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A TAXONOMIC REVISION OF THE GENUS *CHLOANTHES* (CHLOANTHACEAE)

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Abstract

A taxonomic revision of the genus *Chloanthes* R. Br. is provided. Four species are recognized all typified for the first time. *C. stoechadis* R. Br. var. *parviflora* Benth. is found to be synonymous with the typical variety. The affinities and distribution are considered for the genus and each species. A new key to the species is provided and a detailed revised description of each taxon is supplemented by a habit sketch of a flowering branch and analytical drawings of the flowers.

Taxonomic History of the Genus

The genus *Chloanthes* was described by Robert Brown (1810) for two species, *C. glandulosa* and *C. stoechadis*, which he had collected himself in New South Wales. It was referred to the Verbenaceae where it has been retained by the majority of botanists. Sprengel (1825) placed the genus in Linnaeus' "Didynamia Angiospermia" without reference to any family, and also described a new species, *C. lavandulifolia*, now recognized as a synonym of *C. stoechadis* R. Br. Later, Reichenbach (1828) transferred it to the tribe Verbenae in the Labiatae. Subsequently, Bartling (1830) referred this genus to the tribe Viticeae in the Verbenaceae. This tribe was accepted for the genus by Lindley (1836), Bentham (1870) and Maiden & Betche (1916). Spach (1840) also referred this genus to the Viticeae which he termed a section.

In 1836, Endlicher placed it in the tribe Lippieae in the Verbenaceae, and this was followed by Meisner (1840), Endlicher (1841), Dietrich (1843), and Walpers (1845, 1847). Prior to 1845 the genus comprised two species, to which a new one from Western Australia, *C. coccinea*, was added by Bartling (1845) and another from eastern Australia, *C. parviflora*, by Walpers (1845). In 1847, Schauer for the first time provided a detailed description of this genus, placing it in the tribe Verbenae of the Verbenaceae where it was retained by Lindley (1846, 1847, 1853). Subsequently, Bentham (1870) referred this genus to the predominantly Australian subtribe Chloanthinae ("Chloanthae") of the tribe Viticeae in the Verbenaceae. He also described a new variety, *C. stoechadis* var. *parviflora*, which is recognized here as synonymous with the type variety. In 1876, Bentham & Hooker upgraded the subtribe Chloanthinae to the tribe Chloanthae, without altering the circumscription of its genera. This tribe was accepted for the genus by Bailey (1883, 1890, 1901, 1913), Durand (1888), Post & Kuntze (1904) and Lemée (1943).

Briquet (1895) reclassified the Verbenaceae and upgraded the tribe Chloanthae to a subfamily Chloanthoideae. The latter consisted of three tribes: Achariteae, Chloanthae and Physopsidae, with *Chloanthes* in the tribe Chloanthae. This classification was adopted by Briquet (1896), Dalla Torre & Harms (1904), Junell (1934) and Melchior (1964). Diels & Pritzel (1904) revised the Western Australian Verbenaceae comprising only Bentham & Hooker's tribe Chloanthae. They subdivided the tribe into two subtribes, namely Lachnostachydinae and Chloanthinae, placing *Chloanthes* in the latter. Gardner (1931) retained *Chloanthes* in Briquet's subfamily Chloanthoideae, but within the subfamily he referred it to Diels & Pritzel's subtribe Chloanthinae without mention of the tribe Chloanthae.

Hutchinson (1959) raised the status of Bentham & Hooker's tribe Chloanthae to the family Chloanthaceae, which differed from Verbenaceae (s.str.) chiefly in the albuminous seeds. The new family for the genus was accepted by Bullock (1959, 1960), Takhtajan (1959, 1969), Eichler (1965), Symon (1969), Gardner (1972) and Munir (1975, 1976, 1977). Also in 1959, Moldenke published a résumé of the world Verbenaceae and

referred *Chloanthes* and its allied genera to the family Stilbaceae. Within this family, the genus was retained in the subfamily Chloanthoideae, tribe Chloantheae.

In 1965, Airy Shaw referred all genera of Australian Verbenaceae (s.lat.) with albuminous seeds to the family Dicrostylidaceae Drumm. ex Harv. (nom.nud.), a name mentioned incidentally by Harvey (1855) but not validated. The family name, Dicrostylidaceae, however, has been adopted for the "Australian Verbenaceae" with albuminous seeds by Airy Shaw (1966, 1973), Beard (1970), Moldenke (1971), Maconochie & Byrnes (1971), George (1972) and some others. Nevertheless, in the majority of recent publications, *Chloanthes* and its related genera have been recorded in the Verbenaceae.

In the present revision, *Chloanthes* is retained in the family Chloanthaceae (= Dicrostylidaceae Drumm. ex Harv.).

CHLOANTHES R. Brown

(From Greek *Chloros*, grass green; *anthos*, a flower; alluding to the greenish-yellow flowers of the type species.)

Chloanthes R. Brown, Prod. Fl. Nov. Holl. (1810)513; R. Br. in Flind., Voy. Terra Aust. 2, Append. 3(1814)565; Spreng., Syst. Veg. 2(1825)756; Reichb., Consp. Reg. Veg. (1828)117, no. 2904; Bartl., Ord. Natur. Pl. (1830)180; Spreng., Linn. Gen. Pl. 2(1831)479, no. 2362; Endl., Gen. Pl. 2 (1836)634, no. 3691; Lindl., Natur. Syst. Bot. (1836)278; Meisn., Pl. Vasc. 1(1840)290; Spach, Hist. Natur. Veg. Phan. 9(1840)227; Steud., Nomenc. Bot. 1(1840)352; Dietr., Synop. Pl. 3(1843) 371, no. 2869 – "Chlonanthes"; Walp., Rep. Bot. Syst. 4(1845)57; Schauer in DC., Prod. 11(1847)531; Walp., Rep. Bot. Syst. 6(1847)689; Bocq., Rev. Verbenac. (1863)130; Benth., Fl. Aust. 5(1870)44; Pfeiff., Nomencl. Bot. 1(1873)721; Benth. & Hook., Gen. Pl. 2(1876)1140 p.p. [exclud. *Chloanthes lewellinii* F. Muell. (= *Dicrostylis lewellinii* (F. Muell.) F. Muell.); F. Muell., Fragm. viii: 50]; F. Muell., Syst. Cens. Aust. Pl. 1(1882)103 p.p.; Bail., Synop. Qld Fl. (1883)374; F. Muell., Sec. Syst. Cens. Aust. Pl. 1(1889)172 p.p.; Briq. in Engl. & Prantl, Pflanzenfam. 4, 3a (1895)162; Bail., Qld Fl. 4(1901)1167; Dalla Torre & Harms, Gen. Siphon. (1904)431, no. 7168; Diels & Pritz., Bot. Jahrb. Syst. 35 (1904)523; Post & Kuntze, Lexic. Gen. Phan. (1904)120, 668 p.p.; Ewart, Fl. Vic. (1931)975 p.p.; Gard., Enum. Pl. Aust. Occ. 3(1931)112; Junell, Sym. Bot. Upsal. 4(1934)74; Lemée, Dict. Descrip. Syn. Gen. Pl. Phan. 8b (1943)654; Bullock, Taxon 8(1959)165, 204; Hutch., Fam. Fl. Pl. 1, 2 ed. (1959)397; Mold., Résumé Verben. etc. (1959)404; Burb., Dict. Aust. Pl. Gen. (1963)68; Melch., Engl. Syll. Pflanzenfam. 12 ed. (1964)436 p.p.; Airy Shaw, Kew Bull. 8(2) (1965)256; Blackall & Grieve, W. Aust. Wildfls 3(1965)573; Harris, Alp. Pl. Aust. (1970)140; Mold., Fifth Summary Verben. etc. 2(1971)751; Beadle et al., Fl. Syd. Reg. (1972) 507; Airy Shaw, Willis's Dict. Fl. Pl. & Ferns 8 ed. (1973)244.

Type Species: *C. stoechadis* R. Br., Prod. Fl. Nov. Holl. (1810)513 lectotype. The genus was typified by A.A. Bullock, Kew Bull. 14(1960)41.

Number of Species 4.

Description

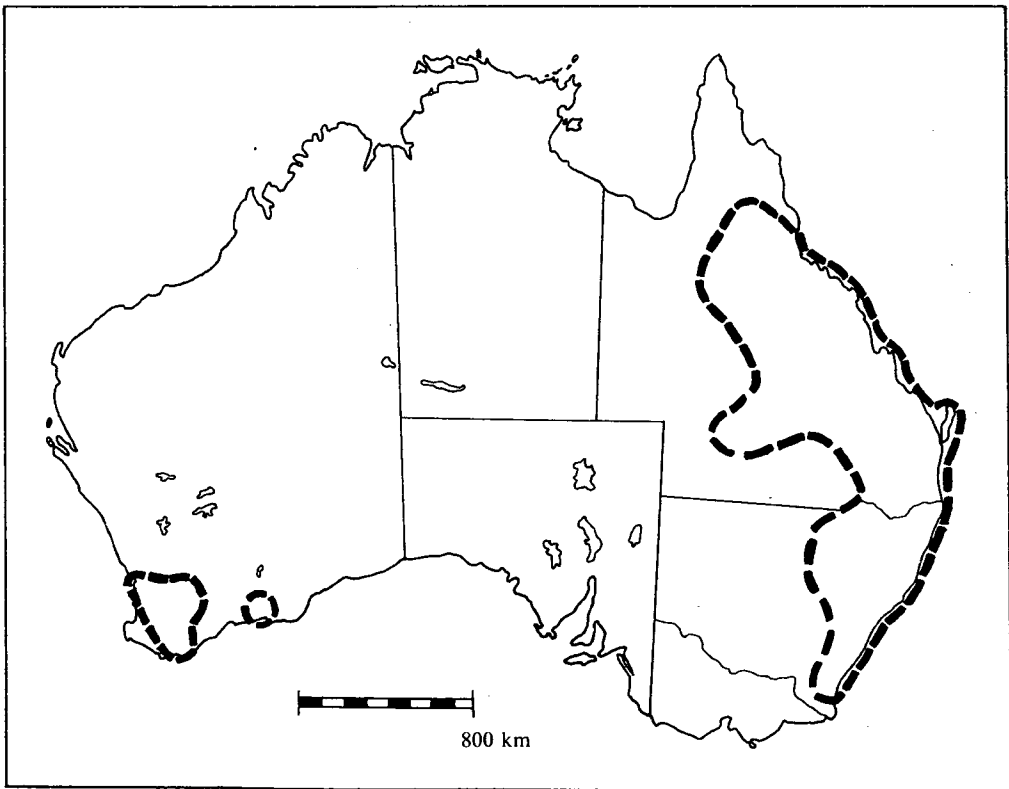
Perennial shrubs or undershrubs. *Stem* erect, branched, cylindrical, solid, woody, tomentose, concealed mainly by the decurrent leaves. *Leaves* cauline and ramal, exstipulate, simple, sessile, reticulate unicostate, decussate or in whorls of three, bullate-rugose and decurrent along the stem. *Flowers* axillary, solitary, bracteate, with two lateral bracteoles, complete, zygomorphic, bisexual, hypogynous. *Calyx* of 5 fused sepals, persistent, deeply 5-lobed, tubular below. *Corolla* of 5 fused petals, caducous, 2-lipped (or unequally 5-lobed in the upper half), tubular below, the upper lip 2-lobed, the lower lip 3-lobed; lobes spreading, the anterior one (i.e. the middle lobe of the lower lip) rather larger than the others; tube elongated, usually curved and dilated upwards. *Stamens* 4,

