

Sertulum Papuanum 20 The Boraginaceae of the Alpine Regions of New Guinea¹

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ABSTRACT: In the alpine flora of New Guinea the Boraginaceae occupy a small place with only three genera, *Cynoglossum*, *Myosotis*, and *Trigonotis*, and a problematical fourth one, *Crucicaryum*, being reported. In the present treatment descriptions of genera and species are given with localities, collectors, and ecological notes. The genus *Trigonotis* is given in its entirety, including all species in New Guinea outside the alpine region. Two new species, *T. culminicola* and *T. vestita*, are described.

IN THE COURSE of a study for a proposed alpine flora of New Guinea, I felt that the Boraginaceae needed extensive investigations. At the same time, it became necessary to include all known species of *Trigonotis* in New Guinea. Strictly speaking, few species of *Trigonotis* are true alpine plants though some, being essentially subalpine and montane species, reach into the alpine grasslands. In this respect the above title is misleading but, inasmuch as this represents the first complete study of that particular genus, I have included all known species in New Guinea. Two new species are described, which made it all the more advisable to revise the nonalpine part of the genus.

BORAGINACEAE A. L. de Jussieu

Gen. Pl. (July/August 1789) 128

Herbs, creeping or erect, solitary or in dense mats, branched or unbranched, sometimes shrubs or trees, usually with a dense cover of bulbous-based hairs. Leaves alternate, sometimes opposite, with cystoliths, simple, usually entire, petiolate but in the apical part of stem often sessile, or leaves seemingly without petiole and the latter clasping the stem, often in the creeping species the petioles twisted to bring all leaf-limbs in one plane. Stipules none.

Inflorescences usually a compound scorpioid or helicoid cyme, or flowers solitary and axillary or extra-axillary, bracteolate or not. Flowers bisexual, rarely unisexual, actinomorphic, sometimes zygomorphic. Sepals 5, free or basally connate, imbricate, or valvate in bud, sometimes with a black gland at tip. Corolla 5-lobed, rarely 6-lobed, lobes imbricate or contort in bud, throat often with hollow scales that are usually finely pilose. Stamens 5, rarely 6, alternipetalous, inserted in the corolla-tube, rarely surpassing the throat-scales, anthers 2-celled, opening lengthwise by 2 slits, introrse. Ovary superior, usually compound of loose carpels, sometimes a 2-celled ovary, becoming 4-celled by false septae, ovules 4, in each cell 2, or 1 ovule in each loose carpel, anatropous, erect, inverted or nearly horizontal. Style 1, gynobasic or terminal, usually simple, stigma usually simple, sometimes 2-lobed. Receptaculum flat or conoid. Disk cup-shaped, often lobed, rarely none. Fruit a 1-4-seeded nut or drupe, or consisting of 4 or more nutlets. Seeds usually without endosperm, or the latter fleshy and usually scant when present.

Distribution

A family of about 100 genera with over 2,000 species, mostly in temperate areas. In the alpine regions of New Guinea 4 genera of which one is doubtful. *Trigonotis* with 13 species has most of its species in the lower regions and only a few in the alpine parts.

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KEY TO THE GENERA

1. a. Corolla-lobes contort in bud. Hairs on upper side of rosular leaves directed toward tip, on underside directed toward base 1. *Myosotis*
 b. Corolla-lobes imbricate in bud 2
 2. a. Nutlets smooth or with straight, entire hairs 2. *Trigonotis*
 b. Nutlets with hooked or glochidiate stiff hairs 3. *Cynoglossum*
 4. *Crucicaryum*

1. *Myosotis* Linnaeus

Sp. Pl. 1 (1753) 131; Schlechter ex Brandt in Diels, Bot. Jahrb. 62 (1929) 490.

Annual or perennial, bushy or solitary herbs. Stems unbranched or with several floral branchings in upper parts. Leaves rosular and cauline, alternate, entire, the rosular ones with petiolar base, or with a distinct petiole, upper ones often sessile. Flowers in terminal scorpioid inflorescences, without bracteoles or reduced leaves, the latter sometimes at base of inflorescence only. Calyx deeply 5-lobed. Corolla usually with a narrow tubular part and radiating lobes, the latter 5, contort in bud, throat usually with hollow scales. Stamens 5, inserted in throat, rarely exsert, usually not surpassing the throat-scales, anthers opening by 2 longitudinal slits. Disk none. Ovary 4-celled and -carpelled. Style gynobasic, stigma clavate, often 2-lobed. Nutlets ovoid, flattish, with rounded back and acute ventral side, attached at base to remnant of style.

Type Species

Myosotis scorpioides L.

Distribution

About 50 species in temperate areas of both hemispheres, or in tropical areas in high mountainous regions. In the alpine region there is 1 species, which at the same time is the only one in New Guinea.

M. australis R. Br., Prodr. (1810) 494; DC, Prodr. 10 (1846) 110; Hooker, Fl. New Zeal. 1 (1853) 201; Fl. Tasm. 1 (1857) 279; Bentham, Fl. Austr. 4 (1868) 405; F. Mueller, Trans. Roy. Soc. Vict. 1, 1 (1889) 31; Bailey, Qld Fl. 4 (1901) 1051; Pulle, Nova Guinea 8 (1910) 683; Allan, Fl. New Zeal. 1 (1961) 818. *M. staminea* Lehmann, Pl. Preiss. 1, 3 (1845) 348. *M.*

sarumagedica Schlechter ex Brandt in Diels, Bot. Jahrb. 62 (1929) 490.

Perennial herbs, up to 60 cm high, usually branched and solitary, sometimes decumbent and tips upcurved, or branched mainly in apical parts with ascending floral branches. Stems densely appressed strigose, with antrorse hairs intermixed with patent hairs and these hairs hooked at tip. **Basal leaves** obovate-spathulate or narrowly spatulate, up to 14 by 1.5 cm, acute, obtuse, and often apiculate at tip, narrowed in basal part, petiolelike, strigose on either side, sometimes denser so on underside of midrib, hairs on upper side antrorse, those on underside retrorse and shorter than those on upper side, sometimes pointing in all directions or rarely all antrorse. **Cauline leaves** more oblong-lanceolate, elliptic-ovate, or spatulate, sessile and gradually decreasing in size toward inflorescence, relatively densely appressed strigose hairy above and hairs antrorse, less densely so below with shorter hairs and these irregularly implanted. Midrib of all leaves grooved above, all hairs or most of them hooked at tip, in some leaves none hooked. Inflorescences terminal and axillary in the upper leaves of the main branch and lateral branches if the latter present, up to 20 cm long, bracts none, rachis with appressed, strigose, upcurved, hooked hairs intermixed with patent ones. **Flowers** white, pale yellow, pale pink, or pale blue, with yellow throat scales. Bracteoles none. Pedicels 2-4 mm long, densely appressedly strigose, with upcurved, hooked hairs, intermixed with patent hairs. Calyx deeply 5-lobed, tube ca. 1 mm long, lobes lanceolate or ovate-lanceolate, 2-2.5 by ca. 1 mm, subacute, acute, or acuminate, densely hirsute on outside and along margins with erect hairs in apical parts and with hooked hairs in basal parts. Corolla-tube 2.5-3.5 mm long, lobes oblong or broadly ovate, sometimes orbicular, ca. 1.5 by 1.5 mm, rounded,

throat-scales kidney-shaped, ca. 0.2 mm across, glabrous. Stamens inserted in apical part of corolla-tube, ca. 1.5 mm long, filaments ca. 0.2 mm long, anthers ca. 1.5 mm, rounded or apiculate, base rounded. **Carpels** 4, glabrous, ca. 0.2 by 0.5 mm, style filiform, 2.5–4 mm, stigma clavate. Nutlets 4, ovoid, ca. 1.5 by 1 mm, triangular in cross section, acute or obtuse, dorsally rounded, ventrally almost flat, brown, dull.

Type Specimen

Brow s.n. in BM, from Australia.

Distribution

New Zealand, Tasmania, temperate parts of Australia, New Guinea. **West New Guinea**, Zendilerong Valley, 3,000 m (*Cooper 9*, June); Lake Habbema, 3,225 m (*Brass 9124*, Aug.); N slope of Mt. Wilhelmina, 4,100 m (*Brass & Meyer-Drees 10076*, Sept.); 11 km NE of Mt. Wilhelmina, 3,400 m (*Brass & Meyer-Drees 9718*, Sept.); Oranje Mts., 3,700 m (*van Noubuys 31 b*, Nov.). **Territory of New Guinea**, Yobobos grasslands, source of Lagaip R., 2,550 m (*Hoogland & Schodde 7612*, Sept.); Sirunki, beneath Umbidam Cliff, 2,560 m (*Walker ANU 524*, Aug.); Mt. Kinkain, 3,500 m (*Vink 16240*, July), 3,550 m (*Vink 16125*, July); Mt. Wilhelm, 2,300–3,950 m (*van Balgooy 212*, May, 299, May, 807, June, *Borgmann 13*, May, *Brass 29840*, June, *Hoogland & Pullen 5771*, July, *Keogh 219*, July, *Millar & van Royen NGF 14659*, Sept., *Philipson & Philipson 3442*, Aug., 3450, Aug., *Wade ANU 7151*, May, 7170, May, *Womersley NGF 8877*, Sept.); Daulo, 2,450 m (*McKee 1501*, Nov.), 2,550 m (*McKee 1389*, Nov.); Finisterre Mts., Lake Naho, Sewe, 2,745 m (*Sayers NGF 21402*, Nov.); Sarawaket Range, Mt. Sarawaket, 3,200 m (*Gillison 119*, Jan., *Hartley 11163*, Jan., *Keysser 21*, type specimen of *M. saruwagedica* Schlechter, Monarauwe, 2,895 m (*Hoogland 9705*, Aug.), Gindoh, 3,385–3,440 m (*Hoogland 9915*, 9939, Sept.), SW of Mt. Enggom, Upper Zaran Creek, 3,355 m (*van Royen NGF 16186*, Febr.). **Papua**, Mt. Giluwe, 3,200 m (*Coode NGF 32527*, June), Mt. Dickson, 3,450 m (*Hartley 12997*, Febr.); Lake Maiolo, 1,700 m (*Gillison 418*, Nov.); Mt. Albert Edward, 3,660–3,680 m (*Brass 4342 & 4385*, May/

July); Wharton Range, Murray Pass, track Avios to Tsjidibombo, 2,925 m (*van Royen NGF 30020*, Jan.); Mt. Dayman, 2,230–2,240 m (*Brass 22226*, May); Mt. Maneau, 2,590 m (*Cruttwell 541*, June), 3,000 m (*Cruttwell 753*, June); Mt. Aniata, 2,025 m (*Cruttwell 1051*, July); Mt. Ganaina, 2,745 m (*Cruttwell 1277*, Aug.); Gurunomi, 2,900 m (*Cruttwell 1331*, Aug.).

