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A TAXONOMIC REVISION OF THE GENUS *ONCINOCALYX* F.MUELL. (VERBENACEAE)*

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Abstract

A taxonomic revision of the monotypic genus *Oncinocalyx* is presented and its affinities and distribution are considered. A detailed description of the type species, *O. betchei*, is supplemented by a habit sketch of a flowering branch and analytical drawings of the flower.

Taxonomic History of the Genus

The genus *Oncinocalyx* was described by F. Mueller (1883) with one species *O. betchei*, the type of which was collected by E. Betche (s.n.) from Gunnedah near the Namoi River in New South Wales, Australia. It was then considered to "mediate the transit from Verbenaceae to Labiatae". In the protologue, F. Muell. (1883) drew special attention to some characters that are in common with *Oncinocalyx* and the genera *Notochaete* Benth. and *Hyptis* Jacq. in the Lamiaceae, *Teucrium* Hook.f. in the Verbenaceae and *Phryma* L. in the Phrymaceae, but he apparently retained it in the Verbenaceae. A year later, C. Moore (1884) placed the genus in the Lamiaceae but F. Mueller (1889) retained it in the Verbenaceae. The family Verbenaceae has been accepted for the genus by all subsequent botanists.

In 1895, Briquet re-classified the Verbenaceae and upgraded the tribe Viticeae to a subfamily Viticoideae. The latter was subdivided into four tribes with *Oncinocalyx* in the tribe Clerodendreae. This classification was adopted by Dalla Torre & Harms (1904), Moldenke (1959, 1971) and Bhoj Raj (1983). Post & Kuntze (1904), however, relegated the subfamily Viticoideae to the synonymy of tribe Viticeae, and placed *Oncinocalyx* in the tribe Viticeae. This was later accepted by Maiden & Betche (1916). In 1934, Junell referred this genus to the subfamily ("Tribus") Viticoideae tribe ("Subtrib.") Ajugeae. The tribe Ajugeae has not been accepted for the genus by any subsequent botanist. Most botanists, however, have retained *Oncinocalyx* in the Verbenaceae without reference to any subfamily or tribe. So far, the monotypic status of this genus has not changed.

ONCINOCALYX F. Muell.

Oncinocalyx F. Muell., S. Sci. Rec. 3, no. 3 (1883) 69; C. Moore, Cens. Pl. N.S.W. (1884) 53; F. Muell., Sec. Syst. Cens. Aust. Pl. 1 (1889) 171; Briq. in Engl. & Prantl, Pflanzenfam. 4, 3a (1895) 177; Post & Kuntze, Lexic. Gen. Phan. (1904) 688; Dalla Torre & Harms, Gen. Siphon. part 6 (1904) 433; Maiden & E. Betche, Cens. N.S.W. Pl. (1916) 178; Junell, Symb. Bot. Upsal. 4 (1934) 130; Mold., Résumé Verbenac. etc. (1959) 413; N. Burb., Dict. Aust. Pl. Gen. (1963) 213; Mold., Fifth Summary Verbenac. etc. 2 (1971) 763; Cliff. &

*The present treatment of the genus *Oncinocalyx* is the 10th in the series of taxonomic revisions in the family Verbenaceae in Australia. See Munir in the *J. Adelaide Bot.Gard.* 1982 (*Callicarpa*), 1984a (*Premna*), 1984b (*Gmelina*), 1985 (*Viticipremna*), 1987a (*Vitex*), 1987b (*Faradaya*), 1989 (*Clerodendrum*), 1990a (*Glossocarya*), 1990b (*Huxleya*).

Ludlow, Keys Fam. Gen. Qld Fl. Pl. (1972) 124; S. Jacobs & Pickard, Pl. N.S.W. (1981) 209; Munir in Morley & Toelken (eds), Fl. Pl. Aust. (1983) 288; N. Beadle, Students Fl. NE N.S.W., part 4 (1984) 255; Bhoj-Raj, Rev. Palaeobot. Palynol. 39 (1983) 375; Stanley in Stanley & Ross, Fl. SE Qld 2 (1986) 365.

Type species: O. betchei F. Muell., S. Sci. Rec. 3, no. 3 (1883) 70.