somewhat didynamous, epipetalous, inserted below the middle of the corolla-tube; filaments filiform, glabrous, the anterior two (i.e. beside the large middle lobe of the lower lip of corolla) longer than the posterior two; anthers dorsifixed, 2-lobed; lobes free and somewhat divergent in the lower halves, without any or with very obscure appendages at the lower end, longitudinally dehiscent. *Ovary* bicarpellary, syncarpous, 4-locular with one axile ovule in each cell; style filiform, glabrous, 2-lobed in the upper half. *Fruit* a dry 4-celled drupe, the endocarp separating into two hard 2-celled nutlets (cocci). *Seeds* solitary in each cell, albuminous.

Distribution (Map 1)

The genus *Chloanthes* is endemic in Australia. Two out of four species, *C. parviflora* and *C. stoechadis*, are restricted to Queensland and New South Wales. The third species, *C. glandulosa*, occurs in eastern New South Wales, and the fourth one, *C. coccinea*, is known from the far south-western part of Western Australia. No records are known from South Australia, Northern Territory, Victoria or Tasmania.

Moldenke (1959, 1971) and Airy Shaw (1966, 1973) erroneously recorded this genus from New Zealand.



Map 1. Distribution of the genus *Chloanthes* R. Br.

Comments

The number of species in *Chloanthes* has been considered to be much higher by a few botanists because many *Pityrodia* species and a few *Dicrasyllis* were described in the past as *Chloanthes*. Bentham (1870) distinguished these genera correctly and transferred most of the species, erroneously described as *Chloanthes*, to *Pityrodia*. F. Mueller (1882, 1889), however, recorded *Pityrodia* as a synonym of *Chloanthes* and transferred all species of *Pityrodia* to the latter, recognizing 19 species. Bentham & Hooker (1876) regarded *Dicrasyllis lewellinii* (F. Muell.) F. Muell. as a 5th species of *Chloanthes* and the same number of species was later mentioned by Durand (1888). Briquet (1895), Dalla Torre & Harms (1904) and Post & Kuntze (1904) each considered the number of species in the genus as 8. Similarly, Pelloe (1921) and Harris (1947) mentioned the number of species as 20 and 19 respectively, whereas Ewart (1931), Melchior (1964) and Airy Shaw (1966, 1973) each regarded the number of species as 10. It seems that F. Mueller's broad concept of this genus influenced the generic concepts of many subsequent authors, who also considered *Pityrodia* and a few *Dicrasyllis* as species of *Chloanthes*. In the present revision, only 4 species are recognized in the genus.

F. Mueller (1876) described *Chloanthes bonneyana* with "*Hemistemon bonneyi* F. M. Coll." as its synonym, both based on Fred Bonney's collection (no. 2, MEL 69138) from across the Darling River. The names *Hemistemon* F. Muell. and *H. bonneyi* F. Muell. were recorded in the Index Kewensis as synonyms of *Chloanthes* R. Br. and *C. bonneyana* F. Muell. respectively. Dalla Torre & Harms (1904) and Airy Shaw (1966, 1973) also recorded *Hemistemon* F. Muell. as a synonym of *Chloanthes* R. Br. Excepting the original description, however, neither F. Mueller nor any other botanist mentioned *C. bonneyana* F. Muell. or *Hemistemon* F. Muell. as belonging to the genus *Chloanthes*. During the present investigation the holotype of *C. bonneyana* F. Muell. has been found not to be *Chloanthes* and is thus excluded from this genus. It is a poor specimen but may be near *Rostellularia* in the Acanthaceae. Both agree in their indumentum being simple and septate; corolla 2-lipped; stamens 2 with similar anthers which are distinctly appendiculate at the lower end and hairy on the back; gynoeceum with similar stigma, style and external ovary characters. Since the type of *C. bonneyana* F. Muell. is without a mature flower or fruit, its identity remains uncertain.

Affinities

Chloanthes is closely related to *Pityrodia* R. Br. in having a 2-lipped corolla, 4 stamens inserted in the lower half of the corolla-tube and a bicarpellary ovary transformed into a completely 4-celled dry fruit. Nevertheless, it can be easily distinguished by its decurrent leaves, lack of appendages to the anthers and longer corolla-tube. The corolla-tube in *C. coccinea* and *C. parviflora* dilates abruptly above the calyx, but in comparison to its width, the tube is longer than in any species of *Pityrodia* R. Br.

Chloanthes is also close to *Denisonia* F. Muell. in having a similar 2-lipped corolla, 4 stamens, axillary solitary flowers towards the end of branches giving the appearance of a spike and non-acrescent fruiting calyces. However, *Denisonia* F. Muell. may be readily identified by its leaves being neither decurrent nor rugose-bullate, corolla-tube rather shorter than the calyx, stamens inserted in the upper half of the corolla-tube and antherlobes divergent in the lower halves.

There are also a few characters shared between *Chloanthes* and *Hemiphora* F. Muell. Both genera have branched tomentum all over the plant, rugose-bullate leaves with recurved margins, axillary solitary flowers towards the end of branches, non-acrescent fruiting calyx, 2-lipped corolla and no appendages to the anthers. Nevertheless, *Hemiphora* F. Muell. can easily be distinguished by its non-decurrent leaves and only 2 fertile stamens.

Key to the Species

1. Stamens and style included (i.e. not extending past top of corolla tube). Lower lip villous inside with a few sparse and short hairs running down into the tube..... 1. *C. parviflora*
 1. Stamens and style exerted. Lower lip glabrous inside or with a few minute hairs (in *C. coccinea*)
 2. Leaves lanceolate or linear-lanceolate with margins scarcely recurved, shortly hispid below, (3.5-) 5-7 (-8) cm x (4-)5-9(-11) mm 4. *C. glandulosa*
 2. Leaves linear-lanceolate to almost terete owing to revolute margins, densely woolly below, less than 4(-5) cm x 3(-5) mm
 3. Corolla greenish-yellow or greenish-blue when fresh; tube gradually dilating upwards (fig. 3). Queensland, New South Wales and doubtfully Western Australia 3. *C. stoechadis*
 3. Corolla scarlet when fresh; tube abruptly dilating immediately above the calyx (fig. 2). Western Australia 2. *C. coccinea*
1. ***Chloanthes parviflora*** Walp., Rep. Bot. Syst. 4(1845)58; Schauer in DC., Prod. 11(1847)532 p.p. exclud.spec. *Lhotzky s.n.* N.S.W.; Benth., Fl.Aust.5(1870)46 p.p. exclud. spec. *Lhotzky s.n.* N.S.W.; F. Muell., Fragm.9(1875)5; F. Muell., Syst.Cens.Aust.Pl.1(1882)103 p.p.; Bail., Synop. Qld.Fl.(1883)374; C. Moore, Cens.Pl.N.S.W.(1884)52 p.p.; Maiden, Proc.Linn.Soc.N.S.W. Sec.Ser.4,(1889)109; F. Muell., Sec.Syst.Cens.Aust.Pl.1(1889)172 p.p.; Bail., Qld.Fl.4(1901)1168; Dixon, Pl.N.S.W.(1906)236; Domin, Bibl.Bot.89(1929)553; Ewart, Fl.Vic.(1931)1975; Mold., Resume Verben.etc.(1959)208; Harris, Alp.Pl.Aust.(1970)140 fig. 229; Mold., Fifth Summary Verben.etc.1(1971)345; Willis, Handb.Pl. Vic.2(1972)581; Beadle et al., Fl. Syd. Reg. (1972)507; Rotherham et al., Fl. Pl. N.S.W. & S. Qld.(1975)49, t.116.

Type: C. E. Hubbard 4328, Broadwater, near Brisbane, 5.x.1930 (BRI neotype designated here: BM, BR, G, K 3 spec., LE, P, NY, S, UPS, US, W - isoneotypes).

Typification

C. parviflora was described by Walpers (1845) on a dried specimen from Australia. At the end of the protologue, he mentioned "crescit in Nova Hollandia (v.s.sp.)" but did not cite any collection, collector's name or number. In 1847, Schauer recorded this species with the description and remarked: "(v.s.sp.orig.h.cl.Lucae Berol.)", which in the opinion of the present author means that Schauer himself saw the original dried specimen in the most renowned "Lucae" Berlin Botanic Gardens, but like Walpers, he too did not cite any details of the type. Elsewhere in his treatment of this species, however, Schauer cited a Lhotzky specimen. Duplicates of a Lhotzky collection are now preserved in Herb. FI, LE and P. These specimens were identified as *C. parviflora* but do not agree with Walper's protologue nor with Schauer's description of this species and are correctly identified as *C. stoechadis* R. Br. There is no possibility, therefore, that these Lhotzky's specimens are types of *C. parviflora* Walp.

During the present investigation, *Chloanthes* material has been examined from 39 herbaria, including Herb. B and G, but no specimen annotated in Walpers' hand or containing any indication of being Walpers' type has been found. According to Stafleu (1967) Walpers' own herbarium and many of the types of his new taxa were sold after his death and their present location is not known. In view of these facts, it seems very likely that the original specimen (i.e. the type) seen by Schauer in the Botanic Gardens, Berlin, was destroyed during the war and is not extant. A neotype is, therefore, selected here.

The specimen collected by Hubbard (No. 4328), now preserved in Herb. BRI, is very typical of this species, conforms in all details with Walpers' description, and is, therefore, designated here as the neotype.

