnae and more massive, harder fruits.

#### 4. *Cotula leptoloba* Mattf., Bot. Jahrb. 68 (1937) 268. — Fig. 4.

Small, creeping, perennial herb forming dense mats, with mostly short internodes, rooting at some nodes. Roots infrequently branching. *Rhizomes* creeping, glabrous, at

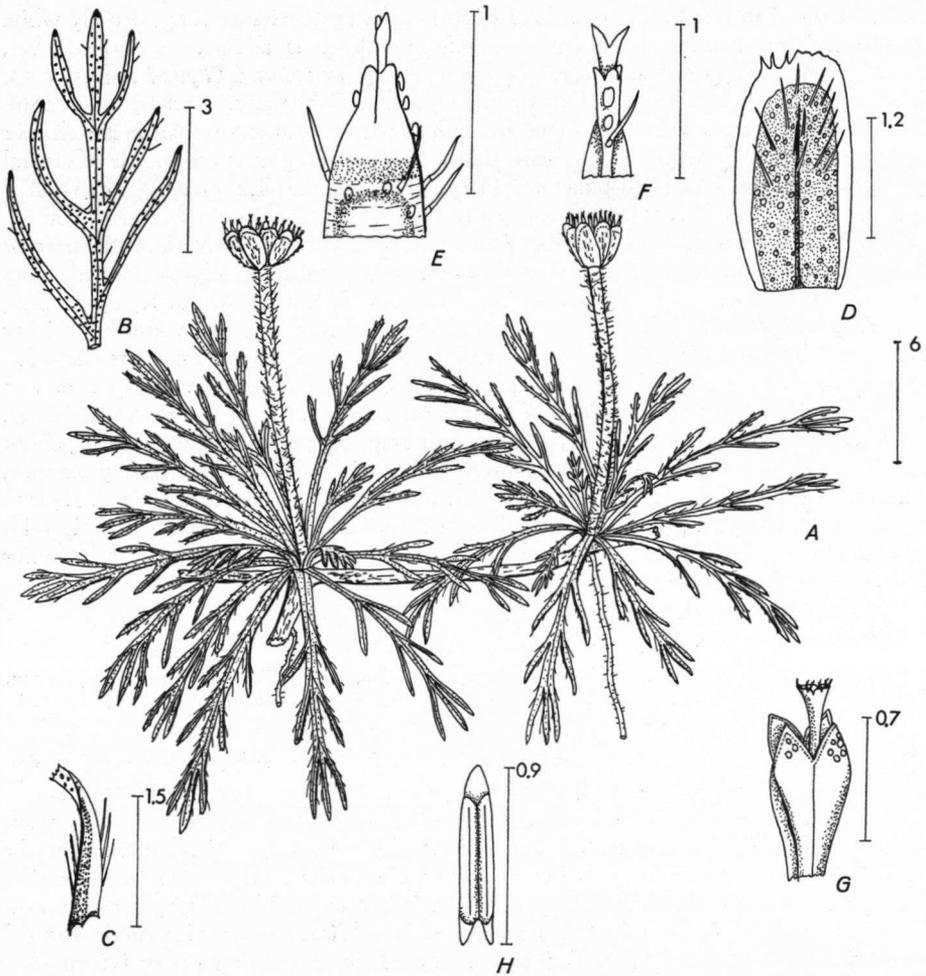


Fig. 4. *Cotula leptoloba* (van Royen NGF 20460). — A. part of plant. — B. apical part of leaf, upper side. — C. base of petiole. — D. outer phyllary. — E. apical part of marginal floret, frontal view. — F. ibidem, lateral view. — G. apical part of disk floret. — H. anther.

