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

Ahmad Abid Munir

State Herbarium, Botanic Gardens, North Terrace,
Adelaide, South Australia 5000

Abstract

A taxonomic revision of the genus *Pityrodia* is provided. *Dennisonia* F. Muell. is reduced to synonymy. A key to the genera of the Chloanthaceae is provided. Forty-one species are recognized of which the following 16 new species and one variety are described:— *P. angustisepala, P. augustensis, P. byrnesii, P. chorisepala, P. gilruthiana, P. glabra, P. glutinosa, P. lanceolata, P. lanuginosa, P. megalophylla, P. ovata, P. puberula, P. pungens, P. quadrangulata, P. serrata, P. spenceri* and *P. exserta* var. *lanata*. The new combination of *P. ternifolia* (Syn. *Dennisonia ternifolia* F. Muell.) is made and *P. uncinata* var. *exserta* Benth. is raised to the status of a species.

The affinities and distribution are considered for the genus and each species. A key to the taxa is provided and a detailed description of each species is supplemented by a habit sketch of a flowering branch and analytical drawings of the flowers.

Taxonomic History of the Genus

The genus *Pityrodia* was described by Robert Brown (1810), with a single species, *P. salvifolia*, which he had collected himself in Queensland. It was referred to the Verbenaceae where it has been retained by the majority of botanists. Sprengel (1825) recorded this genus as a synonym of *Premna* L. which he placed in Linnaeus's "Didynamia Angiosperma" without reference to any family. The synonymous position for *Pityrodia* under the genus *Premna* was accepted only by Dietrich (1843) who referred it to the Verbenaceae. Poiret (1826) had, however, maintained *Pityrodia* as a distinct genus in the Verbenaceae. In 1828, Gaudichaud described a species of *Pityrodia* in a new genus *Quoya*, the type of which he had collected himself from Western Australia. It was also referred to the Verbenaceae where it was retained by Endlicher (1838, 1841), Meisner (1840), Spach (1840), Dietrich (1843), Walpers (1845), Lindley (1846), Schauer (1847), Bocquillon (1863) and Black (1870). Excepting Dietrich (1843), all the above named botanists maintained *Pityrodia* and *Quoya* as two distinct genera, though a few of them listed the latter as a "genus dubium". Reichenbach (1828) also accepted *Pityrodia* as a distinct genus which he referred to the tribe Verbeneae in the Verbenaceae, while treating *Quoya* in the tribe Gesnereae of the Bignoniaceae. In 1830, Bartling transferred *Pityrodia* to the tribe Viticeae (Verbenaceae). This new tribe was accepted for the genus by Lindley (1836), Spach (1840), Schauer (1847) and Bentham (1870). Subsequently, Endlicher (1838) placed it in the tribe Lantanae in the Verbenaceae, and this was followed by Meisner (1840), Endlicher (1841) and Walpers (1845).

In 1839, Endlicher described two *Pityrodia* species in a further new genus *Dasymalla*, which he placed in the family Myoporaceae. This was followed by Meisner (1840), Spach

*The present treatment of the genus *Pityrodia* concludes the series of taxonomic revisions in the family Chloanthaceae (= Dicrastylidaceae) (Munir, 1976-1978). Airy Shaw (1966, 1973) and some others included in this family the albuminous seeded African genera *Acharitea* Benth., *Cyclocheilon* Oliv. and *Nesogenes* DC. After examining representatives of these genera, the present author excluded them from the Chloanthaceae for the following two main reasons (see also Munir, 1978c, pp. 412-416): (1) The ovules in these genera are attached near the base of the ovary and (2) The two bracteoles subtending each flower are absent. A key to the genera of the Chloanthaceae is provided on page 3.

(1840), Endlicher (1841), Dietrich (1843), Walpers (1845), Lindley (1846), de Candolle (1847) and Black (1870). Excepting Dietrich (1843) and de Candolle (1847), all the above authors also retained *Pityrodia* and *Quoya* as distinct genera. In 1859, F. Mueller described a new genus *Dennisonia* with a single species, the type of which he had collected himself from Northern Territory. It was referred to the Verbenaceae where it has been retained by the majority of botanists. During present studies, however, *Dennisonia* F. Muell. has been found to be congeneric with *Pityrodia* and is therefore recorded here as a new synonym of the latter.

From 1859 onwards, F. Mueller regarded *Pityrodia* as a synonym of *Chloanthes* and described 10 new species under it. In 1864 he described one new species under *Quoya* but he later transferred it to the genus *Chloanthes*. A few of F. Mueller's species have since been reduced to synonymy. Turczaninow (1863) also described three *Pityrodia* species one each under *Chloanthes*, *Quoya* and *Pityrodia*. Two of these species are now in synonymy. Bentham (1870) reinstated the genus *Pityrodia* as distinct from *Chloanthes*, and transferred to it all *Chloanthes* species described by F. Mueller and one of the two described by Bartling (1845). He listed *Quoya* Gaud. and *Dasymalla* Endl. as synonyms of *Pityrodia*, and this has been accepted by the majority of botanists. Moreover, he referred this genus to the predominantly Australian subtribe Chloanthinae ("Chloantheae") of the tribe Viticeae in the Verbenaceae, and described a new variety, *P. uncinata* var. *exserta*, which is now raised to the status of a species. In 1876, Bentham & Hooker upgraded the subtribe Chloanthinae to the tribe Chloantheae, 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). Also in 1876, a further new genus *Depremesnilia*, in the Labiatae, was described by F. Mueller for a new species of *Pityrodia*. The new genus was later recognized by F. Mueller (1889) as synonymous with *Chloanthes*.

Briquet (1895) reclassified the Verbenaceae and upgraded the tribe Chloantheae to a subfamily Chloanthoideae. The latter consisted of three tribes: Achariteae, Chloantheae and Physopsideae with *Pityrodia* in the tribe Achariteae. This classification was adopted by Briquet (1896), Dalla Torre and Harms (1904) and Melchior (1964). In 1904, Diels & E. Pritzel revised the Western Australian Verbenaceae comprising only Bentham & Hooker's tribe Chloantheae. They subdivided the tribe into two subtribes namely Lachnostachydinae and Chloanthinae, placing *Pityrodia* in the latter. The genus was subdivided into four sections: *Brachysolenia*, *Chloanthopsis*, *Depremesnilia* and *Eupityrodia*. These sections are found to be artificial and unnatural groups, and are, therefore, not maintained in this revision. Gardner (1931) and Junell (1934) retained *Pityrodia* in Briquet's subfamily Chloanthoideae, but within the subfamily, Junell referred it to Bentham & Hooker's tribe Chloantheae, and Gardner placed it in Diels & E. Pritzel's subtribe Chloanthinae without mention of the tribe Chloantheae. Gardner also adopted the sections proposed within this genus by Diels & E. Pritzel (1904).

Hutchinson (1959) raised the status of Bentham & Hooker's tribe Chloantheae 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 (1965, 1966, 1977, 1978a, 1978b, 1978c). Also in 1959, Moldenke published a résumé of the world Verbenaceae and referred *Pityrodia* and allied genera to the family Stilbaceae. Within this family, the genus was placed in the subfamily Chloanthoideae, tribe Achariteae.

Airy Shaw (1965) referred all genera of Australian Verbenaceae (s.lat.) with albuminous seeds to the family Dicrastylidaceae Drumm.ex Harv. (nom.nud.), a name mentioned incidently by Harvey (1855) but not validated. The family name Dicrastylidaceae, however, has been adopted for the "Australian Verbenaceae" with albuminous seeds by Airy Shaw (1966, 1973), George (1967, 1972), Beard (1970), Maconochie &

Byrnes (1971), Moldenke (1971) and some others.

In the present revision, *Pityrodia* is accepted as belonging to the family Chloanthaceae. Within this family, it is referred to the tribe Chloantheae, a position previously given to it by Briquet (1895) under Verbenaceae.

Key to the genera of the Chloanthaceae

As this is the last paper in the series of revisions of the genera of the Chloanthaceae, a key to the genera has been prepared. Non-Australian genera generally regarded as belonging to this family have been excluded (see footnote on p. 1).

1a. Flowers zygomorphic, heteromerous; corolla mostly more or less 2-lipped or unequally 5-lobed; stamens 4 (Tribe Chloantheae) 6

b. Flowers actinomorphic or nearly so, isomerous; corolla regular or nearly so, 4-8-lobed; stamens 4-8 (Tribe Physopsideae) 2

2a. Perianth 5-8-merous 4

b. Perianth 4-merous 3

3a. Flowers in dense spikes; stamens included; style entire (not lobed) (Munir, 1978c: 578) . . *Physopsis*

b. Flowers in more or less capitate clusters; heads solitary or in corymbose panicles; stamens scarcely exserted; style shortly 2-lobed towards the apex (Munir, 1978: 567) . . . . *Mallophora*

4a. Style deeply 2-branched; corolla usually 5-merous (Munir, 1978c: 437) . . . . . *Dicrastylis*

b. Style entire or very minutely 2-lobed at the end; corolla (5-)6-8 merous 5

5a. Corolla with distinct lobes: stamens inserted between the lobes, included or exserted (Munir, 1978c: 589) . . . . . *Newcastelia*

b. Corolla-tube truncate, not lobed; stamens inserted on the rim of the corolla-tube, exserted (Munir, 1978c: 643) . . . . . *Lachnostachys*

6a. Leaves decurrent (Munir, 1977: 84) . . . . . *Chloanthes*

b. Leaves not decurrent 7

7a. Fertile stamens 2, the lower pair reduced to staminodes (Munir, 1978b: 161) . . . . . *Hemiphora*

b. Fertile stamens 4 8

8a. Fruiting-calyx much enlarged, distinctly venose, toothed; filaments dilated below the anthers in the upper third (Munir, 1978a: 45) . . . . . *Cyanostegia*

b. Fruiting-calyx practically unchanged, neither distinctly venose nor toothed; filaments uniform throughout their length 9

9a. Fruit a succulent drupe; anthers 1-chambered by the confluence of lobes, lobes not appendiculate at the base (Munir, 1976: 3) . . . . . *Spartothamnella*

b. Fruit dry; anthers 2-chambered, lobes separate and appendiculate (often distinctly so) at the base (Munir, 1979) . . . . . *Pityrodia (= Dennisonia)*

PITYRODIA R. Brown

Pityrodia R.Br., Prod.Fl.Nov.Holl.(1810)513; Poiret in Cuvier (Ed.), Dict.Sc.Natur. 41(1826)182; Reichb., Consp.Reg.Veg.1(1828)117, no. 2919; Bartl., Ord.Natur.Pl.(1830) 180; Lindl., Natur.Syst.Bot.edn 2(1836)278; Endl., Gen.Pl.2(1838)636, no. 3702; Meisn., Gen.Pl.Vasc.1, Tab.Diagn.(1840)291; Meisn., Gen.Pl.Vasc.2 Comment.(1840)200; Spach, Hist.Natur.Veg.Phan.9(1840)227; Endl., Ench.Bot.(1841)312; no. 3702; Steud., Nomencl.Bot.2(1841)346; Bartl.in Lehm., Pl.Preiss.1(1845)352; Walp., Rep.Bot.Syst.4 (1845)97; Lindl., Veg.King.edn 2(1847)664; Schauer in DC., Prod.11(1847)628; Bocq., Rev.Verbén.(1863)131; Benth., Fl.Aust.5(1870)46; Pfeiffer, Nomencl.Bot.2(1874)375; Benth.& Hook.f., Gen.Pl.2(1876)114; Bail., Synop.Qld Fl.(1883)374; Durand, Gen.Phan. (1888)319; Briq. in Engl.& Prantl, Pflanzenfam.4, 3a(1895)161; Bail., Qld Fl.4(1901)1168; Dalla Torre & Harms, Gen.Siphon.(1904)431, no. 7166; Diels & E.Pritz., Bot.Jahrb. Syst.35(1904)513; Post & Kuntze, Lexic.Gen.Phan.(1904)443; Bail., Comp.Cat.Qld

Pl.(1913)381; Ewart & Davies, Fl.N.Terr.(1917)236; Gard., Enum.Pl.Aust.Occ.3(1931) 112; Junell, Sym.Bot.Upsal.4(1934)68; Lemée, Dict.Descrip.Syn.Gen.Pl.Phan.8b(1943) 654; Gard. in Parkin.(Ed.), Wildfls West.Aust.(1959)132; Mold., Résumé Verben.etc. (1959)277, 335, 341, 395, 396, 404; Hutch., Fam.Fl.Pl. edn 2, 1(1959)398; Burb., Dict. Aust.Pl.Gen.(1963)234; Beard (Ed.), W.Aust.Pl. edn 1(1965)92; Blackall & G & Grieve, West. Aust.Wildfls 3(1965)560, 567; Airy Shaw, Willis's Dict.Fl.Pl.& Ferns edn 7(1966)885; Beard (Ed.), W.Aust.Pl. edn 2(1970)114; Morcombe, Aust.Wildfls (1970) 89, 94; Mold., Fifty Summary Verben.etc. 1 & 2(1971)474, 475, 615, 739, 740, 750; Clifford & Ludlow, Fam. & Gen. Qld Fl.Pl.(1972)124; George, Nuytsia 1(1972)289; Airy Shaw, Willis's Dict. Fl.Pl.& Ferns edn 8(1973)909; Erickson et al.(Eds), Fl.Pl.West.Aust.(1973)187; Gard., Wildfls West Aust. edn 11 (1973)120.

Type Species: P. salvifolia R.Br., Prod.Fl.Nov.Holl.(1810)513.

Quoya Gaudich. in Freyc. (Ed.), Voy.Bot.(1828) t. 66; Gaudich in Freyc. (Ed.), Voy.Bot.(1829)453; Reichb., Consp.Reg.Veg.1(1828)125, no. 3233; Endl., Gen.Pl.2(1838)638, no. 3719; Meisn., Gen.Pl.Vasc.1, Tab. Diagn. (1840)290; Meisn., Gen.Pl.Vasc.2, Comment.(1840)198; Spach, Hist.Natur.Veg.Phan.9(1840)247; Endl., Ench.Bot.(1841)312, no. 3719; Steud., Nomencl.Bot.2(1841)429; Dietr., Synop.Pl.(1843)372, 619, no. 2887; Walp., Rep.Bot.Syst.4(1845)37; Lindl., Veg.King.edn 1(1846)664; Schauer in DC., Prod.11(1847)697; Bocq., Rev.Verbén.(1863)132; Black in Lindl. & Moore, Treasur.Bot.2(1870)953.

Type Species: Q. cuneata Gaud. in Freyc., Voy.Bot.(1829)453, t.66.

Dasymalla Endl. in Endl.& Fenzl, Nov.Stirp.Dec.2(1839)11; Meisn., Gen.Pl.Vasc.1, Tab.Diagn.(1840)292; Meisn., Gen.Pl.Vasc.2, Comment (1840)201; Spach, Hist.Natur.Veg.Phan.9(1840)247; Endl., Gen.Pl.Suppl. 1(1841)1401, no. 3733/1; Steud., Nomencl.Bot.1(1840)484; Dietr., Synop.Pl.3(1843)628; Walp., Rep.Bot.Syst. 4(1845)139; Lindl., Veg.King.edn 1(1846)665; DC., Prod.11(1847)704; Lemair in Orb., Dict.Uni.Hist.Natur. 4(1849)610; Black in Lindl. & Moore, Treasur.Bot.1(1870)385; Pfeiffer, Nomencl.Bot.1(1874)1013.

Type Species: D. axillaris Endl.in Endl.& Fenzl, Nov.Stirp.Dec.2(1839)11, lectotype designated here.

Dennisonia F. Muell., J.& Proc.Linn.Soc.Bot.3(Feb.1859)157; F.Muell., Fragm.1(April, 1859)123, Sphalm. "Denisonia"; Benth., Fl.Aust.5(1870)54; Black in Lindl.& Moore, Treasur.Bot.1(1870)393; Benth.& Hook.f.; Gen.Pl.2(1876)1141; F. Muell., Syst.Cens.Aust.Pl.1(1882)103; F. Muell., Sec.Syst.Cens.Aust.Pl.1(1889)173; Briq.in Engl.& Prantl, Pflanzenfam.4, 3a(1895)161; Dalla Torre & Harms, Gen.Siphon (1904)431, no. 7167; Diels & E.Pritz., Bot.Jahrb.Syst.35(1904)523; Post & Kuntze, Lexic.Gen.Pl.(1904)688; Ewart & Davies, Fl. N.Terr.(1917)236; Junell, Sym.Bot.Upsal.4(1934)76; Lemée, Dict.Descrip.& Syn.Gen.Pl.Phan.8b(1943)654; Mold., Résumé Verben.etc.(1959)404; Burb., Dict.Aust.Pl.Gen.(1963)93; Airy Shaw, Willis's Dict.Fl.Pl.& Ferns edn 7(1966)340; Mold., Fifth Summary Verben.etc.2(1971)751; Airy Shaw, Willis's Dict.Fl.Pl.& Ferns edn 8(1973)909—*syn.nov.*

Type Species: D. ternifolia F. Muell., J.& Proc.Linn.Soc.Bot.3(February 1859)158.

Premna auct.non Linn., sensu Spreng., Linn.Syst.Veg.2, edn 16(1825)755, quoad *P. salvifolia* R.Br.

Depremesnilia, F. Muell., Fragm.Phyt.Aust.10(1876)59.

Type Species: D. chrysocalyx F. Muell., Fragm.Phyt.Aust.10(1876)59.

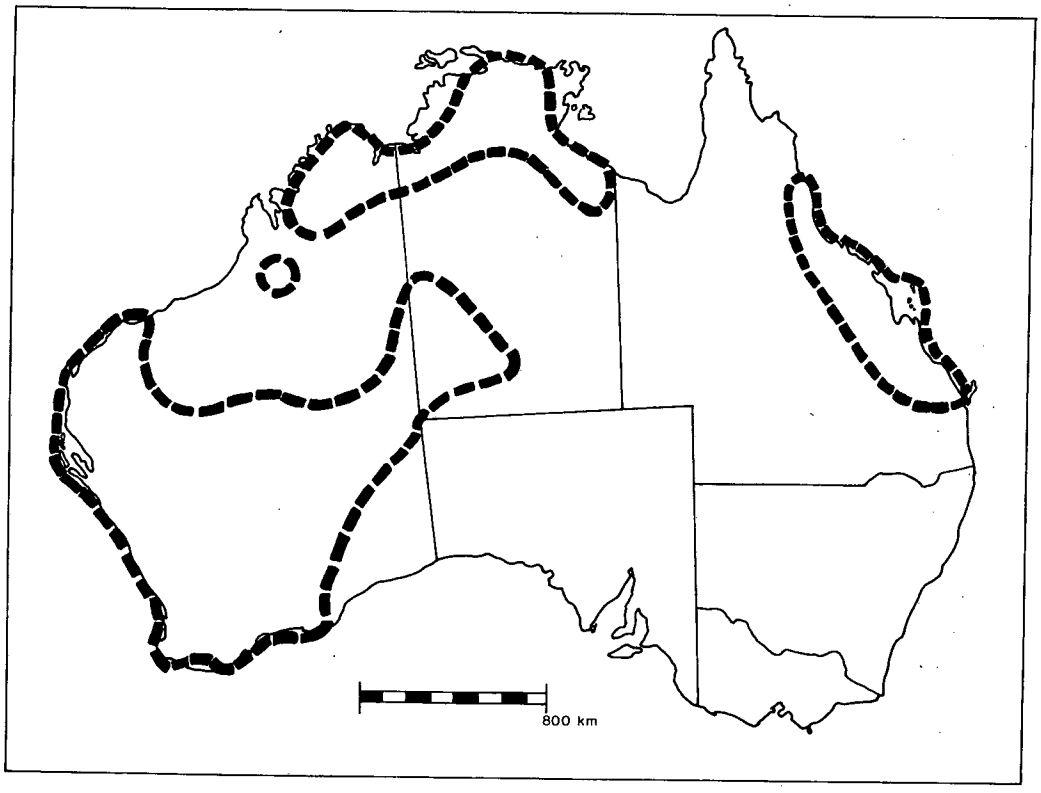
Chloanthes sensu F. Muell., Syst.Cens.Aust.Pl.1(1882)103, p.p. exclud. *C. coccinea* Bartl., *C. parviflora* Walp. and *C. stoechadis* R.Br.; F. Muell., J.Roy.Soc.N.S.W.15(1882)41, p.p.; F. Muell., Sec.Syst.Cens.Aust.Pl.1 (1889)172, p.p.

Number of species: 41.

Perennial shrubs or undershrubs. *Stem* erect, branched, cylindrical or 4-angled, solid and woody. *Leaves* cauline and ramal, exstipulate, simple, reticulate veined, unicostate, decussate, in whorls of 3 or scattered, not decurrent. *Flowers* solitary, or in cymes or clusters, axillary or collected in terminal leafy spikes, racemes or panicles, bracteate, with two lateral bracteoles, complete, zygomorphic, bisexual, hypogynous. *Calyx* of 5 fused sepals, persistent, 5-lobed, tubular below. *Corolla* of 5 fused petals, deciduous, 2-lipped (or unequally 5-lobed in the upper half), tubular below, the upper lip 2-lobed, the lower lip 3-lobed; lobes spreading or those of the upper lip sometimes erect, the anterior (i.e. the middle lobe of the lower lip) rather larger than the others; tube short and broad or long and dilated upwards. Stamens 4, somewhat didynamous, epipetalous, inserted in the corolla-tube; filaments filiform, glabrous, the anterior two (i.e. beside the large middle lobe of the lower lip of corolla) slightly longer than the posterior two; anthers dorsifixed,

2-lobed; lobes free and somewhat divergent in the lower halves, appendiculate at the lower end, longitudinally dehiscent. *Ovary* bicarpellary, syncarpous, 4-locular, with one axile ovule in each cell; style filiform, glabrous, 2-lobed at the top. *Fruit* a dry 4-celled drupe, the endocarp separating into two 2-celled nutlets (cocci); seeds 1 to 2 in each nutlet, albuminous.

Distribution (Map 1 and Table 1)



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

The genus *Pityrodia* R.Br. is endemic to the Australian mainland. It is known to occur in Western Australia (27 spp.), Northern Territory (16 spp.) and Queensland (1 sp.), but has not been recorded from South Australia, Victoria or New South Wales.

Table 1. *Pityrodia* taxa known to exist in various States/Territories in Australia, where x present ; — absent.

Names of taxa	WA	NT	Qld
P. angustisepala	—	x	—
P. atriplicina	x	—	—
P. axillaris	x	—	—
P. augustensis	x	—	—
P. bartlingii	x	—	—
P. byrnesii	—	x	—

Continued page 6

Table 1 (*continued*)

Names of taxa	WA	NT	Qld
P. canaliculata	x	—	—
P. chorisepala	—	x	—
P. chrysocalyx	x	—	—
P. cuneata	x	—	—
P. dilatata	x	—	—
P. exserta var. *exserta*	x	—	—
P. exserta var. *lanata*	x	—	—
P. gilruthiana	—	x	—
P. glabra	x	—	—
P. glutinosa	x	—	—
P. halganiacea	x	—	—
P. hemigenioides	x	—	—
P. jamesii	—	x	—
P. lanceolata	—	x	—
P. lanuginosa	—	x	—
P. lepidota	x	—	—
P. loricata	x	x	—
P. loxocarpa	x	x	—
P. megalophylla	—	x	—
P. obliqua	x	—	—
P. oldfieldii	x	—	—
P. ovata	x	—	—
P. paniculata	x	—	—
P. puberula	—	x	—
P. pungens	—	x	—
P. quadrangulata	—	x	—
P. salvifolia	—	—	x
P. scabra	x	—	—
P. serrata	—	x	—
P. spenceri	—	x	—
P. teckiana	x	—	—
P. terminalis	x	—	—
P. ternifolia	x	x	—
P. uncinata	x	—	—
P. verbascina	x	—	—
P. viscida	x	—	—
Number of species (only) recorded for each State or Territory	27	16	1

Comments

F. Mueller (Feb. 1859) described one of his own collection from near the Gulf of Carpentaria, Northern Territory, as the only species of his new genus *Dennisonia* [J.& Proc.Linn.Soc.Bot.3(Feb. 1859)157]. He regarded it as distinct but nearest in appearance to *Newcastelia* F. Muell. and *Pityrodia* R.Br., but did not give any

distinguishing character. About two months later, he republished his new genus as *"Denisonia"* with an addition of a habit sketch of a flowering branch and analytical drawings of the flower [Fragm.1(April 1859)123-124, t.2] This publication has been erroneously accepted by the majority of botanists (except Black, 1870) as the protologue of this genus. During present studies, *Dennisonia* has been found to be congeneric with *Pityrodia* and is, therefore, recorded here as a new synonym of the latter. The original generic spelling is retained.

Bentham distinguished *Pityrodia* from *Chloanthes* on its non-decurrent leaves, shorter and much broader corolla-tube and appendaged anther-lobes. During present investigation, however, the corolla-tube has been found not always to be shorter and much broader, nor the anther-lobes to have distinct appendages in all *Pityrodia* species. The non-decurrent leaves are fairly distinct and constant throughout the genus and the appendages to the anther-lobes are mostly present on at least the two lower stamens. In a few species, however, the appendages are either very minute or not developed at all. The corolla-tube is of three main types distinguishable more clearly when fully expanded. These are shorter and much broader, longer and cylindrical, and of medium length dilating gradually or abruptly within or immediately above the calyx.

E. Pritzel (1904) subdivided *Pityrodia* into four sections which were adopted by Gardner (1931) without altering the circumscription of its species. During present studies, the sections proposed by E. Pritzel have been found to be very artificial because several closely related species have been separated from their nearest allies. Even after the addition of several new species in the present work, the genus *Pityrodia* seems to be fairly homogeneous in all basic characters and cannot be split into natural sections. In view of this, no sections have been maintained within the genus.

Affinities

Pityrodia is closely related to *Chloanthes* R.Br. in having a 2-lipped corolla, 4 stamens inserted in the lower half of the corolla-tube and a dry fruit. Nevertheless, it can easily be distinguished by its non-decurrent leaves and usually distinctly appendaged anther-lobes. *Pityrodia* is also close to *Hemiphora* F. Muell. in having a similar 2-lipped corolla, dry fruit and non-decurrent leaves. However, *Hemiphora* may readily be distinguished by its only 2 fertile stamens without appendages to the anther-lobes.

There are a few characters shared between *Pityrodia* and *Cyanostegia* Turcz. Both genera have non-decurrent leaves, 2-lipped or unequally 5-lobed corolla, 4 stamens inserted in the lower half of the corolla-tube and a dry fruit. Nevertheless, *Cyanostegia* can easily be distinguished by its calyx being much enlarged, spreading and conspicuously veined after anthesis,filaments much dilated below the anthers in the upper third and anther-lobes without appendages.

See key to the genera of the Chloanthaceae on p. 3.

Key to Species and infraspecific Taxa
(Species asterisked are new)

1a. Stem, leaves (the lower surface at least) and calyx covered with scales 2

b. Stem, leaves and calyx without scales, (glabrous or glutinous and/or pubescent-tomentose) . . . 6

2a. Leaves petiolate, lanceolate, 5-13 cm long; flowers sessile, in axillary clusters of 5 or more; stamens and style included or scarcely exserted. Queensland . . . . . 1. *P. salvifolia*

b. Leaves sessile, linear, ovate, obovate, oblanceolate, oblong-lanceolate or elliptic-ovate, 0.3-4.5 cm long; flowers subsessile or pedicellate, solitary or in axillary clusters of 3; stamens and style exserted. Western Australia and Northern Territory 3

3a. Leaves broadly ovate or elliptic-ovate, reflexed, smooth and glutinous on the upper non-scaly convex surface, usually 2.5-5.5 mm long; calyx-lobes without scales or hairs inside . . . . . 2. *P. chrysocalyx*

b. Leaves linear, oblong-lanceolate or oblanceolate-obovate, spreading or ascending, scaly on both the surfaces, usually 5-30 mm long; calyx-lobes scaly or hairy inside 4

4a. Leaves linear, canaliculate; calyx-lobe up to 1.5 mm long; corolla white with reddish spots in throat; fruit sparsely glandular and puberulous or almost glabrous . . . . . 3. *P. canaliculata*

b. Leaves oblong-lanceolate or oblanceolate-obovate, flat; calyx-lobes more than 1.5 mm long; corolla pale-pink; fruit non-glandular, pubescent all over 5

5a. Scales on stem, leaves and calyx shiny; leaves oblong-lanceolate; calyx-lobes lanceolate, acute, scaly inside; anther-lobes scarcely appendiculate. . . . . 4. *P. loricata*

b. Scales on stem, leaves and calyx dull; leaves oblanceolate-obovate; calyx-lobes more or less deltoid, obtuse, hairy inside; anther-lobes distinctly appendiculate . . . . . 5. *P. lepidota*

6a. Stem and branches 4-angled; fruit 4-ridged 7

b. Stem and branches terete; fruit usually terete, sometimes obtusely lobed, never ridged 10

7a. Calyx-lobes at least twice as long as the tube; flowers yellow 8

b. Calyx-lobes as long as the tube or shorter; flowers red or pink 9

8a. Leaves broadest near the middle, glandular, puberulous; calyx-lobes at least 4 times as long as broad . . . . . 6. **P. angustisepala*

b. Leaves broadest in the upper part, woolly-tomentose; calyx-lobes about twice as long as broad . . . . . 7. **P. quadrangulata*

9a. Leaves ovate, cordate at the base; corolla pink . . . . . 8. **P. megalophylla*

b. Leaves narrowly elliptic-lanceolate, cuneate towards the base; corolla red . . . . . 9. **P. lanceolata*

10a. Leaves with strongly revolute margins, distinctly bullate-rugose above and along the margins, (linear, narrow lanceolate or almost terete) 11

b. Leaves flat or with slightly recurved margins, usually smooth above, if rugose-bullate then the rugae concealed by the dense indumentum, various shaped 16

11a. Flowers in lax terminal panicles; corolla open widely with a broad and extremely wide tube, lobes longer than tube, tube glabrous inside; ovary glabrous with a few glands on top; fruit 4-lobed . . . . . 10. *P. halganiacea*

b. Flowers in dense terminal spikes or racemes or in sessile clusters in the axil of upper leaves; corolla tubular, lobes shorter than the tube, tube with a dense hairy ring inside; ovary pubescent-tomentose; fruit not lobed 12

12a. Leaves all in whorls of 3; corolla white, 6-9 mm long, glabrous outside, with almost cylindrical tube; calyx-lobes ovate, 2-3 mm long . . . . . 11. *P. scabra*

b. Leaves all opposite or some scattered or in whorls of 3 in the same specimen; corolla deep pink or dark red, 10-30 mm long, pubescent outside with non-cylindrical tube; calyx-lobes linear or lanceolate, more than 3 mm long 13

13a. Leaves scabrous; stem glabrescent; stamens and style always exserted . . 12. *P. exserta* var. *exserta*

b. Leaves woolly-tomentose, glabrescent; stem woolly-tomentose; stamens and style included or scarcely exserted 14

14a. Stigma-lobes sagittate; style 3-7 mm long . . . . . 13. *P. uncinata*

b. Stigma-lobes linear; style 10-30 mm long 15

15a. Fruit obovoid, oblique, with a thin-walled concavity on one side; flowers in terminal spikes; style up to 14 mm long . . . . . 14. *P. bartlingii*

b. Fruit subglobose, symmetrical with evenly thickened walls; flowers in the axil of upper leaves; style 15-30 mm long . . . . . 12. *P. exserta* var. *lanata*

16a. Leaves with serrate or dentate margins 17

b. Leaves entire 20

17a. Leaves dentate distally, subsessile; corolla glabrous outside . . . . . 15. **P. glabra*

b. Leaves serrate or dentate all along the margin, sessile; corolla pubescent outside at least on the lobes 18

18a. Leaves pubescent, with the reticulate veins raised and honey-combed underneath . . 16. *P. ternifolia*

b. Leaves glabrous, with the reticulate veins neither raised nor honey-combed underneath 19

19a. Leaves serrate with acute mucronate teeth; calyx glabrous outside; corolla white, with cylindrical tube . . . . . 17. **P. serrata*

b. Leaves dentate with blunt obtuse teeth; calyx pubescent outside; corolla pale blue or mauve, tube abruptly dilating above the ovary . . . . . 18. *P. teckiana*

20a. Peduncles, young branches and upper leaves densely covered with reddish-brown, golden-yellow or pale brownish-yellow indumentum 21

b. Peduncles, branches and leaves glabrous or densely covered with greyish, greenish or white indumentum 23

21a. Leaves ovate or elliptic-ovate, 0.5-1.3 cm long; corolla white, glabrous outside; fruit obovoid-pyriform . . . . . 19. **P. chorisepala*

b. Leaves elliptic-obovate, elliptic-oblong or almost rhomboid, 1.5-10 cm long; corolla pink, pubescent outside; fruit elliptic-ovoid or globose 22

22a. Leaves broadly elliptic-obovate or almost rhomboid, very deeply cuneate towards the base; calyx 2-lipped; calyx-lobes oblong-ovate, obtuse; style lateral on fruit; nutlets without humps . . . . . 20. *P. oldfieldii*

b. Leaves oblong to elliptic; calyx equally 5-lobed; calyx-lobes linear-lanceolate, acute; style apical on fruit; nutlets with a hump on the back . . . . . 21. *P. verbascina*

23a. Leaves narrow-linear with a more or less pungent or mucronate tip 24

b. Leaves oblong, elliptic, ovate, obovate, lanceolate or almost orbicular, obtuse, scarcely mucronate 27

24a. Corolla as long as the calyx or shorter, tube much dilating in the upper half; leaves usually rather pungently mucronate . . . . . 22. **P. pungens*

b. Corolla much longer than the calyx; leaves not pungently mucronate 25

25a. Leaves glabrous, glutinous, flat, often in whorls of 3 . . . . . 23. **P. gilruthiana*

b. Leaves pubescent, non-glutinous, recurved along the margins, always opposite 26

26a. Stem, leaves and outside calyx pubescent with stellate hairs, intermixed with glands; corolla-tube cylindrical; fruit 1.5-2.5 mm in diameter . . . . . 24. **P. puberula*

b. Stem, leaves and outside calyx densely clothed with cineraceous tomentum of non-stellate hairs; corolla-tube not cylindrical; fruit 3-4 mm in diameter . . . . . 25. *P. hemigenioides*