Herbaceous perennials or undershrubs. *Stem* erect, branched, angular. *Leaves* simple, decussate, sessile, exstipulate, narrow-linear or subulate, entire, reticulate-veined, unicostate. *Inflorescence* cymose; cymes in axillary clusters, sessile. *Flowers* bracteate with 2 bracteoles, pedicellate or subsessile, zygomorphic, bisexual, hypogynous. *Calyx* of 5 fused sepals, urceolate in plate or obconical, persistent, 10-nerved, 5-toothed, with teeth hooked at end, non-acrescent. *Corolla* of 5 fused petals scarcely longer than calyx, tubular below, bilabiate above, lower lip 3-lobed, upper lip 2-lobed; tube almost cylindrical. *Stamens* 4, didynamous, exerted, epipetalous; filaments filiform; anthers dorsifixed, unilocular by confluence of locules. *Ovary* bicarpellary, syncarpous, 4-lobed, 4-locular, with one ovule in each cell attached to an axile placenta; style terminal, exerted, filiform, with 2 stigmatic lobes at the top. *Fruit* dry, schizocarpic, splitting into 4 mericarps, enclosed in the persistent calyx.

Number of species: 1

Derivation of name

The generic name is derived from Greek, *onkinos*, a hook; *kalyx*, cup, calyx; referring to the hooked calyx-lobes.

Distribution (Map 1)

The genus *Oncinocalyx* is endemic to the eastern part of mainland Australia where it has been recorded from along the south-eastern border of Queensland and north-eastern part of New South Wales.

Comments

In the protologue, F. Mueller (1883) described the flowers as 2-3 in each axil, stamens not long exerted and the style very short. During present investigations, however, the flowers are now found to be mostly 3-5 in each sessile axillary cluster and stamens and style reasonably exerted in mature flowers.

Affinities

According to F. Mueller (1883) this genus is intermediate between Verbenaceae and Lamiaceae. Among modern phylogenists, Cronquist (1968, 1981), Dahlgren (1977, 1980), Takhtajan (1969, 1980) and Thorne (1976, 1977) are in agreement on the close relationship of these two families, but the boundary between them by characters of convenience is uncertain. Cronquist (1968) stated that "the relationship of the Verbenaceae to Labiatae has been evident to most botanists for many years. Indeed it is difficult to know where to draw the line between them, and a case might be made for treating the present Verbenaceae and Labiatae as the more primitive and more advanced segments of a single family". While stressing the relationship of these families, Cronquist (1981) regarded the Verbenaceae and

Lamiaceae as a closely related pair of families, which together include about three-quarters of the species in the order Lamiales. In his view, "most authors agree that the Lamiaceae represent the realization and culmination of trends that begin in the Verbenaceae. The boundary between the two families is arbitrary and in part merely conventional, but no other means of distinguishing between them seems more satisfactory, and the conceptual utility of recognizing two groups rather than only one has seldom been challenged." All the above phylogenists seem to agree with this view and have retained these families in the order Lamiales, although their classification differ from each other in minor details or major groupings. Since the delimitation of the two families is "arbitrary", border-line cases are not easily placed unless they can be shown to be part of an evolutionary line. *Teucrium*, *Teucrium* and *Notochaete* are often mentioned as genera closely related to *Oncinocalyx* (Mueller, 1883), but although they show some similar features, their position between the two families remains uncertain until detailed monographs become available.

The genus *Oncinocalyx* is here retained in the Verbenaceae because of the non-verticillate inflorescence, absence of oil glands, presence of 4 fertile stamens and strictly non-gynobasic ovary. It showed a few other generic characters which are found both in Verbenaceae and Lamiaceae, such as the presence of quadrangular stems, opposite leaves, bilabiate corollas, didynamous stamens, single ovule in each ovary cell with micropyle directed downward, schizocarpic fruit with four one-seeded mericarps and non-endospermic seeds. Overall, this genus seems to be closer to the Verbenaceae than Lamiaceae but it will remain a problem until a clearer delimitation of the two families has been achieved.