Description (Fig. 1)

A shrub 30-75 (-90) cm high. *Stem* often with several branches arising from a common stock. *Leaves* pale green, linear or almost terete owing to the revolute margins, (1-) 1.5-3.5 (-4) cm long, 2-4 (-5) mm broad, rugose-bullate above, densely white woolly underneath; bullae tuberculate or muricate, the woolly undersurface often concealed by the revolute margins. *Flowers* shortly pedicellate; pedicel 1-2 (-3) mm long, woolly or pubescent with branched septate hairs; bracts leafy, sessile, linear or linear-lanceolate with revolute margins, 1-2.3 cm long, 1.5-3 mm broad, rugose-bullate above, woolly underneath, bullae pubescent, somewhat tuberculate or muricate; bracteoles sessile, linear or almost terete owing to the revolute margins, 5-10 mm long, c. 1 mm broad, rugose and pubescent above, woolly underneath. *Calyx* deeply 5-lobed, with a very short tube, 8-13 mm long, glandular and pubescent outside, pubescent on the inner face of the lobes as well, glabrous inside the tube; lobes linear or oblong-linear, with the margins revolute in the upper halves, slightly recurved in the lower halves, 7-10 mm long, 1.5-2 mm broad at the base; tube 1-2 (-3) mm long. *Corolla* pale mauve with purple spots in throat and tube, 1.5-2.5 (-3.2) cm long, glandular and pubescent outside, hairy (villous) inside on the lower lip with a few sparse and short hairs running down into the tube, a dense hairy ring inside the tube above the ovary; the anterior lobe of the lower lip much larger than the other 4-lobes, broadly elliptic or almost orbicular in outline, 8-12 mm long, 10-11 mm broad at the base; the other 4-lobes almost elliptic-oblong or ovate, 4-6(-8) mm long, 3-5(-6) mm broad at the base; tube short, abruptly dilated above the calyx, narrow towards the base, 10-15 (-20) mm long. *Stamens* 4, included, filaments (3-) 4-7 (-9) mm long; anthers more or less orbicular in outline, 1-1.5 mm long, 0.5-1 mm broad; lobes with a minute tubercle at the lower end. *Ovary* globose, c. 1 mm in diameter, densely tomentose; style included, 10-15 (-18) mm long, distinctly 2-lobed at the summit, lobes 1-2 mm long. *Fruit* oblong-obovate, occasionally almost orbicular in outline, slightly compressed, notched at the apex, puberulous with faint reticulation all over, 3-5 mm long, 2.5-3 (-4) mm broad; nutlets oblong-cylindrical.

Representative specimens

QUEENSLAND (65 specimens seen): *Althofer s.n.*, 22.5 km on Jericho — Blackall road, 11.xii.1968 (NSW 135854) *Blake 4091*, Caloundra, sandy places near creek, 23.viii.1932 (BRI). *Clemens s.n.*, base of Mt. Norman, 10.x.1944 (A, BRI 190686, NY, US). *Dallachy s.n.*, Rockingham Bay, May, 1869 (K 2 spec., MEL 69191-3&69167, NSW 135847). *Domin 8097, 8098, 8099, & 3201*, in collibus Dividing Range dictis inter opp. Jericho et Alpha, March, 1910 (PR 4 spec.). *Everist 8043*, Isa Gorge about 18 miles SW of Theodore, 25° 09'S, 149° 57'E, 28.ix.1968 (BRI, CANB, NSW). *Gittins 365*, Expedition Range, August, 1960 (BRI). *Gittins S/12*, ca. 25 miles WSW of Duaringa, July, 1964 (NSW 135853). *Hubbard 4328*, Broadwater, near Brisbane, 5.x.1930 (BRI NEOTYPE: BM, BR, G, K 3 spec., LE, P, NY, S, UPS. US. W-isoneotypes). *Hubbard 4554*, Fraser Island, 18.x.1930 (BRI, K). *Johnson 1136*, 12 miles SSE of Bluff, Blackdown Tableland, 23.ix.1959 (BRI). *Lebler & Baxter 1088A*, Helidon Hills, about 4 miles NW of Helidon, 5.ix.1968 (BRI). *Lovell s.n.*, Sandy Cape, Fraser Island, August, 1892 (BRI 190683). *Michael s.n.*, Salisbury near Brisbane 1832 (A). *Phillips s.n.*, Currimundi Creek at Golden Beach, 26° 46'S, 153° 07'E, 13.viii.1963 (CBG07145). *L. S. Smith & Everist 962*, ca 10 miles ESE of Lancevale, 23.x.1940 (A, BRI, MEL). *Telford 1955*, Witts Lookout, Paluma Range, 24.v.1970 (CBG). *White s.n.*, Fraser Island, Wide Bay, October, 1921 (A, BRI 190682). *Williams 72038*, Cooloola, 2.4 km S of Camp Como, 19.vii.1972 (BRI).

NEW SOUTH WALES (61 specimens seen): *Alee 67a*: NNE of Mongarlowe, 5.xi.1970 (NSW). *Bailey s.n.*, near Woodburn, Casino Forest, September, 1944 (NSW 135846). *Boorman s.n.*, Stockout Creek, Coledale Rd., October, 1909 (F 287164, MO 823149, NSW 135851). *Boorman s.n.*, Charlies Forest near Braidwood, September, 1915 (AD 97608118, BRI 190685, C, NSW 135852 & 135844, SYD, US 917461). *Burgess s.n.*, 29 miles from Braidwood, on the road to Nowra, 13.x.1969 (AD 97122161, CBG 031405, NT 27442) *Chippendale & Constable s.n.*, Goonoo State Forest, Dubbo—Mendooran, 25.ix.1957 (NSW 17393, US 2038458). *Conabere 333*, Red Rock, 9.x.1971 (NSW). *Forsyth s.n.*, Warrumbungle Range, October, 1899 (E, F 876724, G 2 spec., K NSW 135850, W 3642). *Johnson & Constable s.n.*, Etoo Creek, NE of Gwabegar, 3.xi.1954 (MO 1730067, NSW 30350). *Maiden & Boorman s.n.*, Grafton to Dalmorton, November, 1903 (BRI 190694, NSW 135840). *Rodd & McGillivray 1111*, 2 miles NNW of Mt Coricudgy E of Rylstone, 25.iv.1965 (NSW). *Rodway 2574*, 12 miles S of Nerriga, 19.ix.1937 (A, BRI, K). *Rupp 14*, Warialda, July, 1905 (NSW). *Streimann 185 & Telford s.n.*, 36 km ESE of Cooma, Upper Tuross River, 17.ix.1973 (CBG 050043, MEL).

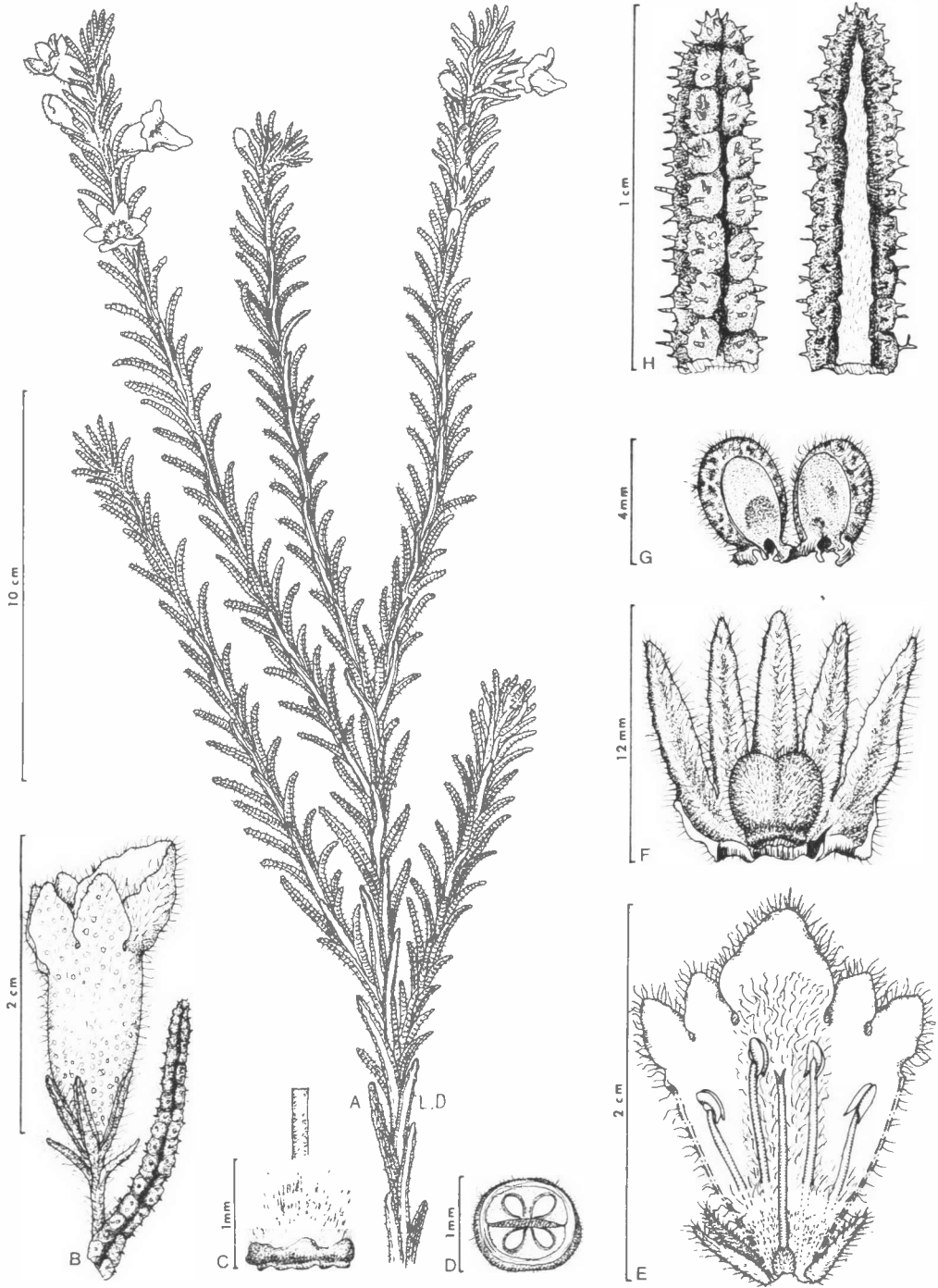
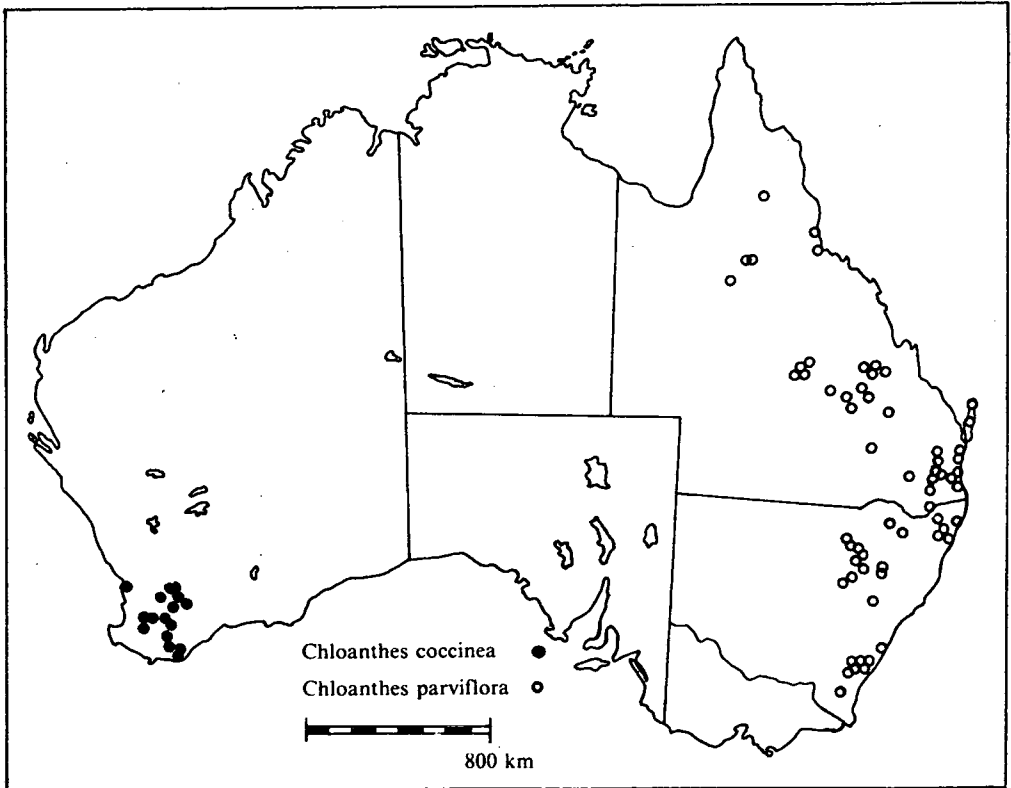