27a. Stem, leaves and outside of calyx glabrous 28

b. Stem, leaves (at least on the lower surface) and outside of calyx pubescent to tomentose 29

28a. Leaves sessile, entire, slightly recurved along the distal margins . . . . . 26. **P. glutinosa*

b. Leaves subsessile, distally dentate, flat . . . . . 15. **P. glabra*

29a. Upper surface of leaves glabrous, viscid and olive green; stem almost glabrous, viscid or invested with a short viscid pubescence . . . . . 27. *P. viscida*

b. Upper surface of leaves pubescent to tomentose, neither viscid nor olive green; stem glabrous or invested with non-viscid pubescence or tomentum 30

30a. Leaves petiolate 31

b. Leaves sessile or if shortly petiolate then the lamina not sharply demarcated from the petiole . . 32

31a. Stem and branches longitudinally striate, glabrous or loosely hairy, leaves elliptic-oblong or almost orbicular; fruit obovoid with a thin-walled concavity on one side . 28. *P. loxocarpa*

b. Stem and branches non-striate, densely tomentose; leaves ovate to oblong-ovate; fruit ovoid-globose, with uniformly thickened walls with no concavity . . . . . 29. *P. obliqua*

32a. Leaves obovate or oblanceolate 33

b. Leaves linear, oblong, elliptic, ovate. lanceolate or almost orbicular 36

33a. Cymes arranged in lax and more or less pyramidal panicles . . . . . 30. *P. paniculata*

b. Cymes arranged in dense non-pyramidal terminal panicles, racemes or spikes 34

34a. Corolla glabrous outside, lobes undulate-denticulate; fruit obovoid with two humps at the top; leaves not constricted . . . . . 31. *P. axillaris*

b. Corolla pubescent outside, lobes entire; fruit more or less globose, without humps; leaves constricted about the middle 35

35a. Leaves much dilating at the base, amplexicaul; corolla orange-red, 20-25 mm long, tube curved and gradually dilating upwards; calyx equally lobed . . . . . 32. *P. dilatata*

b. Leaves scarcely or not dilating at the base, not amplexicaul; corolla blue, 8-14 mm long, tube abruptly dilating within or immediately above the calyx; calyx distinctly 2-lipped at fructescence . . . . . 33. *P. cuneata*

36a. Stem and branches longitudinally striate, glabrous or loosely hairy . . . . . 28. *P. loxocarpa*

b. Stem and branches non-striate, densely tomentose 37

37a. Leaves very broadly elliptic or almost orbicular . . . . . 34. *P. atriplicina*

b. Leaves linear, oblong, ovate, lanceolate or narrow elliptic-oblong to elliptic-lanceolate 38

38a. Leaves oblong or narrow elliptic-oblong 39

b. Leaves narrow elliptic-lanceolate to ovate 41

39a. Leaves mostly in whorls of 3, acute, glandular with sparsely sprinkled short hairs; flowers crowded towards the end of branches; corolla-tube almost cylindrical . . . . . 35. **P. byrnesii*

b. Leaves opposite, obtuse, non-glandular, densely tomentose; flowers crowded towards the end of branches (except *P. ovata*); corolla-tube dilating within or immediately above the calyx 40

40a. Leaves with recurved-revolute margins; corolla white, 9-12 mm long; flowers axillary solitary in terminal leafy spikes . . . . . 25. *P. hemigenioides*

b. Leaves flat; corolla pink or claret-red, 18-27 mm long; flowers 3-5 in cymes arranged in a terminal raceme . . . . . 36. *P. terminalis*

41a. Corolla glabrous outside; ovary glandular, glabrous; leaves flat 42

b. Corolla pubescent or woolly all over outside or at least on the lobes; ovary densely pubescent or tomentose; leaves with recurved margins (except *P. augustensis*) 43

42a. Plant densely covered with a short and dense indumentum of non-glandular pale yellow hairs; leaf-reticulation concealed by the hairs; flowers crowded towards the tip of branches . . . . . 19. **P. chorisepala*

b. Leaves and distal parts of branches viscid, covered with minute gland-tipped hairs; leaf-reticulation honey-combed beneath; flowers in the axil of well-spaced leaves . . . 37. **P. ovata*

43a. Leaves narrow-elliptic, cuneate towards both ends; cymes in terminal woolly racemes; calyx purple-lilac when fresh, lobes linear, narrowing towards both ends . . . . 38. **P. augustensis*

b. Leaves ovate-cordate to ovate-lanceolate; flowers axillary solitary, arranged in a spike-like leafy inflorescence; calyx greenish-grey when fresh, lobes lanceolate 44

44a. Leaves narrow-ovate or lanceolate, rounded at the base, flat or slightly recurved along the margins; upper corolla lip enclosed within the calyx, purple-streaked . . . . 39. **P. lanuginosa*

b. Leaves broad-ovate to oblong-ovate, cordate or deep-sinuate at the base; often distinctly recurved-revolute along the margins; upper corolla-lip exceeding the calyx, not streaked . . 45

45a. Stem yellowish-brown tomentose; leaves opposite, appressed against the stem, amplexicaul, crenate or bullate-rugose along the revolute margins; corolla-tube glabrous outside . . . . . 40. *P. jamesii*

b. Stem cineraceous-tomentose; leaves in whorls of 3 or scattered, spreading or ascending, not amplexicaul, entire along the margins; corolla-tube pubescent outside . . . . . 41. **P. spenceri*

1. **Pityrodia salvifolia** R.Br., Prod.Fl.Nov.Holl.(1810)513; Walp., Rep.Bot.Syst. 4(1845)97; Schauer in DC., Prod.11(1847)628; Bocq.,Rev.Verbén.(1863)132, t.xv, fig. 8-15; F. Muell., Fragm.4(1864)162 in obs.; F. Muell., Fragm.6(1868)155, 255; Benth., Fl. Aust.5(1870)48; F. Muell., Fragm.9(1875)5; Bail., Synop.Qld Fl.(1883)375; Bail., Cat.Indig.& Natur.Pl.Qld (1890)35; Briq.in Engl.& Prantl, Pflanzenfam.4, 3a(1895)161, fig.61 G & H; Bail.,Qld Fl.4(1901)1169; Diels & E.Pritz., Bot.Jahrb.Syst. 35(1904)517 in key only; Bail., Comp.Cat.Qld Pl.(1913)381 nom.tant.; Mold., Résumé Verben. etc. (1959)210, 335, 339; Mold., Fifth Summary Verben.1 & 2(1971)348, 603, 610.

Type: R. Brown s.n., Port Clinton (Port 2), Northumberland Islands, Queensland, Australia, 22.viii.1802 (BM, lectotype designated here; E 2 spec., FI, K 2 spec., LE, MEL, P 2 spec.—isolectotypes).

Premna salvifolia (R.Br.) Spreng., Syst.Veg.2(1825)755, based on *Pityrodia salvifolia* R.Br. (1810).

Chloanthes salvifolia (R.Br.) F. Muell., Syst.Cens.Aust.Pl.1(1882)103, based on *P. salvifolia* R.Br. (1810); F. Muell., Sec.Syst.Cens.Aust.Pl.1(1889)172.

Typification

P. salvifolia R.Br. is based on R. Brown's collection (s.n.) from the Northumberland Islands, Queensland, consisting of at least 9 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.

Description (Fig. 1)

An erect spreading shrub to 2.4 m tall. *Stem* and branches densely clothed with peltate fimbriate scales. *Leaves* petiolate, lanceolate, acute or somewhat obtuse, (5-) 6-10 (-13) cm long, (0.5-) 1-2 (-3.3) cm broad, rugose, appearing pubescent above, rusty below, covered all over with peltate scales similar to those on the stem, the midrib prominent underneath; petiole (0.4-) 0.6 - 0.8 (-1.2) cm long. *Flowers* in axillary clusters of (5-) 7-9, shortly pedicellate or almost sessile; pedicel 1-2 mm long; bracts sessile, linear to linear-lanceolate, shorter than calyx, 3-4.5 mm long, c. 1 mm broad; bracteoles sessile linear, 1.5-2 mm long. *Calyx* persistent, turbinate-campanulate, prominently ribbed, divided to rather below the middle into 5 lobes, 5-6 (-7) mm long, clothed outside with peltate fimbriate scales with minute glands, glabrous inside; lobes lanceolate, acuminate, (2.5-) 3-4 (-5) mm long, 1.5 - 2 (-2.5) mm broad at the base; tube 2-3 mm long. *Corolla* white, scarcely exceeding the calyx, 5-7 mm long, glabrous outside excepting a few hairs on the back of the lobes, a dense ring of hairs inside below the stamens; the middle lobe of the lower lip rather larger than the others, narrowly elliptic, obtuse, c. 3 mm long, almost 2 mm broad in the middle; the other 4 lobes ovate-oblong, obtuse, 2-2.5 mm long, c. 1.5 mm broad at the base; tube broadly campanulate, 2-3 mm long. *Stamens* 4; filaments short, 1-2 mm long; anthers included or scarcely exserted, the two lower ones on either side of the large middle corolla-lobe with prominent appendages at the lower ends of the lobes, the two upper ones with only short tubercles; lobes oblong, c. 1 mm long, 0.5 mm broad. *Ovary* more or less globose, c. 1 mm long, densely pubescent; style included, glabrous in the upper half, sparsely hairy towards the base, 2-3 mm long, shortly 2-lobed at the summit. *Fruit* loosely enclosed within the persistent calyx, obovoid-turbinate, rugosely reticulate, puberulous, 3-5 mm long, 2-2.5 mm broad at the top end, 4-celled with only 1 or 2 mature seeds; seeds albuminous.

Specimens examined

QUEENSLAND (23 collections seen): *Bauer s.n.*, Nova Hollandia ora orientali inter tropicos, undated (W). *Beccari s.n.*, Percy Island, 26.i.1878 (FI). *Brown s.n.* ((J.J. Bennett no. 2330), Northumblerland Islands, 1802-5 (BM, lectotype; E 2 spec., K 2 spec., LE, MEL, P 2 spec.) *Carolin 8105*, Kenfield near Baffle Creek, N. of Bundaberg, 24° 25′ S, 152° 0′ E, 11.xi.1972 (SYD). *Cunningham 214*, Cape Cleveland, Cleveland Bay, 14.vi.1819 (BM, FI, K, MEL 2 spec., NY). *Dallachy s.n.*, Rockhampton, Oct. ? 1869 (K). *Dallachy s.n.*, near Mt Hedlow, undated (MEL 69369). *Fielding 12541*, Tully Falls, 2.x.1948 (BRI). *Gittins S/53*, c. 25 miles W.S.W. of Duaringa, Aug. 1964 (NSW). *Heaps s.n.*, Bundaberg, undated (BRI 190699). *Henderson, Durrington & Sharpe H944*, c. 35 km SE of Blackwater, 3.ix.1971 (MEL, NSW). *Herb. Alleizette S762*, Rockhampton, Jan. 1906 (L). *Hyland, s.n.*, Forest reserve, c. 39 miles SW of Cairns, July 1964 (BRI 075075). *L.A.S. Johnson s.n.*, c. 18 miles SW of Dingo, 29.viii.1968 (NSW 135892). *R.W. Johnson 1148*, 12 miles SSE of Bluff, 23.xi.1959 (BRI). *Keys s.n.*, Mt Perry, undated (BRI 190701). *Pegg s.n.*, Mt Morgan, 25.ix.1934 (BRI 190984). *Rasmussen per Parkinson s.n.*, Kolan River, Bundaberg, January 1955 (BRI 190985). *O'Shanesy 94*, near Rockhampton, 12.xii.1867 (MEL). *Telford 5477*, ca. 1 km WSW of Mt Castletower, 2.vi.1977 (CBG). *Thozett 533*, Mt Wheeler, July ? 1869 (M, MEL 2 spec., P, W). *Trapnell & Williams 56*, Blackdown Tableland, 10.viii.1973 (BRI). *Tryon s.n.*, Middle Percy Island, Dec., 1905 (BRI 190700, NSW 135893).

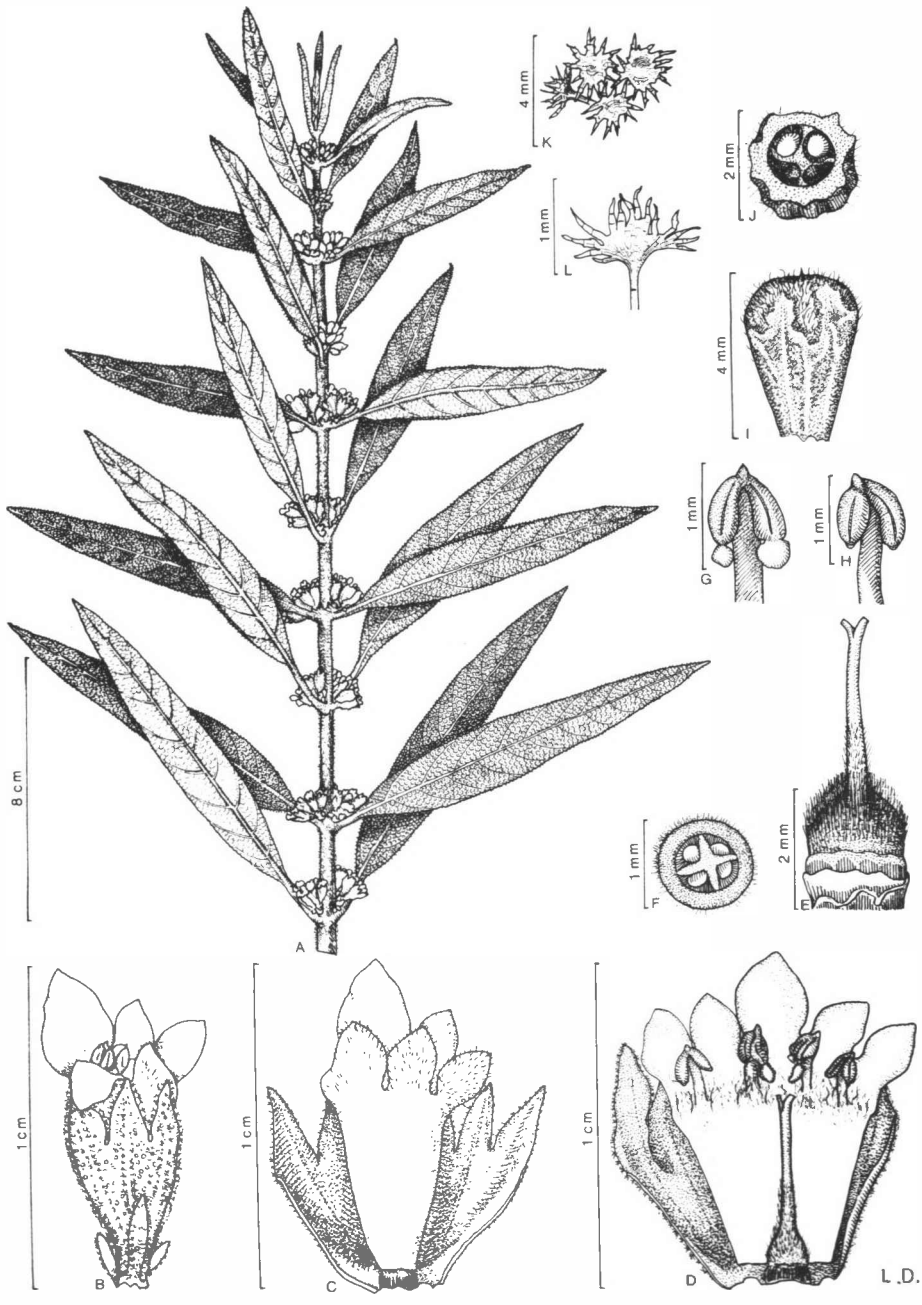
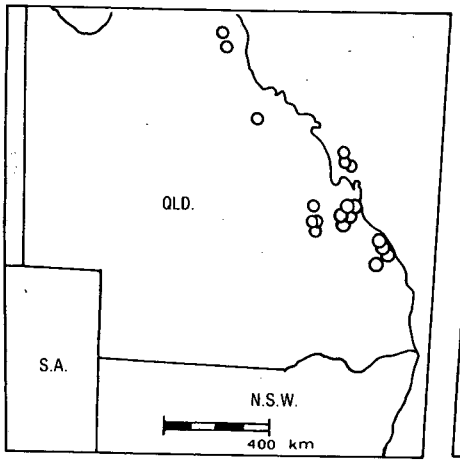


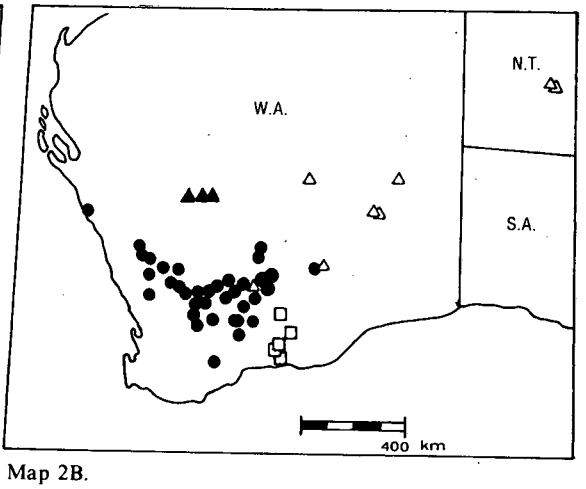
Fig. 1. *Pityrodia salvifolia* R.Br. (*C.H. Gittins S/53*: NSW). A, flowering twig; B, flower with a bract and two bracteoles; C, flower with calyx vertically cut open to show corolla-tube; D, calyx and corolla vertically cut open to show androecium and gynoecium; E, gynoecium; F, transverse section of ovary; G, lower stamen; H, upper stamen; I, fruit; J, transverse section of fruit; K, top view of the leaf-scales; L, side view of a leaf-scale.

Distribution (Map 2A)

P. salvifolia is endemic in the north-eastern tropics of Queensland. Most of the localities are in coastal areas and in the neighbouring Northumberland Islands. The major distribution extends from Bundaberg in the south up to Cairns in the north. A few inland localities are also recorded from south-west Bundaberg, Rockhampton and Townsville.



Map 2A.
P. salvifolia ○



Map 2B.
P. loricata △
P. lepidota ●
P. chrysocalyx □
P. canaliculata ▲

Comments

The scaly vestiture of *P. salvifolia* covers all external parts of the plant except the corolla. A somewhat similar vestiture, with almost the same coverage, is also found in *P. lepidota* (F. Muell.) E. Pritz. and *P. loricata* (F. Muell.) E. Pritz. The scales in *P. loricata* (F. Muell.) E. Pritz., however, are more conspicuous and shiny. Such a scaly vestiture is not found elsewhere in the genus.

Bentham (1870) and Bailey (1883, 1901) erroneously recorded the ovary as "glabrous", when in fact it is very densely hairy when fully developed.

Parkinson noted on his collection (BRI 190985) from near Bundaberg, that "the plant is suspected of poisoning stock". Hyland, noted on his collection (BRI 075075) from SW of Cairns, that its "leaves are very aromatic". In Queensland, the plant is locally known as "rosemary".

The duplicate of Thozett's collection of this species in Herb. MEL and P are with his (field labels and) coll. no. "533", but the other duplicates in Herb. M and W are unnumbered.

Affinities

P. salvifolia is allied to *P. loricata* and *P. lepidota* in its stem and calyx being covered with peltate scales, stamens and style exserted above the corolla-tube and fruit obovoid with short pubescence all over. *P. salvifolia*, however, can easily be distinguished by its leaves being petiolate and much larger, measuring (4-) 6-10 (-13) by (0.5-) 1-2 (-3.3) cm, distinctly rugose, the midrib prominent underneath; the dense villous hairy ring in the corolla-tube restricted to its throat only; stamens inserted in the corolla-throat or at the

base of corolla-lobes and calyx-lobes neither hairy nor scaly inside. *P. salvifolia* is also near to *P. chrysocalyx* in having peltate scales on stem and calyx, but the latter may be readily identified by its leaves being very small, measuring (1.5-) 2.5-5.5 (-8) by (1-) 1.5-3 (-4) mm, ovate, ternate, reflexed, glutinous and convex above; flowers axillary solitary; corolla hairy inside the tube above the ovary, and stamens inserted within the corolla-tube. *P. salvifolia* is endemic in eastern Queensland, whereas all the other above-named species are restricted to the south and south-west of Western Australia.

2. **Pityrodia chrysocalyx** (F. Muell.) Gard., Enum.Pl.Aust.Occ.3(1931)112; Mold., Résumé Verben.etc. (1959)210, 277; Beard (Ed.), W.Aust.Pl. edn 1(1965)92; Blackall & Grieve, West.Aust.Wildfls 3 (1965)568; Beard (Ed.), W.Aust.Pl. edn 2(1970) 114; Mold., Fifth Summary Verben. etc. 1 & 2 (1971) 347, 425, 475, 603.

Type: A. Dempster s.n., between Esperance Bay and Fraser Range, Western Australia, undated (MEL 880, lectotype designated here; MEL 69299, MEL 69300 - isolectotypes).

Depremesnilia chrysocalyx F. Muell., Fragm.10(1876)59, *basionym*; F. Muell., Syst.Cens.Aust.Pl.1(1882)101.

Type: As for *P. chrysocalyx* (F. Muell.) Gard.

Prostanthera chrysocalyx (F. Muell.) Briq. in Engl. & Prantl, Pflanzenfam. 4, 3a(1895)220, based on *Depremesnilia chrysocalyx* F. Muell. (1876).

Chloanthes depremesnilii F. Muell., Sec.Syst.Cens.Aust.Pl.1(1889)172, nom.illegit., based on *Depremesnilia chrysocalyx* F. Muell., Fragm.10(1876)59.

Pityrodia depremesnilii (F. Muell.) E. Pritz., Bot.Jahrb.Syst.35(1904)517, based on *Depremesnilia chrysocalyx* F. Muell.; Mold., Résumé Verben. etc. (1959) 210, 251.

Typification

Pityrodia chrysocalyx is based on A. Dempster's (s.n.) collection from Western Australia, consisting of at least 3 duplicates. Since the original author did not select any one of them as a type, it is, therefore, necessary to designate a type for this name. All the syntypes are preserved in Herb. MEL. One of these, with the number MEL 880, is annotated by F. Mueller and almost certainly used by him in preparing the original description of this species. The specimen is particularly complete and well preserved, and is, therefore, selected here as the lectotype for this name.

Description (Fig. 2)

An erect branched shrub 30-75 cm high, with scattered or more often ternate branches. *Stem* and branches densely clothed with fulvous peltate scales. *Leaves* subsessile or shortly petiolate, scattered or more often ternate, reflexed, rarely spreading, broadly ovate or elliptic-ovate, shortly acuminate, margins slightly recurved-revolute forming a shallow concavity on the lower side, (1.5-) 2.5-5.5 (-8) mm long, (1-) 1.5-3 (-4) mm broad in the lower halves, smooth, glutinous and convex above, densely covered with scurfy, peltate, fulvous scales underneath; petiole scaly, ± 1 mm long. *Flowers* almost sessile or shortly pedicellate, solitary in the axil of upper leaves; pedicel densely covered with scales, 1-2 mm long; bracts leaf-life, reflexed, ovate, sessile or shortly petiolate, glutinous above, scurfy-scaly underneath, 2-4 mm long, 1.5-2 mm broad; bracteoles minute, linear, scaly ± 1 mm long. *Calyx* persistent, 5-7 mm long, shortly 5-lobed with a relatively long tube, densely covered outside with peltate scales, glabrous inside; lobes deltoid, 1.5-3 mm long, 1-1.5 (-2) mm broad at the base, tube 3-5 mm long. *Corolla* "white", 9-12 mm long, pubescent outside on the back of the lobes with stellate hairs, glabrous inside excepting the dense hairy ring above the ovary, and sparse hairs extending to the large anterior-lobe of the lower lip; the anterior-lobe broadly elliptic or elliptic-orbicular, 3.5-5 mm long, 3-5 mm broad; the other 4 lobes almost similar, more or less oblong-elliptic or broadly ovate, (2.5-) 3-5 mm long, (1.5-) 2-3 mm broad; tube much broader at the top end, 4-5 mm long, 2-3 mm broad at the top end. *Stamens* exserted

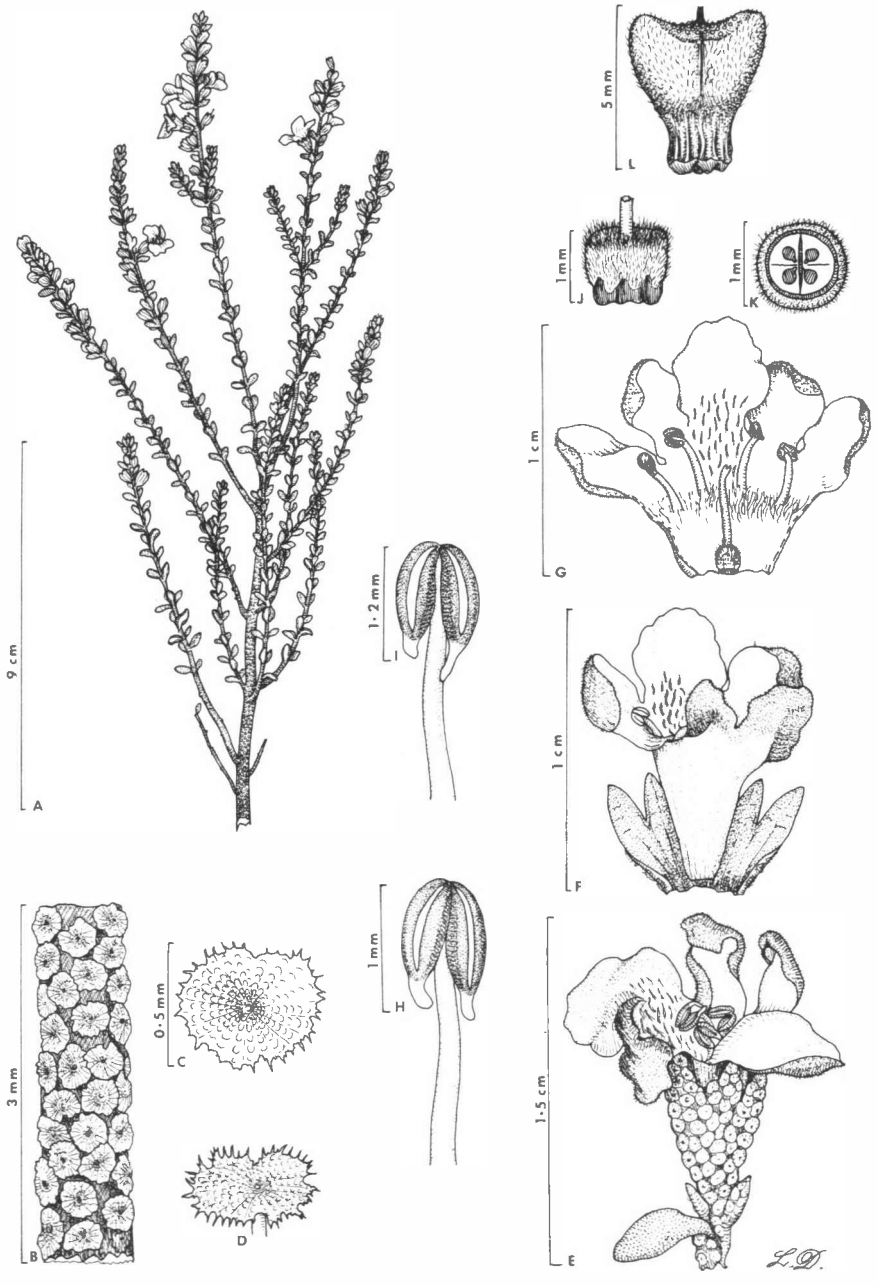


Fig. 2. *Pityrodia chrysocalyx* (F. Muell.) Gard. (A-K, *C.A. Gardner 14223:* PERTH; L, *Wardell & Johnson s.n.*: PERTH). A, flowering branch; B, portion of stem showing scales; C & D, top views of scales; E, flower with a bract and two bracteoles; F, flower with calyx vertically cut open to show corolla-tube; G, corolla-tube vertically cut open to show androecium and gynoecium; H, upper stamen; I, lower stamen; J, ovary; K, transverse section of ovary; L, fruit.

above the corolla-tube; filaments glabrous, filiform, the lower pair 2.5-3 mm long, the upper pair 2-2.5 mm long; anthers more or less orbicular in outline, distinctly appendaged at the lower ends of the lobes, ± 1 mm in diameter; lobes oblong. *Ovary* globose, densely tomentose, seated on a thick disk, ± 1 mm in diameter; style included or scarcely exserted beyond the corolla-tube, glabrous, filiform, 3.5-4.5 mm long, shortly 2-lobed at the summit. *Fruit* enclosed within the persistent calyx, obovoid-pyriform, depressed at the top with two opposite broad based short peripheral projections along the distal end, pubescent all over, 4-5 mm long, 2-3 mm in diameter in the upper half, apparently non-dehiscent; seeds not seen.

Specimens examined

WESTERN AUSTRALIA: *Demarz 6282*, 42 km S of Salmon Gums, 13.xi.1976 (PERTH). *A. Dempster s.n.*, between Esperance Bay and Fraser Range, undated (MEL 880, lectotype; MEL 69299, MEL 69300 - isolectotypes). *Fairall 2444*, near Norseman, 14.x.1967 (PERTH 2 spec.). *Gardner 14223*, near Grass Patch, 5.ix.1962 (PERTH 2 spec.). *Wardell & Johnson s.n.*, Esperance area, 1972 (NSW 138373, PERTH, B, CANB, GH, K, L - not seen). *Wittwer 1873*, 13 km N of Scadden, 13.xi.1976 (PERTH). *Wrigley 5340*, 56 miles from Esperance towards Norseman, 2.xi.1968 (CBG).

Distribution (Map 2B)

P. chrysocalyx is endemic in the southern part of Western Australia, where it seems to occur chiefly between Norseman and Esperance. The type collection came from an unspecified locality between the Fraser Range and Esperance Bay.

Comments

This species was originally described by F. Mueller (1876) as the type of his new genus *Depremesnilia*, in the Labiatae, the species name being *D. chrysocalyx*. He retained the new genus in this family in his first Census of Australian Plants (1882), but in the second Census (1889), he placed it, as a synonym of *Chloanthes*, in the Verbenaceae. The species, however, was renamed as *Chloanthes depremesnilii*, the epithet being derived from the generic name *Depremesnilia*. The leaves are the smallest of any species of *Pityrodia*.

The year "1884" on one isolectotype in Herb. MEL (MEL 69299) should not be mistaken for year of collection, for the species had been described earlier, in 1876. The year "1884" and incorrect information about the locality were written at the bottom of F. Mueller's original annotation in a different hand with a light ink, and seems to have been added much after the actual date of collection.

Moldenke (1959) recorded *P. chrysocalyx* (F. Muell.) Gard. and *P. depremesnilii* (F. Muell.) E. Pritz. as two distinct species, with *Depremesnilia chrysocalyx* F. Muell. and *Chloanthes depremesnilii* as synonyms. In 1971, however, he recognized them both as the same species.

Affinities

P. chrysocalyx is nearest to *P. loricata* and *P. lepidota* in its stem, peduncle and calyx being non-hairy but densely clothed with peltate scales and stamens and style exserted beyond the corolla-tube. Nevertheless, *P. chrysocalyx* may easily be distinguished by the leaves being very small, measuring (1.5-) 2.5-5.5 (-8) by (1-) 1.5-3 (-4) mm, ternate, reflexed, ovate, convex and glutinous dorsally; calyx glabrous inside; fruit with a depression at the top and with two opposite broad-based short peripheral projections at the distal end. *P. chrysocalyx* is also close to *P. salvifolia* in having peltate scales on stem, leaves and calyx, but the leaves in the latter are larger, measuring (4-) 6-10 (-13) by (0.5-) 1-2 (-3.3) cm; flowers (5-) 7-9 in axillary clusters; scales on stem, leaves and calyx mixed with glands and short branched hairs; fruit without any depression at the top. *P. chrysocalyx* is endemic in the south of Western Australia whereas *P. salvifolia* is restricted to eastern Queensland.

3. **Pityrodia canaliculata** George, J.Roy.Soc.W.Aust.50(4)(1967)103; Mold., Fifth Summary Verben. etc. 1(1971)347.

Type: A.S. George 7992, 19 miles west of Sandstone, Western Australia, 12.ix.1966 (PERTH, holotype; K, MEL, PERTH - isotypes).

Description (Fig. 3)

A many stemmed shrub of 1-2.5 m. *Stem* and branches cylindrical, clothed with a close indumentum of peltate, minutely ciliate or fringed scales. *Leaves* almost sessile or narrowed towards the base into a short petiole, linear, almost flat, obtuse, entire, (1-) 1.5-4.5 cm long, 2-4 mm broad, canaliculate-carinate, dark green and becoming glabrous above, pale on the under surface, without conspicuous reticulate nerves, covered all over with a close indumentum of peltate scales. *Flowers* pedicellate, solitary or 3 together in the axil of upper leaves; pedicel scaly, 1.5-3 mm; bracts represented by the upper leaves; bracteoles minute, linear, scaly, 1-1.5 mm long, less than 0.5 mm broad. *Calyx* persistent, campanulate, somewhat angular, 5 lobed at the top, 3-4.5 mm long, densely covered with scales outside and on the inner face of the lobes, glabrous inside the tube; lobes deltoid, 1-1.5 mm long, nearly as broad at the base; tube 2-3 mm long. *Corolla* white with reddish spots in the throat, 8-10 mm long, covered with scales outside excepting the lower half of the tube, a dense hairy ring inside at the base of stamens with some long hairs extending to the large central lobe of the lower lip, a few sparse hairs on the inside of the upper lip; the large central lobe of the lower lip broadly elliptic-orbicular in outline, 4-5.5 mm long, 4-5 mm broad, the lateral lobes of the lower lip ovate or narrowly elliptic-oblong, obtuse, 2-4 (-5) mm long, 1.5-2 (-3) broad; the 2 obtuse lobes of the upper lip oblong, 2.5-4 (-5) mm long, 1.5-2 mm broad; tube 3-4.5 mm long, 2-2.5 mm broad at the top end. *Stamens* exserted, inserted in the corolla-throat; filaments glabrous, filiform, the lower pair 2.5-3 mm long, the upper pair 1.5-2 mm long; anthers more or less orbicular in outline, distinctly appendaged at the lower ends of the lobes, 0.8-1 mm long, nearly as broad. *Ovary* more or less globose, flat topped, densely hirsute-tomentose all over with a few glands at the top ± 1 mm in diameter; style exserted, filiform, glabrous, 4-5 mm long, shortly 2-lobed at the top. *Fruit* enclosed within the persistent calyx, obovoid-pyriform or almost top-shaped, glandular, and almost truncate or flat at the top, 3-4 mm long, ± 2.5 mm broad at the top, almost glabrous or sparsely puberulous with a few glands at the top.