Ecology

This common species of the lower and upper mountain areas often reaches the alpine regions. It is usually found in the wetter parts of the grasslands, and in open areas, on landslides, in deserted native gardens where it can be particularly abundant, and along edges of subalpine shrubberies and forests, at altitudes between 1,700–4,100 m. Fl. and fr. May–Febr.

Note

After comparing the isotype specimen of *M. saruwagedica* with the type specimen of *M. australis*, both in the herbarium of the British Museum (Natural History), I find it hard to believe that these species can be kept apart. Both are rather variable in shape and size of both basal and cauline leaves but have in common nevertheless the peculiar arrangements of the hairs on both sides of the leaves. The New Guinean specimens tend to look more similar to *M. suaveolens* (R. Br.) Poiret, but the hairs on the leaves of the latter are always antrorse.

2. *Trigonotis*

Steven, Bull. Soc. Nat. Moscou 24, 1 (1851) 603; Johnston, Journ. Arnold Arb. 21 (1940) 57–63; 33 (1952) 68–69. *Eritrichium* Schader, § *Endogonia* Turczaninov, Bull. Soc. Nat. Moscou 13, 2 (1840) 256. *Zoelleria* Warburg, Bot. Jahrb. 16 (1893) 28. *Havilandia* Stapf, Trans. Linn. Soc. London, ser. 2, Bot. 4 (1894) 209; Johnston, Journ. Arnold Arb. 16 (1935) 190–192. *Endogonia* (Turczaninov) Lindley, Veg. Kingd. (1847) 656, *nomen solis*.

Creeping, decumbent or erect, simple or branched herbs, sometimes forming large mats, or growing in cushions. Leaves rosular and cauline, alternate, sometimes distinctly petioled,

in the creeping species petioles often twisted and leaves all in one plane flat against the substratum. Flowers solitary, extra-axillary or axillary, or in long, terminal or axillary, scorpioid, elongating inflorescences without leaves and bracteoles. Calyx 5-lobed, imbricate in bud. Corolla 5- or 6-merous, lobes at base invaginate and forming hollow appendages bulging into the throat. Stamens 5 or 6, inserted about halfway the tube, filaments very short, anthers opening introrsely with 2 longitudinal slits. Ovary usually composed of 4 carpels which at base are united by the base of the style, sometimes 8-10 carpels, stigma 2-lobed. Disk cup-shaped, well developed. Fruit composed of 4, 8, or 10 loose nutlets, the latter tetrahedral or the dorsal side rounded and the ventral side acute, the ribs sometimes winged, otherwise acute or rounded, smooth or finely tuberculate, glabrous or with small hairs along the ribs, glossy or dull.

Type Species

Trigonotis radicans Steven.

Distribution

About 50 species from Central Asia, China, and Japan to the Philippines, northern Malaysia, Borneo, and New Guinea. In New Guinea 12 species are known, one of which does not reach the alpine regions, whereas some of the others are essentially montane to subalpine species and are rarely found in the alpine areas.

Ecology

Most species prefer wet, damp spots, and are usually found in slightly shaded areas, though some grow in full sun. These latter species are the true alpine species.

KEY TO THE SPECIES

1. a. Leaves linear, ca. 9 mm long, densely crowded 4. *T. minuta*
 b. Leaves not linear, but if so then well over 2 cm long 2
2. a. Inflorescences many-flowered, distinctly separate from rest of plant and without leaves. Decumbent plants with most of the upper parts upright 3
 b. Flowers solitary, between the leaves or axillary. Plants creeping, solitary or in cushions 6
3. a. Leaves linear to oblong-lanceolate, or oblong. Nutlets finely hairy 1. *T. haackii*
 b. Leaves orbicular to elliptic, lanceolate, ovate or obovate. Nutlets smooth, glabrous 4
4. a. Stems glabrous. Leaves 1-2.2 cm by 1.5-3 mm, strigose along margins only. Inflorescence 4-6-flowered 3. *T. vestita*
 b. Stems densely strigose. Leaves 2-12 by 0.7-3 cm, scattered strigose on either side, denser on underside of midrib. Inflorescence 10-40-flowered 5
5. a. Corolla up to 3.5 mm across. Pedicels 1-4 mm long 2. *T. inoblita*
 b. Corolla 5-12 mm across. Pedicels 3-7 mm long 2. *T. inoblita* var. *archboldii*
6. a. Leaves strigose on either side, or on upper side only and scattered hairy on underside of midrib as well 7
 b. Leaves hairy along margin and/or on underside of midrib only, rarely with a few scattered hairs above mainly in apical part and with hairs on underside in lowest part of midrib only 11
7. a. Nutlets and carpels 4 8
 b. Nutlets and carpels (7-10) 7. *T. procumbens*
8. a. Nutlets ciliolate along their margins 6. *T. ciliolata*
 b. Nutlets glabrous 9
9. a. Nutlets smooth, black or blackish brown, shiny or only slightly so 10
 b. Nutlets finely papillate, gray, dull 9. *T. robusta*

10. a. Leaves scattered strigose above, glabrous below but densely or sparsely strigose on underside of midrib and petioles. Calyx-lobes oblong-ovate, at tip acutish or obtuse, apiculate. Nutlets black, subnitidous 8. *T. culminicola*
 b. Leaves strigose on either side, denser so on underside of midrib. Calyx-lobes ovate, at tip long-acute to subcaudate. Nutlets blackish brown, shiny 5. *T. abata*
11. a. Carpels and nutlets 8–10 12. *T. pleiomera*
 b. Carpels and nutlets 4..... 12
12. a. Hairs along margins of leaves closely adpressed. Nutlets minutely papillate, gray or light brown, dull 10. *T. opaca*
 b. Hairs distinctly patent. Nutlets smooth, blackish or black, rarely ivory white (immature?), shiny 11. *T. papuana*

1. *Trigonotis haackii* F. Mueller, Trans. Roy. Soc. Vict., ser. 2, 1 (1889) 30. *Note*

Erect or decumbent herb, up to ca. 30 cm high. Stems with appressed white, strigose hairs. **Leaves** subopposite or alternate, linear-spathulate to elongate-lanceolate, 1.8–4 by 0.2–0.4 cm, acute, tapering into the petiole, midrib grooved above, narrowly crested below, with scattered appressed, white strigose hairs above, almost entirely glabrous below but with more hairs along the midrib. **Flowers** in an up to 5-cm-long inflorescence, 5–6 mm across. Pedicels 2.5–4 mm long, with appressed white, strigose hairs. Calyx-lobes ovate or ovate-elliptic, 3.5–4.5 by ca. 1.5 mm, acute, strigose on outside mainly along midrib and margins, glabrous on inside, with a black gland at tip of each lobe. Corolla-tube 2.5–3 mm long, lobes 5, orbicular or broadly obovate, 2–2.5 mm across, at base with a hollow, 2-lobed, finely papillate throat-scale. Stamens 1–1.5 mm long, inserted slightly above middle of tube, anthers oblong, ca. 1 mm long. Ovary 4-carpelled, up to 0.5 by 1 mm. Style gynobasic, 1–1.5 mm long, stigma 2-lobed, papillate. Carpels pear-shaped, bifacial, upper surface sometimes slightly 2-lobed, finely papillate. **Nutlets** obliquely pyriform, dorsally rounded, inside acutely crested, ca. 1 mm long, dullish brown, with few fine hairs.

Type Specimen

MacGregor s.n., in MEL, from Mount Victoria.

Distribution

New Guinea. **Papua**, Mount Victoria, ca. 4,000 m (*MacGregor s.n.*, Sept.).

The main distinction between this species and the closely related *Trigonotis inoblita* F. Mueller is the papillate carpels of the present species against the smooth ones of the other species.

The leaves of *T. inoblita*, *T. archboldii* (now *T. inoblita* var. *archboldii*), and *T. haackii* show a gradual narrowing from broad elliptic ones in *T. inoblita*, to the narrow, elongate ones in *T. haackii*, with those of *T. archboldii* more or less in between. Also the shape of the leaves of *T. haackii* in many cases resembles that of *T. robusta* Johnston and *T. pleiomera* Johnston, both species with solitary flowers. In spite of the seemingly distinct separation of the New Guinean species into two groups, one with an elongate inflorescence and the other with single flowers, these details underline the close affinity of all species. In *T. haackii* the number of flowers is so small and one can imagine that a further reduction in number would produce a species related to *T. pleiomera* or *T. robusta*. In the parts of the type specimen preserved in the Arnold Arboretum, one finds nutlets attached to the calyx that correspond to the description above, and to some extent to the description given by von Mueller. In a small envelope attached to the Arnold sheet, one black, shiny seed was found but there is no telling that this belongs to the type specimen.

2. *Trigonotis inoblita* F. Mueller, Trans. Roy. Soc. Vict., ser. 2, 1 (1889) 31; Johnston, Journ. Arnold Arb. 21 (1940) 58, in text—*T. archboldii* Johnston, loc. cit. 57.

Decumbent or erect herb, up to 40 cm high, simple or branched, with denuded basal parts

and leaves mainly in upper half. Stems densely strigose with antrorse hairs or the latter appressed. **Leaves** broadly or narrowly elliptic, spatulate, obovate, or oblong, elliptic- or obovate-oblong, sometimes oblong-ovate, 2–12 by 0.7–3 cm, obtuse or rounded at tip and apiculate, sometimes acutely acuminate, base narrowed into petiole, midrib prominulous or grooved above, prominent below; scattered strigose above, sometimes only patchy so, strigose below but more so on midrib, margins strigose, with 5–7 very fine nerves on either side of midrib that form 2 intramarginal nerves. Petioles 0.5–3.5 cm, glabrous above, strigose below. **Flowers** in 10–40-flowered terminal inflorescences or these axillary in apical leaves, simple or branched, 5–14 cm long, rachis densely strigose. Peduncles of various undetermined lengths, densely strigose, pedicels 1–7 mm long, densely strigose. Calyx widely campanulate, 2–5 mm wide, lobes ovate or ovate-lanceolate, oblong or elliptic-oblong, 1.5–3.5 by 0.5–1 mm, acute, with a black gland just below tip, appressed strigose on outside, sometimes only on the 10 ribs, glabrous on inside. Corolla white, though lobes sometimes pale purple at tips, throat pale yellow, 3–9 mm long and 5–12 mm across, glabrous, tube 2–3 (–5) mm long, lobes suborbicular to orbicular, 1.5–5 mm across, glabrous, appendages kidney-shaped, ca. 1 mm wide, finely ciliate. Stamens inserted in middle of tube, ca. 1 mm long, anthers ca. 0.7 mm long, glabrous, stigma 2-capitate. **Nutlets** pyramidal, 1–1.5 mm long, dark brown, glossy, smooth, ribs 3, acute but hardly developed.