Oncinocalyx betchei F. Muell., S. Sci. Rec. 3, no. 3 (1883) 70; C. Moore, Cens. Pl. N.S.W. (1884) 53; F. Muell., Sec. Syst. Cens. Aust. Pl. 1 (1889) 171; Dixon, Pl. N.S.W. (1906) 237; Maiden & E. Bettle, Cens. N.S.W. Pl. (1916) 178; Junell, Symb. Bot. Upsal. 4 (1934) 130; C. White, Proc. Roy. Soc. Qld 47 (1936) 74; Mold., Résumé Verbenac. etc. (1959) 209; Fifth Summary Verbenac. etc. 1 (1971) 347; Sixth Summary Verbenac. (1980) 337; S. Jacobs & Pickard, Pl. N.S.W. (1981) 209; N. Beadle, Students Fl. N.E. N.S.W., part 5 (1984) 855, fig. 375D; Bhoj-Raj, Rev. Palaeobot. Palynol. 39 (1983) 358, 375; Stanley in Stanley & Ross, Fl. S.E. Qld 2 (1986) 365.

Lectotype: *E. Bettle s.n.*, Namoi River near Gunnedah, N.S.W., Australia, -i.1883 (MEL 583547, lectotype designated here; CAS 31218, HBG, K, NSW 145058 - isolectotypes (F & NY have photographs of the isolectotype in CAS).

Typification

O. betchei is based on Ernst Bettle's un-numbered collection from near the Namoi River, comprising at least 5 duplicates. As no holotype was designated by the author (F. Mueller), a lectotype is chosen here. Of all the syntypes, the one preserved in Herb. MEL (No. MEL 583547) is particularly complete and well preserved. The specimen was certainly used by the author in preparing the original description as it carries an envelope containing F. Mueller's hand-written description and notes. It has, therefore, been selected here as the lectotype of this species.