Specimens examined

WESTERN AUSTRALIA: *Gardner 2513*, Sandstone, 18.viii.1931 (PERTH 4 spec.). *Gardner & Blackall 485*, between Sandstone and Anketell, August 1931 (PERTH 2 spec.). *George 7992*, 19 miles west of Sandstone, 12.ix.1966 (PERTH, holotype; K, MEL, PERTH - isotypes). *Green 1636*, 4 miles east of Anketell, 27.viii.1957 (PERTH). *Jefferies 578042*, loc. cit. August 1957 (PERTH).

Distribution (Map 2B)

P. canaliculata is endemic in Western Australia where it has been recorded from the area between Sandstone and Anketell.

Comments

C.A. Gardner's collections of this species were annotated as *P. lepidota* var. *longifolia* and *P. lepidota* var. *virgata*. Neither of these varietal names, however, seem to have been published. The confusion of *P. canaliculata* with *P. lepidota* is chiefly on the lepidote indumentum in both the species.

In the protologue, the ovary is described as hirsute only on top. Actually, the ovary is hirsute all over excepting the thick disk on which it is seated. At the fruiting stage, however, the hairs on the ovary become sparse and scarcely visible in the lower half which is covered closely by the persistent calyx.

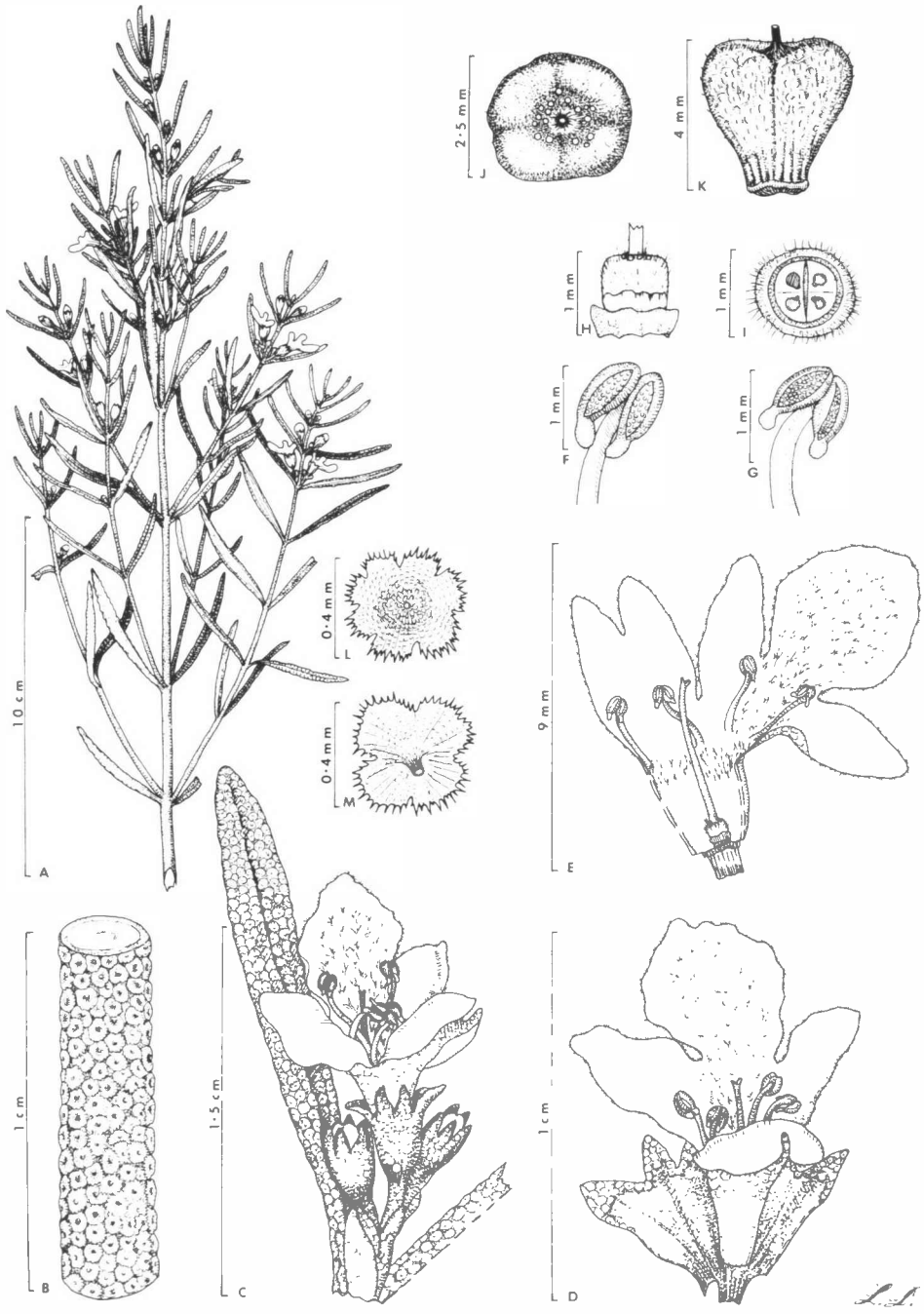


Fig. 3. *Pityrodia canaliculata* A.S. George (*A.S. George 7992*: PERTH). A, flowering twig; B, portion of stem showing scales; C, cyme in the axil of a leaf; D, flower with calyx vertically cut open to show the corolla-tube; E, corolla-tube vertically cut open showing inside; F, lower anther; G, upper anther; H, ovary; I, transverse section of ovary; J, top view of the fruit; K, side view of the fruit.

Affinities

P. canaliculata is closely related to *P. lepidota*, *P. loricata*, *P. chrysocalyx* and *P. salvifolia* in having a close indumentum of more or less peltate scales. Nevertheless, *P. canaliculata* may easily be distinguished by its leaves being narrow-linear, canaliculate and dark green above; fruit almost flat-topped, sparsely puberulous.

4. **Pityrodia loricata** (F. Muell.) E. Pritz., Bot.Jahrb.Syst.35(1904)516; Gard., Enum. Pl.Aust.Occ.3(1931)112; Mold., Résumé Verben. etc. (1959)210, 251; Beard (Ed.), W.Aust.Pl. edn 1 (1965)92; Blackall & Grieve, West.Aust.Wildfls 3(1965)568; Beard (Ed.), W.Aust.Pl. edn 2 (1970)114; Mold., Fifth Summary Verben.etc. 1(1971)348, 426.

Type: J. Young s.n., Queen Victoria Springs, Western Australia, 30.ix.1875 (MEL 69155, lectotype designated here; M, isolectotype).

Chloanthes loricata F. Muell., Fragm.10(1876)14, *basionym*; F. Muell., Syst.Cens.Aust.Pl.1(1882)103; F. Muell., Sec.Syst.Cens.Aust.Pl.1(1889)172; F. Muell.& Tate, Trans.Roy.Soc. S.Aust.16(1896)375.

Type: As for *P. loricata* (F. Muell.) E. Pritz.

Eriostemon argyreus F. Muell.& Tate, Trans.& Proc.Roy.Soc.S.Aust.13(1890) 107 and 97; Wilson, Nuytsia 1(1970)119, syn.nov.

Type: *W.H. Tietkens s.n.*, near Mt Sonder, Northern Territory, 1889 (MEL 4535, holotype).

Pityrodia loricata F. Muell., Fragm.10(1876)14, pro syn.sub *Chloanthes loricata* F. Muell., *nom.invalid.*

Typification

P. loricata is based on J. Young's (s.n.) collection, consisting of at least 2 duplicates. Since the author (of the basionym) did not choose any one of them as a type, it is, therefore, necessary to select a type for this name. The syntype preserved in Herb. MEL (MEL 69155), is annotated by him, and almost certainly used by him in preparing the original description of this species. The specimen is particularly complete and well preserved and is selected here as the lectotype for this name.

Description (Fig. 4)

A much branched low shrub of 30 to 60 cm, glabrous but very densely lepidote all over. *Stem* and branches densely clothed with more or less peltate, sessile, silvery scales, otherwise glabrous. *Leaves* sessile, oblong-lanceolate or narrowly elliptic-lanceolate, rather crowded on the branches, flat, non-decurrent, entire, (5-)8-20(-25) mm long, (2-) 3-5 mm broad, densely clothed with shining scales similar to those on the stem. *Flowers* almost sessile or shortly pedicellate, mostly 3 together in the axil of upper leaves; pedicel densely covered with scales, 1-2 mm long; bracts sessile, linear-lanceolate, scaly on abaxial surface, glabrous but non-scaly on adaxial surface, 3-5 mm long, 0.5-1(-1.5) mm broad; bracteoles linear-lanceolate similar to bracts but shorter, 2-3 (-3.5) mm long, ± 0.5 mm broad. *Calyx* persistent, 5-lobed in the upper half, (4-) 5-7 mm long, densely clothed outside and on the inner face of the lobes with sessile peltate scales, glabrous and non-scaly inside the tube; lobes lanceolate, (2-) 3-4 (-5) mm long, 1-1.5 mm broad at the base; tube 1.5-2.5 mm long. *Corolla* pale pinkish-white, (6-) 7-9 mm long, glabrous all over excepting the dense hairy ring inside above the ovary, and sparse long hairs extending to the large anterior-lobe of the lower-lip; anterior-lobe much larger than the others, more or less broadly elliptic-orbicular or oblong-elliptic, 3-4 mm long, (2-) 2.5-3 mm broad; the other 4 lobes almost equal, more or less oblong-elliptic or ovate, 2-3.5(-4) mm long, 2-2.5 (-3) mm broad at the base; tube (3-) 4-5 mm long, 2-3 mm broad at the top end. *Stamens* exserted; filaments glabrous, filiform, the lower pair longer, (2.5-) 3-4 mm long, the upper pair (2-) 2.5-3.5 mm long; anthers more or less orbicular in outline, scarcely appendaged at the lower ends of the lobes, ± 1 mm long, 0.5-1 mm broad. *Ovary* globose, densely tomentose, seated on a thick glabrous disk, ± 1 mm in diameter; style exserted, filiform, glabrous, 5-7 mm long, shortly 2-lobed at the summit.

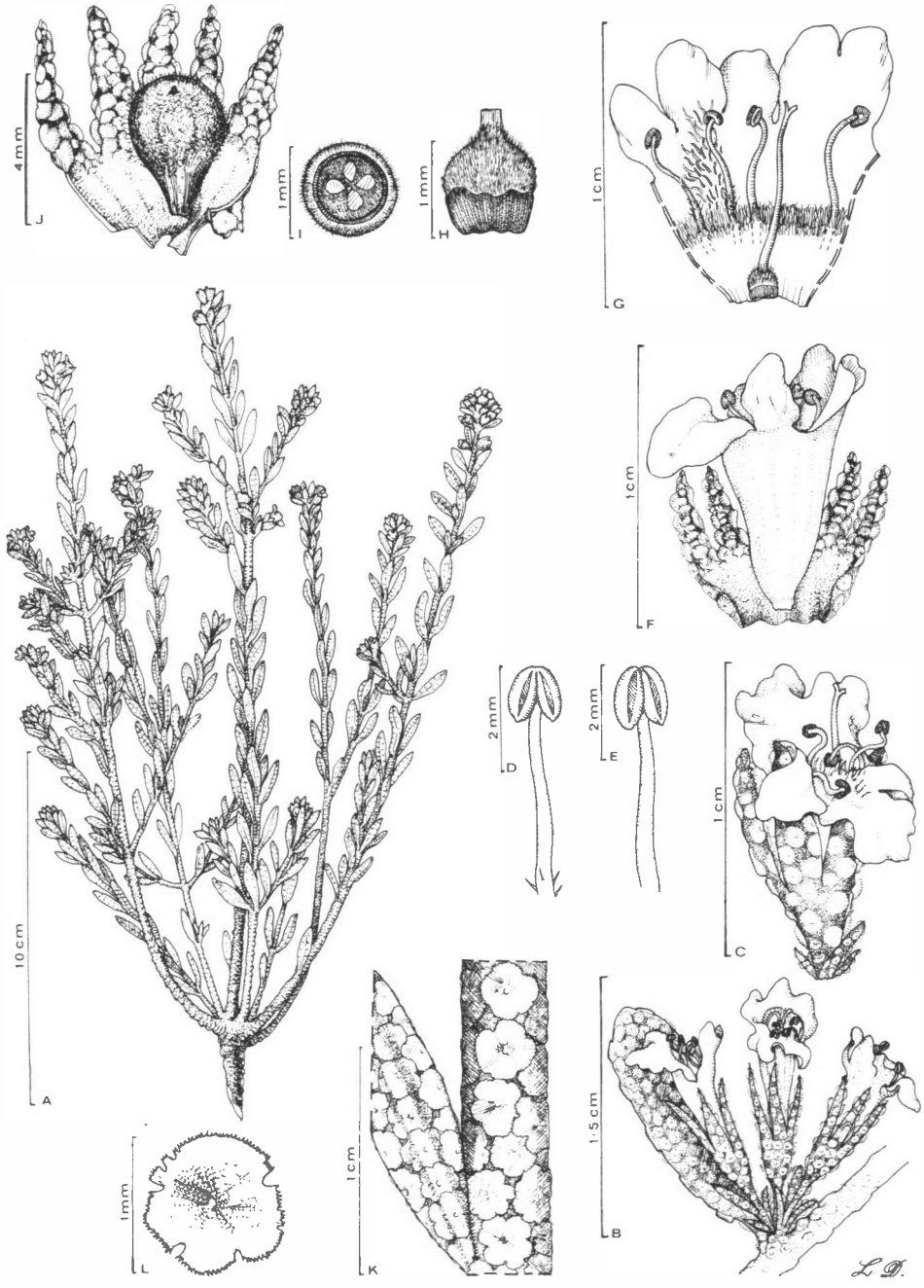


Fig. 4. *Pityrodia loricata* (F. Muell.) E. Pritz. (*R. Helms s.n.*: AD 96414089). A, flowering branches; B, cyme; C, flower with a bract and two bracteoles; D, lower stamen; E, upper stamen; F, flower with calyx vertically cut open showing inside scales and corolla-tube; G, corolla-tube vertically cut open to show androecium and gynoecium; H, ovary; I, transverse section of ovary; J, fruit with persistent calyx; K, portion of stem and leaf to show scales; L, single scale.

Fruit enclosed within the persistent calyx, obovoid-pyriform, pubescent, (2.5-) 3-4.5 mm long, 2-3 mm in diameter at the top end, apparently non-dehiscent; seeds not seen.

Specimens examined

WESTERN AUSTRALIA: *George 2877*, 48 miles NE of Cosmo Newbery, 24.vii.1961 (B, NT, PERTH 2 spec.). *George 8456*, 2.7 miles S of Neale Junction, 12.x.1966 (PERTH). *George 11965*, 5 km S of Neale Junction, Great Victoria Desert, 28° 21′ S, 125° 49′ E, 16.vii.1974 (PERTH). *Helms s.n.*, camp 41, Elder Exploring Expedn, 4.ix.1891 (AD 96414089, G, K, LE, MEL 69156, NSW 135941-135944, NSW 142618, PERTH, WU). *Helms s.n.*, Gnarlbine, 12.xi.1891 (K). *Main s.n.*, near Queen Victoria Springs, 25.viii.1960 (PERTH 2 spec.). *Young s.n.*, Queen Victoria Springs, 30.ix.1875 (MEL 69155, lectotype; M, isolectotype).

NORTHERN TERRITORY: *Schomburgk 93*, Central Australia, undated (AD). *Tietkens s.n.*, near Mt Sonder, 1889 (MEL 4535, holotype of *Eriostemon argyreus* F. Muell. & Tate).

Distribution (Map 2B)

P. loricata is endemic to Western Australia and the Northern Territory. In Western Australia, it is very sparsely distributed in the Carnegie, Coolgardie and Eucla districts, and in Northern Territory it has been recorded from near Mt Sonder in the Macdonnell Ranges.

Comments

During present studies, the type of *Eriostemon argyreus* F. Muell. & Tate has been found to be a specimen of *Pityrodia loricata* and the former name is, therefore, regarded as a synonym of the latter. F. Mueller & Tate (1890) considered *E. argyreus* allied to *E. anceps* Spreng. as far as leaves are concerned. In fact, they referred this species to *Eriostemon* Sm. (Rutaceae) only on the basis of its Rutaceae-like leaves, because the type specimen of *E. argyreus* F. Muell. & Tate is a sterile branch with leaves only. Wilson (1970) recognized it as a *Pityrodia* and with some uncertainty identified it as "?*P. lepidota* (F. Muell.) E. Pritzel". However, he expressed his doubt about the type locality "Mount Sonder", because "this genus has not been recorded by G. Chippendale (1972) as occurring in Central Australia". The occurrence of this species in Central Australia has now been confirmed by two separate collections.

The scaly vestiture of *P. loricata* is somewhat similar to those of *P. lepidota* and *P. salvifolia*. Nevertheless, the scales in *P. loricata* are non-stipitate and much less fringed.

Over a period of more than a century, this species seems to have been rarely collected. This may be due to its sparse occurrence in the remote interior parts of the country or to the species itself being rare.

Beard (1965, 1970) recorded this species from the Austin district of the Eremean Province in Western Australia. The present author, however, has not been able to confirm this by any collection from that district.

Affinities

P. loricata is closely allied to *P. lepidota* in its stem, leaves and outside calyx being densely scaly; flowers crowded towards the end of branches into a spicate inflorescence; leaves sessile; stamens and style exserted; fruit obovoid-pyriform, pubescent all over. Nevertheless, *P. loricata* may readily be distinguished by its scaly stem, leaves and calyx being shining (silvery); leaves oblong-lanceolate, calyx-lobes lancelolate, scaly inside and the anther-lobes scarcely appendiculate.

P. loricata is also near to *P. canaliculata* and *P. chrysocalyx* in having a scaly indumentum on the stem, leaves and calyx. *P. canaliculata* can easily be identified by its narrow-linear canaliculate leaves and *P. chrysocalyx* by its leaves being very small, (1.5-) 2.5-5.5 (-8) mm long, reflexed, broadly ovate or elliptic-ovate, smooth and glutinous on the upper non-scaly convex surface.

5. **Pityrodia lepidota** (F. Muell.) E. Pritz., Bot.Jahrb.Syst.35(1904)516; S. Moore, J.Linn.Soc.Lond.45(1920)189; Gard., Enum.Pl.Aust.Occ.3(1931)112; Junell, Sym.Bot. Upsal.4(1934)70, fig. 116; Mold., Résumé Verben. etc. (1959)210, 251; Beard (Ed.), W.Aust.Pl. edn 1(1965)92; Blackall & Grieve, West.Aust.Wildfls 3(1965)568; Beard (Ed.), W.Aust.Pl. edn 2(1970)114; Mold., Fifth Summary Verben. etc. 1 & 2(1971)348, 426, 603.

Type: *A. Y. Hassell s.n.*, "north-east of Janamonjup", near King George Sound, Western Australia, 1882 (MEL 69343, holotype).

Chloanthes lepidota F. Muell., Syst.Cens.Aust.Pl.1(1882)140, nom.nud.; F. Muell. in Wing, South.Sc.Rec.3 (1883)3, *basionym*; F. Muell., Sec.Syst.Cens.Aust.Pl.1(1889)172.

Type: As for *Pityrodia lepidota* (F. Muell.) E. Pritz.

P. lepidota (F. Muell.) E. Pritz. var. *verticillata* E. Pritz., Bot.Jahrb.Syst.35(1904)516; Mold., Résumé Verben. etc. (1959)210; Blackall & Grieve, West.Aust.Wildfls 3(1965)568; Mold., Fifth Summary Verben.1(1971)348, *syn.nov.*

Type: *L. Diels 5136 & 5138*, "in distr. Austin meridionali Pr. Menzies", Western Australia, ? 1901 (B, n.v.; probably destroyed during the war).

Description (Fig. 5)

A much branched shrub of (20-) 30-70 (-90) cm. *Stem* and branches densely scaly; scales peltate, with fringed margin, cineraceous-brown. *Leaves* sessile, scattered, decussate or more commonly ternate or "verticillate", oblong, oblanceolate or narrowly obovate, flat, obtuse, entire, (3-) 5-10 (-15) mm long, (1.5-) 2-3 (-4) mm broad, densely covered with non-shiny scales similar to those on stem. *Flowers* almost sessile or subsessile, solitary or 3 together in the axil of upper leaves; pedicel short, scaly, 1-2 mm long; bracts leaf-like when supporting single flower, linear-lanceolate and scaly when supporting 3 flowers, the leafy bracts 5-10 by 2 mm, the scaly bracts 1.5-2.5 by 0.5 mm; bracteole minute, linear, scaly, 1-1.5 mm long. *Calyx* persistent, 5-lobed in the upper halves, 5-6 mm long, densely clothed (outside) with peltate scales, glabrous and non-scaly inside the tube and on the lower inner halves of the lobes, hairy in the upper inner halves of the lobes; lobes more or less deltoid, obtuse, 2-3.5 mm long, 1-2 mm broad at the base; tube (1.5-) 2-3 mm long. *Corolla* whitish, "pale lilac", or "pale pink", 7-10 mm long, thinly scaly on the back of the lobes with the aspect of downy pubescence or thin velvet, sparsely stellate hairy inside the large anterior-lobe, glabrous on the inside of other 4-lobes and tube excepting the dense hairy ring above the ovary and sparse long hairs extending to the large anterior-lobe of the lower lip; the anterior-lobe broadly elliptic-orbicular, 4-5 mm long, 3-4.5 (-5) mm broad; the other 4 lobes oblong-obovate, 4-5(-6) mm long, (1.5-) 2-2.5 (-3) mm broad; tube dilated within the calyx, glabrous outside, 3-4 mm long, 2-3 mm broad at the top end. *Stamens* exserted above the corolla-tube; filaments glabrous, filiform, the lower pair (2.5-) 3-4 mm long, the upper pair (1.5-) 2-3 mm long; anthers more or less orbicular in outline; lobes divergent in the lower halves and distinctly appendaged at the lower ends, 0.5-1 mm long, about the same in breadth. *Ovary* globose, densely tomentose, seated on a thick glabrous disk, about 1 mm in diameter; style included or shortly exserted above the corolla-tube, sparsely hairy towards the base, 3-5(-6) mm long, minutely 2-lobed at the apex. *Fruit* enclosed within the persistent calyx, obovoid-pyriform, with the stylar scar deflected to one side, pubescent all over, 3-4 mm long, about 2 mm broad in the upper half, apparently non-dehiscent; seeds not seen.

Representative specimens

WESTERN AUSTRALIA (91 collections seen): *Aplin 2565*, 6 miles west of Kulja on road to Burakin, 27.viii.1963 (PERTH, SYD). *Bailey & Stone 812*, Muntadgin, Sept. 1947 (PERTH). *Baird s.n.*, Kalgoorlie, 1932 (UPS). *Barrow 40*, 10 miles E. of Hyden East Bin, 6.ix.1966 (PERTH, King's Park Perth). *Beard 5153*, Lake Seabrook Survey Area, 23.x.1967 (King's Park Perth). *Blackall 881*, Bronti, east of Southern Cross, 5.x.1931 (PERTH 2 spec.). *Blackall 3327*, 20 miles N of Bencubbin, 6.x.1937 (PERTH 2 spec.). *Blackall 3976*, near Kalannie east of Coorow, Sept. 1938 (PERTH 2 spec.). *Blackall s.n.*, Northampton district, Sept. 1940

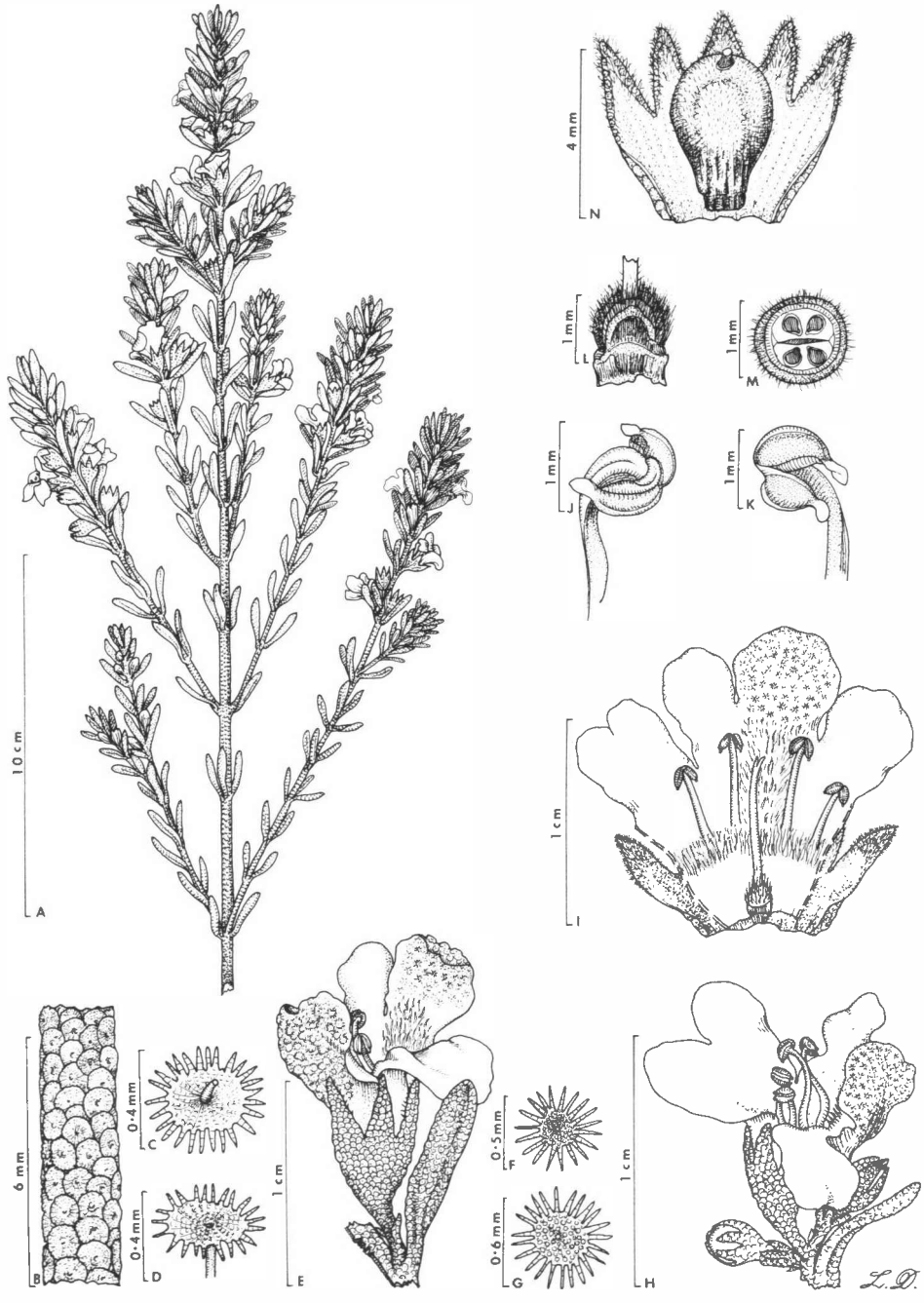


Fig. 5. *Pityrodia lepidota (F. Muell.) E. Pritz.* (A-M, *A.A. Munir 5264:* AD; N, *J.S. Beard 3924:* PERTH). A, flowering twig; B, portion of stem showing scales; C, ventral view of a stem-scale; D, dorsal view of a stem-scale; E, flower with a bract and two bracteoles; F & G, scales from the back of corolla-lobe; H, cyme; I, calyx and corolla vertically cut open to show androecium and gynoecium; J, lower anther; K, upper anther; L, ovary; M, transverse section of ovary; N, fruit with persistent calyx.

(PERTH). *Blackall s.n.*, near Narembeen, Sept. 1929 (PERTH). *Broadbent 1091*, Woolgangie, 26.vii.1953 (BM). *Brooker 2617*, 22 miles N of Cundeelee, 17.vi.1970 (ADW, BRI, PERTH). *Davies 62*, Queen Victoria Rock, mid August 1962 (PERTH). *A. Forrest s.n.*, Boodalin, undated (MEL 531018). *Gardner 128 & 1781*, Carrabin, 7.x.1922 (MEL, PERTH 2 spec.). *Gardner 2693*, Latham, 20.ix.1931 (PERTH). *Gardner 11124*, Comet Vale, 4.xi.1953 (PERTH 3 spec.). *Gardner 12063*, Rabbit Proof Fence eastwards from Perenjori, 8.ix.1953 (AD, L, NSW, PERTH). *Gardner s.n.*, Ballidu, Oct. 1934 (B, PERTH). *Haegi 939*, 15 km north-north-west of Goongarrie on road to Menzies, 14.ix.1976 (AD, BRI, MEL). *Haegi 1117* (? "1119"), 14.5 km north-east of Wubin on road to Payne's Find, 24.ix.1976 (AD). *A. Y. Hassell s.n.*, "north-east of Janamonjup", near King George Sound, 1882 (MEL 69343, holotype of *Chloanthes lepidota* F. Muell.). *Helms s.n.*, Gnarlbine, 12.xi.1891 (AD 96414090). *Keighery 21*, 1 mile W of Mt Hampton, 7.ix.1974 (PERTH, Kings Park Perth). *Keighery 60*, 23 miles east of Muckinbudin-Bullfinch, 6.ix.1974 (PERTH, King's Park Perth). *Kuchel 1779*, 30 km south-east of Londonderry, 14.ix.1964 (AD). *Main 559*, Cundeelee, Queen Victoria Spring area, 25.viii.1960 (PERTH). *Merrall s.n.*, Parker Range, 1892 (MEL 69345, MEL 69157). *Muir 181*, Buntine, 12.vii.1977 (PERTH). *Munir 5255*, 25 km N of Kondinin, 6.ix.1973 (AD). *E. Pritzel 878*, Coolgardie Goldfields, Oct. 1901 (B, BR, E, G 2 spec., GH, HBG, K, L, M, MO, NSW, NY, P, PR, S, US, W). *Royce 5527*, 4 miles S of Queen Victoria Springs, 2.x.1956 (PERTH). *Stacey 75*, 19 miles North of Lake King-Norseman road, on track to Southern Cross, 25.ix.1971 (PERTH). *Steward 442*, Trayning, 1916 (BM). *Wrigley 5782*, 6 miles from the Humps, towards King Rocks, 10.xi.1968 (CBG, NSW).

Distribution (Map 2B)

P. lepidota is endemic to the south-west of Western Australia where it seems to occur chiefly between latitude 29° and 34° S, and between longitude 116° and 124° E. In addition, one collection has come from some unspecified locality in the Northampton district and another one from "north-east of Janamonjup", an unidentified locality in the King George Sound area. Of the known localities, the major distribution is along the Great Eastern Highway, chiefly between Merredin and Coolgardie. North of the Highway, the distribution extends up to Lake Monger and Lake Moore, and southwards it occurs sparsely in the area between the Great Eastern Highway and the Lake Grace - Lake King road. The western-most locality is near the eastern sources of the Swan River and the eastern-most is near Queen Victoria Springs in the Great Victoria Desert.

Comments

In the protologue, the type-locality is mentioned, "north-east of Janamonjup", but the locality noted on the type label is "near King George Sound". The name "Janamonjup", however, has not been recorded on any recent map, or in any atlas or gazetteer available to the present author. It seems, that either this name has changed subsequent to the discovery of this species or is an error for the locality name Jeramungup which is not very far from King George Sound. This species has been collected from around Jeramungup, but so far there is no record to confirm its occurrence closer to King George Sound.

E. Pritzel (1904) described under this species a new variety, *verticillata*, which he segregated from the typical variety chiefly on its leaves being in whorls of 3-5. The present author has seen a few specimens identified by E. Pritzel as var. *verticillata*, but none of them has leaves in whorls of 5. It seems, that when the internode between the two successive nodes bearing opposite and ternate leaves is very contracted, the number of leaves per node may appear to be 5. During present investigations, both decussate and verticillate leaves were found in the type specimen and in several other specimens. The types of var. *verticillata* are not available for study, probably because they were preserved in the herbarium at Berlin and were destroyed during the war. Nevertheless, the characters on the basis of which E. Pritzel (1904) distinguished var. *verticillata* from the typical variety are not unique. Therefore, the type variety and var. *verticillata* are being regarded here as one and the same taxon.

The inflorescence of *P. lepidota* appears lax when there is only one flower in the axil of upper decussate leaves, and fairly congested when there are 3 flowers in the axil of each ternate leaf. Both types are found commonly within this species. The bracts of the axillary

solitary flowers, however, are leafy and of 3-flowered axillary cymes, small and scaly like the bracteoles.

Affinity

P. lepidota is nearest to *P. loricata* in its stem, leaves and outside calyx being densely scaly; inflorescence of densely crowded spicate flower-clusters towards the ends of branches; leaves sessile; stamens and style exserted above the corolla tube and fruit obovoid- pyriform, pubescent all over. Nevertheless, *P. lepidota* may easily be identified by the scales on the stem and leaves not being shiny; leaves cineraceous or dull green; calyx-lobes hairy inside; corolla-lobes scaly on their back and sparsely stellate-hairy inside the large anterior lobe; anther-lobes distinctly appendaged on both pairs of stamens; bracts leaf-like in the axillary solitary flowers. Both the species are restricted in the south-west of Western Australia, but *P. lepidota* is more southern in its distribution.

6. **Pityrodia angustisepala** Munir, sp. nov.