Type Specimen

MacGregor s.n., in MEL, from the Owen Stanley Range.

Distribution

New Guinea.

Var. *inoblita*—*T. inoblita* F. Mueller, loc. cit., 31; Johnston, loc. cit., 58. Flowers 3–3.5 mm long, up to 3 mm across. Pedicels 1–4 mm long.

Type Specimen

MacGregor s.n., in MEL.

Distribution

New Guinea. **Territory of New Guinea**, Hagen-Ogelbeng track, 1,500 m (*Robbins 106*, June); Yaki River, 2,150 m (*Hoogland & Schodde 6777*, June, 6911, July); Mingende (*Simonett 66*, June, 92, June); S slope Wahgi-Jimmy Div., between Kori R. and Mt. Ormogadzin, 2,590 m (*van Royen NGF 18125 A*, Sept.); Kubor Range, Nona-Minj Div., 2,745 m (*Pullen 5361*, Sept.), 3,220 m (*Vink 16150*, July, 16152, July); track from Kegslugl to Pengagl Creek, 2,700 m (*van Royen NGF 15103*, Sept.); Pengagl Creek, 2,680 m (*Millar NGF 23709*, Aug.); Mt. Wilhelm-Piundaunde Valley area, 3,000–3,600 m (*van Balgooy 580*, June, *Borgmann 220*, Oct., *Brass 30524*, July, *Streimann & Kairo NGF 27721*, May, *Wade ANU 7299*, June); Mt. Michael, ca. 3,500 m (*Brass 31358*, Sept., *Womersley NGF 11414*, Sept.); Mt. Kerigomna, 3,250 m (*Hoogland & Pullen 5570*, July); Daulo Camp, 2,440 m (*Hoogland & Pullen 5425*, June); ridge above Daulo, 2,560 m (*McKee & Floyd NGF 6379*, Nov.); Tau, near Chuave, 2,250 m (*Womersley NGF 14116*, Jan.); Chuave-Chimbu Rd, near Kumul, 2,250 m (*Womersley NGF 14152*, Jan.); Arau, 1,400 m (*Brass 32214*, Oct.); Asaro-Mairifutica Div., ca. 2,400 m (*Pullen 493*, Sept.); Okapa Patrol Post, 2,070 m (*Henty NGF 10637*, Jan.); Kainantu, 1,585 m (*Kairo & Streimann NGF 35713*, May), 1,800 m (*Hartley 12123*, July); Mt. Piora, 3,150 m (*Henty & Carlquist NGF 16557*, Febr.); S side of Finisterre Range, Upper Gusap Valley, between Moro and Gumbaram, 1,890 m (*Pullen 6167*, Nov.); Sarawaket Range, 1,820–2,440 m (*Clemens 5653*, April), Mt. Sarawaket, 3,000 m (*Gillison 143*, Jan.); Sambanga, 1,520–1,830 m (*Clemens 7483 bis 7552 a*, Nov., *s.n.*, Sept.), Batop-Sambanga, 1,830 m (*Clemens s.n.*); Kaile, 1,520–1,830 m (*Clemens 4905*, Jan.); Sattelberg, 1,220–1,830 m (*Clemens 8347*, June); E slope of Mt. Rawlinson, 1,480 m (*Hoogland 9245*, June); Dengalu Village near Bulolo, 1,220 m (*Floyd NGF 5246*, July). **Papua**, W. slope of Mt. Giluwe, 2,640 m (*Schodde 1983*, Aug.); near Ebenda, Anga Valley, 2,040 m (*Schodde 1519*, July); Evi R., 1,680 m (*Carr 13592*, Dec.); Mt. Dickson, above Bakaia, 2,100 m (*Hartley 12725*, Jan.); Vanapa Valley, Woitape-Kosipi track, 1,980 m (*van Royen NGF 20188*, Jan.);

crest of Owen Stanley Range (*MacGregor s.n.*, June); Nawandowan R., 1,800 m (*Cruttwell 1024*, July, 1365, Aug.); Mt. Dayman, ca. 2,700 m (*Brass 22630*, May, 23215, July).

Ecology

Although found in the alpine regions up to 3,600 m, this is primarily a species of the subalpine and montane regions. It is usually found in shady spots in damp areas, under trees, along streams, in small creeks, under large boulders, and on mossy slopes. Flowers and fruits are found the year around, with the dominant flowering period occurring between June and September.

Native Names

Agldiem (Chimbu), angba (Chimbu), dibili-mong (Wahgi, Minj, Hagen, Togoba), dub-mung (Minj), korara (Chimbu), nuri'a (Enga, Yogos), okoropi (Mairi, Watabung), pepo (Mendi), tundur (Mendi).

Var. *archboldii* (Johnston) van Royen, nov. comb et nov. stat.—*T. archboldii* Johnston, loc. cit., 57.

Flowers 4–8 mm long, 5–12 mm across. Pedicels 3–7 mm long.

Type Specimen

Brass 4024, in A.

Distribution

New Guinea. **Territory of New Guinea**, Sarawaket Range, Ulap Trail (*Clemens 41131*, April). **Papua**, Mt. Tafa, 2,310 m (*Brass 4024*, May); Upper Zevi Valley, 1,830 m (*Brown 328*, June); Wharton Range, Murray Pass, 2,840 m (*Brass 4598*, July); Mt. Albert Edward, 3,550 m (*Brass 4381*, June).

Ecology

As in var. *inoblita*.

Notes

This variety, originally in the rank of species, on the basis of the sparse material available, is only distinguishable from var. *inoblita* by

larger flowers, as the length of the pedicels is not reliable. The more appressed pubescence of the pedicels and the more elongate leaf-blade of this variety has been regarded by Johnston as another detail separating his species from *T. inoblita*, but the amount of material available of the species shows that is a useless detail. It may well be that the larger flowers can be explained by the plants growing in more open, sunnier spots than the smaller flowered var. *inoblita*, but further studies are needed to confirm this. For the present I keep the two varieties apart though it would not come as a surprise if var. *archboldii* ultimately has to merge with var. *inoblita*.

3. *Trigonotis vestita* van Royen, n. sp.

Figure 1

Herba erecta ramosa vel olim in basi ramosa est, ramis glabris, foliis in ramulis juvenalibus congregatis imbricatis infra plus separatis, lamina lanceolata 1-nervosa solum in marginibus cum pilis subadpressis strigosis apice acuto in basi vaginanti distenti, inflorescentia axillari 4–6-florifera, pedunculo rachidi et pedicellis plus minusve densiter adpresse strigosis, calyce cum lobis per margines et midnervum extra strigosum aliter glabrum, nucus pyramidalibus laevibus glabris brunneis cum angulis acribus.

Small, erect, branched herb, up to 25 cm high, sometimes decumbent at base. Branchlets light gray, angular, glabrous, with leaves along the young flushes but with pendulous remnants of leaves lower down and only with basal parts of the latter in lowermost parts. **Leaves** closely conferted in the young flushes and patent, but more apart lower down, withering, but persisting for a long time, margins often curved inward, 10–22 by 1.5–3 mm, limb lanceolate, at base widening in a sheathlike part, tip acute, truncate and thickened, and often curved downward, 1-nerved, nerve grooved above, crested below, subappressed strigose hairs along margins only, with longer hairs along the margin of the sheathlike part. **Inflorescences** axillary, 4–6-flowered, 1–4.5 cm long, when young scorpioid curved, later upright; peduncle, rachis, and pedicels angular, subdensely to densely appressed strigose. Pedicels 3–6 mm long, in fruit curving downward, usually with

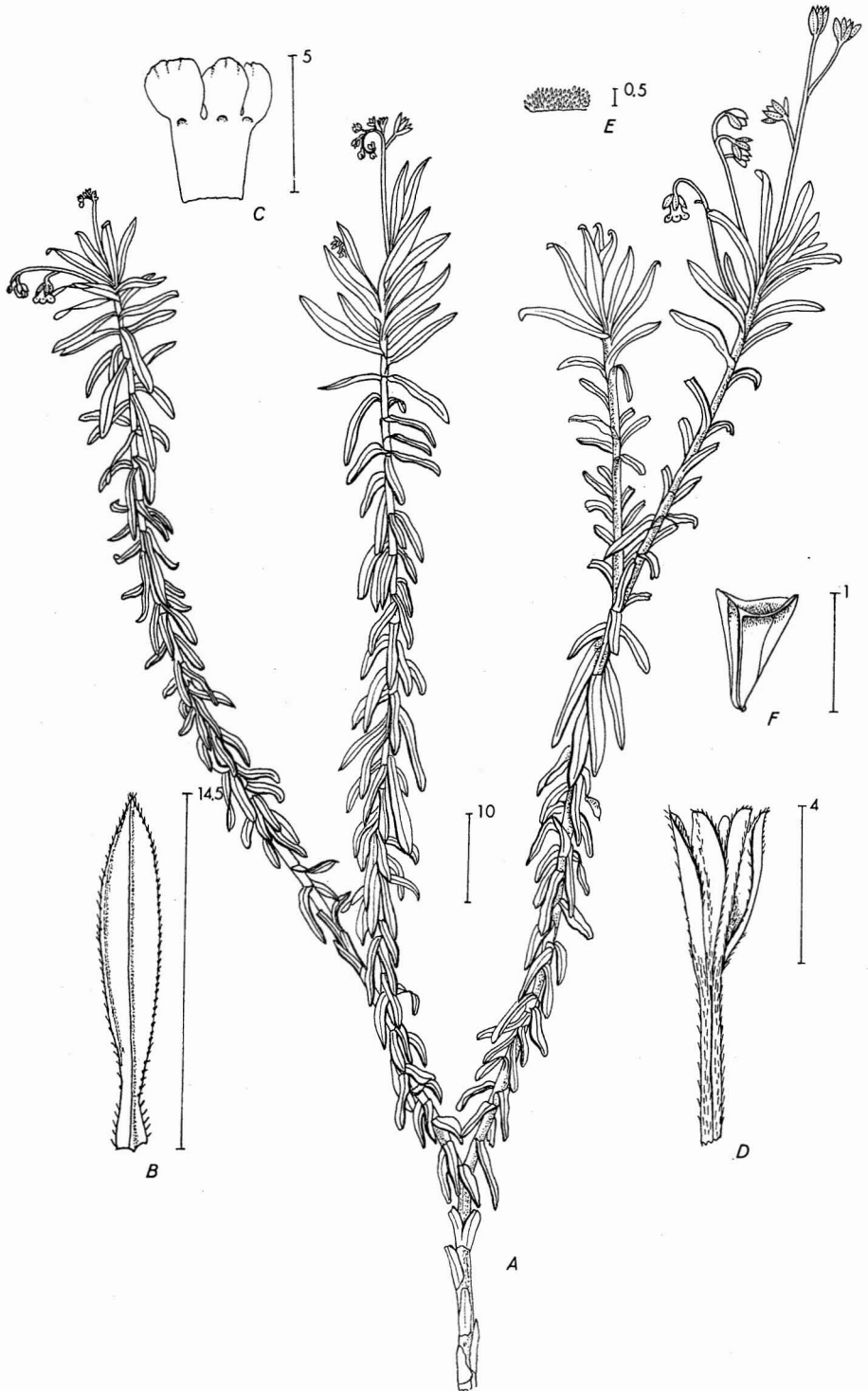


FIGURE 1. *Trigonotis vestita* van Royen. A, habit; B, leaf, underside; C, part of corolla, inside; D, calyx; E, stigma; F, nutlet. (Drawn after Lam 1765.)