Fig. 1 *Chloanthes parviflora* Walp. (T. L. Ryan 00009: BR1). A, flowering twig; B, flower with bract and bracteoles; C, ovary; D, transverse section of ovary; E, flower with calyx and corolla cut open to show androecium, gynoecium and the villous lower lip; F, persistent calyx opened to show fruit; G, fruit split to show the 2 nutlets; H, adaxial and abaxial view of portions of leaf.

Distribution (Map 2)

C. parviflora is endemic in Queensland and New South Wales. The distribution in Queensland is chiefly in the eastern and south-eastern parts with a few inland localities around Jericho and Mt Norman. In the northern parts of the state, it has been recorded from the Blackdown Tableland, Halifax Bay and Rockingham Bay. Southwards, it is sparsely distributed to the west-south-west of Rockhampton, but is fairly common around Brisbane and Toowoomba. A few collections are also known from Fraser Island and the coastal area between Fraser Island and New South Wales border.

In New South Wales, distribution is restricted to the east of longitude 145°. The main northern localities are around Grafton, north of Coffs Harbour, and in the Pilliga Scrub area to the south-west of Narrabri. Moreover, a few scattered localities are to the north-north-west of Dubbo. In the south, it seems fairly common between Braidwood and Nerrigā with one record from the upper part of the Tuross River and another one from south of Sydney.



Map 2. Distribution of *Chloanthes coccinea* Bartl. and *C. parviflora* Walp.

Comments

Ewart (1931) included this species in his 'Flora of Victoria' with the remark: "very rare, if native." In this respect, Willis (1972) pointed out that "the only voucher specimen in Melbourne Herbarium came last century and is labelled "near Swan Hill"; if the species ever did occur in Victoria, it is presumed to have vanished long since." No Swan Hill specimen was included in the loan from Herb. MEL, and no collection of any species of *Chloanthes* is known from Victoria. The presence of this genus in that state has, therefore, not been confirmed.

According to Maiden (1889), *C. parviflora* occurs in the most southern limits of Clyde and Braidwood districts in New South Wales, where the sandstone formation ends. This species is common in that area, but its present distribution limit extends as far south as the upper part of the Tuross River.

Bentham (1870) was uncertain about the colour of the flower which is always mauve, purple or light blue in this species. The confusion was apparently due to his inclusion here of Lhotzky's specimen which is yellow flowered and belongs to *C. stoechadis* R. Br. Previously, the same specimen had apparently been cited under *C. parviflora* by Schauer (1847), and Bentham (1970) may not have re-examined its identification sufficiently critically.

Affinities

This species is nearest to *C. coccinea* in its broad corolla-tube being abruptly dilated above the calyx. However, *C. parviflora* can be easily distinguished by its leaves being more densely woolly underneath; corolla mauve with purple spots in throat and tube; lower corolla-lip villous inside; and stamens and style included. Moreover, *C. parviflora* is restricted to the eastern states while *C. coccinea* is endemic in the south-west of Western Australia. *C. parviflora* is also related to *C. stoechadis* in having similar leaves with dense white woolly tomentum underneath and almost the same general distribution. The latter, however, may be readily identified by its yellow flowers, narrow corolla-tube gradually dilated upwards, and exserted stamens and style.

2. ***Chloanthes coccinea*** Bartl. in Lehm., Pl. Preiss. 1(1845)352; Walp., Rep. Bot. Syst. 6(1847)689; Schauer in DC., Prod. 11(1847)531; F. Muell., Fragm. 6(1868)156; Benth., Fl. Aust. 5(1870)46; F. Muell., Fragm. 9(1875)5; F. Muell., Syst. Cens. Aust. Pl. 1. (1882)103; F. Muell., Sec. Syst. Cens. Aust. Pl. (1889)172; Diels & Pritz., Bot. Jahrb. Syst. 35(1904)524; Pelloë, Wildfls West. Aust. (1921)27; Domin, Mem. Soc. Sc. Bohème 1921-22, 2(1923)106; Gardner, Enum. Pl. Aust. Occ. 3(1931)112; Mold., Résumé Verben. etc. (1959)208; Blackall & Grieve, West. Aust. Wildfls 3(1965)573; Beard, Descrip. Cat. W. Aust. Pl. 2 ed. (1970)113; Mold., Fifth Summary Verben. etc. 1(1971)345; Gardner, West. Aust. Wildfls B(1972)166; Gardner, Wildfls West. Aust. 12 ed. (1975)120.

Type: L. Preiss 2339, Hay district, Western Australia, 7.xi.1840 (GOET lectotype designated here; BR, FI, HBG, KW, LD, LE, M, MEL, MO, P, W 2 spec. — isoelectotypes).

Typification

C. coccinea Bartl. is based on L. Preiss's collection no. 2339, consisting of at least thirteen duplicates. Since the author did not choose any one of them as a type, it is, therefore, necessary to select a lectotype for this name. The syntype preserved in Herb. GOET, where Bartling's herbarium and types are now housed (Stafleu, 1967), was annotated by Bartling and almost certainly used by him in preparing the original description of this species. The specimen is particularly complete and well preserved. It is, therefore, chosen here as the lectotype for this species.

In the protologue the date of collection for the type is given as 7 November, 1840, and the labels of several syntypes (Herb. HBG, LD, LE and MO) bear this date. The date recorded on the label of the lectotype (in GOET) and a syntype in Herb. P is, however, 1843 and, further, the syntypes in Herb. FI and BR are dated 1846 and 1847 respectively. As Preiss left Australia in 1842 the dates of the syntypes in Herb. BR, FI and P probably refer to the year of communication of the specimens to these herbaria.

Description (Fig 2)

A branched shrub about 25-60 cm high. *Leaves* narrow-linear or almost terete owing to the revolute margins, obtuse, (0.8-)1-2.5 (-3) cm long, 2-3 (-4) mm broad, coriaceous, distinctly bullate-rugose above, very woolly underneath, bullae in two or four longitudinal rows, slightly tuberculate or mucronate, shining, the white woolly under-surface usually concealed by the revolute margins. *Flowers* collected into short leafy spike-like clusters near the summit of the branches, shortly pedicellate; pedicel 2-3 (-4) mm long, sparsely glandular and puberulous; bracts leafy, sessile, linear-oblong, bullate and sparsely pubescent on the upper (i.e. inner) surface, densely white woolly underneath, revolute along the margins, 8-11 mm long, 2-2.5 mm broad; bracteoles opposite, sessile, linear-oblong, 4-6 mm long, 1-1.5 mm broad, more or less purplish, pubescent outside (i.e. underneath), glabrous inside. *Calyx* deeply 5-lobed, rarely 6-lobed, 10-13 mm long, glandular and pubescent outside with a few hairs on the inner distal parts of the lobes, glabrous inside; lobes broadly lanceolate with margins bullate and recurved, 6-8 (-9) mm long, 2-3 (-4) mm broad at the base; tube 2-3 (-5) mm long. *Corolla* scarlet, 2.5-3.5 cm long, glandular and pubescent outside, glabrous inside excepting the dense hairy ring above the ovary, and with minute hairs extending to the large anterior-lobe; the (two) lobes of the upper lip oblong-ovate, obtuse, (3-) 4-6 mm long, 2-4 (-5) mm broad at the base; the two lateral lobes of the lower-lip oblong-ovate, 4-7 (-8) mm long, 3-5 mm broad at the base; the anterior-lobe of the lower lip almost orbicular, 8-10 mm in diameter; tube almost cylindrical towards the base, abruptly dilated above the calyx, 1.5-2 cm long, 8-10 mm in diameter in the upper half. *Stamens* 4, exserted; filaments (8-) 11-15 mm long; anthers 1-1.5 mm long, 0.5-1 mm broad. *Ovary* more or less globose, 1-2 mm in diameter, densely tomentose; style exserted, 2-2.5 cm long. *Fruit* more or less globose, 3-5 mm long, 3-4 mm in diameter, pubescent.