Caules et rami tetragoni, dense pubescentes. Foliorum laminae ellipticae vel elliptico-lanceolatae, glandulosae, puberulae. Calycis lobi linearii vel anguste lineari-lanceolati, (10-) 12-16 (-18) mm longi, 1-3 mm lati; tubus 1-2.5 mm longus. Corolla flava. Stamina exserta. Fructus 4-porcati.

Type: *N. Byrnes 1378*, near U.D.P. Falls, Arnhem Land, Northern Territory, Australia, 20.ii.1969 (NT, holotype; AD, BRI, CANB, DNA, NSW - isotypes).

Description (Fig. 6)

An erect branched shrub of 1-2 metres. *Stem* and branches more or less tetragonal, densely pubescent. *Leaves* petiolate; lamina flat, elliptic or elliptic-lanceolate, crenulate, cuneate towards both the ends, glandular and puberulous all over, rugose-bullate above, reticulation honey-combed beneath, (2.5-) 3-7 (-8.5) cm long, (0.6-) 1-2 (-2.5) cm broad; petiole pubescent, 4-10 mm long. *Inflorescence* cymose in the upper axils, not exceeding the leaves. *Flowers* pedicellate, axillary solitary or 3 in a cyme; pedicel glandular-viscid, pubescent, 1-3 mm long; bract narrowly elliptic, glandular pubescent, 4-7 mm long, 1.5-3 mm broad; bracteoles similar to bract, 1.5-3 (-4) mm long, 1-2 mm broad. *Calyx* persistent, deeply 5-lobed, with a short tube at the base, (12-) 13-18 (-20) mm long, densely glandular and puberulous outside and on the inner surface of the lobes, glabrous and non-glandular inside the tube; lobes linear or narrowly linear-lanceolate, ribbed outside, (10-) 12-16 (-18) mm long, 1-3 mm broad; tube short, 1-2.5 mm long. *Corolla* pale yellow, 18-25 mm long, glandular and sparsely stellate tomentose outside, glabrous inside excepting the dense hairy ring above the ovary, and a few very sparse and long hairs extending to the large anterior lobe; lobes broadly ovate, the anterior lobe 3-5 mm long, 2.5-4.5 mm broad at the base, the other 4 lobes 2.5-4 mm long, nearly as broad at the base; tube gradually dilated upwards, slightly curved, 13-16 (-18) mm long, 5-7 mm broad at the top end. *Stamens* much exserted; filaments glabrous, the lower pair (8-) 10-14 mm long, the upper pair (7-) 8-12 mm long; anthers oblong, 2-2.5 mm long, 1-1.5 mm broad, scarcely appendaged at the lower ends. *Ovary* globose, longitudinally corrugated, densely tomentose, with a thick glabrous disk underneath, 1-1.5 mm in diameter; style much exserted, filiform, glabrous, (18-) 20-30 mm long, shortly 2-lobed at the summit. *Fruit* broadly oblong in outline, more or less 4-ridged or angled in the upper half with longitudinal ridges and corrugation, 3-5 mm long, 2-4 mm broad, pubescent in the upper half, glabrous in the lower half, non-dehiscent, the longitudinal ridges protruding above the top end; seeds not seen.

Specimens examined

NORTHERN TERRITORY: *Byrnes 1378*, near U.D.P. Falls, Arnhem Land, 20.ii.1969 (NT, holotype; AD, BRI, CANB, DNA, NSW - isotypes). *Craven 3486*, McArthur River area near the Clyde River, Lat.

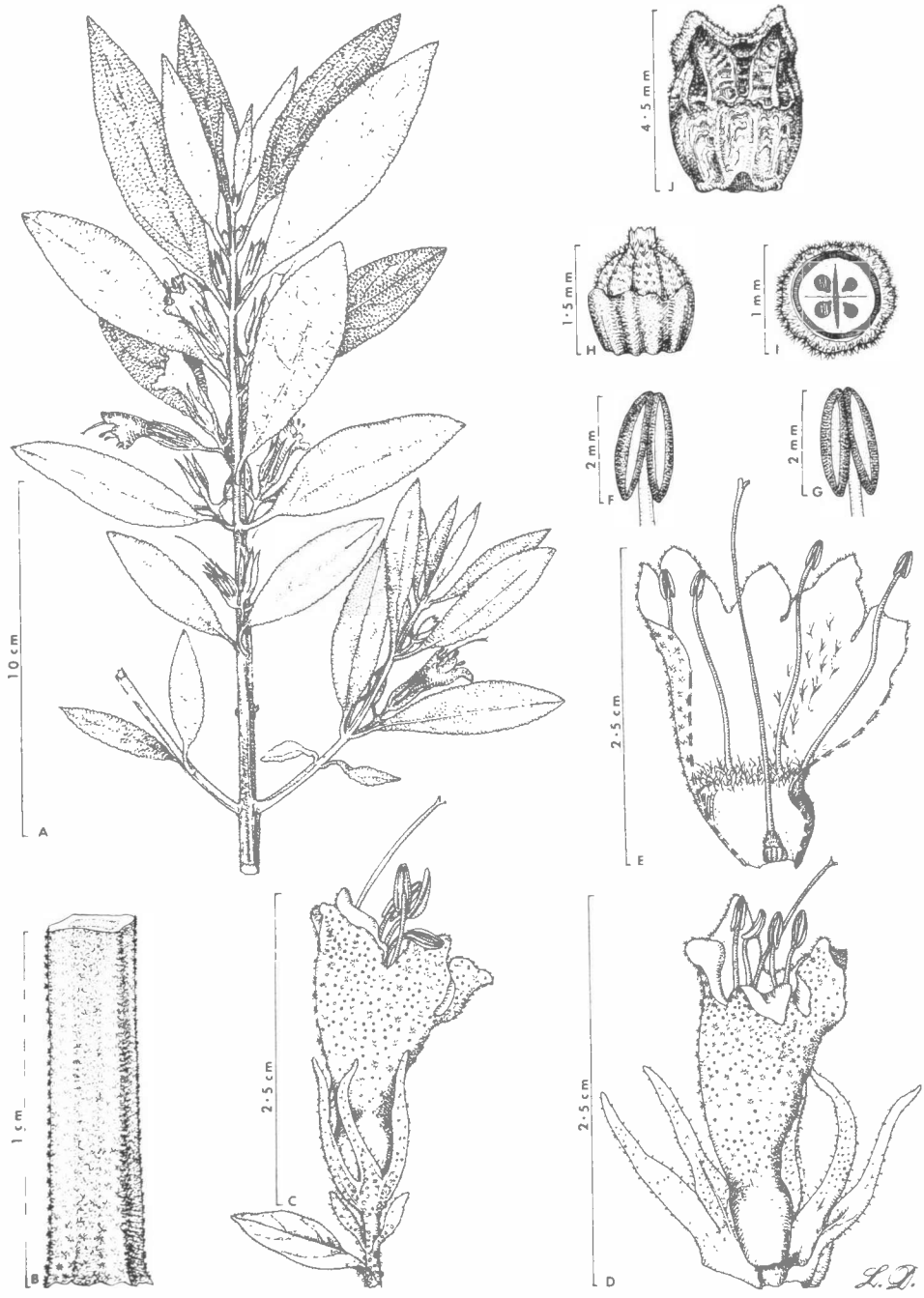
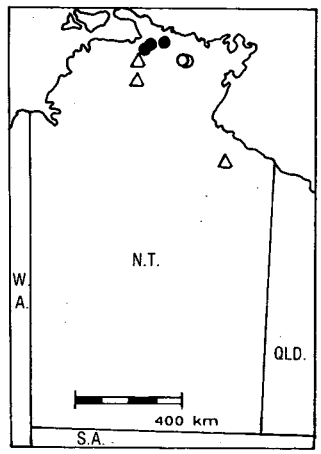


Fig. 6. *Pityrodia angustisepala* Munir (*N. Byrnes 1378*: NT, holotype). A, flowering branch; B, portion of stem to show its 4 angles; C, flower; D, flower with calyx vertically cut open to show corolla-tube; E, corolla-tube vertically cut open to show the inside; F, lower anther; G, upper anthers; H, ovary; I, transverse section of ovary; J, fruit.

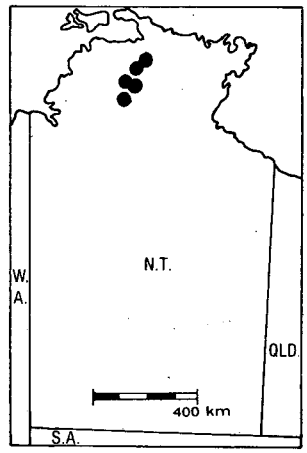
16° 27′ S, Long. 136° 10′ E, 29.i.1976 (AD, BRI, CANB). *Dunlop & Byrnes 2120*, U.D.P. mine area, 17.iii.1971 (AD, BRI, CANB, NT). *Key s.n.*, c. 1.5 km west of Koongarra, 15 km east of Mt Cahill, 29.x.1972 (CANB 233906 and CANB 233911).

Distribution (Map 3A)

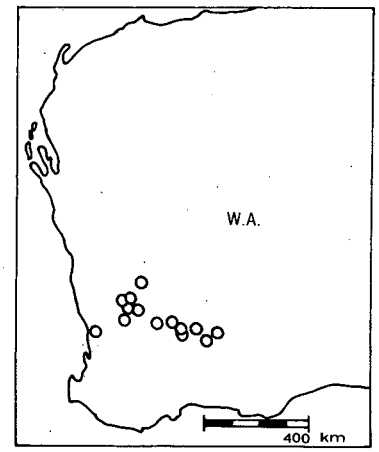
P. angustisepala is endemic in the northern part of Northern Territory. So far it has been recorded chiefly from between 12° and 14° S and between 132° and 133° E. One collection from outside the above limit has been gathered from near the Clyde River, east of McArthur River Homestead.



Map 3A.
P. angustisepala △
P. megalophylla ○
P. lanceolata ●



Map 3B.
P. quadrangulata ●



Map 3C.
P. halganiacea ○

Comments

The calyx-lobes of *P. angustisepala* are apparently the longest and among the narrowest within the genus. Similarly, the much exserted stamens and style, and presence of sessile stellate hairs outside the corolla-tube appear to be a peculiarity of this species.

Affinities

P. angustisepala is closely allied to *P. lanceolata, P. megalophylla* and *P. quadrangulata* in its stem being tetragonous; stamens and style exserted above the corolla-tube; anthers oblong, scarcely appendaged at the lower ends of the lobes; fruit distinctly 4-ridged or 4-angled in the upper half. Nevertheless, *P. angustisepala* can easily be distinguished by its leaves being narrow-elliptic, cuneate towards both the ends; calyx-lobes longest and narrowest of all of them, glandular and puberulous all over and corolla-tube with sessile stellate hairs outside. The distinct leaf-petiole, large disk below the ovary and somewhat similar looking fruit bring this species closer to *P. lanceolata* and *P. megalophylla*. However, the rugose-bullate leaves, long and narrow calyx-lobes and pale yellow corolla at once distinguish it. Besides the above-mentioned characters in common with *P. angustisepala* and *P. quadrangulata*, there are a few other identical features in both the species. They seem nearer to each other in having a pale yellow-corolla with tube gradually dilated upwards, lobes ovate and the inside villous hairs extending to the large anterior lobe being few and very sparse. *P. quadrangulata*, however, may easily be identified by its leaves being subsessile, obovate; calyx woolly-tomentose outside and fruit much more sharply 4-ridged or 4-angled.

7. **Pityrodia quadrangulata** Munir, sp. nov.

Caules et rami tetragoni, lanuginoso-tomentosi. Foliorum laminae elliptico-oblongae vel obovatae, lanuginoso-tomentosae. Calycis lobi lanceolati, membranacei, (5-) 8-11 (-13) mm longi, (2-) 3-4 mm lati; tubus (2-) 3-5 mm longus. Corolla flava. Stamina parum exserta. Fructus acute 4-angulati vel 4-costati.

Type: *L.G. Adams 2795*, 38 miles S of Oenpelli, 12° 52′ S, 133° 06′ E, 10.vii.1972 (CANB, holotype; K, L, NT, US - isotypes).

Description (Fig. 7)

A woolly-tomentose shrub of about 1 m. *Stem* and branches distinctly quadrangular, densely clothed with white woolly branched tomentum. *Leaves* shortly petiolate or subsessile, elliptic-oblong or obovate, cuneate towards the base, entire or crenulate, obtuse, flat, (3-) 4-8 (-10) cm long, (1-) 1.5-2.5 cm broad, sparsely glandular and densely woolly-tomentose, thick, bullate-rugose on the upper surface, reticulate underneath; petiole woolly-tomentose, (2-) 3-7 mm long. *Flowers* pedicellate, 3-9 (-12) together in pedunculate axillary cymes towards the end of branches, disposed in a paniculate inflorescence; cyme-peduncle thick, mostly 4-angled, tomentose, (5-) 10-18 mm long; pedicel slender, tomentose, (1-) 2-3 (-4) mm long; bracts leafy, narrowly elliptic-oblong or lanceolate, tomentose on abaxial surface, glabrous on adaxial surface, 4-8 (-10) mm long, (1-) 2-2.5 (-4) mm broad; bracteoles linear-lanceolate, 2-4 (-6) mm long, (0.5-) 1-1.5 mm broad. *Calyx* persistent, divided to below the middle into 5 lobes, tubular towards the base, 10-14 (-15) mm long, glandular and densely woolly-tomentose outside, sparsely so on the inside of the lobes, glabrous inside the tube; lobes lanceolate, membranous, reticulate (5-) 8-11 (-13) mm long, (2-) 3-4 mm broad at the base; tube ribbed, (2-) 3-5 mm long. *Corolla* pale yellow, 14-25 mm long, pubescent outside, glabrous inside excepting the narrow hairy-ring above the ovary, and occasionally a few sparse hairs extending to the large anterior-lobe of the lower-lip, lobes very broadly ovate, obtuse; the anterior-lobe much larger than any of the others, (2-) 3-4 mm long, 4-6 mm broad at the base; the other 4-lobes almost equal, (1-) 2-3 mm long, 2-4 (-5) mm broad at the base; tube gradually dilated upwards, (8-) 12-20 mm long, (5-) 7-10 mm broad at the top end. *Stamens* as long as the corolla-tube or slightly exserted; filaments glabrous, filiform, the lower pair 7-11 mm long, the upper pair 5-9 mm long; anthers oblong, 1.5-2 mm long, 1-1.5 mm broad, with minute appendages at the lower ends of the lobes. *Ovary* globose, pubescent-tomentose, longitudinally 4-ridged or corrugated, 0.5-1 mm diameter, seated on a very thick, circular, glabrous disk of up to 2 mm diameter; style exserted, filiform, glabrous, 15-25 (-30) mm long, shortly 2-lobed at the summit. *Fruit* enclosed within the persistent calyx, tetraquetrous, with 4 distinct longitudinal ridges or sharp angles, narrowly obovoid, depressed at the top, (3-) 4-6 mm long, 2-2.5 (-3) mm broad, puberulous, somewhat corrugated or sculptured between the wings, the wings protruding beyond the apex; seeds not seen.

Specimens examined

NORTHER TERRITORY: *Adams 2795*, 38 miles S of Oenpelli, 12° 52′ S, 133° 06′ E, 10.vii.1972 (CANB, holotype; K, L, NT, US - isotypes). *Byrnes 1649*, Sleisbeck, 18.vi.1969 (DNA, NT). *Byrnes 1826*, Katherine Gorge National Park, 24.iii.1970 (AD, DNA, NT). *Dunlop 4432*, Deaf Adder Gorge, 13° 04′ S, 132° 59′ E, 23.ii.1977 (AD, DNA, K, NT). *Fox 2554*, loc. cit., 13° 05′ S, 132° 51′ E, 24.ii.1977 (AD, CANB, DNA, NT). *Gittins 2672*, 65 km from Pine Creek, UDP Falls road, July 1973 (BRI 2 spec.). *Mariensz & Schodde AE 563*, 2 to 3 miles N El Sharana, 15.i.1973 (CANB).

Distribution (Map 3B)

P. quadrangulata is endemic in the Arnhem Land region of the Northern Territory. The known distribution is to the north of Katherine, where it has been recorded from between 12° and 15° S and between 132° and 134° E.

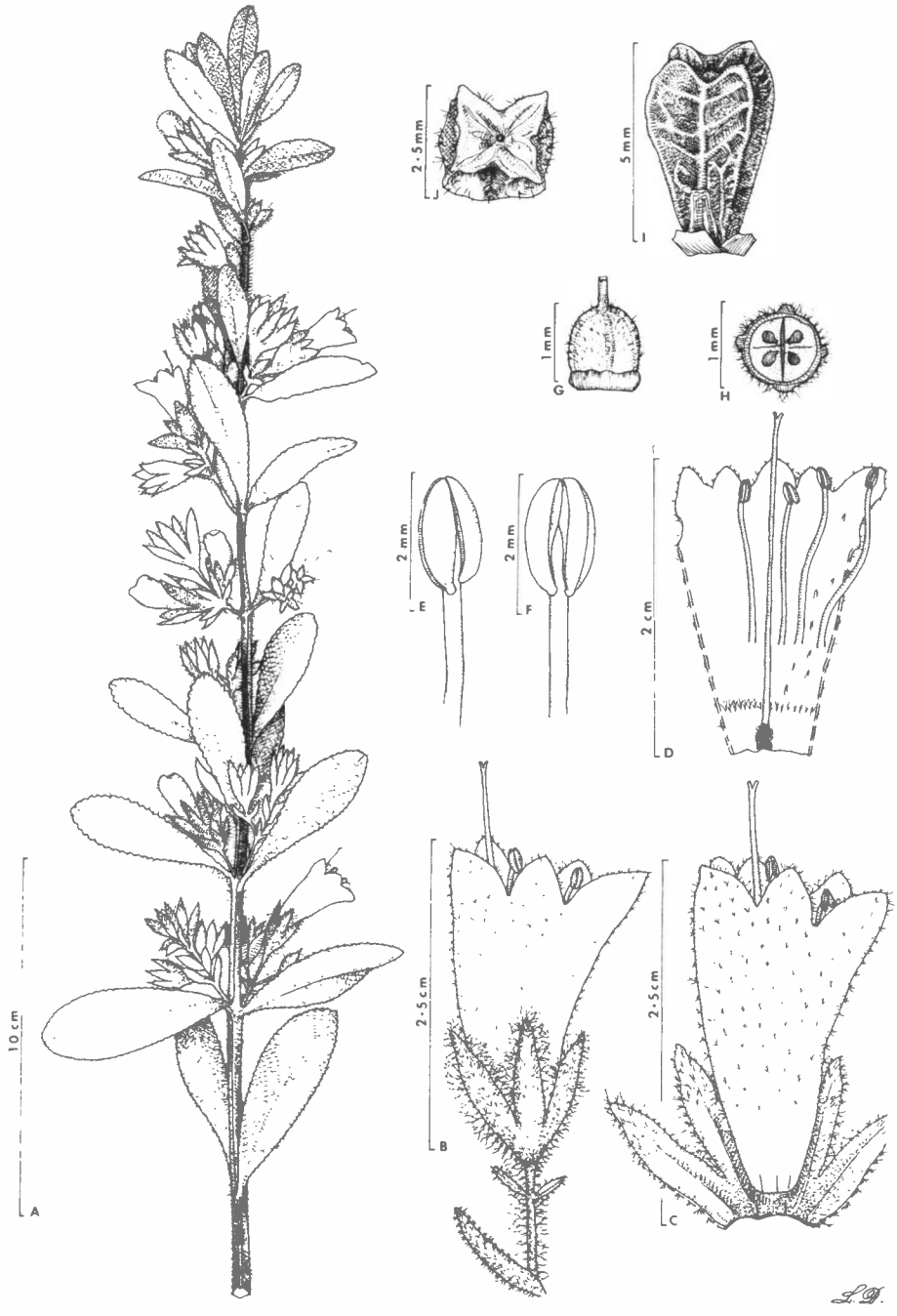


Fig. 7. *Pityrodia quadrangulata* Munir (*L.G. Adams 2795*: CANB). A, flowering twig; B, flower with a bract, two bracteoles and pedicel; C, flower with calyx vertically cut open to show inside; D, corolla-tube vertically cut open to show androecium and gynoecium; E, upper anther; F, lower anther; G, ovary; H, transverse section of ovary; I, fruit; J, top view of fruit showing 4 angles.

Comment

This is one of the most northerly occurring species of this genus.

Affinity

P. quadrangulata is nearest to *P. dilatata* in having similar shaped flat bullate-rugose leaves, pedicellate flowers, membranous and reticulate-veined calyx, gradually upwards dilated corolla-tube, oblong anthers with minute appendages at the base of the lobes, thick glabrous disk below the ovary and 4-angled fruit. However, *P. quadrangulata* can easily be distinguished by its stem and branches being distinctly quadrangular; leaves cuneate towards the base, longer, up to 8 (-10) by 2.5 cm; flowers 3-9 (-12) in a pedunculate axillary cyme, disposed in a more or less paniculate inflorescence; calyx-lobes lanceolate, tomentose inside, with (2-) 3-5 mm long tube; corolla pale yellow, almost glabrous inside at the base of the large non-reflexed anterior-lobe; ovary longitudinally ridged or corrugated; disk smooth and circular; fruit more or less oblong-rectangular, with 4 distinct longitudinal ridges or sharp angles, all over puberulous.

8. **Pityrodia megalophylla** Munir, sp. nov.

Caules et rami plus minusve tetragoni, dense tomentosi. Foliorum laminae ovatae, basi cordatae vel subcordatae, dense tomentosae, (4-) 5-10 (-14) cm longae. Calycis lobi ovati, (7-) 8-12 (-14) mm longi, (5-) 6-8 (-9) mm lati; tubus (7-) 8-10 mm longus. Corolla rosea. Stamina exserta, antheris 2.5-3 mm longis. Fructus apicem versus leviter 4-angulati vel 4-porcati.

Type: *D.E. Symon 7868*, rocky outcrops about 16 km south of Yaimanyi Creek, Arnhem Land, Northern Territory, Australia, 24.vi.1972 (ADW at AD, holotype; AD, CANB, K, NT - isotypes).

Description (Fig. 8)

An erect tomentose shrub of 1-2 m. *Stem* and branches more or less 4-angled, densely clothed with branched tomentum. *Leaves* distinctly petiolate; lamina ovate, acute, entire, more or less cordate at the base, flat, rugose above with distinct reticulation beneath, (4-) 5-10 (-14) cm long, (2-) 3-5 (-6) cm broad, densely greyish tomentose; petiole (0.8-) 1-2 cm long, tomentose. *Inflorescence* cymose; cymes arranged into leafy panicle, densely tomentose, not exceeding the leaves; primary peduncles in the upper axils, 1-1.5 (-2) cm long. *Flowers* pedicellate, 3-7 in a cyme, sometimes axillary solitary; pedicel 2-3 (-4) mm long, tomentose; bracts leafy, narrowly elliptic, cuneate towards the base, glabrous on adaxial surface, tomentose on abaxial surface, flat, entire, 8-12 mm long, (2-) 3-4 mm broad; bracteoles similar to bracts in shape and indumentum coverage, 3-5 mm long, 1-2 mm broad. *Calyx* persistent, divided almost to the middle into 5 lobes, distinctly ribbed, (15-) 18-22 (-24) mm long, densely tomentose outside and on the inner face of the lobes, glabrous inside the tube; lobes ovate, acute, strongly ribbed on the back, (7-) 8-12 (-14) mm long, (5-) 6-8 (-9) mm broad at the base; tube much dilated upwards, (7-) 8-10 mm long. *Corolla* reddish-pink, 22-27 mm long, glandular and woolly-tomentose outside, glabrous inside excepting the dense hairy ring above the ovary and a few sparse hairs extending to the large anterior-lobe; the anterior lobe more or less orbicular in outline, entire, 4-5 mm long, 5-6 mm broad; the other 4 lobes broadly ovate, 2.5-4 mm long, 3-5 mm broad at the base; tube cylindrical towards the base, abruptly dilated above the middle, 18-22 mm long, 6-8 mm broad at the top end. *Stamens* exserted; filaments pubescent in the lower halves, glabrous above, filiform, the lower pair 12-14 mm long, the upper pair 10-12 mm long; anthers oblong, 2.5-3 mm long, 1-1.5 mm broad, the appendages indistinct at the lower ends of the lobes. *Ovary* globose, densely tomentose, seated on a large glabrous disk, 1.5-2 mm in diameter; style exserted, glabrous, filiform, 22-28 mm long, shortly 2-lobed at the summit. *Fruit* oblong or more or less elliptic-oblong,

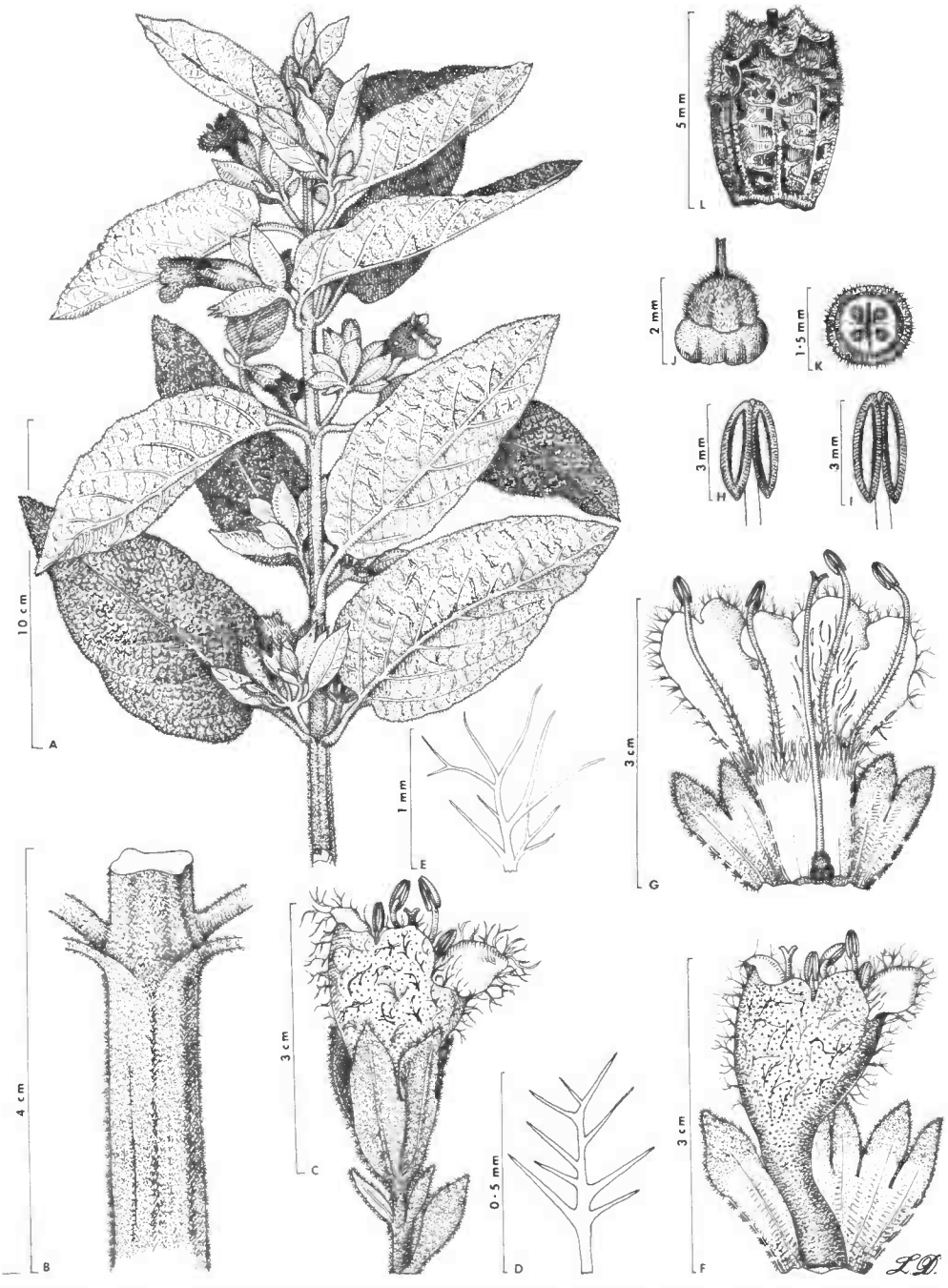


Fig. 8. *Pityrodia megalophylla* Munir (*D.E. Symon 7868*: ADW at AD). A, flowering branch; B, portion of stem showing 4 angles; C, flower with a bract and two bracteoles; D, calyx hair; E, corolla hair; F, flower with calyx vertically cut open to show corolla-tube; G, calyx and corolla vertically cut open to show androecium and gynoecium; H, lower anther; I, upper anther; J, ovary; K, transverse section of ovary; K, fruit.

pubescent and somewhat 4-angled or 4-ridged in the upper half, glabrous in the lower half, all over corrugated, somewhat sculptured in the upper half, (3.5-) 4-6 mm long, (3-) 4-5 mm in diameter, non-dehiscent; seeds not seen.

Specimens examined

NORTHERN TERRITORY: *Basedow 51*, Arnhem Land, loc. incert., April-June, 1928 (AD, K). *Byrnes 2688*, 58 miles NW of Gove - Maningrida Road Junction, 12° 53′ S, 134° 34′ E, 24.vi.1972 (AD, CANB, DNA, K, L, NSW, NT). *Maconochie 1577*, c. 90 miles south of Maningrida, 12° 51′ S, 134° 32′ E, 25.vi.1972 (NT). *Symon 7868*, about 16 km south of Yaimanyi Creek, 12° 53′ S, 134° 34′ E, 24.vi.1972 (ADW at AD, holotype; AD, CANB, K, NT - isotypes).

Distribution (Map 3A)

P. megalophylla is endemic in Arnhem Land, Northern Territory. The only known occurrence is about 93 km north-west of Gove - Maningrida Road junction towards Yaimanyi Creek.

Comments

Of all the *Pityrodia* species, *P. megalophylla* seems to have the largest leaves, calyces and anthers. It is one of the most northerly occurring, and one of the few species of this genus recorded from the Arnhem Land, Northern Territory.

The ovary seems partly imbedded in the glabrous fleshy disk, which in most cases is found to be much larger than the ovary. At infructescence stage, the disk appears to form a fleshy outer covering in the lower half of the fruit, but in the mature dry fruit it becomes irregularly wrinkled or corrugated. The glabrous surface pattern thus formed is different from the hairy sculptured upper half of the fruit, derived from the non-imbedded tomentose portion of the ovary.

Appendages at the lower ends of anther-lobes are not prominent. Similar anthers have also been noticed in a few other species of this genus.

Affinities

P. megalophylla is closely related to *P. obliqua* in its leaves being distinctly petiolate, ovate, cordate at the base; inflorescence (cymes) in upper axils, not exceeding the leaves; corolla pink, glandular and tomentose outside, tube abruptly dilated above the middle; stamens and style exserted above the corolla-tube. Nevertheless, *P. megalophylla* can be distinguished by its stem being distinctly 4-angled; leaves much larger, (3-) 5-10 (-14) by (1-) 2-5 (-6) cm; calyx larger, strongly ribbed, divided to about the middle only into 5 ovate lobes, densely clothed outside with short cineraceous tomentum, tube longer, non-glandular inside; corolla larger; anthers oblong, filaments pubescent in the lower halves; style glabrous all over; fruit more or less oblong with 4 ridges or angles in the upper half, deeply corrugated all over or sculptured in the upper half.

P. megalophylla and *P. quadrangulata* are also close to each other in having 4-angled stems, glabrous calyx-tube inside, exserted stamens and style, oblong anthers with inconspicuous appendages at the lower ends of the lobes and more or less similar looking fruit with distinct 4-angles, corrugations and/or sculpturing. Both the species are endemic in Arnhem Land, Northern Territory. *P. quadrangulata*, however, may readily be distinguished by the presence of long woolly tomentum all over the plant; leaves being subsessile, elliptic-obovate, pronounced bullate-rugose; calyx-lobes lanceolate, membranous when dry; corolla pale yellow, tube gradually dilated upwards, and fruit much more distinctly 4-angled throughout its length.

Another new species, *P. lanceolata*, is very near to *P. megalophylla*. It is found to have similar short cineraceous tomentum all over the plant, 4-angled stem, petiolate leaves, axillary cymes towards the end of branches, strongly ribbed calyx with ovate lobes, reddish-pink corolla with numerous small glands and woolly tomentum outside, exserted

stamens and style, pubescent filaments in the lower halves, oblong anthers with inconspicuous appendages at the lower ends of the lobes, and almost similar fruit. Both species are endemic in the Arnhem Land, Northern Territory. *P. lanceolata*, however, can easily be distinguished by its leaves being lanceolate with rounded or narrowed base, calyx pubescent inside, corolla-tube gradually dilated upwards, ovary and fruit more distinctly 4-winged and densely woolly-tomentose in the upper halves.

9. **Pityrodia lanceolata** Munir, sp. nov.

Caules et rami plus minusve tetragoni, breviter tomentosi. Foliorum laminae anguste elliptico-lanceolatae, basi cuneatae, dense tomentosae, (3-) 4-8 (-9) cm longae. Calycis lobi ovati, 5-7 (-8) mm longi, 3-5 mm lati; tubus 5-8 (-10) mm longus. Corolla rubra. Stamina exserta, antheris 1.5-2.5 mm longis. Fructus 4-angulati vel 4-porcati.

Type: *N. Byrnes 2727*, 8 miles south of Oenpelli Mission, Arnhem Land, Northern Territory, Australia, 13.vii.1972 (AD, holotype; CANB, DNA, K, L, NT - isotypes).