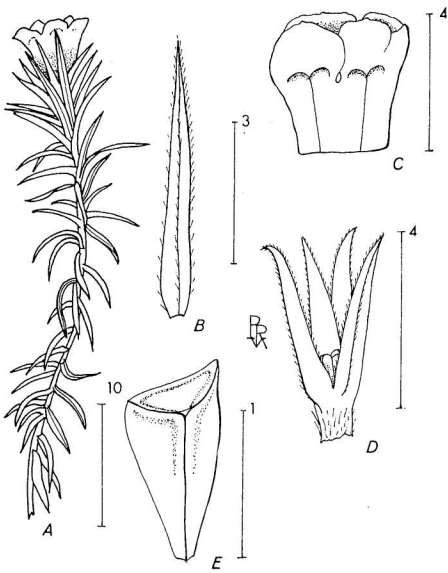


FIGURE 2. *Trigonotis minuta* (Wernham) Johnston. *A*, habit; *B*, leaf, underside; *C*, corolla; *D*, calyx; *E*, nutlet. (Drawn after Kloss *s.n.*)

1 or 2, up to 8-mm-long bracts below the flowers. Calyx up to 3 by 2.5 mm, in fruit more spreading, lobes 5, elliptic, 4–5 by 1.5–2 mm, outer ones larger than inner ones, all slightly folded along midline, obtuse, at tip on outside with a black gland, appressed strigose with white hairs along margins and midrib only, otherwise glabrous. Corolla white, 4–5 mm long, tube 2–2.5 mm long, lobes 5, broadly obovate, 2–2.5 by 1.5–2.2 mm, rounded, at base invaginate on outside and forming kidney-shaped, papillate, ca. 0.5 by 1 mm large throat-scales. Stamens ca. 1 mm long, anthers ca. 0.5 mm long, obtuse. Ovary 4-celled, each cell ca. 0.2 mm across, style ca. 0.5 mm long, glabrous. **Nutlets** pyramidal with sharp margins, ca. 1 mm long, smooth, glabrous, brown.

Type Specimen

Lam 1658, in L.

Distribution

New Guinea. **West New Guinea**, Mt. Doorman, 3,200 m (*Lam 1765*, Oct.), 3,520 m (*Lam 1658*, Oct.).

Ecology

In swampy places between ferns and grasses in alpine grasslands, 3,200–3,520 m. Fl. and fr. Oct.

Notes

A striking species because of the numerous withered leaves that cover the lower parts of the branchlets. In its erect habit this species approaches *T. inoblita* F. Mueller and *T. baackii* F. Mueller, but differing from the former by its narrow, nonpetioled leaves, and from the latter by the glabrous nutlets and the generally shorter leaves and strigose margin of the latter.

4. *Trigonotis minuta* (Wernham) Johnston, Contr. Gray Herb. 81 (1928) 81. *Litbospermum minutus* Wernham, Trans. Linn. Soc. London, ser. 2, Bot. 9 (1916) 118. *Plagiobotrys minutus* (Wernham) Johnston, Contr. Gray Herb. 73 (1924) 68.

Figure 2

Small, erect, slightly branched herb up to 4 cm tall, with numerous pendant dead leaves in lower parts, and patent-spreading ones near apex. **Leaves** densely imbricate, linear, 6–9 by 1–2 mm, acute, widening toward base and clasping stem, midrib grooved above, prominent below, minutely ciliate on underside of midrib and along margins, with longer hairs at base. **Flowers** solitary, terminal, pedicels 3–3.5 mm long, sparsely appressed hairy. Calyx-lobes lanceolate, 2–3 by 1–1.5 mm, acuminate, ciliate along midrib and margins. Corolla-tube 1.5–2 mm long, lobes orbicular, ca. 2.5 mm across, throat-scales kidney-shaped, papillate. Stamens 0.5–0.8 mm long, anthers ovoid, ca. 0.5 mm long. Ovary 4-carpelled, ca. 0.2 by 0.7 mm. **Nutlets** pyramidal, ca. 1 by 0.7 mm, triangular in cross section, all ribs angular, blackish, smooth, shiny.

Type Specimen

Kloss s.n., in BM.

Distribution

New Guinea. **West New Guinea**, Bandarong Valley, Camp XIII–XIV, 3,140–3,685 m (*Kloss s.n.*, Jan.).

5. *Trigonotis abata* Johnston, Journ. Arnold Arb. 21 (1940) 58; Hoogland, Blumea Suppl. 4 (1958) 233.

Creeping herb, rooting in nodes, with stems up to 30 cm long. Stems when young strigose, glabrescent. **Leaves** ovate or elliptic, oblique in many cases, 8–20 by 8–20 mm, rounded, apiculate, base rounded, abruptly narrowed into the 1–2 mm long, sheathlike, clasping, often twisted petiole, strigose on either side but hairs on upper side more patent than on underside, midrib slightly grooved above, prominent below and denser strigose than rest of leaf, with distinct intramarginal nerves and 1 or 2 lateral nerves on either side of midrib. **Flowers** solitary, extra-axillary. Pedicels 1–2 mm long, slightly longer in fruit, with white strigose hairs. Calyx cup-shaped, 1.5–2.5 mm long, lobes ovate, ca. 1.5 by 1 mm, long-acute or subcaudate, with white strigose hairs on outside, sometimes only so on midrib and along margins, glabrous on inside, 1-nerved, with a black, linear gland below tip. Corolla white with yellow throat, 4–5 mm across, glabrous except for the ciliate appendages in throat, lobes obovate, 1.5–2.5 mm across, finely nerved, tube 1–1.5 mm long, appendages kidney-shaped, ca. 0.5 mm wide. Stamens ca. 1 mm long, anthers ca. 0.5 mm long. Ovary 4-celled, ca. 0.5 by 0.7 mm, glabrous; style ca. 1 mm, glabrous. **Nutlets** 4, pyramidal with rounded back and 2 flat sides on inside, 2–3 by 1–1.5 mm, brownish black, glossy, 3-crested, crests narrow, sharp.

Type Specimen

Brass & Meyer-Drees 9838, in A.

Distribution

New Guinea. **West New Guinea**, Mt. Wilhelmina area, 3,560 m (*Brass & Meyer-Drees 9838*, Sept.); Lake Habbema, 3,225 m (*Brass 9477*, Aug.); 9 km from Lake Habbema, 2,800 m (*Brass 10818*, Oct.). **Territory of New Guinea**, Kubor Range, Mt. Kinkain, 3,500–3,550 m (*Vink 16119*, 16126, July, 16252, Aug.); Mt. Wilhelm area, 2,600–3,600 m (*Brass 29837*, June, 30263, 30727, July, *Hoogland & Pullen*

5661, July, *Philipson & Philipson 3443*, Aug., *van Balgooy 321*, May, *Wade ANU 7094*, May); Kortumi S.D.A. Mill via Goroka, 2,150 m (*Floyd & Womersley NGF 6777*, Nov.); Marafunga logging area, 2,510 m (*Vandenberg c.s. NGF 35009*, May); Rawlinson Range (*Clemens 12661*, Oct.).

Ecology

Reported from landslides, open sandy beds of streams, or in ground mosses of shrubberies bordering forests, at elevations between 2,800 and 3,560 m. At its lowest reported locality, the sandy bed of a stream at 2,800 m, it is obvious that this species is growing there due to cold airstreams coming down from higher mountains, since it is usually found at much higher altitudes. Fl. and fr. May–Nov.

6. *Trigonotis ciliolata* Johnston, Journ. Arnold Arb. 33 (1952) 69.

Small, creeping herb. Stems densely, patently hairy. **Leaves** ovate, 1.6–2.6 by 0.8–2 cm, acute or apiculate, base rounded, abruptly narrowed into the petiolelike, clasping base, midrib grooved above, prominent below, subappressed, white strigose hairy on either side but denser on underside of midrib. Petiole 2–6 mm long, strigose on either side. **Flowers** extra-axillary, solitary, pedicels slender, 12–15 mm long, densely strigose. Calyx 3.5–5 mm long, lobes lanceolate, 3–3.5 by 1–1.5 mm, in fruit up to 4.5 mm long, acute, strigose on both sides but less so on inside than on outside. Corolla white, 5–7 mm long, tube 2.2–2.5 mm, lobes orbicular, 3–4 mm across, appendages trapezoid, finely pilose, ca. 1 mm across. Stamens inserted in the middle of tube, ca. 1.2 mm long, filaments ca. 0.4 mm long, anthers ca. 0.7 mm long. Ovary 4-carpelled, ca. 1–1.5 mm across and up to 1 mm long, style 1–1.3 mm long. **Nutlets** 4, pyramidal, ca. 1 mm long, with 3 flat sides and 1 curved one, the latter ca 2 mm long and wide, margins acute, ciliate, black, glossy, smooth.

Type Specimen

Kanehira & Hatusima 13883, in A.

Distribution

New Guinea. **West New Guinea**, Arfak Mts., Angi Lakes, 1,900 m (*Kanehira & Hatusima 13883*, April).

Ecology

Not known.

7. *Trigonotis procumbens* (Warburg) Johnston, Journ. Arnold Arb. 21 (1940) 62. *Zoelleria procumbens* Warburg, Bot. Jahrb. 16 (1893) 28; Johnston, Contr. Gray Herb. 81 (1928) 82.