the tip upturned, with many clustered leaves. *Leaves* numerous, pinnatifid, 8—20 by 3—6 mm, limb 4—10 mm long, elliptic in outline, pinnae 3—5 on either side, rather distant, linear, terete or slightly flattened, 1.5 by c. 0.3 mm, straight or falcate, obtuse, thickened, and brown at tip, decurrent at base, occasionally with a linear lobe on one or both sides, apical lobe similar to lateral pinnae; all pinnae 1-nerved, subdensely pellucid-punctulate; leaf subcoriaceous, patent to spreading, often with overhanging or upcurved tips, scattered, subappressed, antrorse villose with 0.4—0.6 mm long hairs. *Petioles* linear, 2—10 mm long, only slightly sheath-like widened at base and only in the younger leaves amplexicaulous, glabrous or scattered villose, scattered pellucid-punctate. *Inflorescences* terminal, longer than the leaves, monoecious with ♀ and ♂ florets (of which the latter

functionally ♂) in one head. *Peduncle* blackish purple, up to 40 mm long, densely white woolly with more or less spreading hairs, nude or with one small linear or 1-lobed bract. *Heads* green, widely campanulate, *c.* 6 by 4 mm. *Receptacle* convex. *Phyllaries* green, *c.* 15, in 2 indistinct imbricate series, oblong or slightly obovate-oblong, 2.5—2.8 by 0.8—1 mm, rounded and irregularly scarious along tip, with a broad membranous margin and thicker central part, 1- or 3-nerved, with relatively many long white hairs on outside of central part only, scattered pellucid-punctate. Marginal florets purplish green, ♀, *c.* 25 in 2 indistinct series, pedicels cylindrical, *c.* 0.2 mm long, glabrous. *Corolla* persistent, conoid, compressed, *c.* 0.6 mm long, 2—4-lobed at tip, inflated at base, glabrous, on the narrow margins with a few globose stalked glands. *Style* *c.* 0.2 mm long; stigma 2-lobed, lobes oblong-conoid, *c.* 0.1 mm long. *Achene* ellipsoid-obovoid, compressed, *c.* 1.7 by 0.7 mm, narrowly winged, the central part in texture hardly different from the wings but thicker with a few long hairs in apical part of margins and an occasional one on surface between margins, with a few globose glands mainly near tip of achene, when ripe soft, papery, and unwrinkled. *Disk florets* ♀, 15—30, pedicels shorter than those of the marginal florets, otherwise similar. *Corolla* funnelshaped, *c.* 2 mm long, constricted at base of lobes, about halfway and in lower  $\frac{1}{3}$ , 4-nerved, glabrous, lobes triangular-ovate, *c.* 0.2 by 0.2 mm, acutish, margins thickened, on outside with a few globose glands. *Stamens* 4, *c.* 1.5 mm long; anthers linear, *c.* 0.5 mm long, with 0—4 short uniseriate hairs near tip, at tip with an elliptic membranous appendage, indistinctly 2-lobed, fimbriate along margin. *Abortive achene* ellipsoid, *c.* 0.1 mm long, glabrous, joint with corolla indistinct.

*Type specimen:* Brass 4737 (B, †; iso in A, Lincoln, NY).

*Distribution:* New Guinea.

EAST NEW GUINEA. *P a p u a.* Mt. Strong, 3500 m, *Coode & Stevens NGF 46186*; Mt. Dickson, 3500 m, *Hartley 12984*; Wharton Ra., Murray Pass, 2890—2895 m, *Brass 4737, van Royen NGF 20900, 20460*; Mt. Albert Edward, 3800 m, *Brass 4303, 4487*.

*Ecology:* On dry open slopes in alpine grasslands or on sandy banks of creeks, sometimes epiphytic on treeferns, 2800—3800 m. Fl. & fr. Jan., Febr., May—Sept.

*Notes.* *C. leptoloba* is the least similar of the New Guinea species to the Australian species of the series *Oligoleima*. It is unique in the series (and in section *Leptinella*) in the narrow almost terete pinnae, in the very short ovaries of disk florets, and in the uniseriate hairs present on some anthers. The peculiar habit is shared with *C. sarawaketensis*; most leaves are produced in a terminal cluster and remain imbricate; the few internodes formed immediately after a flowering node is produced are long, then a new rosette is formed.

The Mt. Dickson specimen differs from the Wharton Ra. specimens in having flattened pinnae and in the density of hairs and glands on the marginal florets.

#### ACKNOWLEDGMENT

We like to express our sincere gratitude to Dr. H. St John of Honolulu for preparing the Latin diagnosis of the new species.