Description (Fig. 9)

An erect glaucous shrub of 1-2 m. *Stem* and branches more or less 4-angled, densely clothed with short, greyish, branched tomentum which often becomes yellowish upwards. *Leaves* distinctly petiolate; lamina narrowly elliptic-lanceolate, flat, entire, rounded or cuneate at the base, dark green and rugose above, greyish with distinct reticulation beneath, densely tomentose all over, (3-) 4-8 (-9) cm long, (0.5-) 0.6-2 (-2.5) cm broad; petiole slender, 6-10 (-13) mm long, greyish-tomentose. *Inflorescence* cymose in the upper axils; cymes paniculate, not exceeding the leaves; peduncle short. *Flowers* pedicellate, axillary solitary or 3 in a cyme; pedicel 1-3 mm long, greyish-tomentose; bracts petiolate, about the shape and size of a leaf; bracteoles sub-sessile, oblong or narrowly elliptic-lanceolate, 2-4 (-6) mm long, 0.5-1.5 (-2) mm broad. *Calyx* persistent, divided in the upper half into 5 lobes, distinctly ribbed, 10-16 (-18) mm long, greyish tomentose outside and on the inner face of the lobes, puberulous inside the tube; lobes ovate, acute, ribbed on the back, 5-7 (-8) mm long, 3-5 mm broad; tube dilated upwards, 5-8 (-10) mm long. *Corolla* red, 20-27 mm long, densely glandular and woolly-tomentose outside, inside with a dense hairy ring above the ovary and a few sparse hairs extending to the large anterior lobe; the anterior lobe more or less orbicular in outline, entire, 4-7 mm long, 3-6.5 mm broad; the other 4 lobes broadly ovate, 3-4.5 mm long, 3-5 mm broad at the base; tube gradually dilated upwards, slightly curved, 14-22 mm long, 5-8 mm broad at the top end. *Stamens* exserted; filaments filiform, sparsely hairy in the lower halves, glabrous above, the lower pair 10-12 mm long, the upper pair 8-10 mm long; anthers oblong, 1.5-2.5 mm long, 1-1.5 mm broad, indistinctly appendaged at the lower ends. *Ovary* globose, densely tomentose, seated on a large glabrous disk, 1-1.5 mm in diameter, style exserted, glabrous with a few sparse hairs in the lower half, 20-25 mm long, shortly 2-lobed at the top. *Fruit* more or less oblong in outline with 4 distinct longitudinal ridges or angles, woolly-tomentose in the upper half, glabrous in the lower half, corrugated all over, 4-6 mm long, 3-4 mm in diameter, non-dehiscent; seeds not seen.

Specimens examined

NORTHERN TERRITORY: *Byrnes 2717*, 8 miles south of Oenpelli Mission, 13.vii.1972 (AD, holotype; CANB, DNA, K, L, NT - isotypes). *Key 57920.5*, 15 km south-west by Nimbuwah Rock, 12° 17′ S, 133° 14′ E, 1.xi.1972 (CANB 2 spec.). *Maconochie 1594*, 8 km (5m) west of Rum Bottle Creek, 12° 04′ S, 133° 44′ E, 28.vi.1972 (CANB, NT). *Symon 7958*, loc. cit. 28.vi.1972 (ADW at AD).

Distribution (Map 3A)

P. lanceolata is endemic in Arnhem Land, Northern Territory. The known distribution is to the east of Darwin where it has been recorded from between 12° and 13° S and between 133° and 134° E.

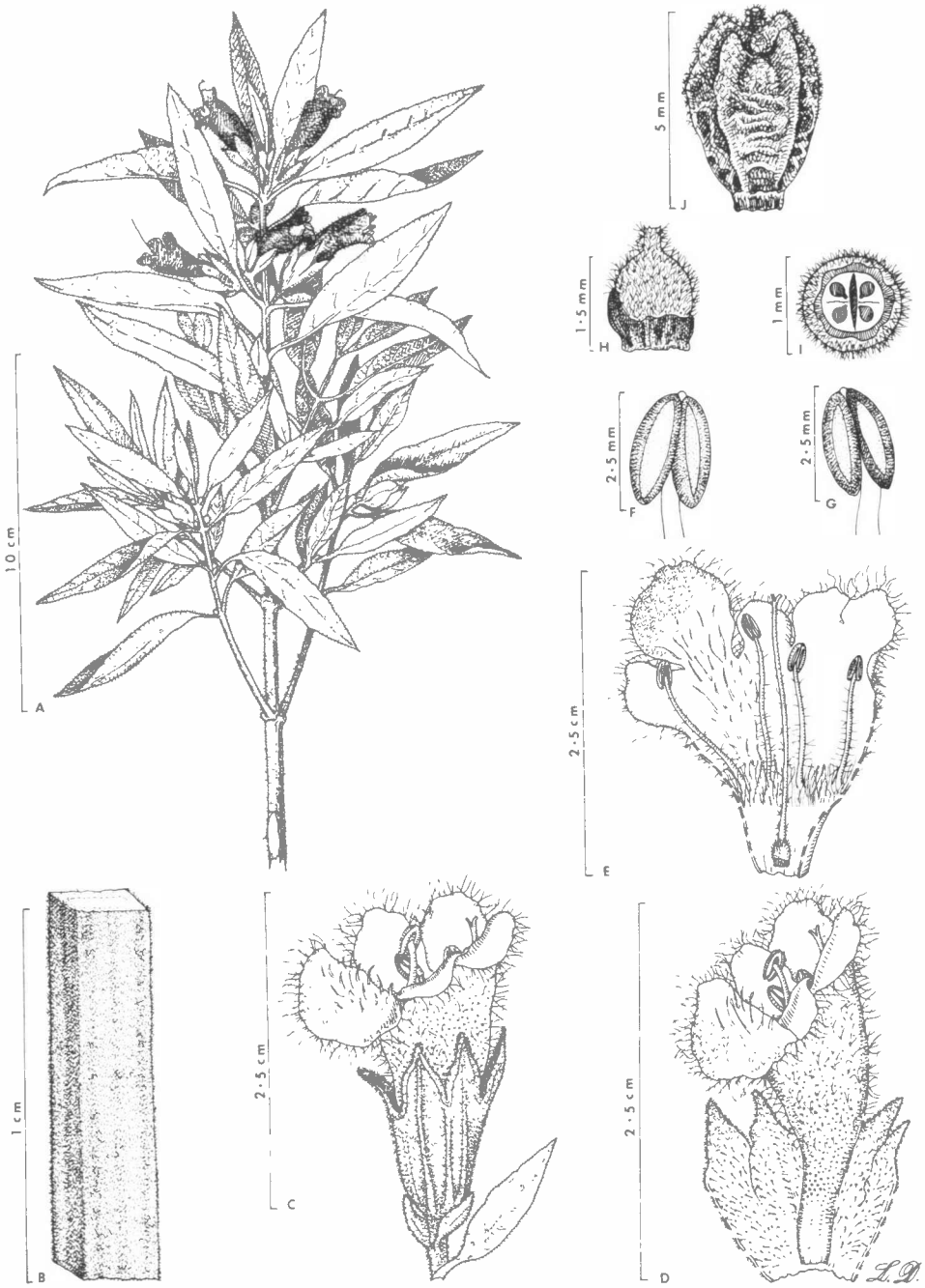


Fig. 9. *Pityrodia lanceolata* Munir (*N. Byrnes 2717*: AD). A, flowering twig; B, portion of stem showing 4 angles; C, flower with a bract and two bracteoles; D, flower with calyx vertically cut open to show inside glands and corolla-tube; E, corolla-tube vertically cut open to show androecium and gynoecium; F, lower anther; G, upper anther; H, ovary; I, transverse section of ovary; J, fruit.

Comment

The greyish hairs outside the calyx are fairly dense, branched and non-glandular, whereas the hairs inside the calyx-tube are more or less transparent, simple, septate and mostly gland-tipped.

Affinity

P. lanceolata is nearest to *P. megalophylla* in having cineraceous tomentum all over the plant, 4-angled stem, petiolate leaves, axillary cymes, strongly ribbed calyx, reddish corolla with numerous glands and branched woolly-tomentum outside, exserted stamens and style, pubescent filaments in the lower halves, oblong anthers without conspicuous appendages and in outline almost similar shaped fruit. Both the species seem to grow under the same ecological conditions in the Arnhem Land. Nevertheless, *P. lanceolata* may easily be identified by its leaves being narrower, lanceolate, cuneate or almost rounded at the base; bracts and bracteoles densely hairy on the adaxial surface as well; calyx pubescent inside the tube; corolla-tube mostly gradually dilated upwards; ovary more densely tomentose, style sparsely hairy in the lower half; fruit more distinctly 4-ridged and woolly-tomentose in the upper half.

10. **Pityrodia halganiacea** (F. Muell.) E. Pritz., Bot.Jahrb.Syst.35(1904)516; Gard., Enum.Pl.Aust.Occ.3(1931)112; Mold., Résumé Verben. etc. (1959)251; Beard (Ed.), W.Aust.Pl. edn 1(1965)92; Blackall & Grieve, West.Aust.Wildfls 3(1965)568; Beard (Ed.), W.Aust.Pl. edn 2(1970)114; Mold., Fifth Summary Verben. etc.1(1971)348, 425.

Type: *J. Young s.n.*, Mount Churchman, Western Australia, undated (MEL 885, holotype).

Chloanthes halganiacea F. Muell., Fragm.10(1876)14, *basionym*; F. Muell., Syst.Cens.Aust.Pl.1(1882)103; F. Muell., Sec.Syst.Cens.Aust.Pl.1(1889)172.

Type: As for *P. halganiacea* (F. Muell.) E. Pritz.

Chloanthes caerulea F. Muell. & Tate, Bot.Centralbl.55(1893)317; F. Muell. & Tate, Trans.Roy.Soc.S.Aust.16 (1896)375, *syn.nov.*

Type: *R. Helms s.n.*, near Gnarlbine, Western Australia, 12.xi.1891 (AD 2 spec., G, K, MEL 2 spec., NSW 4 spec., PERTH - syntypes of *Ch. caerulea* F. Muell. & Tate); *E. Merrall s.n.*, Parkers Range, Western Australia, 1892 (MEL, syntype of *Ch. caerulea* F. Muell. & Tate).

Pityrodia caerulea (F. Muell. & Tate) E. Pritz., Bot.Jahrb.Syst.35(1904)516; Gard., Enum.Pl.Aust.Occ.3(1931) 112; Mold., Résumé Verben. etc. (1959)251; Beard (Ed.) W.Aust.Pl. edn 1(1965)92; Beard (Ed.), W.Aust.Pl. edn 2(1970)114; Mold., Fifth Summary Verben. etc. 1 & 2 (1971)347, 425, 603,971, based on *Chloanthes caerulea* F. Muell. & Tate.

Pityrodia caerulea (F. Muell. & Tate) Ewart & White, Proc.Roy.Soc.Vict. n.s. 22(1910)324, *comb.superfl.*, later homonym.; S. Moore, J.Linn.Soc.London 45(1920)188; Mold., Résumé Verben.etc.(1959)210; Blackall & Grieve, West.Aust.Wildfls 3 (1965)568, based on *Chloanthes caerulea* F. Muell. & Tate.

Description (Fig. 10)

An erect branched shrub of (20-) 30-90 cm, branching chiefly near the base. *Stem* and branches densely clothed with short cottony-white or cineraceous branched hairs. *Leaves* sessile, somewhat crowded, often ternately or quarternately verticillate, linear-lanceolate or almost terete owing to revolute margins, (0.7-) 1-2.5 (-3.5) cm long, (1.5-) 2-3 (-4) mm broad, smooth and sparsely woolly above, but becoming glabrous when old, densely white woolly underneath, the woolly undersurface often concealed by the revolute margins. *Flowers* pedicellate, mostly 3-7 in a cyme, rarely solitary; cymes pedunculate, arranged into a more or less pyramidal lax panicle; peduncles densely covered with stellate and simple but septate gland-tipped brownish hairs, (0.7-) 1-2 cm long; pedicels densely tomentose with stellate and simple gland-tipped hairs, 2-3.5 (-5) mm long; bracts sessile, narrowly ovate or lanceolate, tomentose all over, (2-) 3-6 mm long, (0.5-) 1-1.5 mm broad; bracteoles linear-lanceolate, tomentose on abaxial surface, sparsely so on adaxial

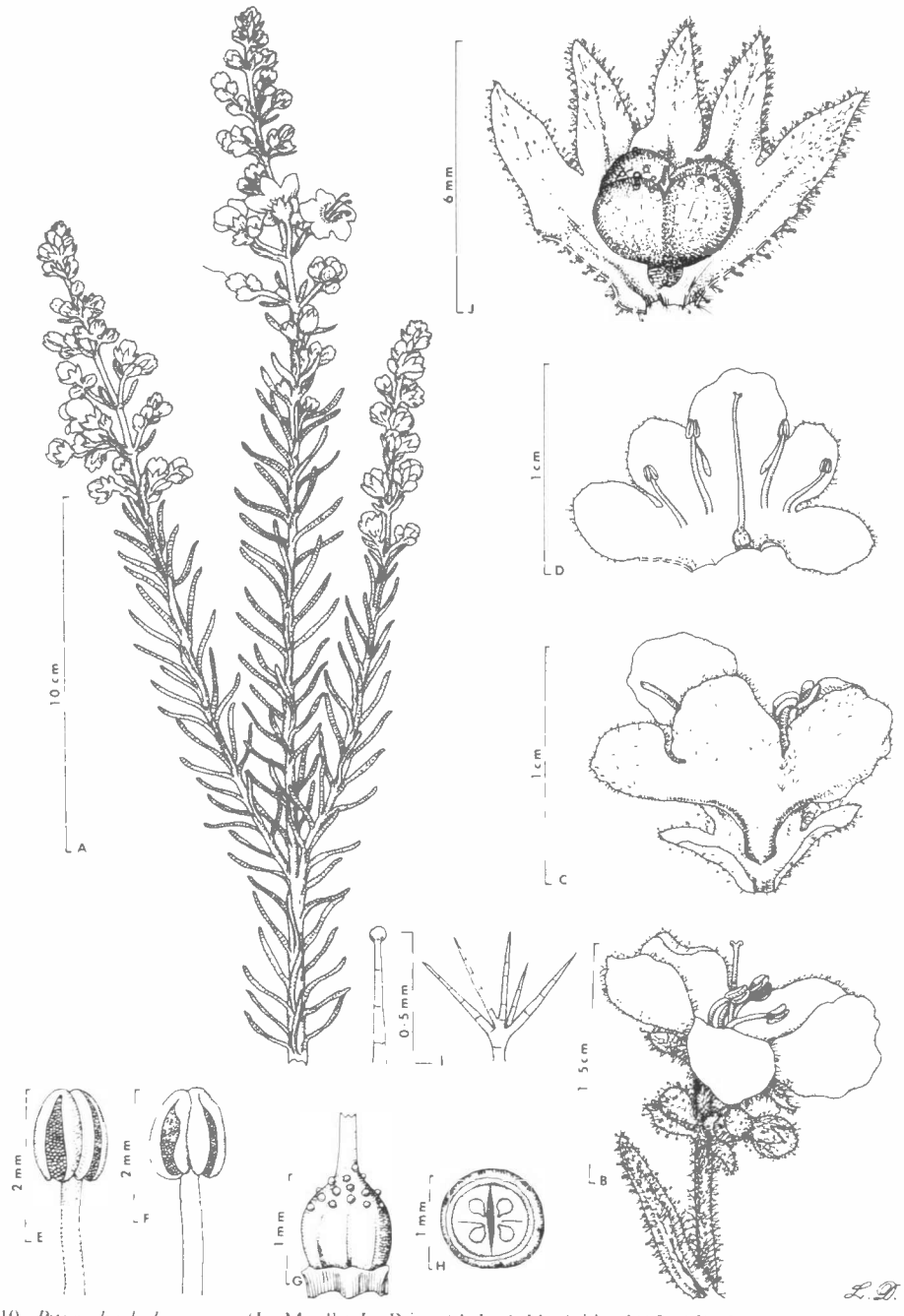


Fig. 10. *Pityrodia halganiacea* (F. Muell.) E. Pritz. (A-I, *A. M. Ashby 3605*; AD; J, *R. Helms s.n.*; AD). A, flowering branch; B, cyme; C, flower with calyx vertically cut open to show corolla-tube; D, corolla-tube vertically cut open to show androecium and gynoecium; E, upper anther; F, lower anther; G, ovary; H, transverse section of ovary; I, gland-tipped simple and eglandular branched hairs outside the calyx; J, persistent calyx vertically cut open to show fruit.

surface, 2-3 (-4) mm long, ± 0.5 mm broad. *Calyx* "pink", persistent, deeply cleft in the upper half into narrow ovate-lanceolate lobes, tubular in the lower half, 4-6 mm long, tomentose outside with stellate and simple gland-tipped hairs, glabrous inside excepting a few hairs on the upper halves of the lobes; lobes 2-3 (-4) mm long, 1-2 mm broad at the base; tube (1-) 1.5-2 mm long. *Corolla* purplish-blue, wider than long, deeply lobed, (7-) 10-15 mm long, (10-) 12-15 (-20) mm across, pubescent outside on the back of the lobes only, glabrous inside with no hairy ring inside the tube; the anterior-lobe the largest, more or less oblong or broadly elliptic-orbicular, (3.5-) 4-8 (-10) mm long, (2-) 3.5-7 (-10) mm broad; the other 4 lobes almost equal, oblong-orbicular, (2-) 3-5 (-7) mm long, 2-4 (-5) mm broad; tube shorter than the lobes, much broader, 1.5-3 (-4) mm long, 3-5 (-7) mm broad at the top end. *Stamens* exserted, yellow; filaments glabrous, filiform, attached near the base of the corolla-tube, the lower pair 5-8 mm long, the upper pair 4-7 mm long; anthers oblong in bud, almost roundish after dehiscence, without distinct appendages, ± 1 mm long. *Ovary* globose in outline, longitudinally quadrisulcate, glabrous, glandular at the top; style exserted, filiform, glabrous, 5-9 mm long, terminal, arising from between the 4 ovary lobes but not gynobasic, stigma minutely 2-lobed. *Fruit* enclosed within the persistent calyx, globular in outline, deeply 4-lobed, glabrous, glandular at the top, 1.5-2.5 mm long, 2-2.5 mm in diameter, faintly reticulate, splitting into 4 nutlets, each nutlet 1-seeded.

Representative specimens

WESTERN AUSTRALIA (32 collections seen): *Ashby 3605*, Kulja, 6.ix.1970 (AD 2 spec., PERTH). *Beard 2438*, Boorabbin, 8.xi.1962 (King's Park Perth). *Blackall s.n.*, Southern Cross, Sept. 1929 (PERTH 2 spec.). *Blackall & Gardner 830*, near Bencubbin, 29.ix.1931 (PERTH 2 spec.). *Cough 144*, near Duri, 19.xi. 1963 (PERTH). *Cronin s.n.*, between Upper Blackwood River and Lake Lefroy, 1893 (MEL 69303). *Davies s.n.*, near Queen Victoria Rock, August-Sept. & Nov., 1964 (PERTH 3 spec.). *Demarz 5898*, 7 km E Burakin, 28.xi.1975 (PERTH, Kings Park Perth). *Demarz 5610*, c. 12 miles W of Mollerin, 23.ix.1975 (PERTH). *Diels s.n.*, Southern Cross, undated (PERTH). *Gardner 1278*, Westonia, 5.x.1922 (MEL, PERTH 2 spec.). *Gardner 8021*, near Yellowdine, 20.x.1945 (PERTH). *George 11174*, "3 miles" (4.82 km) WSW of Kulja, 30° 30′ S, 117° 15′ E, 13.xi.1971 (PERTH). *Helms s.n.*, near Gnarlbine, 12.xi.1891 (AD 96430052, AD 97608122, G, K, MEL 69304, MEL 69305, NSW 135945, NSW 135946, NSW 138370, NSW 138371, PERTH - syntypes of *Chloanthes caerulea* F. Muell. & Tate). *Keighery 70*, 1 mile E of Yellowdine, 8.ix.1974 (PERTH, Kings Park Perth). *Kuchel 1769*, 25 km south-east of Londonderry Siding, 14.ix.1964 (AD). *Lullfitz 3106*, Bullfinch to Southern Cross, 7.xii.1963 (PERTH, Kings Park Perth). *Merrall s.n.*, Parkers Range, 1892 (MEL 69302, syntype of *Chloanthes caerulea* F. Muell. & Tate). *Munir 5241*, 3 km west of Yellowdine, 5.ix.1973 (AD). *Rogerson 306*, Cleary, N of Kellerberrin & W of Bonnie Rock, Oct. 1966 (PERTH). *Rosier 245*, loc.cit., 24.xii.1959 (PERTH). *Rosier 285*, Wyalkatchem, Oct. 1960 (PERTH). *Rosier 361*, 9 miles S of Mollerin, 27.x.1963 (PERTH). *Selk 1312*, Mundaring near old Stn area, 26.x.1970 (Kings Park Perth). *Stacey 185*, 18 miles east of Southern Cross, 12.x.1972 (PERTH). *Stacey 224*, 2.5 miles E of Kulja, 15.x.1972 (PERTH). *Stoward 401 & 458*, Cowcowing, 1916 (BM). *Stoward 378*, Mt Marshall, 1917 (BM). *Young s.n.*, Mt Churchman, undated (MEL 885, holotype of *Chloanthes halganiacea* F. Muell.).

Distribution (Map 3C)

P. halganiacea is endemic in the south-south-west of Western Australia. The main distribution is to the east and north-east of Perth between latitude 29° and 32° S, and between longitude 117° and 121° E. To the east of Perth, it occurs between Coolgardie and Southern Cross along the Great Eastern Highway. A few localities south of the Highway are near Gnarlbine, Queen Victoria Rock and Parker Range. Several localities north of the Highway are in the area between Lake Moore and Kellerberrin. One further locality from east of Perth is near the Old Mundaring Station.

Comments

E. Pritzel (1904) recognized *Pityrodia halganiacea* (F. Muell.) E. Pritz. and *P. caerulea* (F. Muell. & Tate) E. Pritz.. It is not certain, however, whether he did actually see the type specimens or not. Both species have also been accepted by Gardner (1931), Beard (1965, 1970) and Moldenke (1971). During the present investigation, the types of *P. halganiacea* (F. Muell.) E. Pritz. and *P. caerulea* (F. Muell. & Tate) E. Pritz. have been found to be

conspecific, therefore, the name *P. halganiacea* (F. Muell.) E. Pritz., based on an earlier validly published name is accepted here for this species. In 1910, Ewart & White erroneously published a superfluous combination *P. caerulea* (F. Muell. & Tate) Ewart & White, based on (*Ch. caerulea* F. Muell. & Tate) the basionym of E. Pritzel's earlier combination. The superfluous combination by Ewart & White has been accepted by S. Moore (1920), Moldenke (1959) and Blackall & Grieve (1965).

Two specimens in Herb. MEL are erroneously labelled as types of *Chloanthes caerulea* F. Muell. & Tate. One of them (MEL 69303) belongs to Miss M. Cronin's (s.n.) collection from between the Upper Blackwood River and Lake Lefroy. This specimen was mentioned by Ewart & White (1910) as having come from a new locality. The other specimen without collector's name or place of collection has the no. MEL 69301. Since the types of *Ch. caerulea* F. Muell. & Tate were collected by R. Helms (s.n.) from Gnarlbine and E. Merrall from Parkers Range, therefore, the above mentioned two specimens in the type folders in Herb. MEL should not be mistaken for the types of *Ch. caerulea* F. Muell. & Tate.

The absence of hairs on the ovary and inside the corolla-tube seems a peculiarity of this species. Similarly, the anther-lobes are very obscurely or not at all appendaged at the lower ends and are found to dehisce sooner after the flowers open than in other species.

Blackall & Grieve (1965) recorded this species from L. Diel's botanical district Irwin. Its occurrence that far north-west has not been confirmed.

According to Ewart & White (1910), this plant has a pleasant fragrance when rubbed or broken.

Affinities

P. halganiacea is nearest to *P. bartlingii* in its leaves being ternate, sessile, linear or narrowly linear-lanceolate, with revolute margins; corolla-tube shallow, much dilated above the calyx and anther-lobes without distinct appendages at the lower ends. However, *P. halganiacea* may easily be distinguished by its inflorescence being a lax pyramidal panicle, ovary and inside corolla-tube glabrous; stamens and style exserted; fruit globular in outline, deeply 4-lobed; tomentum on young branches, peduncles and calyces of stellate and simple gland-tipped hairs. In *P. bartlingii*, the inflorescence is a spike-like woolly raceme; fruit obovoid, oblique, with a thin-walled concavity on the side and tomentum on young branches, peduncles and calyces, hairs neither simple nor gland-tipped.

P. halganiacea is also close to *P. uncinata* in having leaves of similar shape and arrangement, corolla-tube shallow, anther-lobes non-appendiculate and fruit globular in outline. The latter, however, can readily be identified by its spike-like inflorescence, non-glandular hairs on young shoots, peduncles and calyces, included stamens and style, hairy ovary and the inside of corolla-tube, distinctly sagittate stigma and only 2-lobed (i.e. 2 nutlet) fruit.

11. **Pityrodia scabra** George, J.Roy.Soc.W.Aust.50(4)(1967)103; Mold., Fifth Summary Verben. etc. 1(1971)348.

Type: *S.B. Rosier 27*, Cowcowing, between Wyalkatchem and Koorda, Western Australia, May 1958 (PERTH, holotype; K, MEL, PERTH - isotypes).

Description (Fig. 11)

A shrub of about 1 m tall. *Stem* and branches terete, densely clothed with a viscid, golden-rusty indumentum of branched hairs. *Leaves* sessile, in whorls of 3, linear or almost terete, obtuse, with deeply revolute margins, more or less crenulate so as to appear bullate, 5-10 (-15) mm long, 1-2 (-3) mm broad, somewhat viscid, coarsely tomentose,

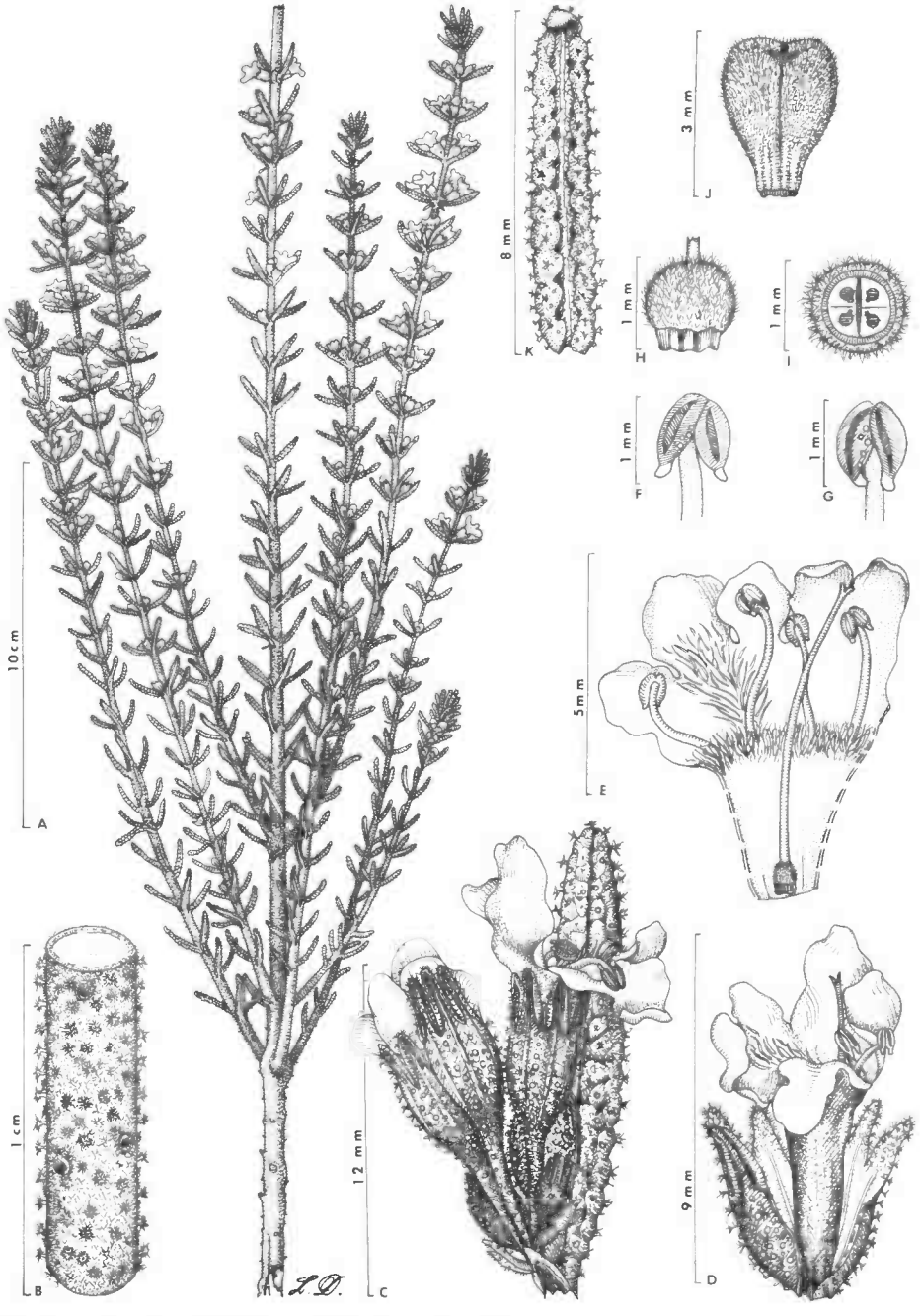


Fig. 11. *Pityrodia scabra* A.S. George (*S.B. Rosier 27*: MEL, isotype). A, flowering twig; B, portion of stem; C, cyme with a leaf; D, flower with calyx vertically cut open to show corolla-tube; E, corolla vertically cut open to show androecium and gynoecium; F, lower anther; G, upper anther; H, ovary; I, transverse section of ovary; J, fruit; K, abaxial view of leaf.

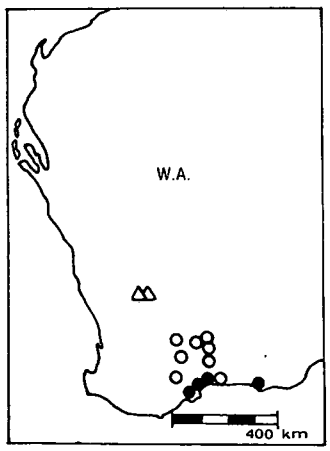
becoming scabrous above, ferrugineous underneath. *Inflorescence* cymose; cymes sessile, verticillate in the upper axils, (3-) 7-9 (-15) flowered. *Flowers* pedicellate; pedicels glandular-pubescent, (2-) 3-5 (-5.5) mm long; bracts linear, glandular-pubescent on abaxial surface, almost glabrous on adaxial surface, 3-5 mm long, 0.5-1 mm broad; bracteoles linear, 2-3 mm long, ± 0.5 mm broad. *Calyx* persistent, 5-lobed in the upper half, tubular below, 4-5 mm long, glandular and pubescent outside and on the inner surface of the lobes, glabrous inside the tube; lobes more or less ovate, obtuse, with recurved margins and prominent midrib, 2-3 mm long, 1-1.5 mm broad at the base; tube 2-2.5 mm long. *Corolla* white, (6-) 7-9 mm long, glabrous all over excepting the dense hairy ring inside around the base of the filaments and a few hairs extending to the mid-lobe of the lower lip; the mid-lobe more or less elliptic-orbicular in outline, ± 2.5 mm across, the side-lobes elliptic-obovate, (2-) 2.5-3 mm long, ± 2 mm broad; the 2 upper lobes more or less oblong, obtuse, 2.5-3 mm long, 1.5-2 mm broad; tube longer than the lobes, almost cylindrical in the lower half, gradually dilated upwards, 3-5 mm long, 1.5-2 mm broad at the top end. *Stamens* exserted; filaments filiform, glabrous, the lower pair (2-) 2.5-3.5 mm long, the upper pair (1.5-) 2-3 mm long; anthers more or less orbicular in outline, with distinct short appendages at the lower ends of the lobes, ± 1 mm long and broad, lobes oblong. *Ovary* globose, 0.5-1 mm in diameter, densely tomentose; style exserted, filiform, glabrous, 4-6 mm long, shortly 2-lobed at the summit. *Fruit* enclosed within the persistent calyx, obovoid, pubescent with distinct reticulate nerves, 2-3 mm long, 1.8-2 mm in diameter at the top, splitting into two 2-celled nutlets with one seed in each.

Specimens examined

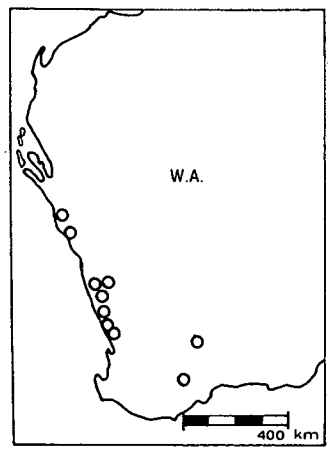
WESTERN AUSTRALIA: *George 11641*, ± 1 km south of Cowcowing, 12.xi.1972 (PERTH). *S.B. Rosier 27*, Cowcowing, between Wyalkatchem and Koorda, May 1958 (PERTH, holetype; K, MEL, PERTH - isotypes).

Distribution (Map 4A)

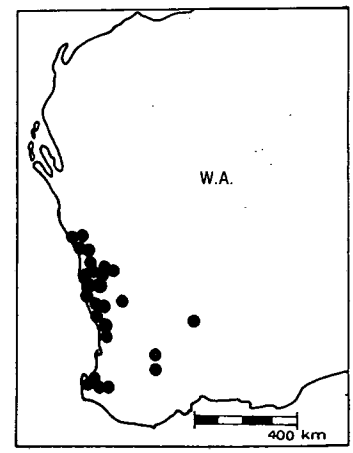
P. scabra is endemic to Western Australia, where it has so far been recorded only from near Cowcowing, north of Wyalkatchem.



Map 4A.
P. scabra △
P. exserta var. *exserta* ●
P. exserta var. *lanata* ○



Map 4B.
P. uncinata ○



Map 4C.
P. bartlingii ●

Comments

P. scabra is one of the rarest species of this genus, known only from the type locality. In the protologue, the date of collection for the holotype is "Aug. 1959", but the date on the labels of the isotypes in Herb. MEL and PERTH is "May, 1958". The author of this species, however, has confirmed that the published date "Aug. 1959" is an error, and the correct date for the type collection of *P. scabra* is "May, 1958" (Pers. comm. A.S. George, no. 90/76, 1.xii.1978). The date noted on the holotype sheet also agrees with the isotypes. At least 4 duplicates of A.S. George's collection no. 11641 are still to be distributed.