Creeping herb with long slender stems, much branched, tips slightly erect, sometimes growing in clumps. Stems sometimes purple, with appressed strigose hairs. **Leaves** ovate, elliptic, or ovate-elliptic, sometimes almost round, 0.3–4.5 by 0.2–3 cm, rounded or obtuse, apiculate, base cuneate, abruptly narrowed, midrib grooved above, prominent below, lateral nerves 3 or 4 on either side of midrib, archingly joined, appressed strigose on either side, sometimes denser on underside of midrib. Petioles 1–12 mm long, densely or sparsely appressed strigose. **Flowers** solitary, axillary. Pedicels 3–8 mm, appressed strigose. Calyx-tube 0.5–1 mm long, in fruit up to 2 mm, lobes ovate, ovate-lanceolate, or elliptic, sometimes broadly so, 2–3 by ca. 1 mm, lobes ovate, ovate-lanceolate, or elliptic, sometimes broadly so, 2–3 by 1–2 mm, acute, strigose on either side, with a black gland at tip of lobes. Corolla white, pale mauve, or violet, or only the tip of the lobes pink, throat-scales yellow, tube 1.5–2 mm across, finely papillate on inside, scales pulvinate and indistinctly 2-lobed, ca. 0.2 by 0.5 mm, ciliolate. Stamens 0.5–0.8 mm long, anthers ovoid, ca. 0.5 mm long. Ovary 8–10-carpelled, ca. 0.2 by 0.7 mm, style ca. 1 mm long. Disk very low, 8–10-lobed. **Nutlets** 7–10, pyriform, ca. 0.8 mm long, triangular in cross section, dorsally rounded, brownish gray or blackish brown, smooth, shiny, rarely with a few hairs dorsally.

Type Specimen

Hellwig 331, in B, †, duplicate in A.

Distribution

New Guinea. **Territory of New Guinea**, Yobobos grassland area, source of Lagaip R., 2,550 m (*Hoogland & Schodde 7694*, Sept.); Sirunke, Wabag, 2,850 m (*Womersley NGF 14270*, July); Nona-Minj Div., 2,740 m (*Pullen 5362*, Sept.), 3,220 m (*Vink 16147*, July); Wahgi-Jimmy Div., Mt. Ormogadzin, 3,100 m (*van Royen NGF 18090*, April), confluent Warapuri-Kori Rivers, 2,160 m (*van Royen NGF 18188*, Sept.); between Keglsugl and Komanemambuno, 2,700 m (*van Balgooy 516*, June); Pengagl Creek, 2,740 m (*Sayers & Millar NGF 19931*, Aug.); Komanemambuno, 2,900 m (*Borgmann 139*, Sept.); Mt. Wilhelm, E slopes, 3,070 m (*Millar & van Royen NGF 14656*, Sept.); Lake Aunde, 3,510 m (*Womersley NGF 8948*, Aug.); Dauilo, 2,440 m (*Womersley c.s. NGF 6071*, Nov.), 2,560 m (*Floyd & McKee NGF 6372*, Nov., *McKee 1170*, Nov., *1376*, Nov.); Mt. Michael, 3,060 m (*Brass 31398*, Sept., *Womersley NGF 11430*, Sept.); Upper Omahaige Valley, 2,280 m (*Pullen 595*, Sept.); Marafunga, 1,700 m (*Hartley 13279*, Oct.); Finisterre Mts., 1,400 m (*Hellwig 331*, Oct.); Sewe, 2,440 m (*Sayers NGF 21341*, Nov.); Kesangan, Wantoat vicinity, 1,830–2,440 m (*Clemens 11325 B*, Febr.–April); Samanzing, 1,520–1,830 (*Clemens 8862*, Sept.); Sambanga, 1,520–2,010 m (*Clemens 7033*, Sept.); Matap Station, 910–1,220 m (*Clemens 11312 bis*, Febr.–April, *s.n.*, March); Sarawaket Range, 2,440–2,740 m (*Clemens 5987*, March–April); Zitari, on S slope of Mt. Enggom, 3,300 m (*van Royen NGF 16193*, Febr.); Mt. Sarawaket, 3,050 m (*Hartley 11175*, Jan.). **Papua**, Mt. Giluwe, 3,100 m (*Coode & Warring NGF 29992*, July); Kagub, Tambul-Mendi track 2,740 m (*Coode & Katik NGF 32921*, Sept.).

Ecology

This species is essentially not an alpine one but rather a representative of the upper montane forests. It is found in open places which are usually wet and sometimes lightly shady; thus, it is found in grassy clearings in forests, on forests' edges, and along creek banks, between 1,400 and 3,300 m elevation. The Matap Station find by Clemens seems to be a rather dubious locality for none of the other speci-

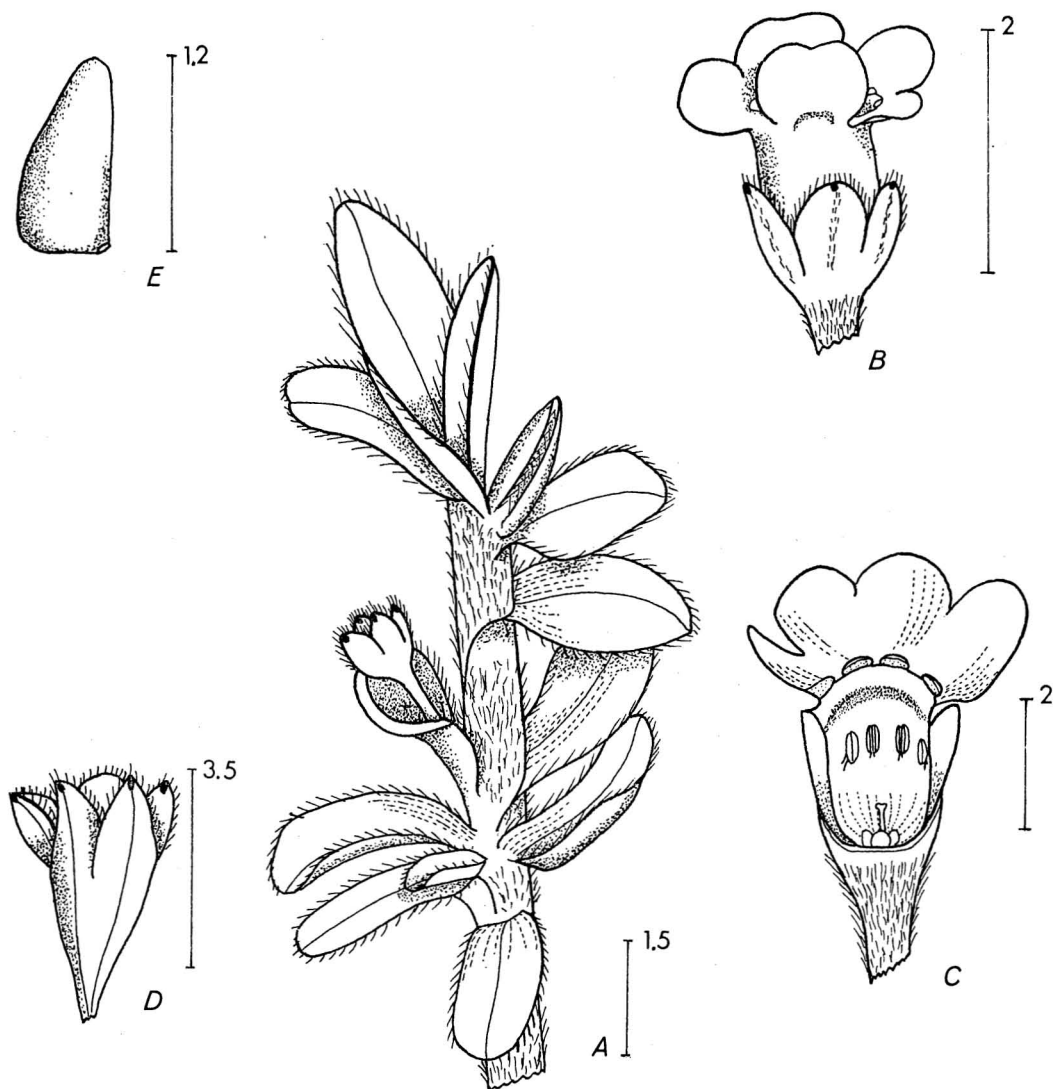


FIGURE 3. *Trigonotis culminicola* van Royen. A, part of stem; B, flower; C, flower, cut open; D, calyx; E, nutlet. (Drawn after Hoogland & Pullen 5790.)

mens have ever been collected below 1,000 m and Matap is at ca. 900 m and just outside the range of this species. At the other end it is rarely reported above 3,000 m and this points to the montane character of this species. It seems to flower year around.

Native Name

Kommo (Sewe).

8. *Trigonotis culminicola* van Royen, n. sp.—*T. cf. papuana* Johnston, Hoogland, *Blumea* Suppl. 4 (1958) 233.

Figure 3.

Herba parva repens tegates vel puvinos formanti est, calibus dense strigosis, foliis obovatis spatulatis vel oblongis supra remote strigosis infra glabris sed in midnervo et petiolo

et in marginibus densiter vel sparse strigosis in apice rotundatis vel olim retusis vel mucronatis in basi sensim in petiolo vaginato deminuenti, floribus solitariis extra-axillaribus, pedicellis strigosis, lobis calycis oblongi-obovatis per margines et in midnervo extra strigosis intra glabris, nuculis pyriformibus triangularibus nigris laevibus paululum lucidis in dorsa rotundatis.

Small, creeping herb forming dense mats or cushions. Stems densely strigose. **Leaves** obovate, spatulate, or oblong, 5–8 by 3–4 mm, rounded, sometimes retuse or mucronulate, base gradually narrowed into the sheathlike, 1–3 mm long, clasping petiole, midrib impressed above, prominulous below, scattered strigose above, glabrous below but densely or sparsely strigose on underside of midrib and petiole, and along margins. **Flowers** solitary, extra-axillary, between the leaves. Pedicels 2–3.5 mm long, in fruit up to 4.5 mm long, strigose with patent hairs. Calyx-tube 0.5–1 mm, but elongating later and then 1.5–2 mm long, lobes oblong-obovate, 2–2.5 by 1–1.5 mm, acutish or obtuse, apiculate, with a black gland at tip, strigose with white hairs along margins and midrib on outside of lobes. Corolla white, pink, or lavender, throat yellow, tube 1.5–2.5 mm long, lobes rotundate, ca. 1.5 mm across, rounded or retuse at tip, at base vaginate so as to form kidney shaped, finely ciliate appendages on inside of throat. Stamens ca. 1 mm long, anthers oblong-ovoid, ca. 0.7 mm long, apiculate. Ovary 4-celled, ca. 0.2 by 0.5 mm, style ca. 0.5 mm long, stigma capitate. **Nutlets** pyriform, triangular in cross section, with rounded back, ca. 1.2 mm long, black, slightly shiny, smooth.

Type Specimen

Hoogland & Pullen 5790, in l.