Specimens examined

WESTERN AUSTRALIA: *Ashby s.n.*, Lake Grace to Newdegate Road, 10.vii.1963 (AD 96428135). *Ashby 247*, Tarin Rock, west of Lake Grace, 12.viii.1963 (AD). *Ashby 1292*, Tarin Rock, 26.x.1964 (AD). *Ashby 1952*, loc. cit., 7.ix.1966 (AD). *Ashby 1984*, Duggan, 30 km west of Lake Grace, 3.x.1960 (AD). *Ashby 3634*, Tarin Rock, 9.ix.1970 (AD). *Ashby 5250*, loc. cit., 11.ix.1975 (AD). *E. Ashby s.n.*, Kondinin to Wagin, Sept. 1930 (ADW 14618, NSW 135856). *E. Ashby 2701*, Kondinin to Wagin, Sept. 1930 (BM). *Brewer s.n.*, loc. incert., 1878 (UC). *Broadbent 133*, Duggan, 19.x.1952 (BM). *Clyne s.n.*, Narrogin towards Lake Grace, 11.x.1969 (NSW 135855). *Cronin s.n.*, Sources of the Blackwood River, 1888-9 & 1892 (MEL 69145, 69147-8). *Cronin s.n.*, Lake Wagin, N. of King George's Sound, 1890 (MEL 69235). *Drummond Coll. III no. 142*, "Swan River", 1844 (BM, CGE, FI, G 2 spec., GH, K, KW, MEL, W). *Drummond 97*, loc. incert., undated (MEL 69141-2). *Drummond s.n.*, loc. incert., undated (MEL 69143-4). *Knight s.n.*, Gordon River, undated (MEL 69149). *Kuchel 2008*, 15 km north-east of Kukerin, 20.ix.1964 (AD). *Lukin s.n.*, Fremantle, 1874 (MEL 69146). *Meebold 6896*, Broomehill, Etna Farm, Nov. 1928 (BR, M 2 spec.). *F. Mueller s.n.*, Gordon River, 9.ix.1894 (C, M, MEL, NY, W). *Muir s.n.*, 100 miles north of Stirling Range, 1879 (MEL 69237). *Preiss 2339*, district Hay, 7.xi.1840 (GOET lectotype; BR, FI, HBG, KW, LD, LE, M, MEL, MO, P, W 2 spec.). *Resch s.n.*, Armadale district, "Spring" 1956 (MEL 69150). *Rogerson 61*, between Kulin and Jitarning, Dec. 1961 (MO). *D. Smith s.n.*, Bridgetown to Kojunup and Slab Hut Gully, 1910 (K, PR 530707). *Vaughan s.n.*, near King George's Sound, 1901 (BM). *Walter s.n.*, Blackwood River, undated (NSW 135857). *Webb s.n.*, King George's Sound, 1880 (MEL 69238). *Whibley 3340*, between Kulin and Corrigin, 22.x.1969 (AD). *Whibley 5306*, 25 km west of Lake Grace near Tarin Rock, 11.xi.1974 (AD).

Distribution (Map 2)

This species is endemic in the far south-west of Western Australia. The main areas of its occurrence are in the South Western Province of Gardner and Bennetts (1956) where it seems to be restricted between latitude 32° and 35° S. and between longitude 116° and

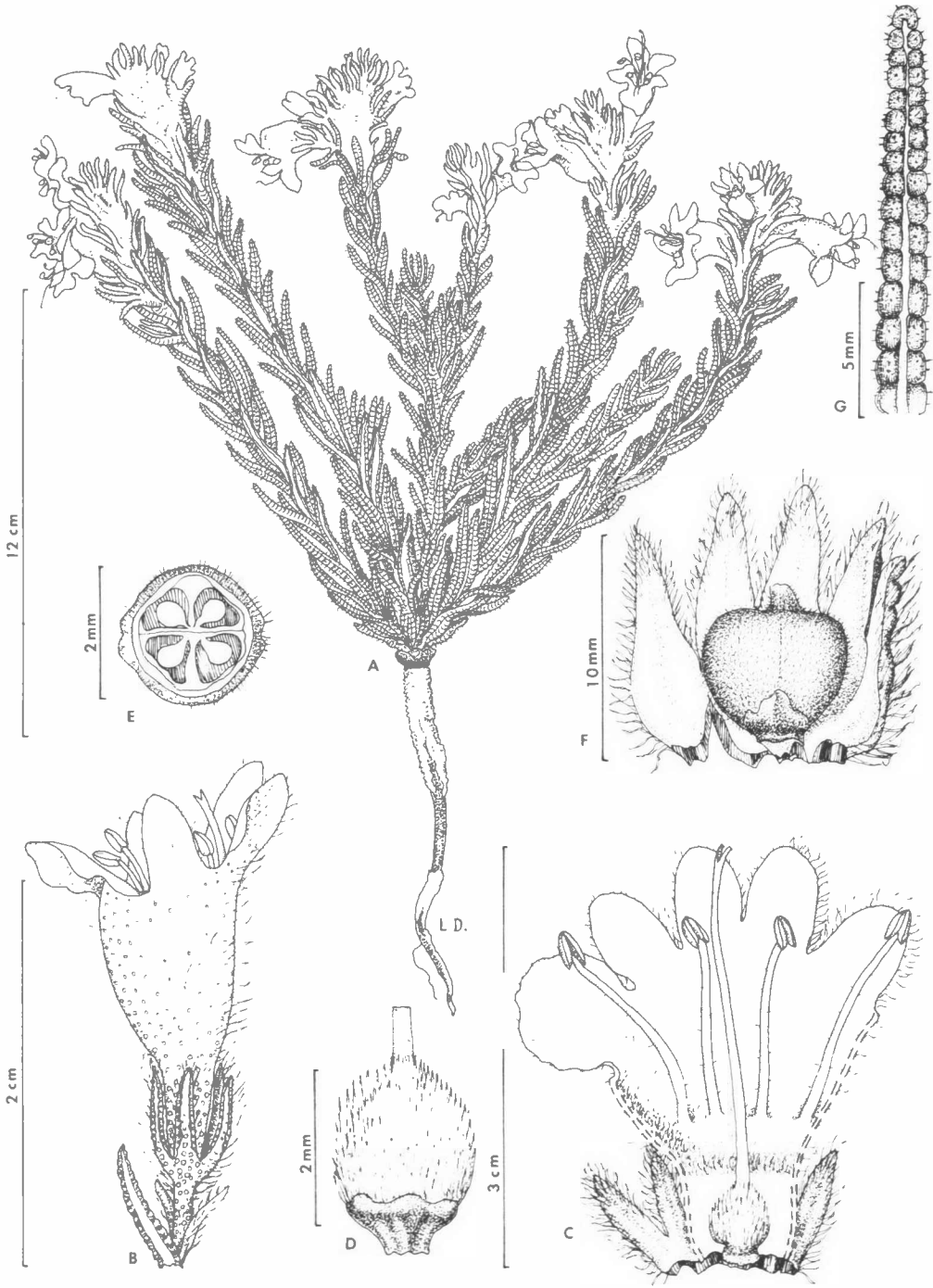


Fig 2. *Chloanthes coccinea* Bartl. (R. H. Kuchel 2008: AD). A, habit drawing; B, flower with bract and bracteoles; C, flower with calyx and corolla cut open to show androecium and gynoecium; D, ovary; E, transverse section of ovary; F, persistent calyx opened to show fruit; G, abaxial view of portion of leaf.

119° E. It is common between Lake Grace and Kukerin and between Corrigin and Kulin. In the south, the distribution is mainly between Katanning and King George's Sound with a few localities between Bridgetown and Kojonup.

Comments

The size of plant is not mentioned in the original description nor by any collectors. Plant height given here is, therefore, estimated from the herbarium specimens examined. Bentham (1870) probably did the same when he recorded it as a "shrub of about 1 to 2ft."

The locality recorded for *Drummond Coll. III no. 142* is "Swan River" where this species has not otherwise been collected. It was probably gathered far to the south-east of the Swan River near the Stirling Range or the Porongurups Range where this species is known to occur commonly and which area was visited by Drummond during his third collecting expedition in 1844 (Erickson, 1969). The dates on the duplicates of this collection also refer to the years of their distribution.

C. coccinea is the only geographically disjunct species, separated by over 2,500 km to the west from the main distribution area of the genus.

Affinities

C. coccinea is closely related to *C. parviflora* in its broad corolla-tube being abruptly dilated above the calyx. Nevertheless, it may be readily identified by its leaves being more rigidly and regularly bullate above, less densely tomentose beneath; corolla scarlet with the lower-lip glabrous inside; and stamens and style exserted. *C. coccinea* is endemic in the far south-west of western Australia whereas *C. parviflora* is restricted to eastern New South Wales and Queensland.

3. ***Chloanthes stoechadis*** R. Br., Prod. Fl. Nov. Holl. (1810)514; Spreng., Syst. Veg. 2(1825)756; Walp., Rep. Bot. Syst. 4(1845)57; Schauer DC., Prod. 11(1847)532; Bocq., Rev. Verben. (1863)131, pl.111, figs 15-24; F. Muell., Fragm. 6(1868)156; Benth., Fl. Aust. 5(1870)45; F. Muell., Syst. Cens. Aust. Pl. 1(1882)103; Havil., Proc. Linn. Soc. N.S.W. 2 Ser. 1(1886)1051; F. Muell., Sec. Syst. Cens. Aust. Pl. 1(1889)172; Briq. in Engl. & Prantl, Pflanzenfam. 4, 3a(1895)162, fig. 61 E & F; Dixon, Pl. N.S.W. (1906)236; Petrie, Proc. Linn. Soc. N.S.W. 37 (1912)229; Petrie, Proc. Linn. Soc. N.S.W. 50(1925)159; Junell, Sym. Bot. Upsal. 4(1934)74, fig. 124a-d; Harris, Wild Fls Aust. (1947)159, t. 12; Mold., Résumé Verben. etc. (1959)208, 211; Mold., Fifth Summary Verben. etc. 1(1971)345; Beadle et al., Fl. Syd. Reg. (1972)507.

Type: R. Brown s.n., Port Jackson, New South Wales, Australia, 1802-5 (BM lectotype designated here; E 7 spec., F, G, K 2 spec., LE 2 spec., MEL 2 spec., P 5 spec. — isolectotypes).

C. lavandulifolia Sieber ex Spreng., Syst. Veg.2(1825)756; Steud., Nomen. Bot.1(1840)352; Walp., Rep.Bot.Syst.4(1845)58.

Type: Sieber 185, Novae Hollandiae, 1823 (BM, BR, FI, G, GH, HEID, K, LE, 2 spec., M 2 spec., MEL 2 spec., PR, W 4 spec. — syntypes).