Affinities

P. scabra is closely allied to *P. spenceri* in its leaves being more or less sessile, recurved along the margins; corolla-tube gradually dilated upwards; fruit obovoid, pubescent all over. Nevertheless, *P. scabra* may easily be distinguished by its stem being clothed with a viscid, golden-rusty indumentum; leaves linear, in whorls of 3, bullate and scabrous above; flowers more than one (average 7-9) in a leaf-axil; calyx non-ribbed; fruit almost flat to truncate at the top. *P. scabra* is also nearer to *P. hemigenioides*, but the latter can readily be identified by its leaves being greyish-tomentose, opposite; corolla-tube abruptly dilated above the calyx and fruit elliptic-globose with a somewhat rounded top. In some characters, *P. scabra* and *P. exserta* are also very close to each other. Both the species have scabrous, bullate leaves, gradually upwards dilated corolla-tube, exserted stamens and style, obovate fruit with pubescence all over. Nevertheless, *P. exserta* may easily be separated by its narrow, linear-lanceolate leaves, deep pink corolla with pubescence outside; oblong anthers and more or less conical-tipped fruit with shallow humps on the back of each nutlet.

12. **Pityrodia exserta** (Benth.) Munir, stat. nov.

P. uncinata (Turcz.) Benth. var. *exserta* Benth., Fl.Aust.5 (1870)49, *basionym*; Mold., Résumé Verben.etc. (1959)427; Mold., Fifth Summary Verben.etc.1(1971)348.

Type: *G. Maxwell s.n.*, Cape Arid, Western Australia, 1869 (K, lectotype designated here; MEL 69383, MEL 69384 - isolectotypes).

Typification

P. exserta is based on G. Maxwell's (s.n.) collection, consisting of at least 3 duplicates. Since the author of the basionym did not choose any one of them as a type, it is, therefore, necessary to select a type for this name. The syntype preserved in Herb. K, where Bentham's herbarium and types are now preserved (Stafleu, 1967, 1976) is annotated by him, and almost certainly used by him in preparing the original description of this species. The specimen is particularly complete and well preserved and is selected here as the lectotype for this species.

Description (Fig. 12)

A sprawling shrub or undershrub of 15 to 40 cm. *Stem* and branches woolly-tomentose, or becoming glabrescent in the old parts. *Leaves* decussate, scattered or in whorls of 3, sessile, crowded but non-decurrent, linear or linear-lanceolate, deeply recurved or revolute along the margins, very distinctly scabrous and bullate-rugose above, densely cottony - woolly all over or pubescent underneath when young, later glabrescent, (1-) 1.5-3.5 (-4.5) cm long, (1-) 2-4 (-5) mm broad, the floral leaves mostly exceeding the calyx. *Flowers* pedicellate, solitary or 3 together on short peduncles in the axils of the upper leaves, forming terminal leafy spikes; pedicel slender, hairy, 2-4 mm long; bracts leafy, mostly exceeding the calyx, sessile, linear-lanceolate, recurved along the margin, scabrous-hairy and rugose along the margins and on adaxial surface, hairy on abaxial surface, (8-) 10-15 mm long, 1.5-2.5 mm broad; bracteoles linear, smooth, (4-) 7-9 mm

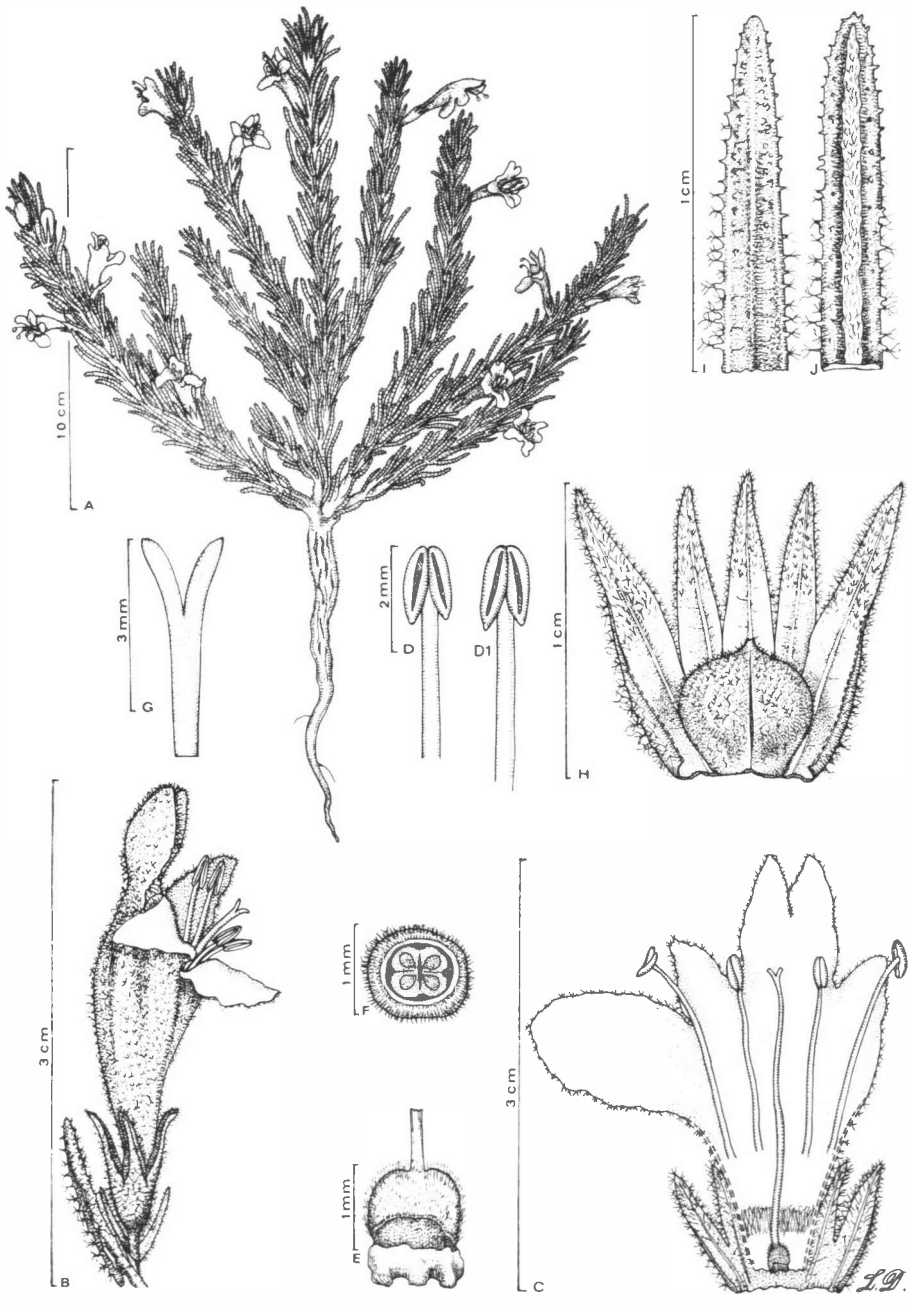


Fig. 12. *Pityrodia exserta* (Benth.) Munir var. *exserta* (*A.S. George 6970*: PERTH). A, habit drawing; B, flower with a bract and two bracteoles; C, calyx and corolla vertically cut open to show androecium and gynoecium; D, upper stamen; D1, lower stamen; E, ovary; F, transverse section of ovary; G, stigma with 2 simple lobes; H, persistent calyx cut open to show fruit; I, & J, adaxial and abaxial views of a leaf-portion.

long, 1-1.5 mm broad. *Calyx* persistent, deeply divided into 5 lobes, shortly tubular towards the base, (6-) 8-12 mm long, scabrous outside and on the inner distal parts of the lobes, glabrous within the tube; lobes lanceolate, acute, slightly recurved along the distal margin, (5-) 6-10 (-11) mm long, 1-2 (-2.5) mm broad; tube 1-2.5 mm long. *Corolla* deep pink or dark red, (15-) 20-30 mm long, pubescent outside, glabrous inside excepting only the dense hairy ring above the ovary; the upper lip shortly 2-lobed, the lower lip of 3 spreading lobes; the anterior lobe almost twice as large as the others, broadly elliptic-orbicular in outline, (7-) 9-11 mm long, nearly as broad; the other lobes almost equal, more or less oblong-ovate, 5-8 (-10) mm long, (3-) 4-6 mm broad; tube gradually dilating upwards, slightly incurved, (10-) 13-17 (-18) mm long, (4-) 5-6 mm broad at the top end. *Stamens* exserted or scarcely so; filaments filiform, glabrous, the lower pair longer, 9-13 (-15) mm long, the upper pair short, 6-8 (-10) mm long; anthers oblong, lobes with obsolete or obscure appendages at the lower end, (1-) 1.5-2 mm long. *Ovary* globose, c. 1 mm in diameter, densely tomentose; ovules attached at or near the top with a very short funicle; style exserted, filiform, glabrous, (15-) 20-30 mm long, shortly 2-lobed at the summit, not sagittate. *Fruit* enclosed within the persistent calyx, sub-globose, shortly concical at the top, (2-) 3-4 (-5) mm long, (2-) 3-4 mm in diameter, pubescent, splitting into two separate nutlets, each with a shallow hump on the back; seeds not seen.

Pityrodia exserta (Benth.) Munir var. **exserta**

Stem and branches tomentose but becoming glabrescent in the old parts. Leaves scabrous and bullate-rugose above, pubescent underneath when young, later glabrescent. Stamens and style exserted beyond the corolla-tube.

Specimens examined

WESTERN AUSTRALIA: *Demarz 154*, E Mt Barren, 25.v.1968 (Kings Park Perth). *Fairall 2398*, east of Barren, 11.x.1967 (PERTH 2 spec., Kings Park Perth). *Gardner 2211*, W Mt Barren, 16.x.1928 (PERTH). *Gardner & Blackall s.n.*, loc.cit., Oct. 1928 (PERTH). *George 584*, SW side of E Mt Barren, 31.i.1960 (PERTH). *George 1783*, near top of W Mt Barren, 29.xi.1960 (PERTH). *George 6970*, W Mt Barren, S coast, SW of Ravensthorpe, 28.x.1965 (B, PERTH). *George 10107*, Mid Mt Barren Res., 16.vii.1970 (PERTH). *G. Maxwell s.n.*, Cape Arid, 1869, (K, MEL 69383 - 4, 2 spec. - syntypes of *P. uncinata* (F. Muell.) Benth. var. *exserta* Benth.). *Newbey 1609*, E. Mt Barren, 25.x.1964 (PERTH). *Stevenson s.n.*, loc.cit., Nov. 1933 (PERTH 2 spec.). *D. Young 296*, loc.cit., 11.x.1967 (Kings Park Perth).

Distribution (Map 4A)

P. exserta var. *exserta* is endemic in the southern part of Western Australia. It occurs near the southern coast, chiefly around East Mt Barren, Mid Mt Barren and West Mt Barren. The only other locality is near Cape Arid, where only one collection was made in 1869, but it has not been recollected from that area since.

Comments

P. exserta var. *exserta* has so far been identified with *P. uncinata* (Turcz.) Benth., because they are almost identical in habit and possess similar leaves and inflorescence. The distinction between these species is based chiefly on their flower characters, namely the length of filaments and the shape of stigma which can more easily be observed in a dissected flower. Many botanists seem to have based their identification on superficial observation of the plants, and others may not have examined the floral parts critically enough to pick up the distinguishing characters. All these characters are presented here in the analytical flower-drawing of both the species.

Affinities

P. exserta is very close to *P. uncinata* in its leaves being scattered or in whorls of 3, narrow-linear with revolute margins, bullate-rugose above; flowers in terminal leafy spikes and anther-lobes with obscure or obsolete appendages. However, *P. exserta* may

easily be distinguished by its leaves being much more scabrid; corolla-tube gradually dilating upwards, glabrous in the upper half; stamens and style exserted; anthers mostly 1.5-2 mm long; stigma simply 2-lobed, not sagittate; fruit obovoid, shortly conical at the top.

P. exserta is also related to *P. bartlingii* (Lehm.) Benth. in having almost similar leaves, inflorescence and stigma. Nevertheless the latter can easily be distinguished by its inflorescence being non-leafy; leaves larger, up to 5.5 cm long, less scabrous; inflorescence woolly-tomentose; corolla-tube much dilated within or immediately above the calyx, with a few sparse hairs inside extending from the dense hairy ring to the large anterior-lobe; stamens and style included; fruit obovoid, oblique, with a thin walled concavity on one side.

Pityrodia exserta (Benth.) Munir var. **lanata** Munir, var. nov.

A var. typico caule et foliis supris perdense gossypino-lanuginosis et staminis styloque parum exserto differt.

Type: *J. W. Wrigley s.n.*, 26 miles from Lake King towards Norseman on no. 1 Rabbit Proof Fence, Western Australia, 11.xi.1968 (CBG 030930, holotype; AD, NSW - isotypes).

P. uncinata auct. non (Turcz.) Benth., sensu Benth., Fl.Aust.5(1870)48, 49 (quoad spec. *Maxwell s.n.* from Oldfield River and *Röe s.n.*, loc. incert, W.A., both in Herb. K.).

Var. *lanata* differs from the typical variety by its stem and upper leaves being very densely cottony-woolly, and stamens and style scarcely exserted beyond corolla-tube.

Specimens examined

WESTERN AUSTRALIA: *Ashby 2418*, east of Newdegate, 29.x.1967 (AD). *Barrow 60*, Hyden, 6.ix.1966 (PERTH, Kings Park Perth). *Beard 3851*, 300 mile post on Hyben - Norseman Rd, 24.x.1964 (Kings Park Perth). *Blackall 1264*, between Lake Hope and Mt Hatten, 3.xi.1931 (PERTH 2 spec.). *Chinnock 4344*, Hyden to Lake Cronin, 11.xi.1978 (AD 2 spec.). *Demarz 6339*, 42 km N of Ravensthorpe - Lake King, 33° 10′ S, 120° 00′ E, 19.xi.1976 (PERTH). *George 315*, 25.8 miles N of Ravensthorpe, 13.ix.1959 (PERTH). *George 7012*, Rabbit Proof Fence, NW of Jerramungup, 29.x.1965 (PERTH). *Maxwell s.n.*, Oldfield River, undated (K, MEL 69381). *Newbey 1130*, 44 miles E of Hyden, 13.x.1963 (PERTH). *Röe s.n.*, SW of W.Australia, undated (K). *Wrigley s.n.*, 26 miles from Lake King towards Norseman, on no. 1 Rabbit Proof Fence, 11.xi.1968 (CBG 030930, holotype; AD, NSW - isotypes). *Wrigley s.n.*, 7 miles from Lake King towards Newdegate, 6.xi.1968 (CBG 038180).

Distribution (Map 4A)

P. exserta var. *lanata* is endemic in the southern part of Western Australia. It is restricted between latitude 32° and 34° S and between longitude 118° and 121° E. The major distribution is to the east-south-east of Hyden and north-north-east of Ravensthorpe, towards Norseman. Both var. *lanata* and the typical var. *exserta* seem to occur in the same general area, but they have not been found growing together in the same locality. Actually the var. *exserta* is known from the coastal areas whereas the var. *lanata* comes from somewhat dry inland.

Comments

The majority of collections of var. *lanata* were found to be annotated as *P. uncinata*, and a few as *Chloanthes coccinea*. The latter does occur in the same region and superficially looks the same because of similar leaves and corolla. Nevertheless, the leaves in *Chloanthes* are always decurrent and anther-lobes without any appendage at the lower ends.

Affinities

As mentioned for the typical variety, var. *lanata* is also allied to *P. uncinata* in having similar leaves and inflorescence. The presence of densely cottony-woolly indumentum in

the upper leaves and inflorescence bring them both more close to each other. Nevertheless var. *lanata* can readily be distinguished by its corolla-tube being gradually dilating upwards, glabrous in the upper half; stamens and style larger; stigma simply 2-lobed, not sagittate.

13. **Pityrodia uncinata** (Turcz.) Benth., Fl.Aust.5(1870)48, exclud. var. *exserta* Benth.; Briq., Mém.Soc.Phys.Geneve 32(2), no.8(1896)77; Diels & E.Pritz., Bot.Jahrb.Syst.35 (1904)519; Gard., Enum.Pl.Aust.Occ.3(1931)112; Junell, Sym.Bot.Upsal.4(1934)70, fig.117; Mold., Résumé Verben.etc.(1959)210, 251, 335; Beard (Ed.), W.Aust.Pl. edn 1 (1965)93; Blackall & Grieve, West.Aust.Wildfls 3(1965)569; Beard (Ed.), W.Aust.Pl. edn 2(1970)114; Mold., Fifth Summary Verben. etc.1 & 2(1971)348, 425, 426, 603; Gard., West.Aust. Wildfls B(1972)166, 167 upper plate.

Type: *J. Drummond 4th Coll. no. 160*, Swan River, 1847 (K, lectotype designated here; BM p.p., CGE, G, KW, LE, MEL, P, TCD, W - isolectotypes).

Chloanthes uncinata Turcz. in Bull.Soc.Nat.Mosc.36(2)(1863)194, *basionym*; F. Muell., Fragm.6(1868)156 in obs.; F. Muell., Syst.Cens.Aust.Pl.1(1882)103; F. Muell., Sec.Syst.Cens.Aust.Pl.1(1889)172.

Type: As for *Pityrodia uncinata* (Turcz.) Benth.

Chloanthes bullata F. Muell., Fragm.6(1868)156.

Type: *J. Drummond s.n.*, Murchison River, undated (MEL 69375, lectotype designated here; MEL 69225, MEL 69377, MEL 69379, MEL 41218, P, US - isolectotypes).

Typification

P. uncinata (Turcz.) Benth. is based on J. Drummond's 4th collection no. 160, consisting of at least 10 duplicates, all agreeing with the type description. Since the author did not select any one of them as a type, it is, therefore, necessary to choose a type for this name. Of these syntypes, none of which was annotated by Turczaninow, the one preserved in Herb. K is particularly complete and well preserved and is, therefore, designated here as the lectotype for this species.

Description (Fig. 13)

An erect spreading shrub of (15-) 30-60 cm. *Stem* and branches densely clothed with white cottony tomentum. *Leaves* decussate, scattered or in whorls of 3, sessile, crowded but non-decurrent, linear or linear-lanceolate, acute, often terminating in a hooked blunt point, recurved or revolute along the margins, (1-) 1.5-3.5 (-5) cm long, 2-4 (-5) mm broad, tomentose and bullate-rugose above, woolly-tomentose or sometimes almost glabrescent underneath, the floral-leaves mostly exceeding the flowers. *Flowers* pedicellate, solitary or 3 together on short peduncles in the axils of the upper leaves, forming terminal leafy spikes, usually woolly-tomentose; pedicel tomentose, slender, 2-4 mm long; bracts mostly exceeding the calyx, sessile, linear-lanceolate, tomentose on abaxial surface, glabrous on adaxial surface, 7-10 (-14) mm long, 1-2 mm broad; bracteoles similar to bract but much smaller, (4-) 5-7 mm long, 0.5-1 mm broad. *Calyx* persistent, deeply divided into 5 lobes, shortly tubular towards the base, (5-) 6-8 (-9) mm long, tomentose outside with a few sparse hairs on the upper halves of the lobes, glabrous inside the tube; lobes lanceolate, acute, membranous, 4-6 (-7) mm long, 1-2 mm broad near the base; tube 1-2 mm long. *Corolla* deep pink, (10-) 13-15 (-17) mm long, pubescent outside, glabrous inside excepting the dense hairy ring above the ovary, and sparse hairs extending to the anterior lobe of the lower lip; the upper lip very shortly 2-lobed, the lower of 3 very spreading lobes; lobes deeply sinuate or erose, more or less elliptic-orbicular in outline, 4-6 mm long, nearly the same in width; tube much dilated above the calyx, slightly incurved, 7-10 mm long, 5-7 mm broad at the top end. *Stamens* included; filaments short, filiform, glabrous, the lower pair 2-4 mm long, the upper pair 0.5-1 mm long; anthers oblong, lobes apparently without appendages at the lower end, c. 1 mm long. *Ovary*

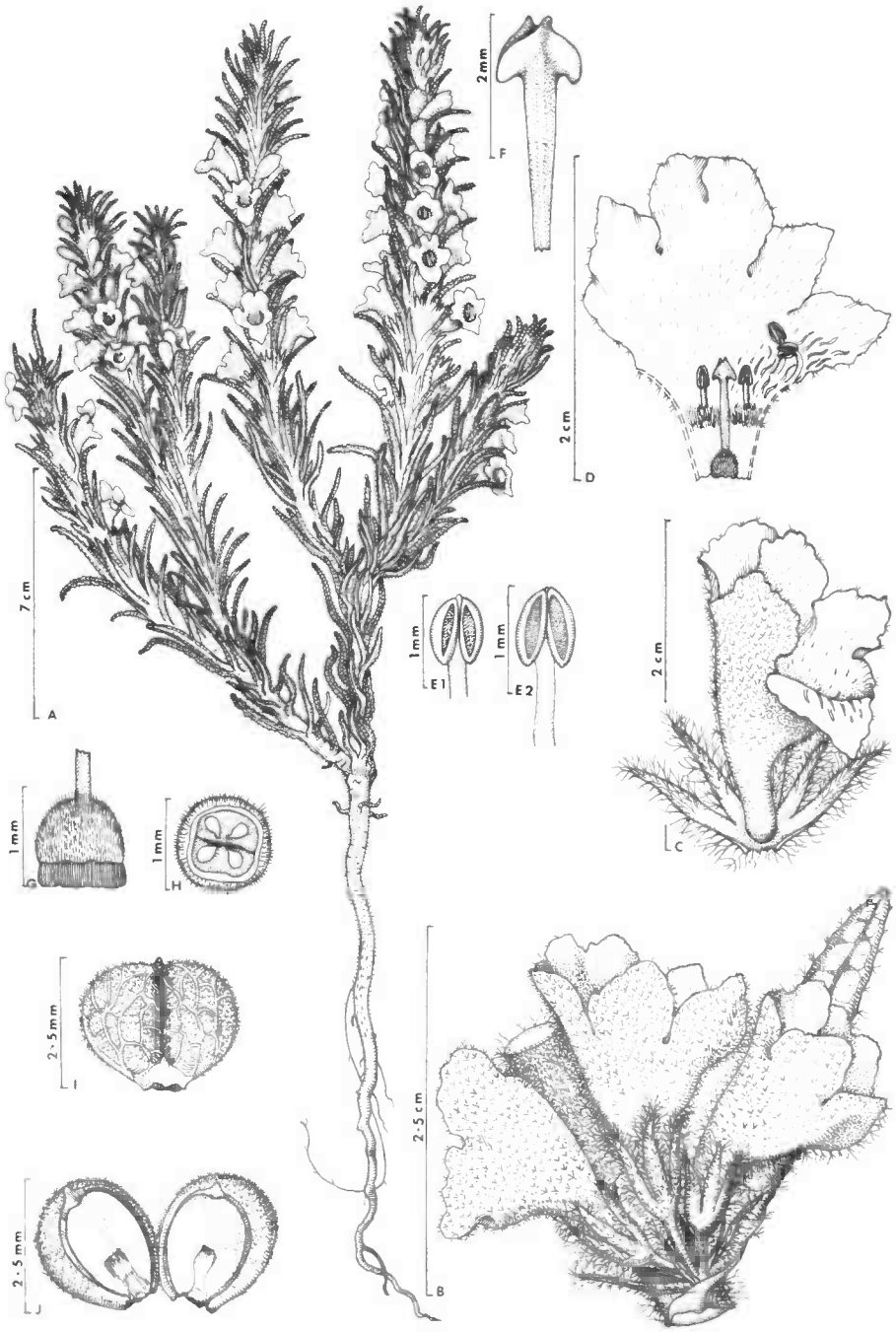


Fig. 13. *Pityrodia uncinata* (Turcz.) Benth. (A, *F.v. Mueller s.n.*: MEL 69378; B-J, *E. Pritzel 897*: AD). A, habit drawings; B, cyme in the axil of a leaf; C, flower with calyx vertically cut open to show corolla-tube; D, corolla-tube vertically cut open to show androecium and gynoecium; E1, upper anther; E2, lower anther; F, sagittate stigma; G, ovary; H, transverse section of ovary; I, fruit; J, fruit split into two halves.

globose, c. 1 mm in diameter, densely tomentose; ovules attached at or near the top, with a very short or scarcely any funicle; style included, filiform, glabrous, (3-) 5-7 mm long; stigma distinctly sagittate, 0.5-1 mm broad. *Fruit* enclosed within the persistent calyx, more or less globose with a slight depression at the top end, 2-3 mm long, 2.5-3 mm in diameter, pubescent and clearly net-veined all over, splitting into two separate nutlets when mature; seeds not seen.

Representative Specimens

WESTERN AUSTRALIA (27 collections seen): *Andrews s.n.*, Cannington, Perth, Sept. 1904 (PERTH). *Ashby 721*, 30 km W of Moora, Dandarragan Road, 18.xi.1963 (AD). *Baird s.n.*, Kenwick Swamps, 1.xi.1932 (UPS). *Blackall 2969*, Gingin, Sept. 1933 (PERTH) 2 spec.). *J. Drummond 4th Coll. no. 160*, Swan River, 1847 (K, lectotype; BM p.p., CGE, G, KW, LE, MEL, P. TCD, W - isolectotypes). *J. Drummond s.n.*, Murchison River, undated (MEL 69375, MEL 69377, MEL 69225, MEL 41218, MEL 69379, P, US - syntypes of *Chloanthes bullata* F. Mueller). *Fitzgerald s.n.*, Canning Plains, Oct. 1903 (NSW 135897, NSW 135899, SING 044214). *George 7012*, Rabbit Proof Fence, NW of Jeramungup, 29.x.1965 (MO). *Gardner s.n.*, Hill River, 21.vii.1934 (PERTH 3 spec.). *Gardner s.n.*, near Dandaragan, Sept. 1960 (PERTH). *Keighery 123*, Cannington Brook, 18.vii.1975 (Kings Park Perth). *Koch 1540*, Watheroo Rabbit Proof Fence, Oct. 1905 (AD, K, NSW, PERTH). *Morrison 11084*, Cannington, Lower Canning River, 21.ix.1901 (K). *F.v. Mueller s.n.*, Murchison River, undated (C, GH 2 spec., L, MEL 69378, MEL 69380). *F.v. Mueller s.n.*, loc.incert. (probably from Murchison River) undated (M, W 2 spec.). *Phillips s.n.*, 87 miles N of Perth, beyond Gingin, 22.ix.1962 (CBG 011683). *E. Pritzel 897*, Avon district, Nov. 1901 (A, AD, B, BM p.p., BR, E, G, HBG, K 2 spec., L, M, MEL, MO, NSW, NY, P, PR, S, US, W). *Royce 4727*, 15 miles W of Gingin, 15.xii.1953 (PERTH 2 spec.). *Saffrey 173*, 61 mile peg on Gingin to Dandaragan Road, 31.x.1966 (PERTH). *Thorne 24295*, 9 miles W of Moora, 12.ix.1959 (L, UC). *Willis s.n.*, 200 km N of Perth and 45 km E of Jurien Bay, 8.x.1961 (MEL 69385). ? *Leg. s.n.*, Dandarragan, undated (PERTH).

Distribution (Map 4B)

P. uncinata is endemic in the south-south-west of Western Australia. The main distribution is in the area located west of the southern portions of the Geraldton Highway and Great Northern Highway. One disjunct locality in the north is near the Murchison River and two in the south are near the upper sources of Gairdner River and along the road between Hyden and Lake Cronin. A few more collections from south-east of Perth have been recorded from near the Canning River.

Comments

Moldenke (1971) recorded *Chloanthes drummondii* F. Muell. as a synonym of this species, but during present investigations the above name has been found only on a few herbarium labels annotated by Mueller, who is not known ever to have published this name.

According to Bentham (1870), the flowers are solitary in the axils of the upper leaves. During present studies, however, the flowers have been found to be solitary as well as 3 together on short axillary peduncles.

The sagittate stigma of *P. uncinata* is unique in the genus and seems a good character in distinguishing this species from its close allies.

Due to the shape and arrangement of leaves, and very obscure anther-appendages, *P. uncinata* and *P. bartlingii* have often been recognized as *Chloanthes*. Nevertheless, both the species can easily be distinguished from *Chloanthes* by their non-decurrent leaves and broad corolla-tube.

The date (year only) noted with two duplicates of J. Drummond's 4th coll. no. 160, now preserved in Herb. K and TCD, is "1848". Another duplicate of the same collection in Herb. G is annotated "Received July 1848". None of these seem to refer to the collecting date, because the annotation on the herbarium sheet in Herb. G has clearly indicated that "1848" is the date of receipt of specimen by that institution. According to Erickson (1969), however, the 4th collection of Drummond, consisting of 14 sets of 400 species, was sent to Hooker and subscribers in England during July, 1847. The collecting date of this set of plants, therefore, would certainly be before July 1847.

Beard (1965, 1970) recorded this species only from Gardner & Bennett's (1956) botanical district "Avon" in the South Western Province of Western Australia. At present, however, the distribution has extended to Darling, Irwin and Stirling districts. Moldenke (1959, 1971) recorded this species from New South Wales and Queensland, but its occurrence in those states has not been confirmed.

Affinities

P. uncinata is nearest to *P. exserta* in its leaves being scattered or in whorls of 3, narrow-linear with revolute margins, bullate-rugose above; flowers in terminal leafy spikes and anther-lobes with obscure or obsolete appendages. Nevertheless, *P. uncinata* can easily be distinguished by its leaves being less scabrid; stamens and style included; anthers shorter, c. 1 mm long; stigma distinctly sagittate; fruit more or less globose with a shallow depression at the top between the nutlets.

P. uncinata is also closely allied to *P. bartlingii* in having narrow linear leaves with revolute margins, bullate-rugose above; flowers pedicellate in terminal spikes; stamens and style included and anther-lobes with obscure or obsolete appendages. However, *P. bartlingii* can readily be identified by its inflorescence being non-leafy, much more woolly; anther-lobes longer, 1.5-2 (-3) mm long; stigma non-sagittate, shortly 2-lobed; fruit obovoid, oblique, with a thin-walled concavity on the side.

14. **Pityrodia bartlingii** (Lehm.) Benth., Fl.Aust.5(1870)49; F. Muell., Fragm.9(1875) 5; Briq., Mém.Soc.Phys.Geneve 32(3), no.8(1896)76; Diels & E.Pritzel, Bot.Jahrb.Syst. 35(1904)519; Gard., Enum.Pl.Aust.Occ.3(1931)112; Junell, Sym.Bot.Upsal.4(1934)68, figs. 118, 119; Gard., W.Aust.Wildfls edn 8(1951)108; Mold., Résumé Verben. etc. (1959) 210, 251, 335; Gard., Wildfls West.Aust.(1959)131, 132; Blackall & Grieve, West.Aust. Wildfls 3(1965)569, t.28; Beard (Ed.), W.Aust.Pl. edn 2(1970)114; Mold., Fifth Summary Verben.etc.1 & 2(1971)347, 425, 603.

Type: *Preiss 2340*, in calculosis ad radices jugi montium Darling's Range, 23.xi.1839 (GOET, lectotype designated here; BR, C, FI, G, HBG, L 2 spec., LD, LE 2 spec., M, MEL 2 spec., MO, P 2 spec., S, TCD, W 2 spec. - isolectotypes).

Chloanthes bartlingii Lehm., Ind.Sem.Hort.Hamb.Bot.(1844)8, *basionym*; Bartl. in Lehm., Pl.Preiss.1(1845) 352; Walp., Rep.Bot.Syst.4(1845)134; Schauer in DC., Prod.11(1847)531; Bocq., Rev. Verbén.(1863)131; F. Muell., Fragm.6(1868)156; F. Muell., Syst.Cens.Aust.Pl.1(1882)103; F. Muell., Sec.,Syst.Cens.Aust.Pl.1 (1889)172.

Type: As for *Pityrodia bartlingii* (Lehm.) Benth.

Typification

P. bartlingii (Lehm.) Benth. is based on L. Preiss's collection no. 2340, consisting of at least twenty-one duplicates. Since the original author did not choose any 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 preserved (Stafleu, 1967), were almost certainly used by him in preparing the original description of this species. The specimen is particularly complete and well preserved. It is chosen here as the lectotype for this species.