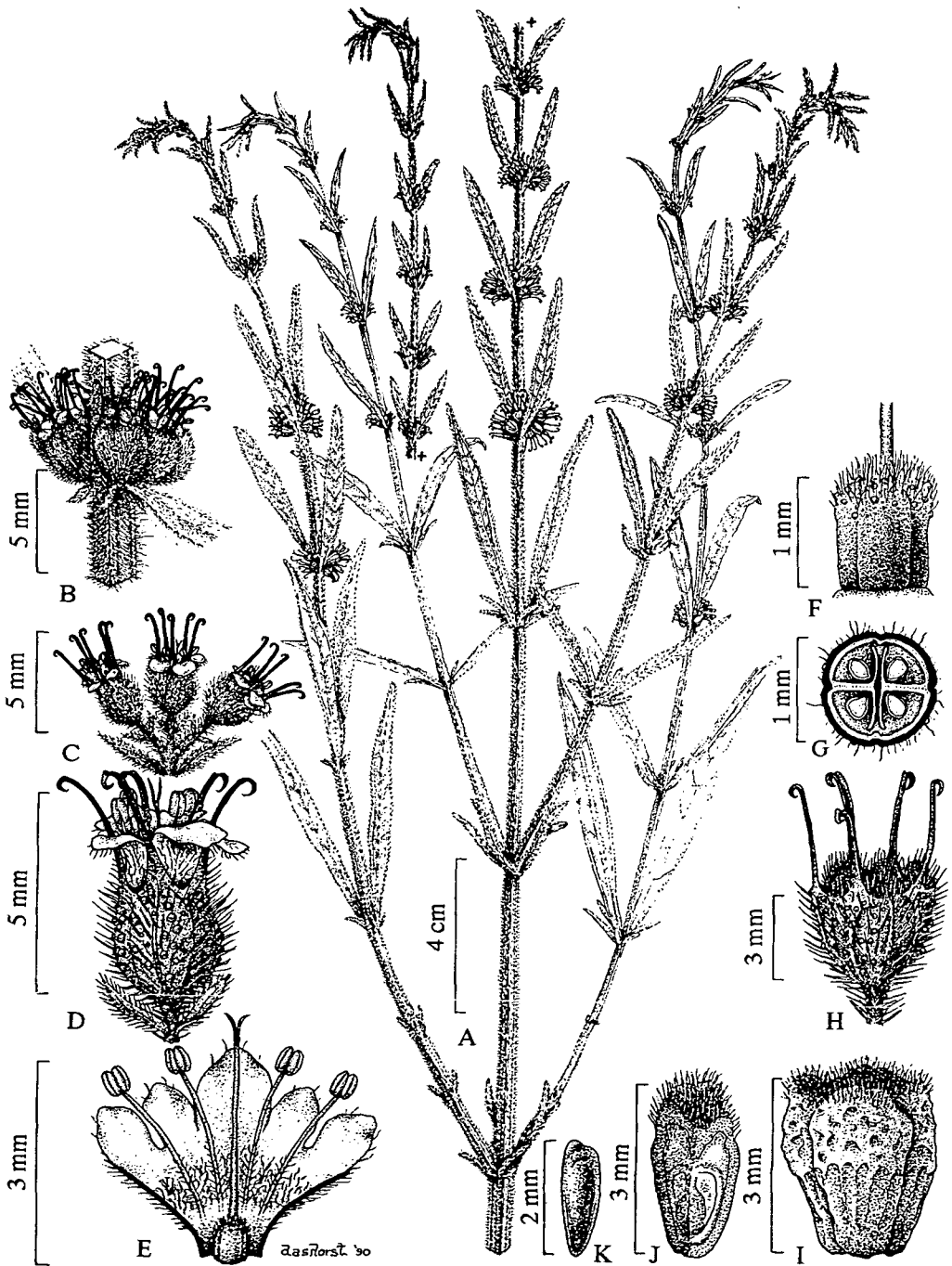


Fig. 1. *Oncinocalyx betchei* F. Muell. (A-K, A.N. Rodd 4069: MEL). A, habit sketch of a flowering branch; B, portion of stem with opposite clusters of cymes; C, cyme showing bracts and bracteoles; D, flower; E, flower with corolla vertically cut open showing androecium and gynoecium; F, ovary; G, transverse section of ovary; H, fruit with persistent calyx; I, naked fruit; J, mericarp; K, seed.

Description (Fig. 1)

Perennial herb or undershrub to c. 1 m tall. *Stem* distinctly tetragonal, grooved, often branched near the base, pubescent, 1.5-4 mm diam. *Leaves* opposite, sessile, linear-subulate, acute, entire, with recurved-revolute margins, (1.5-) 20-60 (-75) mm long, (1.5-) 2-5 (-7) mm wide, pubescent, the upper surface groove above the middle, the lower surface with minute glands concealed by pubescence. *Cymes* almost sessile in the axils of upper leaves. *Flowers* mostly in cluster of 3-5 in the upper leaf-axils, rarely solitary, shortly pedicellate, bracteate, with two minute bracteoles at the base; pedicels glandular and pubescent, 1-3 mm long; bracts linear-subulate, glandular and pubescent abaxially, 2-4 (-5) mm long, c. 0.5 mm wide. *Calyx* tubular below, 5- (sometimes 6- or 7-) lobed above, glandular and pubescent outside the tube, glabrous inside; lobes equal, subulate, strongly hooked, glabrous in the distal half, 1-3 mm long, 1-1.5 mm wide at base; tube obconical, 1.5-2 (-3) mm long, 2-2.5 mm wide at top. *Corolla* white, tubular, 2-lipped, scarcely protruding beyond calyx-lobed, glandular and pubescent outside, villous inside the tube, 4-5 mm long; lower lip 3-fid, with middle lobe larger, elliptic-ovate, acute, 1.5-2.5 mm long, 1-1.5 mm wide, the lateral lobes shorter than the middle one, oblong-ovate, 1-1.5 mm long; upper lip 2-lobed, lobes almost equal, oblong-elliptic, 1.5-2.5 mm long, 1-1.5 mm wide; tube almost cylindrical, 1.5-2.5 mm long, 1-1.5 mm diam. *Stamens* exerted; filaments white, filiform, attached inside the corolla-tube towards base, villous in the lower half, glabrous above, 2.5-4 mm long; anthers reniform, unilocular, bivalved, \pm 0.5 mm long. *Ovary* globose, glandular and pubescent, shortly 4-lobed, 4-locular, with one ovule in each cell attached below the middle, \pm 1 mm diam.; style exerted, filiform, glabrous, 2.5-3 (-4) mm long; stigma subulate, deeply 2-lobed, glabrous, 1-2 mm long. *Fruit* obovoid-globose, 4-lobed, scarcely longer than the persistent calyx, glandular, pubescent (particularly on top), splitting into 4 mericarps, 2-3 mm long, 1.5-2.5 (-3) mm diam. near top.