Distribution

New Guinea. **Territory of New Guinea**, Mt. Wilhelm, 4,250–4,450 m (*Brass* 29957, 30024, June, Hoogland & Pullen 5790, July, *van Balgooy* 34, April, 468, May, *Walker ANU* 5247, May).

Ecology

This species is found growing on moist ground among gravel near summit of Mt. Wilhelm, which itself consists of huge barren boulders with only scattered specimens of *Styphelia suaveolens* (Hook. f) Warburg growing among them.

Notes

Hoogland (loc. cit. 1958) supposes this species to be a high altitude form of *Trigonotis papuana* Johnston, but the differences between the two species are too many to ignore. It is clearly near to *T. papuana* but differs by the glabrous calyx-lobes (except for the hairs along the margin and on outside of midrib), by the obtuse and apiculate calyx-lobes, the longer calyx-tube in relation to the lobes, by the smaller leaves, by the sparse pubescence on the upper side of the leaves, and also by the fact that in all pubescent parts the hairs are longer and softer. The latter in itself is a character of high altitude plants when compared with specimens of lower levels.

This species is also related to *T. procumbens* (Warburg) Johnston but differs from that species by the smaller corolla, by the glabrous underside of the leaves, by the more oblong leaves, and by the dense moss cushionlike growth. Of course, the most readily discernible detail that separates the two species is that *T. culminicola* has 4 nutlets and *T. procumbens* has 7–10.

9. *Trigonotis robusta* (Johnston) Johnston, Journ. Arnold Arb. 21 (1940) 62. *Havilandia robusta* Johnston, Journ. Arnold Arb. 16 (1935) 191.

Large, lax, rarely branched herb, up to 30 cm high, often growing in large groups. Stems fairly densely appressed strigose, glabrescent, in basal parts with remnants of basal parts of leaves only. **Leaves** spatulate, spatulate-oblong, or oblong, 1.5–4.5 by 0.4–0.7 cm, rounded or retuse at tip, at base subabruptly narrowed into the 0.5–1.2 cm long petiole, midrib grooved above, prominent below, lateral nerves 3 on either side of midrib, with 2 additional basal ones, all arching, sparsely strigose in apical part above only, and along margins, glabrous except for some hairs only

below, denser along underside of midrib. **Flowers** solitary, axillary, pedicels slender, 8–12 mm long, in fruit up to 18 mm, fairly densely appressed strigose. Calyx 5–6.5 mm long, narrowly funnel-shaped, tube very short, lobes narrowly lanceolate or elliptic, 4–6 by 1–1.5 mm, acute, usually with a black gland just below tip, subappressedly strigose along margins and midrib on outside, glabrous on inside, tube strigose hairy on outside, glabrous on inside. Corolla pink or blue, white in center, or entirely white, or white with blue tips, throat-scales yellow; up to 9 mm long and up to 12 mm across, glabrous except for a dense fine papillation on inside of corolla-lobes, tube 4–6 mm long, lobes broadly spatulate-obovate, 4–6 mm across, scales trapeziform, ca. 0.5–1 mm, ciliolate. Stamens ca. 1 mm long, anthers ca. 0.8 mm long. Ovary 4-carpelled, each carpel ca. 0.5 by 0.5 mm, style 1–1.5 mm long. **Nutlets** 4, angular-ovoid, ca. 1 mm long, dorsally rounded, on inside with a narrow, acute crest, the other 2 ribs acute; gray, dull, finely papillate, glabrous.

Type Specimen

Brass 5681, in NY.

Distribution

New Guinea. **Papua**, Mt. Albert Edward, 3,680 m (*Brass 5861*, June, type specimen of *Havilandia robusta* Johnston and *Trigonotis robusta* [Johnston] Johnston); Wharton Range, Murray Pass, 2,895 m (*van Royen NGF 30012*, Jan.).

Ecology

This species was found by L. J. Brass at 3,680 m along forests' edges, but the collection made by me in the same mountain range about 5 km west of Mount Albert Edward was growing at the lower altitude of 2,895 m, and along a rivulet with icy cold water. This was on a northern, shady slope on the south side of Murray Pass and the Era River. Cool winds funneled along this rather narrow area and these two conditions of cold water and cool winds might explain why this second locality is so much lower. Fl. and fr. June.

Note

Johnston described this species as being procumbent on the basis of the habit of the plant as he saw it in the herbarium specimens, inasmuch as Brass did not mention anything about it. However, this description is not entirely true, though the plant has rather weak, lax stems that are slightly decumbent at their bases, with the upper parts upright.

10. *Trigonotis opaca* (Johnston) Johnston, Journ. Arnold Arb. 21 (1941) 62. *Havilandia opaca* Johnston, Journ. Arnold Arb. 16 (1935) 190.

Small, much branched, creeping herb, forming large dense mats. Stems densely white appressed strigose. **Leaves** olive green, oblong to oblong-ovate, 4–7 by 2–4 mm, rounded or retuse at tip, base cuneate, subabruptly narrowed into petiole, midrib grooved above, prominent below, with 3 or 4 lateral nerves on either side of midrib, these arching joined, glabrous, margins and underside of midrib densely strigose. Petioles 1–2 mm long, strigose on underside and along margin, glabrous above. **Flowers** solitary, axillary, pedicels 0.5–1 mm. Calyx 3–3.5 mm long, lobes ovate-elliptic, 1.7–2.5 by ca. 1 mm, acute, hairy on outside only along midrib, glabrous on inside, hairy along margin. Corolla white, scales in throat yellow, 3–3.5 mm long, up to 4.5 mm across, tube 1.5–2 mm long, lobes rotundate-obovate, 1.2–1.5 mm across, finely papillate on inside, otherwise glabrous, throat-scales trapeziform, ca. 0.5 mm wide, finely ciliolate. Stamens ca. 0.7 mm long, glabrous, anthers 0.4–0.6 mm long. Carpels 4, ca. 0.5 by 0.5 mm, style ca. 0.7 mm, glabrous. **Nutlets** ovoid, ca. 1 by 0.5 mm, dorsally rounded, ventrally crested and 2-sided, lateral ribs acute; light brown or gray, dull, minutely papillate.

Type Specimen

Brass 4178, in A.

Distribution

New Guinea. **Papua**, Wharton Range, Murray Pass, 2,840–2,940 m (*Brass 4178*, June, *van Royen NGF 20468, 30015*, Jan.).

Ecology

Common in open grasslands where it forms dense mats on the black peaty soil, at elevations between 2,840–2,950 m. Fl. and fr. Jan. and June. Once found growing epiphytic on dead tree ferns (*van Royen NGF 20468*).

11. *Trigonotis papuana* (Hemsley) Johnston, Journ. Arnold Arb. 21 (1940) 63. *Havilandia papuana* Hemsley, Kew Bull. (1899) 107; Johnston, Journ. Arnold Arb. 16 (1935) 191.

Creeping herb, often forming open mats. Stems appressed strigose, lower parts often rooting in the nodes. **Leaves** seemingly distichous by twisting of the petioles, oblong, oblong-obovate, or sometimes spatulate, limb 4–20 by 2–9 mm, rounded and often retuse at tip, base abruptly narrowed into 1–7 mm long, sheathlike, clasping petiole, midrib grooved above, prominent below, glabrous above, strigose below on midrib only, margins strigose. **Flowers** solitary, extra-axillary or axillary, pedicels 1–3 mm long, in fruit up to 7 mm long, appressed strigose. Calyx-tube ca. 1.5 by 1.5 mm, lobes ovate or ovate-lanceolate, 2–3 by 1–1.5 mm, acutish, strigose along midrib and margins, glabrous on inside, with a black gland near tip. Corolla white or pink, very light purplish pink, purple, or sometimes with a bluish tinge, throat-scales yellow, tube 1–1.5 mm long, lobes obovate-rounded or sometimes spatulate, 1.5–3 by 1.5–2.5 mm, rounded, finely papillate on inside, invaginate at base and forming kidney-shaped, ca. 0.5 by 0.2 mm large, finely ciliate throat-scales. Stamens about 1 mm long, anthers about 0.8 mm long. Carpels 4, ca. 0.5 by 0.5 mm, style 0.7–1 mm. Disk low, cup-shaped. **Nutlets** obpyriform, 1–1.5 by ca. 1 mm, acute, dorsally rounded, ventrally narrowly crested, dark brown, rarely ivory white (young?), glossy, smooth.

Type Specimen

Giulianetti & English s.n., in κ (see note below).

Distribution

New Guinea. **West New Guinea**, Mt. Wilhelm area, 3,800–4,100 m (*Brass & Meyer-*

Drees 10042, 10105, 10106, 10215, Sept.); Lake Habbema, 3,225 m (*Brass 9176*, Aug.). **Territory of New Guinea**, Wahgi-Jimmy Div., Mt. Ormogadzin, 3,100 m (*van Royen NGF 18390*, Sept.); Kubor Range, 3,180 m (*Pullen 5033*, July); Mt. Kinkain, 3,500–3,610 m (*Vink 16083, 16174, 16195, 16242*, July); Mt. Wilhelm area, 3,500–4,115 m (*Borgmann 14, Brass 30036*, April, *Philipson & Philipson 3423*, Aug., *van Balgooy 17*, April, 480, May, *van Royen NGF 15136*, Sept., *Walker ANU 18*, June, *Womersley NGF 8966*, Aug.); Sarawaket Range, S slope of Mt. Sarawaket, Zitari, 1,650 m (*van Royen & Millar NGF 17540*, Febr.). **Papua**, W summit of Mt. Giluwe, 3,660 m (*Schodde 1936*, Aug.); Mt. Ambua, 3,490 m (*Kalkman 4958*, July); Mt. Kerewa, 3,490 m (*Kalkman 4747*, July); Mt. Strong, 3,550 m (*Coode & Stevens LAE 51386*, May); Mt. Scratchley, 3,840–4,000 m (*Giulianetti s.n.*, see note below, *Coode & Stevens LAE 54515, 54529*, May); Wharton Range, Murray Pass, 3,385 m (*Giulianetti & English s.n.*, see note below); track from Avios to Tsjidibombo, 3,035 m (*van Royen NGF 30115*, Jan.); Mt. Albert Edward, 3,680 m (*Brass 4245*, May/July); near summit of Owen Stanley Range (*MacGregor s.n.*); Mt. Ganaina, 2,700 m (*Crutwell 1281*, Aug.); Mt. Aniata, 2,925 m (*Crutwell 1053*, July).

Ecology

This species is found in wet, open places such as swampy peaty black soil of wet slopes, along streams across alpine grasslands, and on wet landslides, at elevations of 2,900–4,100 m, with a prevalence between 3,500–4,100 m. When found at lower levels it is usually due to cold winds coming down narrow valleys. Fl. and fr. Jan.–Oct. with a peak period from June–October.