Description (Fig. 14)

An erect shrub 30-90 (-150) cm tall. *Stem* and branches densely clothed with greyish-rusty indumentum of branched hairs. *Leaves* sessile, scattered or in whorls of 3, sometimes decussate, linear, lanceolate or almost terete owing to revolute margins, obtuse, (1-) 3-4 (-5.5) cm long, (2-) 3-5 (-7) mm broad at the base, bullate and hairy above and along the recurved margins, densely woolly-tomentose underneath. *Flowers* pedicellate, solitary or often 3 together on short axillary peduncles, forming terminal spike-like woolly racemes

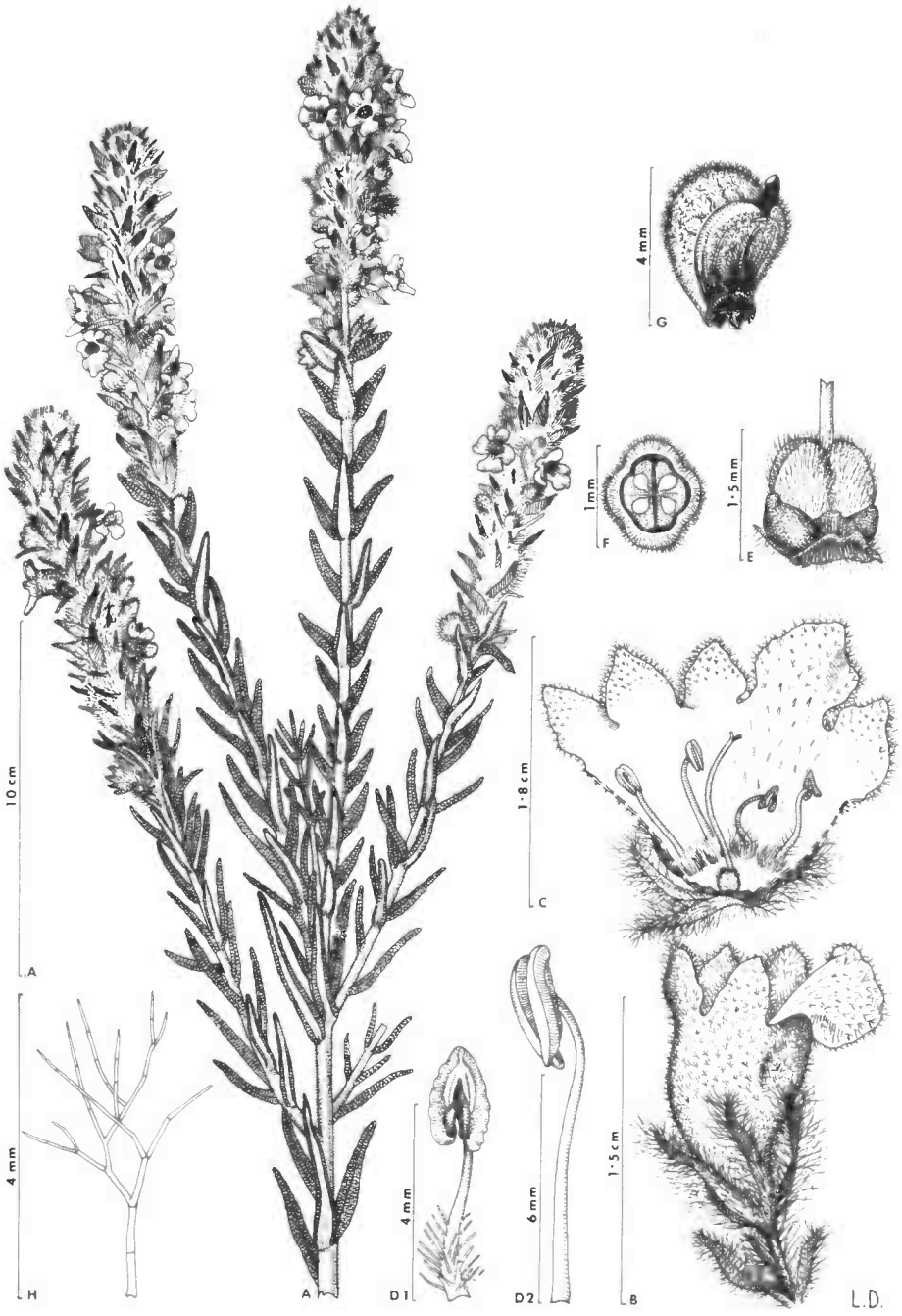


Fig. 14. *Pityrodia bartlingii* (Lehm.) Benth. (*R.D. Royce 3179*: PERTH). A, flowering twig; B, flower with a bract and two bracteoles; C, calyx and corolla vertically cut open to show androecium and gynoecium; D1, lower stamen; D2, upper stamen; E, ovary; F, transverse section of ovary; G, fruit; H, calyx-hair.

of (6-) 10-25 (-35) cm; pedicel slender, tomentose, 2-4 (-6) mm long; bracts leafy, mostly exceeding the calyx, sessile, linear-lanceolate or broadly elliptic, densely tomentose on abaxial surface, glabrous or sparsely hairy on adaxial surface, (1-) 1.5-2.5 (-3) cm long, (3-) 5-8 (-10) mm broad; bracteoles sessile, linear or linear-lanceolate, abaxially tomentose, adaxially glabrescent or sparsely hairy, 7-12 mm long, 1.5-2 mm broad. *Calyx* persistent, divided almost to the base into 5 linear or linear-lanceolate lobes, shortly tubular near the base, densely woolly-tomentose outside, sparsely so inside except near the base, 8-13 mm long; lobes linear, entire, obtuse 7-12 mm long, 1-1.5 mm broad; tube ca. 1 mm long. *Corolla* purplish-pink with brownish dots in throat, (12-) 15-23 mm long, pubescent outside and on the inner upper halves of the lobe, glabrous inside the tube excepting the dense hairy ring above the ovary, and with a few minute and sparse hairs extending to the large anterior lobe of the lower lip; the anterior lobe larger than the others, almost elliptic-orbicular, (5-) 6-9 mm long, (6-) 7-11 m broad; the other lobes more or less ovate, almost equal, 4-8 mm long, 3-7 mm broad at the base; tube much dilated above the ovary into a broad campanulate throat but oblique and somewhat incurved, 8-11 (-14) mm long, 6-12 (-14) mm broad at the top end. *Stamens* included, subdidynamous; filaments 4-7 mm long, the upper pair glabrous, the lower pair hairy in the lower half; anthers oblong, 1.5-2 (-3) mm long, 1-1.5 mm broad, the lower pair always smaller than the upper, shrunken (apparently sterile), with obscure appendages at the lower end, the appendages in the upper (anther) pair almost obsolete. *Ovary* globose, 1-2 mm in diameter, densely tomentose; style included, glabrous, filiform, 10-14 mm long, shortly 2-lobed at the summit. *Fruit* enclosed within the persistent calyx, obovoid, oblique with a thin-walled concavity on one side, apparently non-dehiscent, 3-4 mm long, 2-3 mm in diameter at the top end, puberulous and faintly reticulate.

Representative specimens

WESTERN AUSTRALIA (87 collections seen): *Ashby 1711*, east of Kulin, 13.x.1965 (AD). *Baird s.n.*, Maida Vale, at foot of Darling Range, 20.xi.1932 (UPS). *Blackall 2858*, between Perenjori and Dalwallinu, 25.ix.1932 (PERTH 2 spec.). *Broadbent 1305*, Dinner Hill, 22.viii.1953 (BM). *Brooker 1935*, 3 miles south-west of Mt Lesueur, 24.vii.1969 (PERTH 2 spec.). *Drummond 399*, Swan River, undated (W). *Drummond 1st coll. no. 447*, loc.cit 1843 (A, BM, E, G 2 spec., K 3 spec., MEL 2 spec., P, W 2 spec.). *Drummond 1st coll. s.n.*, loc.cit., 1839 (BM, CGE 3 spec., G 3 spec., GH, K 4 spec.). *Forrest s.n.*, Gingin, 24.iii.1880 (MEL 69234). *Gardner 14248*, near Moore River west of Mogumber, Nov. 1962 (PERTH). *George 280*, 7.8 miles W of Lake Grace, 12.ix.1959 (PERTH 2 spec.). *Hartley 13947*, between Moora and Jurien Bay, 16.viii.1973 (CANB). *Harvey 6203*, east of Allanooka, Oct. 1961 (PERTH). *Havel 205*, east of Yanchep, 3.xii.1965 (PERTH). *Lullfitz 146*, 184 mile peg Buntine, 20.xii.1961 (PERTH). *Milligan s.n.*, Wongan Hills, 11.x.1903 (K). *Morrison s.n.*, Watheroo, 14.i.1905 (BM, E). *Morrison 14236*, Gooseberry Hill to Guildford, 16.vii.1904 (E, K). *F. Mueller s.n.*, Greenough and Irwin Rivers, Nov. 1877 (MEL 69291). *Munir 5241*, 160 km W of Coolgardie near Yellowdine, 5.ix.1973 (AD). *Newbey 1378*, 1.5 miles S of Regans Ford, 26.viii.1964 (PERTH). *Orchard 4222*, 19 km E of Green Head on Jurien - Green Head Road, 28.xi.1974 (AD). *Paust 1177*, 9.6 km E of Jurien, 3.x.1972 (PERTH). *Phillips s.n.*, 60 miles from Moora towards Jurien Bay, 23.9.1962 (CBG 046306). *Phillips s.n.*, 13 miles from Walkaway towards Strawberry, 15.ix.1968 (CBG 035350). *Preiss 2340*, in Calculosis ad readices jugi montium Darling's-Range, 23.xi.1839 (GOET lectotype; BR, C, FI, G, HBG, L 2 spec., LD, LE 2 spec., M, MEL 2 spec., MO, P 2 spec., S, TCD, W 2 spec.). *E. Pritzel 981*, between Moore River and Murchison River, Nov. 1901 (A, AD, B, BM, BR, E, G 3 spec., GH, HBG, K, L, M, MEL, MO, NSW, NY, PR 2 spec., S, US, W). *Royce 3179*, Walsall, S of Busselton, 17.x.1949 (PERTH 2 spec.). *Thorne 24200*, Hill River, on Moora-Badgingarra - Dinner Hill - Watheroo Road, 12.xi.1959 (L, UC). *Whibley 3189 and 3189a*, between Badgingarra and Jurien Bay, 8.x.1969 (AD 3 spec.).

Distribution (Map 4C)

P. bartlingii is endemic to the south-west of Western Australia. It is restricted between latitude 28° and 34° S and between longitude 115° and 120° E. The major distribution is to the north of Perth where it is commonly found in the area between the Swan River and Murchison River. In the south, it is recorded from near the Darling Ranges and between Busselton and Bridgetown. The only other southern localities are near Kulin and Lake Grace. Towards the east it has been collected from near Yellowdine along the Great Eastern Highway. This locality is the easternmost, and disjunct from the main distribution area by over 300 kilometres.

Comments

This species was originally described as *Chloanthes bartlingii* Lehm., and the same genus was accepted by F. Mueller (1868) and others. Bentham (1870) transferred it to *Pityrodia* R.Br. Following this, F. Mueller (1875) accepted the name *P. bartlingii* but subsequently (1882, 1889) recorded it as a synonym of *Chloanthes bartlingii*.

According to Bentham (1870), the upper pair of stamens is usually smaller than the lower, but the examination of many mature flowers has shown that the upper pair is in fact larger than the lower. The anthers of the upper stamens are turgid, full of pollen grains, 2 mm or over in length and without appendages at the lower end. Anthers of the lower stamens, however, are apparently shrunken and/or sterile, less than 2 mm in length and with obscure appendage at the lower end. The filaments of the upper stamens are glabrous and longer while those of the lower stamens are shorter and hairy in the lower halves.

The fruit of *P. bartlingii* seems to resemble that of *P. loxocarpa* in being indehiscent, obovoid, oblique, and puberulous with a thin-walled concavity on one side. The fruit-wall in the latter, however, seems smooth and without any distinct reticulation.

Leaves and flower-bracts are exceedingly variable in size and shape, and unlike several other *Pityrodia* species, the flower-bracts, bracteoles and calyx-lobes are somewhat hairy on the adaxial surface.

The fruit is always enclosed within the persistent calyx and being not visible without removing the calyx it has always been overlooked in the past. Therefore a description of the fruit does not occur in any previously published record of this species.

Moldenke (1959, 1971) recorded this species from Queensland, but so far its occurrence in eastern Australia has not been confirmed.

Affinities

P. bartlingii is closely related to *P. halganiacea* in its leaves being ternate, sessile, linear or narrowly linear-lanceolate, with revolute margins; corolla-tube shallow, much dilated above the calyx, and anther-lobes without distinct appendages at the lower ends. Nevertheless, *P. bartlingii* may easily be identified by its spike-like woolly racemes, larger and prominent leafy flower-bracts, non-glandular hairy ovary, villous hairy ring inside the corolla-tube, included stamens and style, obliquely obovoid fruit and non-glandular hair on young shoots, peduncles and calyces.

P. bartlingii is also close to *P. uncinata* in the shape and arrangement of its leaves, spike-like inflorescences, included stamens and style and non-appendiculate anther-lobes. The former, however, can readily be distinguished by its very woolly inflorescence, prominent leafy flower-bracts, longer anther-lobes (1.5-3 mm), non-sagittate (i.e. simple 2-lobed) stigma and obliquely obovoid non-dehiscent fruit with a thin-walled concavity on the side.

15. **Pityrodia glabra** Munir, sp. nov.

Caules et rami teretes, glabri, strato externo crasso, flavido-ferrugineo. Folia subsessilia; lamina oblonga vel anguste oblongo-obovata, basi cuneata, distaliter obtuse dentata, viscida, glabra, (8-) 10-15 (-20) mm longa, (3-) 5-8 (-10) mm lata. Calycis lobi lanceolati, 3-5 (-6) mm longi, 2-3 (-3.5) mm lati; tubus 2-3.5 mm longus. Corolla extus glaber, alba. Stamina inclusa vel parum exserta. Fructus ellipsoideo-obovoidei, apice glandulosi.

Type: *A.S. George 9561*, 11.27 km along Tamala road from Hamelin - Denham road, Western Australia, 26.viii.1969 (PERTH, holotype; one isotype still to be distributed).

Description (Fig. 15)

Branched glabrous shrub of 50-120 cm. *Stem* and branches densely covered with thick (epidermal) yellowish-rusty layer. *Leaves* subsessile, oblong or narrowly oblong-obovate, narrowed at the base, non-amplexicaul, bluntly dentate at the apex, entire along the margin, (8-) 10-15 (-20) mm long, (3-) 5-8 (-10) mm broad, somewhat viscid and glabrous, brittle when dry. *Flowers* subsessile, axillary solitary towards the end of branches; pedicel viscid, glandular, glabrous, 0.5-1.5 mm long; bracts leafy, subsessile, elliptic-ovate with entire margins or leaf-shaped with a few small teeth at the apex, 6-10 (-15) mm long, (3-) 5-8 mm broad, viscid, glabrous; bracteoles leafy, subsessile, elliptic or ovate-elliptic, entire, viscid, glabrous, 4-7 mm long, 2-3 mm broad. *Calyx* persistent, divided almost halfway down into 5 lobes, 5-8 mm long, glabrous, viscid and sparsely glandular outside; lobes lanceolate, ribbed, mucronate, somewhat scabrid and slightly recurved along the margins, 3-5 (-6) mm long, 2-3 (-3.5) mm broad at the base; tube 2-3.5 mm long. *Corolla* white, 9-12 (-14) mm long, glabrous outside, inside with a dense hairy ring near the throat and sparse long hairs extending to the large anterior-lobe of the lower lip, the hairs protruding outside the corolla-tube; anterior lobe broadly elliptic-orbicular, (3.5-) 4-6 mm long, (2.5-) 3.5-5 mm broad; the other 4 lobes oblong-ovate or narrowly elliptic-oblong (3-) 4-5 mm long, 2-3 mm broad; tube gradually dilated upwards, 4-6 mm long, 3-4 mm broad at the top end. *Stamens* included or scarcely exserted, not distinctly didynamous; filaments glabrous, filiform, the lower pair ± 3 mm long, the upper pair ± 2.5 mm long; anthers orbicular in outline, ± 1 mm across, lobes oblong, free and divergent in the lower halves, appendaged at the lower end. *Ovary* globose, densely pubescent-tomentose, seated on a thick fleshy disk, ± 1 mm in diameter; style included or scarcely exserted, glabrous, filiform, 4-6 mm long, shortly 2-lobed at the summit. *Fruit* ellipsoid-obovoid, sparsely pubescent, glandular at the top, faintly reticulate, 3-4 mm long, nearly as broad in the upper half, splitting into two nutlets; seeds not seen.

Specimens examined

WESTERN AUSTRALIA: *George 9561*, "7 miles" (11.27 km) along Tamala road from Hamelin - Denham road, 26.viii.1969 (PERTH, holotype; one isotype still to be distributed). *F. Mueller s.n.*, Shark Bay, loc.incert., undated (MEL 69336).

Distribution (Map 5A)

P. glabra is endemic in Western Australia where it has been recorded from near Shark Bay.

Comments

P. glabra seems to be one of the rarest species of this genus as it has only recently been rediscovered since its first record probably a century ago. So far, it has been identified with *P. teckiana* from which it can readily be distinguished by its glabrous habit and non-amplexicaul leaves. It is known to occur near the Shark Bay where *P. teckiana* does not grow.

The measurements of various plant organs are taken from the only two available collections which may slightly vary when a wider range of material becomes available for examination.

Affinity

P. glabra is nearest to *P. teckiana* in its leaves being viscid and apparently similar shaped; inflorescence with axillary solitary flowers; stamens and style almost included or scarcely exserted above the corolla-tube and fruit ellipsoid-obovoid. Nevertheless, *P. glabra* can be distinguished by its stem and leaves being glabrous without any distinct glands; leaves subsessile, non-amplexicaul, dentate only at the distal end, entire along the margins; calyx and corolla glabrous outside; calyx-lobes free to about halfway down

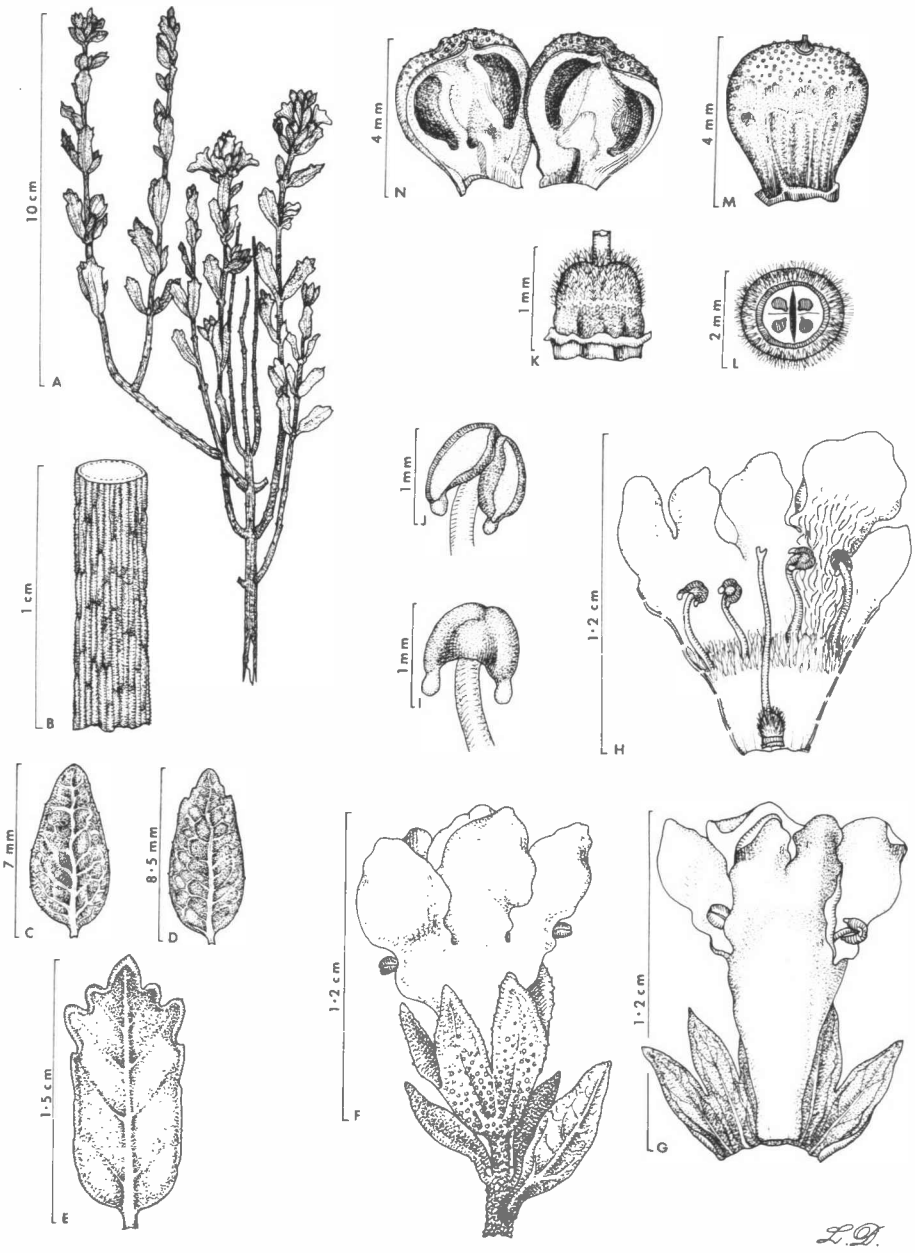
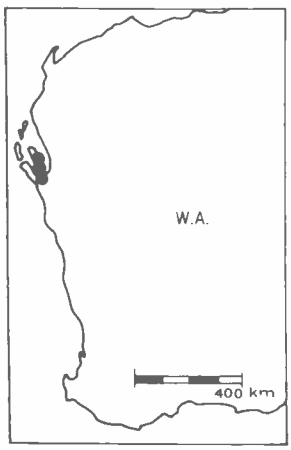
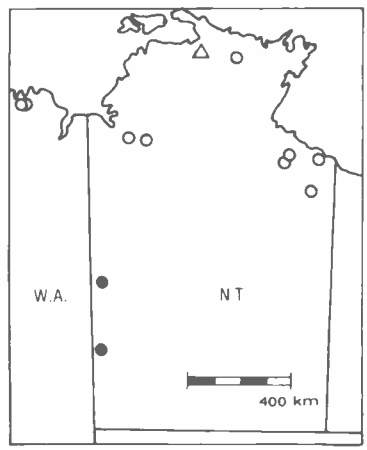


Fig. 15. *Pityrodia glabra* Munir (*F.v. Mueller s.n.*: MEL 69336). A, flowering branch; B, portion of stem to show texture; C, D & E, leaf-shapes and dentation; F, flower with a bract and two bracteoles; G, flower with calyx vertically cut open to show corolla-tube; H, corolla-tube vertically cut open to show androecium and gynoecium; I, lower anther; J, upper anther; K, ovary; L, transverse section of ovary; M, fruit; N, fruit split into two halves.

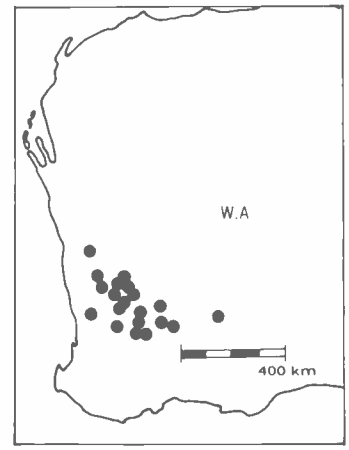
only; corolla-tube gradually dilated upwards; stamens not distinctly didynamous; fruit sparsely puberulous, glandular at the top.



Map 5A.
P. glabra ●



Map 5B.
P. serrata △
P. ternifolia ○
P. chorisepala ●



Map 5C.
P. teckiana ●

16. **Pityrodia ternifolia** (F. Muell.) Munir, comb. nov.

Dennisonia ternifolia F. Muell., J. & Proc.Linn.Soc.(Bot.)3 (February, 1859)158,*basionym*; F. Muell., Fragm. 1(April, 1859) 124 and 245, t.2 - "Denisonia ternifolia"; Benth., Fl.Aust.5(1870)54; F. Muell., Syst.Cens.Aust. Pl.1(1882)103; F. Muell., Sec.Syst.Cens.Aust.Pl.1(1889)173; Ewart & Davies, Fl.N.Terr.(1917)236; Junell, Sym.Bot.Upsal.4(1934)76; Mold., Résumé Verben. etc.(1959)208; Mold., Fifth Summary Verben.etc.1(1971) 345; Chipp., Proc.Linn.Soc.N.S.W.96(1971)256. - *syn.nov.*

Type: *F. Mueller s.n.*, Seven Emu "River" (Creek), Gulf of Carpentaria, ?1856 (K, lectotype designated here; GH, K, TCD - isolectotypes; AD, photograph of TCD spec.; W, 2 copies of the original drawings).

Chloanthes denisonii F. Muell., Vic.Natur.6(1889)104; F. Muell., Bot.Centralbl.55(1893)268.

Type: This name was based on *Dennisonia ternifolia* F. Muell. (1859).

Typification

P. ternifolia is based on F. Mueller's two collections from the Gulf of Carpentaria, Northern Territory. One of them, consisting of at least 4 duplicates, has come from Seven Emu "River" (Creek) and the other, with at least 2 duplicates, from McArthur River. Since the author did not choose any one of them as a type, it is, therefore, necessary to select a type for this name. Of all the syntypes, a duplicate from Seven Emu "River" (Creek) collection preserved in Herb. K seems the best representative of this species. The specimen is particularly complete and well preserved, and most likely used by the author in preparing the original description of this taxon. It has, therefore, been selected here as the lectotype.

Description (Fig. 16)

An erect shrub of 60-80 cm. *Stem* and branches terete, densely clothed with a short glandular tomentum intermixed with long and branched spreading hairs. *Leaves* sessile,

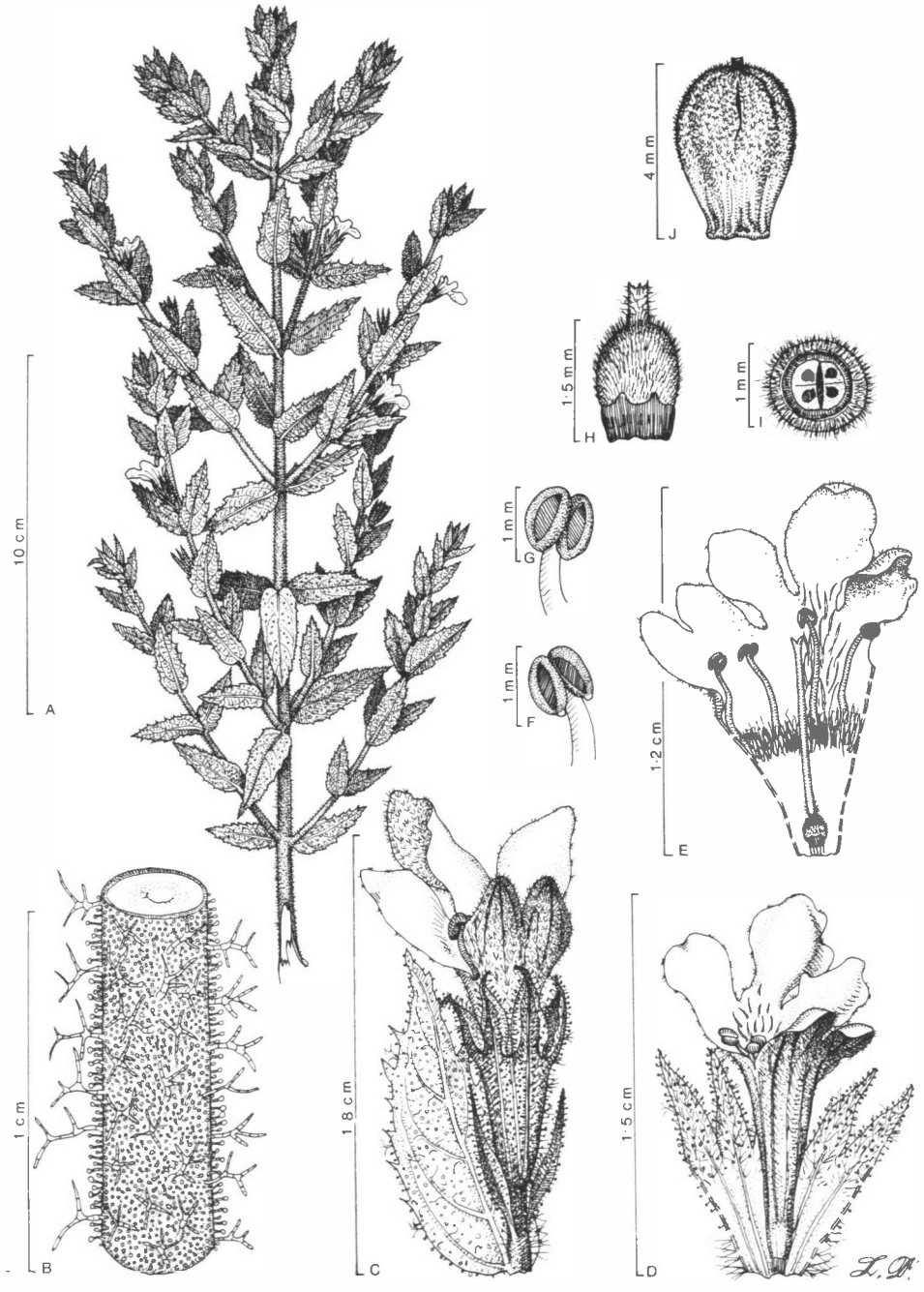


Fig. 16. *Pityrodia ternifolia* (F. Muell.) Munir (*C.R. Dunlop 2195*: MEL). A, flowering branch; B, portion of stem; C, flower with a leafy bract and two bracteoles; D, flower with calyx vertically cut open to show corolla-tube; E, corolla-tube vertically cut open to show androecium and gynoecium; F, lower anther; G, upper anther; H, ovary; I, transverse section of ovary; J, fruit.

sticky and prickly, usually in whorls of 3, rarely scattered or decussate, ovate to ovate-lanceolate, more or less cordulate at the base, acute and pungently mucronate, flat, bordered by acute mucronate teeth, (1-) 1.5-5 (-6) cm long, (0.5-) 0.8-2 (-2.5) cm broad, sometimes up to 8.5 by 3-3.5 cm, crustaceous, sprinkled all over with short gland-tipped hairs, nearly smooth above, with very strong raised veins and reticulation underneath. *Flowers* pedicellate, solitary in the axils of upper leaves, usually shorter than the leaves; pedicel slender, densely covered with a short glandular tomentum intermixed with long and branched spreading hairs, (1-) 2-3 (-4) mm long; bracts sessile, represented by the upper leaves; bracteoles sessile, linear-lanceolate or narrowly elliptic, cuneate towards both the ends, entire, acute, covered with short glandular tomentum intermixed with a few long and branched spreading hairs, 3-6 mm long, (0.5-) 1-2.5 mm broad. *Calyx* persistent, narrow campanulate, 10-ribbed, divided to the middle into 5 narrow lobes, 8-10 (-11) mm long, covered all over outside and on the inside of the lobes with a short glandular tomentum intermixed with long and branched hairs, glabrous inside the tube; lobes lanceolate, acute, 4-7 (-8) mm long, 1.5-3 (-4) mm broad; tube narrow campanulate, (2.5-) 3-4 mm long. *Corolla* mauve or pink-red, 11-14 (-15.5) mm long, greyish-pubescent outside the lobes (lips) only, a dense hairy ring inside the tube below the insertion of the stamens and a few long hairs extending to the central lobe of the lower lip; the lower lip 3-lobed, spreading, the central lobe larger than the two lateral, elliptic-obovate or almost orbicular in outline, 4-6 (-7) mm long, (2.5-) 3-4 (-5) mm broad, the lateral lobes more or less elliptic, 3-5 (-6.5) mm long, (2-) 2.5-3.5 (-4) mm broad; the upper lip erect, shortly notched, with 2 spreading lobes, much shorter than the lower lip, the lobes oblong or narrowly elliptic-oblong, with deep purple-red longitudinal streaks, 3-4.5 mm long, 1.5-2 (-2.5) mm broad; tube almost cylindrical or gradually dilated in the upper half, glabrous outside, 6-9 mm long, 1.5-2 (-3) mm broad at the top end. *Stamens* shortly exserted, inserted above the middle of the corolla-tube; filaments filiform, glabrous, the lower pair (2.5-) 3-3.5 mm long, the upper pair (1.5-) 2-2.5 (-3) mm long; anthers more or less orbicular in outline, ± 1 mm long, nearly as broad; lobes elliptic-oblong, much divergent in the lower halves, minutely appendiculate in the lower pair, almost obsolete in the upper. *Ovary* globose, tomentose, seated on a thick and glabrous disk, ± 1 mm in diameter; style shortly exserted, filiform, glabrous, (6-) 7-10 mm long, shortly 2-lobed at the top. *Fruit* obovoid or sub-cylindrical-obovoid, cuneate towards the base, pubescent, 3-4.5 (-5.5) mm long, 2-3 mm broad in the upper half, apparently non-dehiscent but may split into two 2-celled nutlets; seeds narrow, tapering at the base.

Specimens examined

NORTHERN TERRITORY: *Byrnes 709*, Victoria River Crossing, 7.v.1968 (DNA, NT, PERTH). *Byrnes 1702*, loc.cit., 12.ix.1969 (BRI, DNA, NT, L, NSW). *Craven 3482*, McArthur River Area, 16° 27′ S, 136° 10′ E, 29.i.1976 (CANB, NT, PERTH). *Dunlop 2195*, Caranbirini Creek, SSW of Borroloola, 16° 17′ S, 136° 04′ E, 4.vi.1971 (BRI, CANB, MEL, NT). *Holtze 1408*, mouth of the Victoria River, 1897 (MEL 73284). *Key 4065.7*, Bukalara Plateau NE of McArthur River Homestead, McArthur River area, 16° 20′ S, 136° 05′ E, 23.iv.1976 (CANB). *F. Mueller s.n.*, sources of the Nicholson River, 1856 (MEL 73283). *F. Mueller s.n.*, Seven Emu "River" (Creek), Gulf of Carpentaria, ?1856 (K, lectotype; GH, K, TCD - isolectotypes; AD, photograph; W, copies of 2 drawings). *F. Mueller s.n.*, McArthur River, Gulf of Carpentaria, ?1856 (MEL 41227, MEL 73282 - syntypes of *Denisonia ternifolia* F. Muell.). *Symon 7897*, about the Cadell River Crossing, 12° 39′ S, 134° 18′ E, 25.vi.1972 (AD, ADW, CANB, NT).

WESTERN AUSTRALIA: *Byrnes 2304*, Kalumburu, 20.v.1971 (CANB, DNA, NT, PERTH). *George 13370*, south-east of Cape Londonderry, north Kimberley, 13° 53′ S, 127° 04′ E, 5.viii.1975 (PERTH). *Maconochie 1251*, Kalumburu Mission, 31.v.1971 (AD, CANB, K, NT, PERTH). *Symon 10187*, between Kalumburu Mission and Longini Landing, 14° 16′ S, 126° 37′ E, 26.v.1975 (AD, ADW).

Distribution (Map 5B)

P. ternifolia is known from the northern half of Northern Territory and from the northern-most part of Kimberley in Western Australia. Distribution in Northern Territory is sparse and disjunct, with the majority of localities towards the southern part of the Gulf of Carpentaria, and a few in the north-western part of the Territory near the

mouth of the Victoria River. The only other known locality to the far north is in the Arnhem Land area.

Comments

This species is recorded for the first time from Western Australia, where it is the northern-most representative of *Pityrodia*.

Bentham (1870) described the corolla-tube as "rather shorter than the calyx". During present studies, however, the corolla-tube has been found to be almost equal to the calyx or occasionally slightly extending above the calyx-lobes.

According to C.R. Dunlop's note (coll. no. 2195), the foliage of this species is strongly aromatic. In dried plant specimens, however, no fragrance is noticed.