Specimens examined

AUSTRALIA: NEW SOUTH WALES: *Bates 12601*, Moonbi Gap, 20.xi.1987 (AD); *Betche s.n.*, Namoi River near Gunnedah, -.i.1883 (MEL 583547, lectotype; CAS 31218, F 1252688; photograph of CAS, HBG, K, NSW 145058, NY photograph of CAS - isoelectotypes); *Blakely s.n.*, Kootingal, -.iv.1927 (NSW 145068); *Boorman s.n.*, Gunnedah, -.vi.1907 (BR, CSPU 121595, GH, K, L 90921-611, L 908140-1789, LE, MEL 583546, NSW 145066, NY, NY photograph of CSPU, UPS, W, Z); *Boorman s.n.*, loc. cit., -.viii.1907 (B 2 spec., M, UC); *Boorman s.n.*, loc. cit., -.ix.1910 (L 912184-530, L 92126-13, M, P); *Cabbage 2365*, Nandewar Range, 4.xi.1909 (NSW, SYD); *Cabbage 3594*, c. 3.2 km N Boggabri, 17.x.1912 (NSW, SYD); *Carter s.n.*, c. 9.6 km N Coonabarabran, -.ii.1955 (NSW 145062, NSW 214466, NSW 214467); *Cleland s.n.*, Gunnedah, undated (AD); Council of Shire of Cudgong *s.n.*, Mudgee district, 14.vi.1947 (NSW 145059); *Coveny 2294*, c. 3.2 km NW Boggabri, 8.x.1969 (NSW); *Froggatt s.n.*, Warrah Creek, -.iii.1920 (NSW 145070); *Gauba s.n.*, near Coonabarabran, 9.iii.1954 (CBG 011911); *Harvey s.n.*, Dunedoo, undated (C, NSW); *Irvine 12500*, Singleton, 6.v.1966 (NSW 214468); *Johnson & Briggs BGB 2991*, Mt. Martha, 8 km SW Curlewis, 15.xi.1969 (K, NSW); *Johnson & Briggs LAS 8182*, 1 km W Quirindi, 8.xi.1975 (NSW); *R.I. Johnson s.n.*, Hargraves, -.viii.1961 (NSW 145060); *Jurjens s.n.*, Duri Mountain, 23.i.1973 (NSW 145061); *Porter s.n.*, Manilla, -.xii.1950 (NSW 145069); *Rodd 4069*, Barraba-Bundarra Road, near Ironbark Creek, 37 km from Barraba, 21.xi.1984 (MEL); *Salasoo 2333*, Gilgandra Road, c. 3.2-5 km SSE Coonabarabran, 7.i.1962 (NSW); *"Shire Clerk" s.n.*, Barraba, 26.iii.1929 (NSW 145065); *Sonter s.n.*, c. 6.4-8 km S Bingora, 18.xi.1964 (NSW 89916); *"Stock Inspector" s.n.*, Inverell, 29.v.1934 (NSW 145063); *Waterhouse s.n.*, Gunnedah, -.iii.1914 (NSW 145064); *Young s.n.*, Upper Bingara, -.i.1949 (NSW 145067).

QUEENSLAND: *Fraser s.n.*, Goondiwindi, undated (BRI 267343, BRI 267345, GH); *Thompson s.n.*, Ardenlea, Stanthorpe Shire, 3.xi.1986 (BRI 391845).