Native Name

Kua'pepo (Mendi).

Note

The type specimen is *Giulianetti & English s.n.*, from the Wharton Range. This specimen is mounted together with *Giulianetti s.n.* from Mt. Scratchley on the same sheet in the Kew

Herbarium. The former being the more complete one, it has been chosen as the type specimen though there is no telling which label belongs to what specimen.

12. *Trigonotis pleiomeria* Johnston, Journ. Arnold Arb. 21 (1940) 61.

Prostrate, branched herb with the leaves often seemingly distichous by twisting of the petioles, solitary or in dense mats. Stems up to 35 cm long, sometimes pinkish, usually green, appressed strigose. **Leaves** elliptic, obovate, oblong or elliptic- or obovate-oblong, (0.8-)1-2 by 0.3-1 cm, rounded or obtuse, apiculate, narrowed at base and narrowing into petiole, midrib grooved above, prominent below, 3 or 4 lateral nerves on either side of midrib, arching, joined, scattered appressed strigose along margins, glabrous below except for a fairly dense cover of white hairs on midrib. Petioles 1-3 mm long, glabrous above, hairy along margins and on underside of midrib, clasping. **Flowers** solitary, extra-axillary, 7-9 mm across, pedicels 8-15 mm long, appressed white strigose. Calyxlobes ovate or oblong-ovate, 3-5 by 2-2.5 mm, acute, strigose on outside of midrib only and along margins. Corolla white, purplish, pink, or pale purple-blue, tube 3-4 mm long, lobes 5 or 6, orbicular-ovate, 4-5 by 3.5-4.5 mm, rounded, at base invaginate and forming 5 or 6 hollow, kidney-shaped, finely hairy throat-scales, ca. 0.5 mm wide. Stamens 1-1.5 mm, anthers oblong-ovoid, ca. 1 mm long. Ovary 5-10-carpelled, up to 0.2 by 1 mm, style 1-1.5 mm long. Disk cup-shaped. **Nutlets** 10 or 8, obliquely ovoid, 1-1.5 by 0.5-1 mm, acute, dorsally rounded, acutely crested, light gray, shiny, smooth.

Type Specimen

Clemens 5989, in A.

Distribution

New Guinea. **Territory of New Guinea**, Kubor Range, Mt. Kinkain, 3,550 m (*Vink 16123*, July); Mt. Kerigomna, 3,250 m (*Hoogland & Pullen 5556*, July); Mt. Michael, 3,290-3,650 m (*Brass & Collins 31202*, Aug.); Mt. Otto, 3,500 m (*Brass & Collins 30995*, Aug.);

Mt. Amungwiwa, 3,420 m (*Womersley NGF 19016*, Nov.); Mt. Piora, 3,150 m (*Henty & Carlquist NGF 16575*, Febr.); Finisterre Mts., Lake Naho, Sewe, 2,745 m (*Sayers NGF 21429*, Nov.); Sarawaket Range, Mt. Sarawaket, 3,000-3,965 m (*Clemens 5989*, April, *Gillison 133, 135*, Febr., *Hartley 11164, 11187*, Jan., *Keysser s.n.*), Mt. Bolan, 2,400-3,000 m (*Keysser s.n.*), Mt. Bangeta, 4,100 m (*van Royen NGF 20041*, Nov.), SW slope of Mt. Enggom, Upper Zaran Creek, 3,355 m (*van Royen NGF 16149*, Febr.), Tempanpan, 3,300 m (*Hoogland 9815*, Sept.), Monarauwe, 2,895 m (*Hoogland 9697*, Aug.); Rawlinson Range, Samazing, 2,440-2,740 m (*Clemens s.n.*, Febr.), 2,130-3,660 m (*Clemens 12351*, June, *41407*, May); Sattelberg, 3,660 m (?) (*Clemens 7288*, Oct.).

Native Name

Ngoi (Chimbu).

Ecology

Although this species is sometimes found in the alpine grasslands, it seems to be more common in the upper montane ranges. It is generally found in slightly shaded areas, both in the alpine regions and in the forested montane ranges, between 2,130-4,100 m elevation. The lower limit is rather doubtful as it is based on Mrs. M. S. Clemens' collection, the labelling of which has not always been careful enough. Fl. and fr. Febr.-Dec.

3. *Cynoglossum* Linnaeus

[Tournefort, Inst. Rei Herb. (1700) 139, t. 57]; Gen. Pl. (1737) 183; Sp. Pl. (1753) 134; Gen. Pl., ed. 5 (1754) 65; Sp. Pl., ed. 2 (1762) 192; Lehmann, Pl. Asperif. (1818) t. 15, 42; DC, Prodr. 10 (1846) 146; Bentham & F. Mueller, Fl. Austr. 4 (1869) 408; Maximowicz, Bull. Acad. Petersb. 17 (1872) 450; Mél. Biol. 8 (1872) 553; Bentham & Hooker, Gen. Pl. 2 (1876) 848; Gürke, Nat. Pfl. Fam., ed. 1, 4, 3a (1893) 102; Bailey, Fl. Qld 4 (1901) 1048; Kusnezow, Fl. Cauc. Crit. 4, 2 (1913) 120; Lecomte, Fl. Gen. Indo-Chine 4 (1915) 225; Brand, Pfl. Reich 78 (1921) 114; Ohwi, Fl. Japan (1965) 756; Backer & Bakhuizen v.d. Brink, Fl. Java 2 (1965) 463.

Biennial or perennial, rarely annual, erect herbs often much branched in apical parts, coarsely grayish or white strigose in many parts. **Leaves** in a basal or subbasal rosette, with long petioles, and scattered cauline, usually sessile leaves, pinnatinerved. **Flowers** in cincinni, rarely forming a loose panicle, often dichotomously branched, without, rarely with bracts, sessile or pedicelled, in fruit the stalks recurved. Calyx 5-partite or 5-lobed down to the base, patent or reflexed, persistent and enlarged in fruit. Corolla blue or white, cylindrical or funnel-shaped, tube short, limb lobed to the middle or to the base, lobes imbricate in bud, each on inside at base with an obtuse or reniform appendage. Stamens 5, inserted in corolla-tube, filaments short, anthers 2-celled. Receptacle hemispherical or convex. Carpels 4, with a basal attachment to receptacle and style, each with 1 horizontal ovule. Style persistent, stigma usually capitate. **Nutlets** 4, spreading, indehiscent, with hooked or glochidiate stiff prickles. Seeds without albumen.

Type Species

Cynoglossum officinale L.

Distribution

About 100 species in temperate areas, rarely reaching into the tropics. In New Guinea one species only with this one sometimes reaching the alpine areas.

C. javanicum (Lehmann) Thunberg ex DC, Prodr. 10 (1846) 588; Miquel, Fl. Ind. Bat. 2 (1856) 923; Maximowicz, Bull. Acad. Petersb. 17 (1872) 451; Warburg, Bot. Jahrb. 16 (1892) 15; K. Sch. & Ltb, Fl. D. Sch Südsee (1901) 521; Koorders, Exk. Fl. Java 3 (1912) 129, t. 9; Brand, Pfl. Reich 78 (1921) 136; Backer & Bakhuizen v.d. Brink, Fl. Java 2 (1965) 463. *Myosotis javanica* Swartz ex Lehmann, Neue Schrift. Nat. Ges. Halle 3, 2 (1817) 21; Pl. Asperif. (1818) 118. *Echinosperrum javanicum* Lehmann, Pl. Asperif. (1818) 118; Hooker & Arnott, Bot. Beechey Voy. (1838) 267; DC, Prodr. 10 (1846) 143. *Rochelia javanica* (Lehmann) R. & S., Syst. 4 (1819) 108, 780. *C. borbonicum* Bory, *β latifolium* Hasskarl, Act. Soc. Sc.

Indo-Neerl. 1 (1856) 50, non Bory. *C. bellwigii* Brand, Fedde Rep. 13 (1915) 546.

Erect, simple or branched, up to 1 m high, extremely variable biennial herb, whitish hirsute or hispidulous in many parts of plant, in lower parts of stems with retrorse hairs, in upper parts with antrorse hairs. **Leaves** linear-lanceolate, oblong-elliptic, 3–15 by 1–5 cm, acute, obtusish, or mucronate-acuminate at tip, narrowly cuneate at base and stalked, or sessile and rounded or cordate and clasping the stem, midrib impressed or prominulous above, prominent below, lateral nerves 3–5 on either side of midrib, curved, arching, joined, distinct but hardly raised on either side; margin entire; herbaceous, patent, strigose on either side, sometimes denser so on underside of midrib. Petioles 0–6 cm long, strigose, hirsute or hispidulous. **Cincinni** terminal and axillary in axils of leaves gradually diminishing in size toward tip of inflorescence, up to 12 cm long, forked with equal or unequal branches, all forming together a large loose panicle. Peduncle up to 3.5 cm long, white appressed hairy, hirsute, or strigose. Calyx green, base tinged with reddish purple, deeply 5-partite, 2.5–4.5 mm long, pubescent, lobes ovate or elliptic, ca. 2 mm long, obtuse or acutish, ciliate along margin, 1-nerved. Corolla white, throat and base of lobes pink, turning blue, 6–17 mm across, glabrous, tube 2–5 mm long, lobes ovate, ovate-oblong, or ovate-elliptic, 1.5–2.5 by 1.5–2 mm, 3-lobed or entire, lobes rounded or obtuse, sometimes mucronulate as well, finely nerved, throat-scales oblong kidney-shaped, ca. 1 mm wide, finely pilose. Style 0.7–1 mm long, stigma 4-lobed. **Nutlets** brown, 3–4 mm long, scattered glochidiate, scar triangular.

Type Specimen

Zollinger 1976, in L.

Distribution

Java, Sumatra, New Guinea. **West New Guinea**, Kebar Valley, 550 m (*van Royen & Sleumer 8253*, Dec.). **Territory of New Guinea**, Kubor Range, Nona-Minj Div., Uinba 1,950 m (*Vink 16305*, Aug.); Keglsugl Air-strip, 1,700 m (*van Royen NGF 15104*, Sept.);

Pengagl Creek, 2,700 m (*Vandenberg* NGF 39678, June); Komanemambuno, 2,900 m (*Borgmann* 224, 226, Oct.); Mt. Wilhelm, E. slopes, 3,170 m (*Brass* 30643, July); Finisterre Mts., 500 m (*Hellwig* 362, Oct., type specimen of *C. bellwigii* Brand). **Papua**, Tigibi, 1,600 m (*Vink* 16881, June).

Ecology

A species of open deserted native gardens, roadsides, banks of rivers, open grasslands, hardly an alpine species, 500–3,170 m. Fl. and fr. July–Dec.