C. stoechadis R. Br. var. *parviflora* Benth., Fl.Aust.5(1870)46; Bail., Qld Fl.4(1901)1168; Maiden & Betch, Cens N.S.W.Pl.(1916)177; Mold., Résumé Verben. etc.(1959)208; Mold., Fifth Summary Verben. etc.1(1971)345. *Syn.nov.*

Type: A. Cunningham 40, Woolloomooloo, N.S.W., vii.1817(K syntype); *Mossman 119*, Waverley Hills, Sydney, 1850(BR1, E, FI, K, LE, P — syntypes).

"*C hispida* Burges": Mold., Résumé Verben. etc. (1959) 208, 274; Mold., Fifth Summary Verben. etc. 1 (1971)345, 467, nom.nud. (Based on A. Burges's collection (s.n.) gathered in October, 1931, from (Sydney) National Park, now preserved in Herb. NY).



Fig. 3 *Chloanthes stoechadis* R. Br. (R. Brown s.n.: E). A, flowering twig; B1, & B2, adaxial and abaxial views of an enlarged leaf portion; C, flower with bract and bracteoles; D, flower with calyx and corolla vertically opened to show androecium and gynoecium; E, persistent calyx opened to show fruit; F, fruit split to show the 2 nutlets; G, ovary; H, transverse section of ovary.

"*C. rosmarinifolia* A. Cunn.": Mold., Résumé Verben. etc. (1959) 208; Mold., Fifth Summary Verben. etc. 1 (1971) 345, nom.nud. (Probably based on an Allan Cunningham collection from New South Wales, but this has not been located).

C. parviflora auct. non Walp.: Schauer in DC., Prod. 11 (1847) 532 p.p. quoad spec. *Lhotsky s.n.*, N.S.W.; Benth., Fl. Aust. 5 (1870) 46 p.p. quoad spec. *Lhotsky s.n.*; F. Muell., Syst. Cens. Aust. Pl. 1 (1882) 103 p.p.; Moore, Cens. Pl. N.S.W. (1884) 52 p.p.

Typification

C. stoechadis R. Br. is based on R. Brown's collection (s.n.) from New South Wales, consisting of at least 21 duplicates, all of which remained in Brown's possession until after his death. On his death, his herbarium passed by bequest to J. J. Bennett who kept it at the British Museum and began the distribution of duplicates (Stearn, 1960). The main and probably the best set was retained at the British Museum and the second and third sets went to Kew and Edinburgh herbaria (Stafleu, 1967). A syntype of this species in Herb. BM was annotated by R. Brown and almost certainly used by him in preparing the original diagnosis of this species. The specimen is particularly complete and well preserved and is therefore selected here as the lectotype for this species. The number 2334 was given to this collection by Bennett.

Description (Fig 3)

Branched shrub 30-60 (-90) cm high. *Leaves* narrow-linear, linear-lanceolate or almost terete owing to the revolute margins, (0.5-) 1-4(-5) cm long, (1-)2-3(-5) mm broad, rugose-bullate above, with bullae scabrous-muricate owing to the thick basal portions of the broken off septate hairs, white woolly underneath. *Flowers* sub-sessile or on very short pedicels; pedicel 1-3 (-4) mm long, pubescent; bracts leafy, sessile, linear-lanceolate with revolute margins, 8-17 mm long, 1.5-3 mm broad, rugose-bullate above, woolly underneath, bullae pubescent, somewhat scabrous-muricate; bracteoles sessile, linear, with recurved margins, 3-6 mm long, c. 1 mm broad near the base, slightly rugose above and along the margins, sparsely pubescent all over. *Calyx* deeply 5-lobed with a relatively short tube, (7-)9-13 mm long, glandular and densely tomentose outside, pubescent on the inner face of the lobes, glabrous inside the tube; lobes lanceolate or ovate-lanceolate, recurved-revolute along the margins, bullate, 5-7 (-9) mm long, 1.5-2(-3) mm broad; tube 2-4 mm long. *Corolla* greenish-yellow, or greenish-blue (1.8-) 2-3.5 (-4.5) cm long, sparsely glandular and pubescent outside, glabrous inside except a ring of dense woolly hairs above the ovary; the upper lip somewhat concave, comprising two short spreading lobes, (4-)6-10 (-12) mm long; lobes ovate or ovate-orbicular, obtuse, (2-) 3-5 mm long, 2-4 (-5) mm broad at the base; the lower lip divided into three spreading lobes, lobes oblong-ovate or more or less elliptical, the middle one rather longer and more reflexed than the others, (6-) 8-13 mm long, (3.5-) 4-6 (-8) mm broad at the base, the other two lobes 4-7 (-9) mm long, 2.5-4 (-5) mm broad at the base; tube gradually dilated upwards, (1.5-) 2-3 cm long. *Stamens* 4, exserted, filaments (5-) 10-15 (-23) mm long; anthers ± oblong, 1.5-2 mm long, c. 1 mm broad. *Ovary* more or less globose, 1 mm long, 1-1.5 mm in diameter, densely tomentose; style much exserted, (1.8-) 2-3.5 (-4.5) cm long, distinctly 2-lobed at the summit, lobes 1.5-2.5 (-3) mm long. *Fruit* broadly elliptic-obovate, slightly compressed, separating into two hemispherical reticulate hairy cocci (nutlets), (3-) 4-5 mm long, 4-5 mm across in the upper half.

Representative specimens

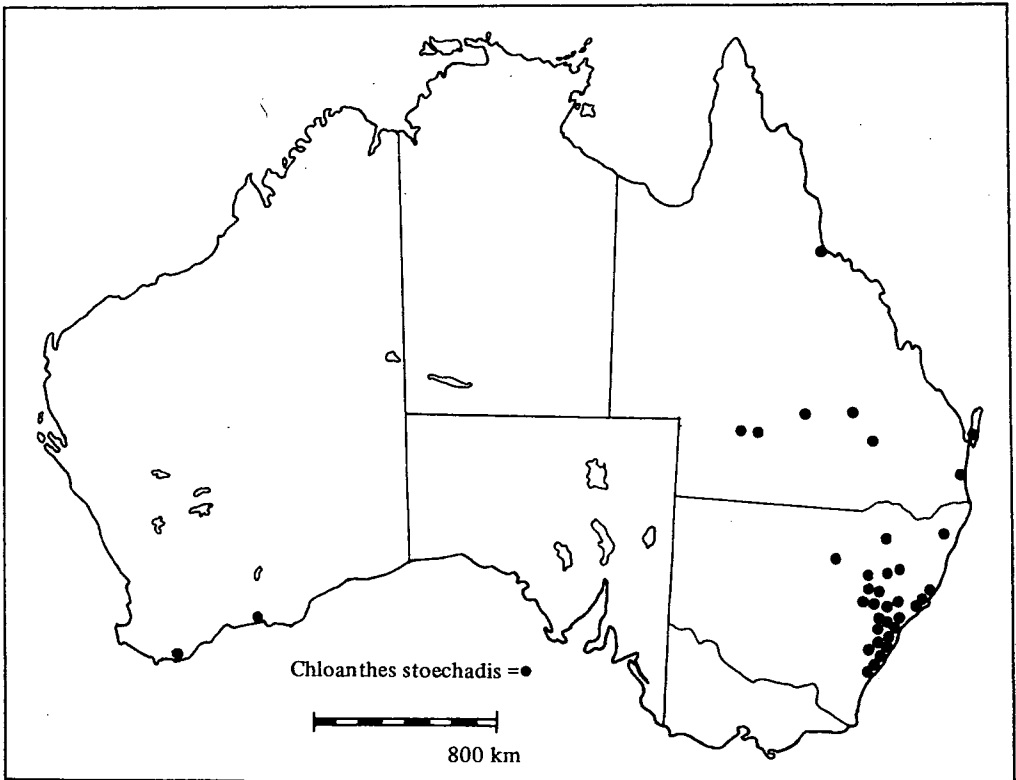
WESTERN AUSTRALIA: *Hügel s.n.*, King George Sound, undated (W). *Maiden s.n.*, Esperance, November, 1909 (C).

NOTE: The above collections are the only record of this species from Western Australia. These localities are nearly 2500 km west of its general range.

QUEENSLAND (12 specimens seen): *Camfield s.n.*, Como, August, 1897 (NSW 135872). *Clark 1*, Oxford Downs, 16.vii.1949 (P). *Hooker s.n.*, Moreton Bay, 1835 (K). *F. Mueller s.n.*, Hinchinbrook Mt., undated

(MEL 69194). *Rupp s.n.*, Herb. Rodway no. 6819, Warrabeen, December, 1916 (NSW). *Unknown collector s.n.*, Fraser Island or Great Sandy Island, 1824 (A, E, W 2 spec.).