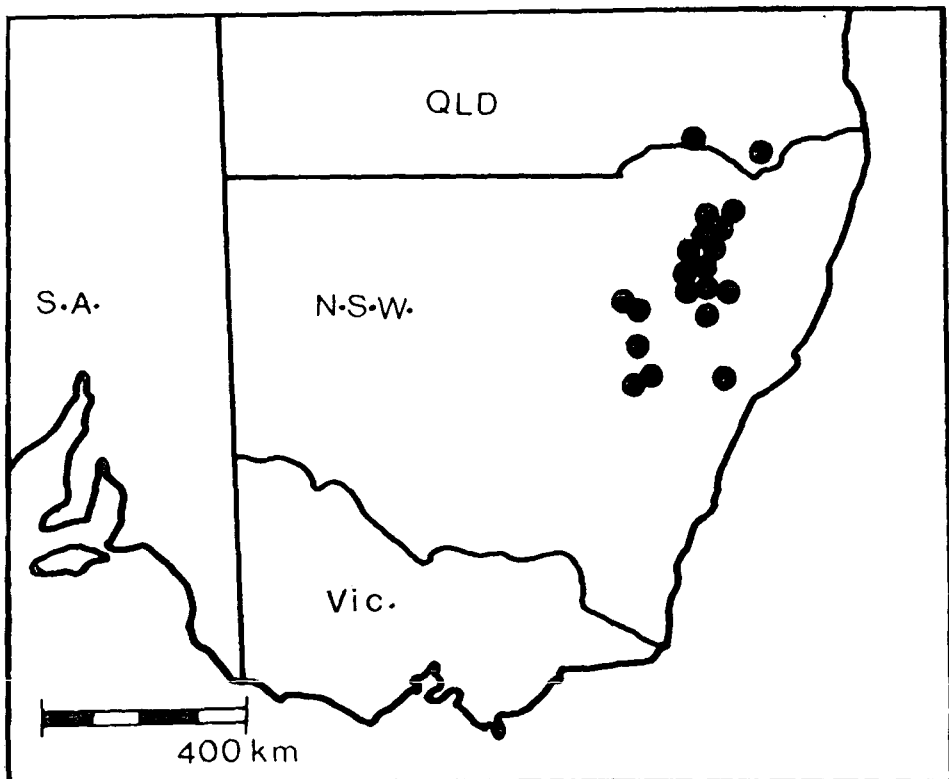
Distribution and ecology (Map 1)

O. betchei is endemic to New South Wales and Queensland in Australia. The major distribution is in New South Wales where it has been recorded from between 29° and 33°S and between 149° and 152°E. Within this range most localities are to the west and north-west of Newcastle and to the east and north-east of Dubbo. The frequency of occurrence is

chiefly along the Namoi River and around the townships of Gunnedah, Boggaberri, Coonabarabran, Mudgee, Tomworth and Bingara.

Distribution in Queensland is along the southern boundary of the State where it has been recorded from near the township of Goondiwindi and Stanthorpe. According to Stanley (1986), this taxon is "restricted to a small area around Goodiwindi in the southern Darling Downs district and adjacent areas of N.S.W."

According to collectors' field notes, this species grows chiefly on "rocky hillside" and "on slopes below conglomerate rocks". It is also recorded from "rock on top of volcanic hill", in "loose stony country", "granite sands by rock outcrop" and on "light sandy soil of natural grazing land". Beadle (1984) "recorded near Tamworth (Loomberah) on "red basalt" in grazing land, and at Goodiwindi (Q) on stony ground."



Map 1. Distribution of the genus *Ocinocalyx* F. Muell.

Comments

One of Harvey's (s.n.) collections of this taxon was identified as "*Ocinocalyx occidentalis* MS", and its locality given as "Dunedin W.A.". According to present investigation, there is no *Ocinocalyx* species published under the name *O. occidentalis*, nor

has the occurrence of this genus in Western Australia been confirmed. As mentioned under the "distribution", this taxon occurs only in mid north-eastern New South Wales and adjacent border areas of Queensland. The locality "Dunedin W.A." could be a mistake for Dunedoo in New South Wales which is well within the distribution range of this species.

Beadle (1984) and Stanley (1986) described the stamens respectively as "enclosed" and "included in corolla". In fact the stamens and style are always exerted in mature flowers of this species. It seems that either Beadle and Stanley saw flower-buds only or they may have been misled by the protologue where stamens were said to be "shorter than corolla". Regarding the number of flowers in a cyme ("group"), Stanley (1986) reported "axillary, solitary or in groups of 2-3". During present studies, however, the flowers were found to be mostly in clusters of 3-5 in the upper leaf-axils. As far as the flower stalk is concerned, Beadle (1984) considers them "sessile", but during present investigations the flowers are found to be with pedicels 1-3 mm long. Flowers in each cluster (cyme) are borne on a very short axillary peduncle. Moreover, each flower has a linear-subulate bract and two minute bracteoles at the base which have not been previously recorded.

Generally, each calyx has 5 lobes, but in *Porter's s.n.* collection (NSW 145069) the number of calyx-lobes range from 5-7 in flowers of the same cluster (cyme). The corolla appears to be shorter than calyx because often it does not protrude beyond the tips of the calyx-lobes. The ovary is 4-lobed but the style is not gynobasic as in the Labiatae or in some Boraginaceae genera.

This species is sometimes considered a nuisance because the hooked calyx-lobes with the enclosed fruit can become attached to the fleece of sheep and are not easily separated.

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