Native Name

Tsu-ens (Hagen-Chimbu, Yoowi).

4. *Crucicaryum* Brand

In Diels, Bot. Jahrb. 62 (1929) 489.

Small, erect herbs, stems appressedly villose. **Leaves** lanceolate, upper ones sessile, lower ones unknown. Inflorescences subthyrsoidal cincinni, bracteate. **Flowers** numerous, stalked. Calyx 5-lobed (?), tube very short. Corolla 5-lobed (?), widely cylindric, lobes ovate, throat-scales 5 (?), semilunate. Stamens 5 (?), inserted in tube. Carpels 4, connate at base only to the style. Style shortly claviform. Receptacle flat, indistinct. **Nutlets** plano-compressed, shortly hairy with hooked hairs, horizontally spreading.

Type Species

Crucicaryum papuanum Brand.

Distribution

A monotypic genus in New Guinea.

C. papuanum Brand in Diels, loc. cit. 489.

Herb. **Leaves** lanceolate, ca. 3 by 0.5 mm, acute, sessile. Pedicels known in fruit only and as long as calyx. Sepals ovate, 1.5–2 mm long. Corolla 3 mm long. **Nutlets** orbicular, hardly 1 mm long.

Type Specimen

Keysser 41, in B, †.

Distribution

New Guinea. **Territory of New Guinea**, Sarawaket Range, 3,600–4,000 m (*Keysser* 41).

Note

No material has been seen of this species and the description given is based on Brand's notes. The material originally in Berlin was lost during the 1943 burning of the herbarium, but from the description it is suspected that it merely represents a poor form of *Cynoglossum javanicum* (Lehmann) Thunberg. The flattened spreading nutlets with hooks, the lanceolate upper leaves, and the subthyrsoidal cincinni all point to that genus and perhaps to that species, though the size of the nutlets is considerably smaller.

INDEX TO COLLECTORS' NUMBERS

The first number of the two given in parentheses refers to the genus, the second to the species. 1, *Myosotis*; 2, *Trigonotis*; 3, *Cynoglossum*; 4, *Crucicaryum*.

Borgmann 13 (1.1), 14 (2.11), 139 (2.7), 224 (3.1), 226 (3.1). *Brass* 4024 (2.2), 4178 (2.10), 4245 (2.11), 4342 (1.1), 4381 (2.2), 4385 (1.1), 4598 (2.2), 5681 (2.9), 9124 (1.1), 9176 (2.11), 9477 (2.5), 10818 (2.5), 22226 (1.1), 22630 (2.2), 23215 (2.2), 29837 (2.5), 29840 (1.1), 29957 (2.8), 30024 (2.8), 30036 (2.11), 30263 (2.5), 30524 (2.2), 30643 (3.1), 30727 (2.5), 31358 (2.2), 31398 (2.7), 32214 (2.2). *Brass & Collins* 30995 (2.12), 31202 (2.12). *Brass & Meyer-Drees* 9718 (1.1), 9838 (2.5), 10042 (2.11), 10076 (1.1), 10105 (2.11), 10106 (2.11), 10215 (2.11). *Brown* 328 (2.2), s.n. (1.1). *Carr* 13592 (2.2). *Clemens* 4905 (2.2), 5653 (2.2), 5987 (2.7), 5989 (2.12), 7033 (2.7), 7288 (2.12), 7483 bis (2.2), 7552 a (2.2), 8347 (2.2), 8862 (2.7), 11312 bis (2.7), 11325 B (2.7), 12351 (2.12), 12661 (2.5), 41131 (2.2), 41407 (2.12), s.n. (2.2, 2.7, 2.11, 2.12). *Coode* NGF 32527 (1.1). *Coode & Katik* NGF 32921 (2.7). *Coode & Stevens* LAE 51386 (2.11), 54515 (2.11), 54529 (2.11). *Coode & Warring*

NGF 29992 (2.7). *Cooper* 9 (1.1). *Crutwell* 541 (1.1), 753 (1.1), 1024 (2.2), 1053 (2.11), 1277 (1.1), 1281 (2.11), 1331 (1.1), 1365 (2.2). *Floyd* NGF 5246 (2.2). *Floyd & McKee* NGF 5246 (2.2). *Floyd & Womersley* NGF 6777 (2.5). *Gillison* 119 (1.1), 133 (2.12), 135 (2.12), 143 (2.2), 418 (1.1). *Giulianetti* s.n. (2.11). *Giulianetti & English* s.n. (2.11). *Hartley* 11163 (1.1), 11164 (2.12), 11175 (2.7), 11187 (2.12), 12123 (2.2), 12725 (2.2), 12997 (1.1), 13279 (2.7). *Hellwig* 331 (2.7), 362 (3.1). *Henty* NGF 10637 (2.2). *Henty & Carlquist* NGF 16557 (2.2), 16575 (2.12). *Hoogland* 9245 (2.2), 9697 (2.12), 9705 (1.1), 9815 (2.12), 9915 (1.1), 9939 (1.1). *Hoogland & Pullen* 5425 (2.2), 5556 (2.12), 5570 (2.2), 5661 (2.5), 5771 (1.1), 5790 (2.8). *Hoogland & Schodde* 6777 (2.2), 7612 (1.1), 7694 (2.7). *Kairo & Streimann* NGF 35713 (2.2). *Kalkman* 4747 (2.11), 4958 (2.11). *Kanehira & Hatusima* 13883 (2.6). *Keogh* 219 (1.1). *Keysser* 21 (1.1), 41 (4.1), s.n. (2.12). *Kloss* s.n. (2.4). *Lam* 1658 (2.3), 1765 (2.3). *MacGregor* s.n. (2.1, 2.2, 2.11). *McKee* 1170 (2.7), 1376 (2.7), 1389 (1.1), 1501 (1.1). *McKee & Floyd* NGF 6379 (2.2). *Millar & Sayers* NGF 23709 (2.2). *Millar & van Royen* NGF 14656 (2.7), 14659 (1.1). *Philipson & Philipson* 3423 (2.11), 3442 (1.1), 3443 (2.5), 3450 (1.1). *Pullen* 493 (2.2), 595 (2.7), 5033 (2.11), 5361 (2.2), 5362 (2.7), 6167 (2.2). *Robbins* 106 (2.2). *Sayers* NGF 21341 (2.7), 21402 (1.1), 21429 (2.12). *Sayers & Millar* NGF 19931 (2.7). *Schodde* 1519 (2.2), 1983 (2.2). *Simonett* 66 (2.2), 92 (2.2). *Streimann & Kairo* NGF 27721 (2.2). *van Balgooy* 17 (2.11), 34 (2.8), 212 (1.1), 299 (1.1), 321 (2.5), 468 (2.8), 480 (2.11), 516 (2.7), 580 (2.2), 807 (1.1). *Vandenbergh* c.s. NGF 35009 (2.5), 39678 (3.1). *van Nouhuys* 31 b (1.1). *van Royen* NGF 15103 (2.2), 15104 (3.1), 15136 (2.11), 16149 (2.12), 16186 (1.1), 16193 (2.7), 18090 (2.7), 18125 A (2.2), 18188 (2.7), 18390 (2.11), 20041 (2.12), 20188 (2.2), 20468 (2.10), 30012 (2.9), 30015 (2.10), 30020 (1.1), 30115 (2.10), 30115 (2.11). *van Royen & Millar* NGF 15664 (2.7), 17540 (2.11). *van Royen & Sleumer* 8253 (3.1). *Vink* 16083 (2.11), 16119 (2.5), 16123 (2.12), 16125 (1.1), 16126 (2.5), 16147 (2.7), 16150 (2.2), 16152 (2.2), 16174 (2.11), 16240 (1.1), 16242 (2.11), 16252 (2.5), 16305 (3.1), 16881 (3.1). *Wade* ANU 5247 (2.8), 7021 (2.11), 7094 (2.5), 7151 (1.1), 7170 (1.1), 7299 (2.2), 8966 (2.12). *Walker* ANU 18 (2.11), 524 (1.1). *Womersley*

NGF 8877 (1.1), 8948 (2.7), 8966 (2.11), 11414 (2.2), 11430 (2.7), 14116 (2.2), 14152 (2.2), 14270 (2.7), 19016 (2.12). *Womersley* c.s. NGF 6071 (2.7).

INDEX TO SCIENTIFIC NAMES

The first number refers to the genus, the second to the species; if only one number is given the number of the genus is referred to. Names printed in **bold** letters represent new species and combinations; names printed in *italics* are synonyms. 1, Myosotis; 2, Trigonotis; 3, Cynoglossum; 4, Crucicaryum.

Crucicaryum Brand	4
C. papuanum Brand	4.1
C. Cynoglossum L.	3
C. borbonicum Bory	
<i>β latifolium</i> Hasskarl	3.1
C. <i>bellwigii</i> Brand	3.1
C. javanicum (Lehmann) Thunberg	3.1
<i>Echinosperrum javanicum</i> Lehmann	3.1
<i>Endogonia</i> (Turcz.) Lindley	2
<i>Eritrichium</i> Schader	
§ <i>Endogonia</i> Turcz.	2
<i>Havilandia</i> Stapf	2
<i>H. opaca</i> Johnston	2.10
<i>H. papuana</i> Hemsley	2.11
<i>H. robusta</i> Johnston	2.9
<i>Lithospermum minutus</i> Wernham	2.4
Myosotis L.	1
M. australis R. Br.	1.1
M. javanica Swartz	3.1
M. saruwagedica Schlechter	1.1
M. scorpioides L.	1
M. <i>staminea</i> Lehmann	1.1
M. <i>suaveolens</i> (R. Br.) Poir.	1.1
<i>Plagiobotrys minutus</i> (Wernham) Johnston	2.4
<i>Rochelia javanica</i> (Lehmann) R. & S.	3.1
Trigonotis Steven	2
T. <i>abata</i> Johnston	2.5
T. <i>archboldii</i> Johnston	2.2
T. <i>ciliolata</i> Johnston	2.6
T. culminicola van Royen	2.8
T. <i>haackii</i> F. Mueller	2.1
T. <i>inoblita</i> F. Mueller	2.2
var archboldii (Johnston) van Royen	2.2
var. <i>inoblita</i>	2.2
T. <i>minuta</i> (Wernham) Johnston	2.4
T. <i>opaca</i> (Johnston) Johnston	2.10

T. papuana (Hemsley) Johnston	2.11	T. robusta (Johnston) Johnston	2.9
T. pleiomera Johnston	2.12	T. vestita van Royen	2.3
T. procumbens (Warburg) Johnston	2.7	<i>Zoelleria</i> Warburg	2
T. radicans Steven	2	<i>Z. procumbens</i> Warburg	2.7