NEW SOUTH WALES (156 specimens seen): *M. Anderson s.n.*, Port Jackson, 1832 (G, GOET). *Baudin s.n.*, Port Jackson, 1801 (BR, E, FI, K, LE, NY 3 spec., US, WU). *Boorman s.n.*, Port Jackson District, June, 1903 (E, GH). *Boorman s.n.*, Nelson's Bay, August, 1911 (G, NSW 135883). *I. P. Burgess 91*, Forster, 20.x.1961 (NSW). *C. Burgess s.n.*, Red Rock, north coast, 10.v.1970 (AD 97123124, CBG 035236, NT 28705). *R. Brown s.n.* (*J. J. Bennett no. 2334*), Port Jackson, 1802-5 (BM lectotype; E 7 spec., F, G, K 2 spec., LE 2 spec., MEL 2 spec., P 5 spec. — isolectotypes). *Carolin 3691*, Myall Lakes, 1.ix.1963 (SYD). *Carolin 4423*, The Castle, Budawang Range, Kalianna Ridge, 15.xii.1964 (SYD). *Constable 16594*, Mt Tomah to Bell, Blue Mountains, 6.x.1950 (MO, NSW, US). *Constable 4034*, eastern end of tunnel, Cox's Gap, ca. 25 miles S. of Merriwa, 10.viii.1962 (B, NSW, S). *A. Cunningham 40*, Woolloomooloo, July 1817 (BM, K 2 spec., syntypes of *C. stoechadis* R. Br. var. *parviflora* Benth.). *Day s.n.*, Killara, May, 1936 (CANB 10289). *Forrest s.n.*, Cook's River, August, 1892 (BRI 190693). *Gaubas s.n.*, Jervis Bay, 14.vii.1950 (AD 97007269, CBG 2943 & 2945). *I.A.S. Johnson 1716*, 13 miles E. of Curraris Mt Gap, 8 miles E. of Olinda, 31.viii.1951 (NSW), *Leichhardt s.n.*, Ballimore, 8.viii.1843 (NSW 135864). *Maiden & Boorman s.n.*, Grafton to Dalmorton, November, 1903 (NSW 135885). *McKee s.n.*, east of Rylstone, 30.ix.1951 (SYD) *Mossman 119*, Waverly hills, Sydney, 1850 (BRI, E2 spec., FI, K, LE, P — syntypes of *C. stoechadis* R. Br. var. *parviflora* Benth.). *Richards s.n.*, 6 miles south of Forster on road to Bulahdelah, 21.vii.1966 (CBG). *Rodway 11562*, Mt Bulwarra, 4 miles west of Wandandian, 4.viii.1940 (NSW). *Rodway 6816*, Dee Why, 20.x.1934 (NSW). *Shoobridge s.n.*, 31 miles from Nerriga on Nerriga Tomerang Rd, 28.x.1962 (CBG). *Sieber 185*, Nova Hollandia, 1823 (BM, BR, FI, G, GH, K, LE 2 spec., M 2 spec., MEL 2 spec., PR, W4 spec. type of *C. lavandulifolia* Sieber ex Spreng). *Sieber 186*, loc. cit., 1823 (BM, BR, F, FI, GH, HBG, K 2 spec., KW, LD, LE, M 2 spec., MEL 2 spec., MO, NY, PR, S, W 7 spec.). *Story 7562*, Fire trail between Putty and Rylstone, between Mt Munundilla and Mt Coricudgy, 21.x.1960 (CANB, NSW). *Willis s.n.*, Khyber Pass, ca. 24 miles E. of Rylstone, 5.x.1959 (MEL 69206). *Wrigley s.n.*, Kuringai Chase, 7.i.1970 (CBG 036000).



Map 3. Distribution of *Chloanthes stoechadis* R. Br.

Distribution (Map 3)

C. stoechadis is restricted chiefly to New South Wales with some scattered localities in the southern and eastern parts of Queensland and only two records from near the southern coast of Western Australia. The latter are nearly 2500 km west of its general range.

In New South Wales, the main distribution is between latitude 30° and 36° S. and longitude 149° and 153° E. It is fairly common in the Blue Mountains and in the coastal region between Jervis Bay and Newcastle. A few well-spread localities are to the north of the Blue Mountains and also to the north and north-west of Newcastle. Of these, the northern-most records are from near Grafton and Narrabri and the western-most are along the Castlereagh river.

There are two records of this species from Western Australia; Maiden's collection (s.n.) from Esperance and Hügel's (s.n.) from King George Sound. However, if the species ever did occur in Western Australia, it is unlikely that it still does.

Comments

Bentham (1870) described the small-flowered plants of this species as a new variety, *parviflora*. During the present investigation, however, small and large flowers were found to be present on plants from the same area and in some cases in the same collection. There seems to be a continuous gradation in the size of flower within the species, and no additional character has been found in the plants with the smaller flowers to justify their segregation as a variety. In view of this, Bentham's var. *parviflora* is recorded here as a synonym under var. *stoechadis*.

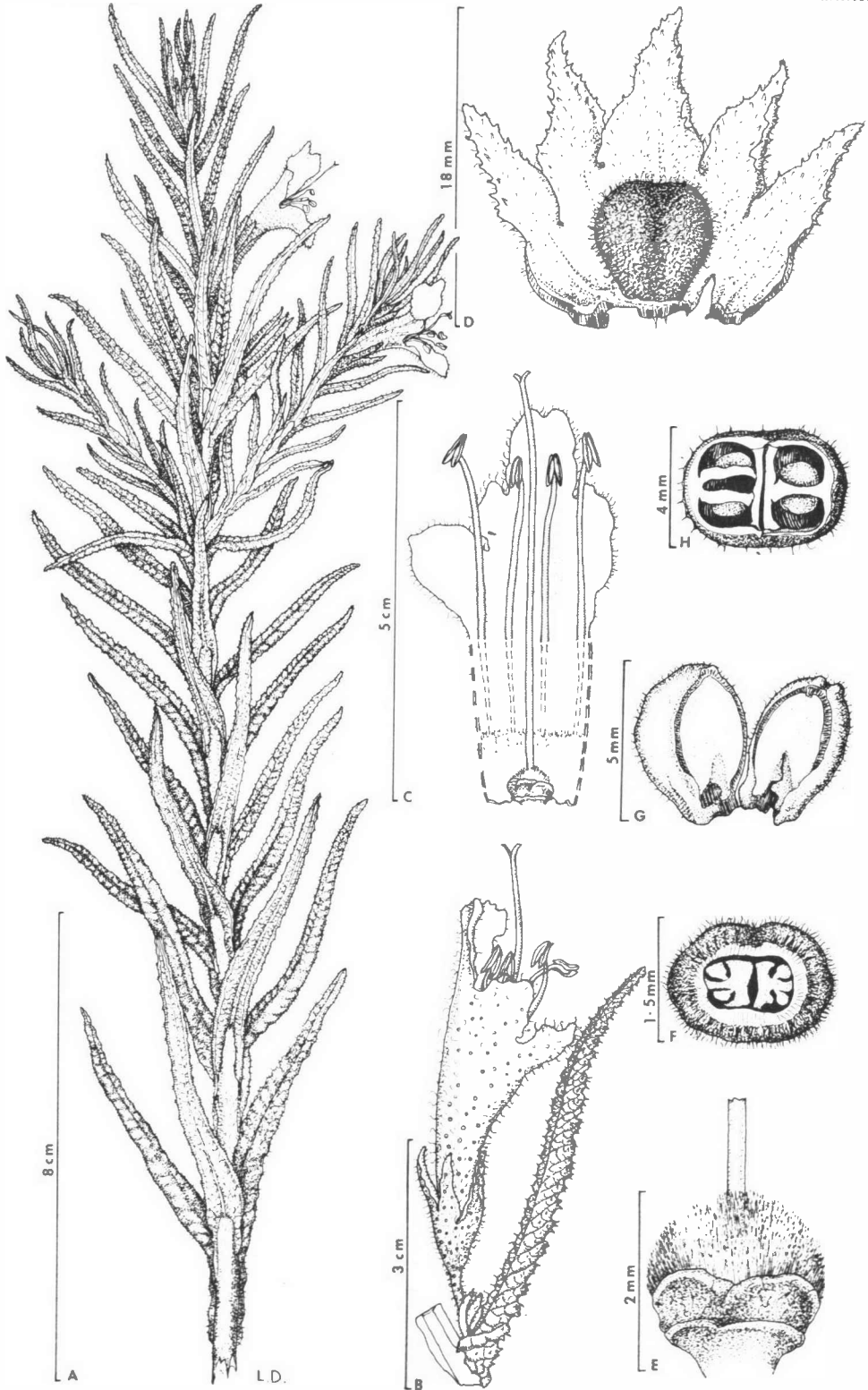
The collecting dates are not recorded with Sieber's collections, but according to Maiden (1908), "he collected in New South Wales for seven months during the year 1823, and took considerable and excellent collections to Europe, which he sold in numbered sets bearing the labels 'Flor. Nov. Holl.' or 'Pls. Exot.'".

Walpers (1845) provided the first detailed description to this species and Schauer (1847) was the first to recognize *C. lavandulifolia* Sieb. ex Spreng. as conspecific with *C. stoechadis*. Similarly, Bauer (1813) prepared the first habit sketch and analytical drawings of the flower and fruit of this species. Subsequently, Bocquillon (1863) published his own detailed drawings of its flower and fruit with a sketch of a calyx hair and the floral diagram. Bocquillon's drawings of the un-dissected flower and its vertical section were republished by Briquet (1895). Since then, the only new habit sketch and revised analytical drawings of the flower and fruit of this species are those presented in this work.

According to Petrie (1912), *C. stoechadis* gave a negative result when tested to show the presence of hydrocyanic acid.

Moldenke (1959, 1971) erroneously recorded this species from New Zealand.

Fig 4. *Chloanthes glandulosa* R. Br. (E. F. Constable s.n.: NSW 55731). A, flowering twig; B, flower with leafy bract and small bracteoles; C, flower with corolla vertically opened to show androecium and gynoecium; D, persistent calyx opened to show fruit; E, ovary; F, transverse section of ovary; G, fruit split to show the 2 nutlets; H, transverse section of fruit showing albuminous seeds.



Affinities

C. stoechadis is closely allied to *C. glandulosa* in its flower being greenish-yellow, corolla-tube gradually dilated upwards and stamens and style exserted. Moreover, both the species occur together in eastern New South Wales. *C. stoechadis*, however, can be easily distinguished by its leaves being narrow-linear or almost terete owing to the revolute margins, densely white woolly underneath and mostly up to 4 cm by 3 mm. It is far more wide-spread within New South Wales and is also known from southern Queensland where *C. glandulosa* does not occur.

C. stoechadis is also related to *C. parviflora* in having similar leaves with dense woolly tomentum underneath and almost the same general distribution. The latter, however, may be easily identified by its mauve corolla with purple spots in throat and tube; lower corolla lip villous inside; corolla tube abruptly dilated above the calyx; and stamens and style included.

4. *Chloanthes glandulosa* R. Br., Prod. Fl. Nov. Holl. (1810)514; Spreng., Syst. Veg. 2(1825)756; Steud., Nomenc. Bot. 1(1840)352; Walp., Rep. Bot. Syst. 4(1845)58; Schauer in DC, Prod. 11(1847)531; Benth., Fl. Aust. 5(1870)45; Mold., Résumé Verben. etc. (1959)208; Mold., Fifth Summary Verben. etc. 1(1971)345; Beadle et al., Fl. Syd. Reg. (1972)507.

Type: *R. Brown s.n.*, Bank of the Grose River, New South Wales, Australia, 1802-5 (BM lectotype designated here; BM, E, K, MEL, isolectotypes; Port Jackson, FI, P, syntypes). *C. stoechadis* R. Br. var. *glandulosa* (R.Br.) F. Muell. ex Maiden & Betche, Cens. N.S.W. Pl. (1916)177 — based on *C. glandulosa* R. Br.

Typification

C. glandulosa R. Br. is based on R. Brown's collection (s.n.) from New South Wales, consisting of at least 7 duplicates, all of which remained in Brown's possession until after his death. On his death, his herbarium went to the British Museum where the main set is still held. A complete and well preserved syntype of this species in Herb. BM, annotated by R. Brown, and almost certainly used by him in preparing the original diagnosis of this species, is selected here as the lectotype. (For additional information see typification under *C. stoechadis* R. Br.)

Description (Fig. 4)

A "bushy" shrub 30-90 cm high. *Leaves* lanceolate or linear-lanceolate, scarcely recurved along the margins, (3.5-) 5-7 (-8) cm long, (4-) 5-9 (-11) mm broad, bullate-rugose, shortly hispid on both sides, not woolly underneath, the primary and secondary veins prominent on the under surface. *Flowers* pedicellate; pedicel 4-7 mm long, glandular and pubescent; bracts leafy, mucronate; bracteoles sessile, linear-lanceolate or linear-oblong, (3-)5-8 mm long, 1-1.5 mm broad, pubescent outside (i.e. underneath), glabrous inside (i.e. above). *Calyx* deeply 5-lobed, 15-18 (-20) mm long, glandular and pubescent outside with a few hairs on the inner distal parts of the lobes; lobes ovate-lanceolate with margins more or less crenate and recurved, 8-12 mm long, (2-) 3-5 mm broad at the base; tube 3-5 (-7) mm long. *Corolla* greenish-yellow or "greenish-cream," (3.5-) 4-5 cm long, sparsely glandular and pubescent outside, glabrous inside excepting the dense hairy ring above the ovary; the (two) lobes of the upper-lip with a shallow cleft at the summit, more or less ovate, obtuse, 8-10 (-12) mm long, 5-7 mm broad at the base; the two lateral-lobes of the lower-lip more or less deltoid, (2-) 3-4 mm long, 5-7 mm broad at the base; the anterior-lobe of the lower-lip almost rotundate, 7-10 mm in diameter; tube cylindrical towards the base, gradually dilated upwards, 2-2.7 cm long. *Stamens* 4, much exserted; filaments 1.5-2 (-2.5) cm long; anthers 2-3 mm long, 1-1.5 mm broad. *Ovary* globose, 1-2 mm in diameter, densely tomentose; style exserted, 3.5-4.5 cm long, minutely 2-lobed at

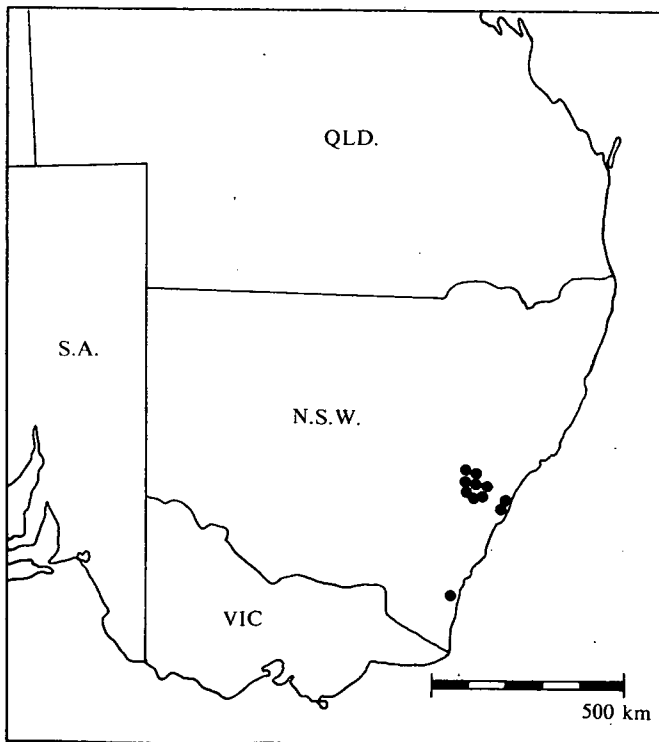
the summit. *Fruit* more or less elliptic-obovate, 5-6 mm long, 4-5 mm in diameter in the upper half, pubescent with faint reticulation all over, separating vertically into two hemispherical nuts, each nut 2-celled.

Specimens examined

NEW SOUTH WALES: *Bauer s.n.*, Port Jackson, undated (W). *Bowden s.n.*, Linden Creek, Faulconbridge, July 1968 (NSW 135860). *Brown s.n.*, Bank of the Grose river, 1802-5 (BM lectotype: BM, E, FI, K, LE, MEL, P-isolectotypes). *Conabere 373*, Blue Mountains, 1972 (NSW). *Constable s.n.*, Martin Place Road, ½ mile west of Linden Railway Station, Blue Mountains, 31.x.1960 (AD 97113090, ADW 36974, BRI 118951, CANB 187808, MEL 69151, NSW 55731, W 10837). *A. Cunningham s.n.*, Blue Mountains, 3.ix.1822 (K); *Novae Hollandiae*, loc. incert., 1820 (BM, CGE); Springwood, undated (BM). *R. Cunningham s.n.*, *Mt. Tomah*, 1835 (*E3 spec.*, *K2 spec.*). *Fraser s.n.*, Port Jackson, 1817 (A, BM). *King s.n.*, Springwood, Blue Mountains, 1893 (MFL 69153-4). *Mackey s.n.*, loc. incert., undated (BM) *Pearce s.n.*, Birdwood Gully, Springwood, 1961 (NSW 135859). *Salasoo 1503*, Tabrac Ridge, Kurrajong Heights, 27.xii.1956 (NSW). *Sieber 581*, Port Jackson, 1823 (BM, MO, P, W). *Sturgess 1*, Tuross River Mountains 3.i.1944 (NSW).

Distribution (Map 4)

C. glandulosa is known chiefly from the Blue Mountains in New South Wales. A few collections are from Port Jackson (i.e. Sydney) and one from the mountain area of the Tuross River. The latter is the southernmost locality being disjunct from the main distribution area by over 300 kilometres.



Chloanthes glandulosa =●

Map 4. Distribution of *Chloanthes glandulosa* R. Br.

Comments

Maiden and Betche (1916) recorded this species as *C. stoechadis* var. *glandulosa* F. Muell. Mueller is not known ever to have made this combination, and the reason for their attributing it to him has not been established with certainty.

The size of plant is not mentioned in the original diagnosis nor in any subsequent description of this species. The height of the plant is known only from the notes with a recent collection by E.F. Constable (no. NSW 55731).

Flowers of *C. glandulosa* are always pedicellate but, being axillary, they are often concealed by the subtending leaves and therefore superficially look sessile.

The accompanying illustration is the first to be published of this species.

Affinities

C. glandulosa is nearest to *C. stoechadis* in its flower characters and distribution, but may be readily distinguished by its leaves being lanceolate, the margins almost flat or scarcely recurved, shortly hispid on both sides, more distinctly bullate above, not woolly underneath and mostly above 4 cm by 3 mm. Though these species occur together in eastern New South Wales, *C. stoechadis* is far more widespread within that state and is also known from southern Queensland.

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Collectors' names are in alphabetical order, and their numbers (in Arabic numerals) are followed by the numbers (in Roman numerals) given below to each species. T represents holo-, lecto- or neo-type of the species indicated.

<i>Chloanthes parviflora</i>	=	I
<i>C. coccinea</i>	=	II
<i>C. stoechadis</i>	=	III
<i>C. glandulosa</i>	=	IV

Alee 67a/1. — *Althofer* s.n., NSW 135854/1. — *M. Anderson* s.n./III. — *N. J. Anderson* s.n./III. — *Armstrong* s.n., NSW 135866/III. — *Ashby* 247/II; 1292/II; 1952/II; 1984/II; 3634/II; s.n.; AD 96428135/II; s.n., ADW 14618/II; s.n., NSW 135856/II. — *Atkinson* 10/III. — *Audas* s.n., MEL 69189/III. — *Bailey* s.n., BRI 190678/1; s.n., BRI 190680/1; s.n., MEL 69165/1; s.n., NSW 135846/1. — *Baird* 5176/1. — *Backhouse*

328/III. — *Baker* s.n., US 268954/1, s.n./III. — *Banks & Solander* s.n./III. — *Baudin* s.n./III. — *Bäuer* s.n./III; s.n./IV. — *Bäuerlein* 431/1; 357/III. — *Bawrlin* s.n., NSW 135842/1; *Benzville* 6/1; 428(3)/III. — *Biddulph* 51/1; s.n., MEL 69217/1. — *Blake* 4091/1; 4148/1. — *Blakely* s.n., NSW 135874/III. — *Blakely & Shiress* s.n., NSW 135840/1. — *Boorman* s.n., NSW 135841/1; s.n., NSW 135844/1; s.n., NSW 135845/1; s.n., NSW 135851/1; s.n., NSW 135852/1; s.n./III; s.n., NSW 135883/III. — *Bowden* s.n., NSW 135860/IV; s.n., NSW 135882/III. — *Brass* s.n./III. — *Brewer* s.n./II. — *Broadbent* 133/II. — *Brown* s.n./IIIT; s.n./IVT. — *Browne* s.n., NSW 135849/III. — *Burgess* s.n., CBG 023854/1; s.n., CBG 031405/1; s.n., CBG 006696/1; s.n., CBG 035065/1; 91/III; s.n./III; s.n., CBG 003108/III; s.n., CBG 009425/III; s.n., AD 97123124/III; s.n., CBG 035236/III. — *Burrows* 6717/15/1. — *Caley* s.n./III; s.n., NSW 135876/III. — *Camfield* s.n./III; s.n., NSW 1349951/III; s.n., NSW 135872/III. — *Carolin* 3691/III; 4423/III. — *Chapman* s.n./III. — *Chippendale* s.n., NSW 135878/III. — *Chippendale & Constable* s.n., NSW 17393/1. — *Chiswick* s.n., MEL 69204/III. — *Clark* 1/III. — *Cleland* s.n., AD 97608119/1; s.n., AD 97608120/III. — *Clemens* 42848/1; s.n., BRI 190686/1. — *Clowes* s.n., F 362834/III. — *Clyne* s.n., NSW 135855/II. — *Conabere* 333/1; 373/IV. — *Constable* 4034/III; 4301/III; 48911/III; 16594/III; 26598/III; 48911/III; s.n., AD 97113090/IV; s.n., AD 36974/IV; s.n., BRI 118951/IV; s.n., MEL 69151/IV; s.n., NSW 55731/IV; s.n., W 10837/IV. — *Coveny* 2998/III. — *Cronin* s.n., MEL 69145/II; s.n., MEL 69147/II; s.n., MEL 69148/II; s.n., MEL 69235/II. — *A. 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