Affinities

P. ternifolia is closely related to *P. serrata* in its leaves being in whorls of 3, ovate, prickly with sharply toothed margins; flowers axillary and solitary; calyx ribbed, glandular outside; corolla-tube almost cylindrical, glabrous outside, with the upper lip erect and streaked purple; stamens and style shortly exserted; anthers almost orbicular in outline and fruit obovoid. Nevertheless, *P. ternifolia* may easily be distinguished by its leaves being cordulate at the base, sprinkled all over with short gland-tipped hairs; calyx with gland-tipped hairs outside; corolla mauve or pink-red, the dense hairy ring inside the tube well below the corolla-throat and the anther-lobes less distinctly appendiculate.

P. ternifolia is also nearest to *P. byrnesii*, *P. gilruthiana* and *P. pungens* in its leaves being in whorls of 3; flowers axillary and solitary; calyx ribbed, glandular and pubescent outside; corolla-tube cylindrical; the upper corolla-lip erect and streaked purple; stamens and style shortly exserted; fruit obovoid, pubescent. From all these species, however, *P. ternifolia* can readily be identified by its ovate leaves with toothed margins, gland-tipped hairs all over the stem, leaves and calyx, and corolla mauve or pink-red. The leaves in the rest of the above species are linear-lanceolate or narrowly elliptic-oblong; entire; stem, leaves and calyx with sessile glands; corolla pale white with only the upper lip with purple streaks.

17. **Pityrodia serrata** Munir, sp. nov.

Caules et rami teretes, dense tomentosi. Folia sessilia, verticillata terna, oblongo-ovata, serrata, mucronata, 5-13 mm longa, 2-4 mm lata, glabra, laevia. Sepala extus glabra; lobi lanceolati, pungentes, margine vix recurvato, 3-5 mm longi, 1-2 mm lati; tubus 2-2.5 mm longus. Corolla subalba. Stamina parum exserta. Fructus obovoidei, pubescentes.

Type: *T.G. Hartley (Leg. R. Schodde) 13821*, Tin Camp Creek, about 20 miles south of Nabarlek mining camp, Lat. 12° 28′ S, Long. 133° 15′ E, Arnhem Land, Northern Territory, Australia, 30.v.1973 (CANB, holotype; NT, isotype).

Description (Fig. 17)

An erect branched shrub to 1 m. *Stem* and branches cylindrical, densely clothed with a short tomentum of more or less stellately branched hairs, the old stem ferruginous - orange. *Leaves* sessile, in whorls of 3, crowded, with the lower ones mostly overlapping the basal part of the next upper, ovate to oblong-ovate, pungently mucronate, sharply serrate along the margins, 5-13 mm long, 2-3.5 (-4) mm broad, glabrous and smooth, coriaceous, midrib and reticulation not raised underneath. *Flowers* sessile or very shortly pedicellate, axillary and solitary; pedicels ± 1 mm long, glandular and pubescent; bracts represented by the upper leaves; bracteoles sessile, lanceolate, entire, acute, pungent, glabrous, 5-7 mm long, 1-1.5 mm broad. *Calyx* persistent, longer than the corolla-tube,

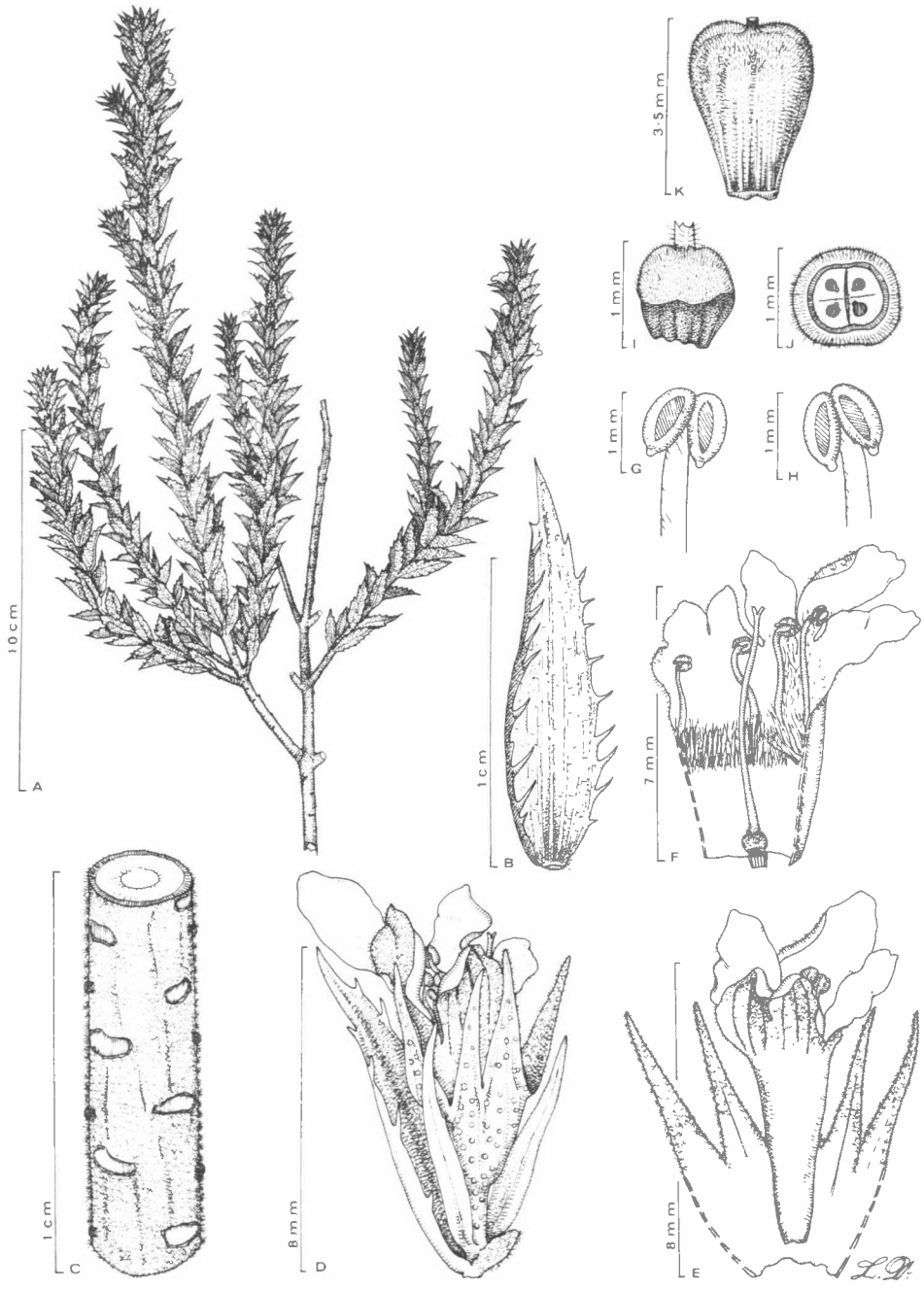


Fig. 17. *Pityrodia serrata* Munir (*T.G. Hartley* [*Leg. R. Schodde*] *13821*: CANB, holotype). A, flowering twig; B, enlarged leaf to show serration; C, portion of stem; D, flower with a leafy bract and two bracteoles; E, flower with calyx vertically cut open to show corolla-tube; F, corolla-tube vertically cut open to show androecium and gynoecium; G, lower anther; H, upper anther; I, ovary; J, lower anther; K, fruit.

more or less campanulate, ribbed, divided more than halfway down into 5 lobes, 6-7.5 mm long, glabrous but sparsely glandular outside, pubescent inside the lobes, glabrous within the tube; lobes lanceolate, with a pungent tip, scarcely recurved along the margin, 3-5 mm long, 1-1.5 (-2) mm broad at the base; tube campanulate, 2-2.5 mm long. *Corolla* off-white with the upper lip streaked purple, scarcely longer than the calyx, 6-8 mm long, pubescent outside the lobes, with a dense hairy ring inside the tube below the insertion of stamens, and a few long hairs extending to the central lobe of the lower lip; the upper lip erect, 2-lobed, shorter than the lower lip, the lobes oblong-ovate, faintly streaked purple, 2-2.5 mm long, 1-1.5 mm broad; the lower lip spreading, 3-lobed, the central lobe larger than the two lateral, narrowly elliptic-obovate, ± 3 mm long, 1.5-2 mm broad, the lateral lobes more or less elliptic-oblong, ± 2.5 mm long, 1.5 (-2) mm broad; tube cylindrical, glabrous outside, 3-3.5 mm long, 1-1.5 (-2) mm broad at the top end. *Stamens* shortly exserted, inserted above the middle of the corolla-tube; filaments filiform, glabrous, the lower pair 1.5-2 (-2.5) mm long, the upper pair 2-2.5 mm long; anthers more or less orbicular in outline, 0.8-1 mm long, ± 1 mm broad; lobes narrowly elliptic-oblong, shortly appendiculate at the lower ends, free and divergent in the lower halves. *Ovary* globose, densely tomentose, ± 1 mm in diameter; style shortly exserted, filiform, glabrous, 4-5.5 mm, shortly 2-lobed at the summit. *Fruit* obovoid, pubescent, 3-3.5 mm long, 2-2.5 mm broad at the top end, apparently non-dehiscent; seeds not seen.

Specimens examined

The type collection is the only material available for examination.

Distribution (Map 5B)

P. serrata is endemic in Arnhem Land, Northern Territory, where it has been recorded from south of Nabarlek near the Tin Camp Creek.

Comments

P. serrata is one of the few *Pityrodia* species with corolla almost equalling the calyx or very shortly exceeding it. Likewise, the filaments of the upper and lower pairs of stamens are usually almost equal or in a few flowers the lower filaments may be a little shorter than the upper. All the anthers, however, are about the same size with a short appendage at the lower ends of the lobes. The leaves of *P. serrata* are glabrous, but unlike several other species of this genus they are neither glandular nor glutinous.

Affinities

P. serrata is nearest to *P. ternifolia* in its leaves being in whorls of 3, ovate, prickly with sharply toothed margins; flowers axillary and solitary; calyx ribbed, glandular outside; corolla-tube almost cylindrical, glabrous outside, with the upper lip erect and streaked purple; stamens and style shortly exserted; anther almost orbicular in outline; fruit obovoid, pubescent. However, *P. serrata* may easily be identified by its leaves being much crowded, glabrous and without any glands, with the marginal teeth smaller but sharper; calyx with sparse sessile glands outside, non-glandular but more densely pubescent inside the lobes; corolla pale white, the dense hairy ring inside the corolla-throat and the anther-cells more distinctly appendiculate.

P. serrata is also related to *P. byrnesii*, *P. gilruthiana* and *P. pungens* in its leaves being in whorls of 3; flowers axillary and solitary; calyx ribbed, glandular outside; corolla pale white with almost cylindrical tube and the upper lip streaked purple; stamens and style shortly exserted; anthers more or less orbicular in outline; fruit obovoid, pubescent. *P. serrata*, however, can readily be distinguished by crowded pungent leaves with sharp serrate margins.

18. **Pityrodia teckiana** (F. Muell.) E. Pritz., Bot.Jahrb.Syst.35(1904)521; Gardner, Enum.Pl.Aust.Occ.3(1931)112; Junell, Sym.Bot.Upsal.4(1934)68; fig.115; Gardner in Parkinson (Ed.), Wildfls West.Aust.(1959)133, in obs.; Mold., Résumé Verben.etc.(1959) 210, 251; Beard (Ed.), W.Aust.Pl. edn 1(1965)93; Blackall & Grieve, West.Aust.Wildfls 3(1965)571; Beard (Ed.), W.Aust.Pl. edn 2(1970)114; Mold., Fifth Summary Verben. etc.1(1971)348, 426; Gardner in Edmonds (Ed.), Wildfls West.Aust. edn 11(1973)121, in obs.

Type: *J. Forrest s.n.*, near Lake Deborah, 1889 (MEL 69207, lectotype designated here; K, MEL 69208 - isolectotypes).

Chloanthes teckiana F. Muell., Vict.Natural.6(1889)104, *basionym*; F. Muell., Bot.Centralbl.40(1889)268; F. Muell. & Tate, Trans.Roy.Soc.S.Aust.16(1896)375.

Type: As for *Pityrodia teckiana* (F. Muell.) E. Pritz..

Pityrodia maculata Gardner, J.Roy.Soc.W.Aust.27(1942)190; Beard (Ed.), W.Aust.Pl.edn 1(1965)92; Blackall & Grieve, West.Aust.Wildfls 3(1965)570; Beard (Ed.), W.Aust.Pl. edn 2(1970)114; Mold., Fifth Summary Verben. etc.1(1971)348 - *syn.nov.*

Type: *C.A. Gardner 2708*, near Ballidu south of Pithara, 22.ix.1931 (PERTH, lectotype; PERTH 2 isolectotypes).

Typification

P. teckiana is based on J. Forrest's (s.n.) collection from Lake Deborah, Western Australia, consisting of at least 3 duplicates. Since the author (F. Mueller) did not select any one of them as a type, it is, therefore, necessary to choose a type for this name. Of all the three syntypes, the one preserved in Herb. MEL under the no. MEL 69207 has been annotated by F. Mueller and almost certainly used by him in preparing the original description of this species. This specimen is particularly complete and well preserved, and is designated here as the lectotype for this species.

Description (Fig. 18)

A branched viscid shrub of 30-90 (-150) cm. *Stem* and branches densely covered with sticky exudation from the numerous short gland-tipped septate hairs. *Leaves* sessile, amplexicaul, mostly decussate, sometimes ternate towards the base, brittle, ovate-oblong or narrowly elliptic-oblong, bluntly serrate-dentate at the tip and along the margins, (0.5-) 0.8-2.5 (-3.5) cm long, (3-) 5-10 (-12) mm broad, glabrous, viscid and green on both sides. *Flowers* shortly pedicellate, mostly axillary solitary, rarely 3 together in the axil of upper leaves; peduncle and pedicel viscid, covered with short gland-tipped hairs; pedicel 1-3 (-4) mm long; bracts green, leafy, sessile, amplexicaul, oblong or narrowly elliptic-oblong, entire or somewhat dentate in the upper half, viscid all over, 4-12 (-17) mm long, (2-) 3.5-5 (-7) mm broad; bracteoles green, sessile, semi-amplexicaul, oblong-elliptic or ovate-elliptic, entire, 2.5-5 mm long, 1.5-3 mm broad, viscid all over. *Calyx* persistent, divided to near the base into 5 lobes, 5-8 mm long, viscid all over, outside with numerous short and simple gland-tipped hairs and a few branched hairs chiefly towards the base and along the lobe-margins, glandular viscid inside; lobes lanceolate or narrowly elliptic, 4-7 mm long, (1-) 1.5-2 (-3) mm broad; tube short, 1-1.5 mm long. *Corolla* pale blue-mauve or violet-lilac, 15-25 mm long, sparsely pubescent outside with simple gland-tipped hairs, glabrous inside excepting the dense hairy ring above the ovary, and sparse villous hairs extending to the large anterior-lobe of the lower lip; anterior-lobe nearly rounded and sometimes with a small terminal notch, 4-8 mm long, 6-10 (-12) mm broad; the other 4 lobes semi-orbicular or semi-ovate, (2.5-) 3-5 (-7) mm long, 4-6 (-7) mm broad; tube abruptly dilating above the ovary within the calyx; 10-15 mm long, 5-8 (-11) mm broad at the top end. *Stamens* didynamous, included or the lower pair slightly exserted above the corolla-tube; filaments glabrous, filiform, the lower pair 6-12 mm long, the upper pair 3-5 mm long; anthers broadly elliptic-oblong or almost orbicular in outline, 1.5-2 mm long, 1-1.5 (-2) mm broad, the lower pair with a

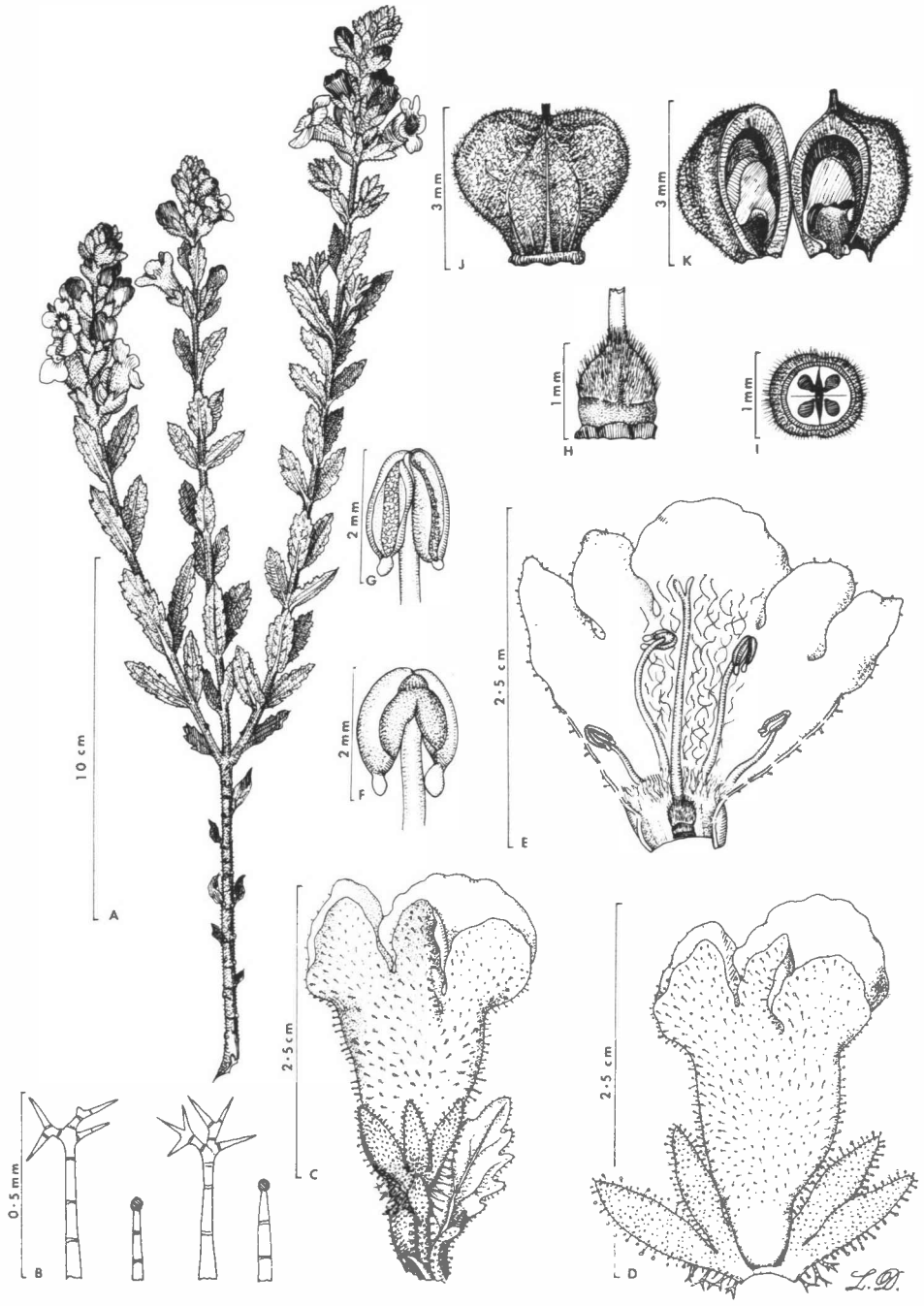


Fig. 18. *Pityrodia teckiana* (F. Muell.) E. Pritz. (A-I, *R.J. Chinnock 4117*: AD; J-K, *C.A. Gardner 13554*: PERTH). A, flowering branch; B, hair-types in calyx; C, flower with a bract and two bracteoles; D, flower with calyx vertically cut open to show corolla-tube; E, corolla-tube vertically cut open to show androecium and gynoecium; F, lower anther; G, upper anther; H, ovary; I, transverse section of ovary; J, fruit; K, fruit split into two halves.

thick mass on the back, the lobes oblong, distinctly appendaged at the lower end. *Ovary* globose, densely tomentose, with a thick disc at the base, ± 1 mm in diameter; style scarcely exserted above the corolla-tube, glabrous, filiform, 10-16 (-20) mm long, shortly 2-lobed at the apex. *Fruit* almost globular or somewhat ellipsoid-obovoid, with a very shallow depression at the top, pubescent, faintly reticulate, 2-3 mm long, 2.5-3 mm broad in the upper half, splitting into two nutlets; seeds not seen.

Representative specimens

WESTERN AUSTRALIA (35 collections seen): *Ashby 3180*, north of Trayning on Bencubbin Road, 28.v.1970 (AD, PERTH). *Bailey 172*, Muntadgin, Sept. 1947 (PERTH). *Baird s.n.*, Kalgoorlie, 1932 (UPS). *Bingold s.n.*, Hill Station, 10 miles N of Broome, Sept. 1939 (MO, PERTH). *Blackall 3529*, near Bencubbin, Sept. 1937 (PERTH). *Blackall s.n.*, near Southern Cross, Sept. 1929 (PERTH). *Blackall s.n.*, loc.incert., Sept. 1930 (PERTH). *Chinnock 4117*, near Roe Dam, 30 km N of Narembeen, 23.ix.1977 (AD). *Davies s.n.*, 5 miles east of Merredin, 30.x.1963 (PERTH). *Dvoretsky s.n.*, Burracoppin, Oct. 1930 (PERTH). *J. Forrest s.n.*, near Lake Deborah, 1889 (MEL 69207, lectotype; K, MEL 69208 - isolectotypes). *Gardner 1791*, "Yorkrakine Rocks", Westonia, 5.x.1972 (MEL, PERTH). *Gardner 2708*, near Ballidu, S of Pithara, 22.ix.1931 (PERTH 3 spec., types of *P. maculata* Gard.). *Gardner 13554*, near Beacon, 10.x.1961 (PERTH). *Gardner s.n.*, near Koorda, Sept. 1963 (PERTH 2 spec.). *Gardner & Blackall 784*, between Pithara and Wongan Hill, 26.ix.1931 (PERTH). *Haegi 1186*, 2½ km E of Muntadgin towards Mt Hampton, 3.x.1976 (AD). *Helms s.n.*, 36 miles north-west from Southern Cross, 27.xi.1891 (AD 3 spec., K, MEL 69213, MEL 69214, NSW 135934, NSW 142629). *Koch 2849*, Merredin, 15.x.1923 (K, MEL, MO, NSW). *Lawson s.n.*, Hill Station 10 miles N. of Broome, Sept. 1957 (PERTH). *Lullfitz 3098a*, 4 miles from Warralakin, 6.xii.1963 (PERTH, Kings Park Perth). *Merrall s.n.*, sources of Swan River, 1888 (MEL 69210). *Newbey 1537*, 6 miles W of Muntadgin, 21.x.1964 (PERTH). *Rogerson 311*, Wialki, N of Merredin, Oct. 1966 (PERTH). *Sargent 845*, Burracoppin, 19.vi.1915 (NSW). *Sewell s.n.*, lower Swan River, 1889 (MEL 69212). *Stacey 252*, 6.8 miles N of Cleary, 17.xi.1972 (PERTH). *Weber 5207*, 40 km NE of Cleary, 19.x.1975 (AD). *Went A116*, between Mullewa and Wubin, 9.ix.1962 (MO).

Distribution (Map 5C)

P. teckiana is endemic mainly in the south-west of Western Australia where it has been recorded between latitude 29° and 32° S and between longitude 116° and 120° E. Besides, one disjunct locality is in the north of the state near Broome. The south-western distribution is chiefly to the north of the Great Eastern Highway with a few localities south of the Highway towards Narembeen and Mt Holland. North of the Highway, it has been collected from several localities of which Wubin and Lake Moore are the northern-most. The western-most locality is around the sources of the Swan River and the eastern-most near Kalgoorlie.

Comments

The specific epithet *teckiana* was proposed by F. Mueller after "the Duke of Teck, G.C.B., in appreciation of the powerful support which His Highness, as president of the Royal Horticultural Society of England, afforded to the very meritorious pursuits of that great union".

After examining the types of *P. teckiana* and *P. maculata* Gardner, these taxa are found to be conspecific. Therefore, the latter is being regarded here as a synonym of the former. In the protologue of *P. maculata*, Gardner pointed out its affinity with *P. dilatata* without naming any character common between the two. Similarly, *Chloanthes teckiana* (= *P. teckiana*), has been regarded by F. Mueller as "nearest allied to *Chloanthes denisonii*" (= *Dennisonia ternifolia*), but he too did not mention any character common to both species. The latter species so far has been treated as belonging to a distinct genus *Dennisonia* F. Muell., which is generally accepted as the nearest ally of *Pityrodia*. Both *P. teckiana* and *Dennisonia ternifolia* have somewhat similar shaped leaves and axillary solitary flowers towards the end of branches. However, *Dennisonia ternifolia* can easily be distinguished by the following characters. Plant non-viscid; leaves ternately whorled and provided with sharper mucronate serratures; calyx less deeply cleft with more pointed (or mucronate) lobes; corolla considerably smaller, less turgid and anther-appendages scarcely visible. Gardner's view about the affinity between *P. teckiana* and *P. dilatata* seems less plausible, because the latter is not only a non-glandular, non-viscid

and very woolly-tomentose shrub, but has different shaped leaves, flowers and fruit.

Contrary to the general decussate phyllotaxy and axillary solitary flowers, the lower leaves in F.W. & C.W. Went's collection (No. A116: MO) are successively decussate and ternate and flowers mostly 3-together on short axillary peduncles.

Affinity

P. teckiana is closely related to *P. glabra* in its leaves being viscid and apparently similar looking; inflorescence with axillary solitary flowers; stamens and style included or scarcely exserted above the corolla-tube and fruit ellipsoid-obovoid. *P. teckiana*, however, may easily be distinguished by its stem and branches being densely covered with short, gland-tipped, septate hairs; leaves viscid and green on both sides, sessile, amplexicaul, serrate-dentate at the tip and along the margins; calyx and corolla hairy outside with gland-tipped hairs; calyx-lobes almost free to the base; corolla-tube abruptly dilated above the ovary within the calyx; stamens distinctly didynamous; fruit non-glandular, pubescent, with a very shallow depression at the top.

19. **Pityrodia chorisepala** Munir, sp. nov.

Caules et rami teretes, dense tomentosi. Folia sessilia, opposita, ovata vel elliptico-ovata, integra, 0.5-1.3 cm longa, 3-5.5 mm lata, pubescentia vel tomentosa. Sepala extus glandulosa et pubescentes; lobi linearii, subdiscreti, 3-6 mm longi, 0.5-1.5 mm lati; tubus 0.5-1 mm longus. Petala extus glabra, rosea. Stamina exserta. Fructus plus minusve obovoideo-pyriformes.

Type: *P.K. Latz 6543*, south of Mongrel Downs Station, 20° 43'S, 129° 35'E, Northern Territory, Australia, 4.viii.1976 (AD, holotype; AD, CANB, NT, PERTH - isotypes).

Description (Fig. 19)

A rigid branched shrub to 90 cm. *Stem* and branches densely clothed with cineraceous indumentum of short and branched hairs which often becomes yellowish upwards. *Leaves* sessile, ovate or elliptic-ovate, contracted at the base, somewhat crowded towards the apex, obtuse, entire, flat, (5-) 7-15 mm long, 3-5.5 mm broad, densely yellowish-grey-tomentose. *Flowers* pedicellate, solitary or more often 3-together in the axil of upper leaves, sometimes more, forming a spike-like inflorescence towards the end of branches; pedicel densely glandular-puberulous or glandular-glutinous, (2-) 3-5 (-6) mm long; bracts leafy, sessile, ovate or elliptic-ovate, glandular with interspersed short gland-tipped hairs, (4-) 5-6 (-8) mm long, 1.5-2.5 mm broad; bracteoles leafy, sessile, linear or narrowly elliptic-oblong, glandular with branched ciliate tomentum along the margins, 3-4 mm long, 0.5-1 mm broad. *Calyx* persistent, deeply 5-lobed, 4-7 mm long, glandular-puberulous or glandular-glutinous outside, with long branched hairs or ciliate tomentum along the lobe-margins; lobes linear, almost free to the base, somewhat chartaceous when dry, 3-5 (-6) mm l ong, 0.5-1 (-1.5) mm broad; tube short, 0.5-1 mm long. *Corolla* white, 6-8 mm long, glabrous outside with a dense hairy ring inside the tube below the stamens and a few long hairs extending to the large central lobe of the lower lip; the central lobe almost elliptic-orbicular in outline, rounded at the apex, 3-4 mm long, 3-5.5 mm broad; the lateral lobes of the lower lip broadly elliptic, ± 3 mm long, 2-3 mm broad; the 2 lobes of the upper lip more or less oblong, 3-5 mm long, 2-3 mm broad; tube cylindrical in the lower half, dilated at the top within or immediately above the calyx, 3-4 mm long, 1.5-2 mm broad at the top end. *Stamens* exserted; filaments filiform, glabrous or with sparse and short gland-tipped hairs, the lower pair 2.5-3 mm long, the upper pair 1.5-2 mm long; anthers more or less orbicular in outline, distinctly appendiculate at the lower ends of the lobes, 0.5-0.8 (-1) mm long, nearly as broad. *Ovary* globose, glabrous, densely glandular with minute gland-tipped hairs, ± 1 mm in diameter; style exserted, filiform glabrous with a few sparse gland-tipped hairs towards the base, 4-5 mm long,

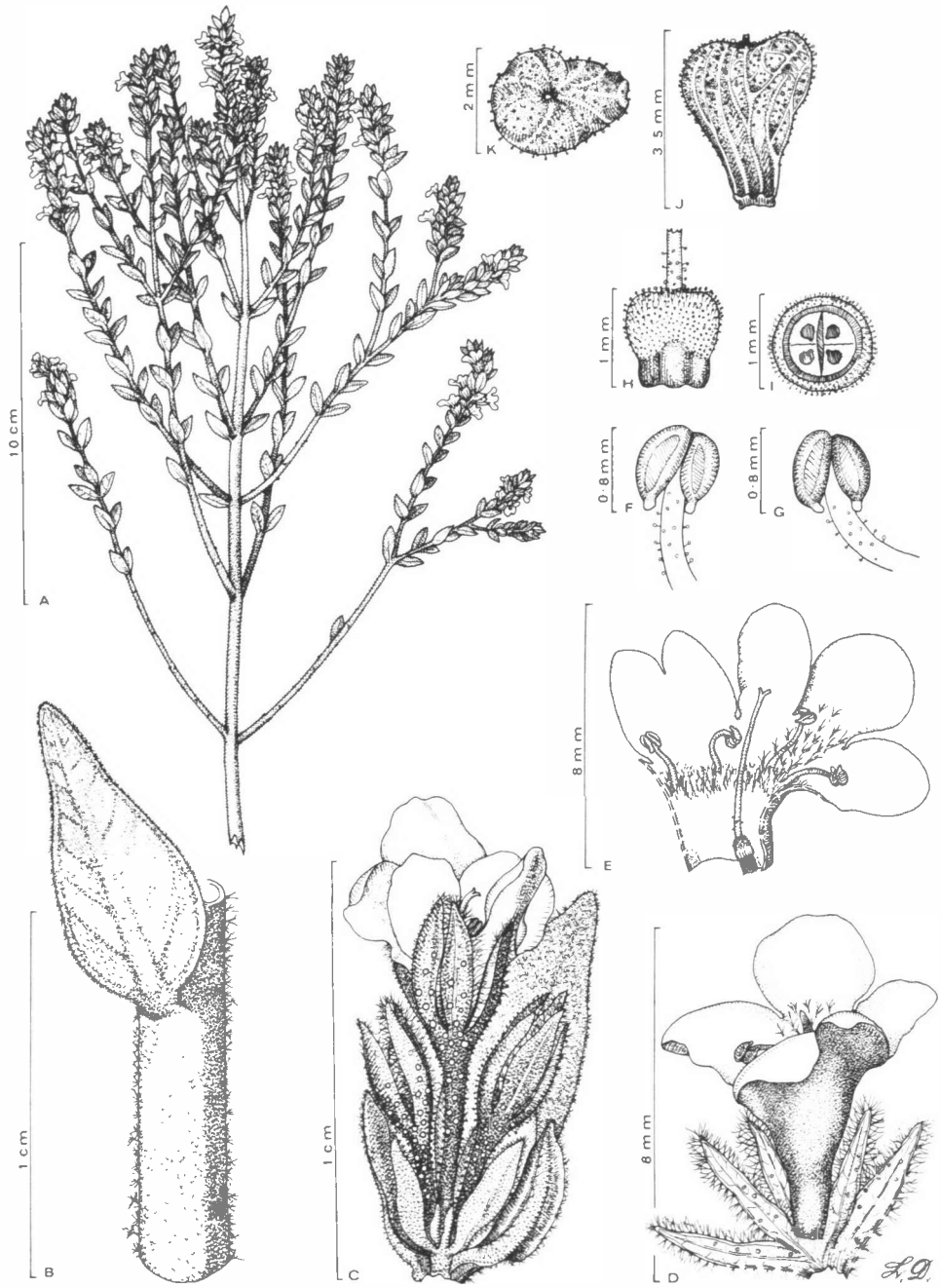


Fig. 19. *Pityrodia chorisepala* Munir (*P. K. Latz 6543*: AD, isotype). A, flowering twig; B, portion of stem with a leaf; C, cyme in the axil of a leaf; D, flower with calyx vertically cut open to show corolla-tube; E, corolla-tube cut open to show androecium and gynoecium; F, lower stamen; G, stamen; H, ovary; I, transverse section of ovary; J, fruit; K, fruit showing top view.

shortly 2-lobed at the summit. *Fruit* more or less obovoid-pyriform with a shallow depression at the top, and two unequal rounded lobes in the upper half, distinctly corrugated along the reticulate venations, densely pubescent with short gland-tipped hairs, 3-3.5 mm long, 2-2.5 mm broad at the top end, apparently non-dehiscent; seeds not seen.

Specimens examined

NORTHERN TERRITORY: *George 8921*, "12 miles" (19.21 km) west of Sandy Blight Junction, 26.vii.1967 (PERTH). *P.K. Latz 6543*, south of Mongrel Downs Station, 20° 43′ S, 129° 35′ E, 4.viii.1976 (AD, holotype; AD, CANB, NT, PERTH - isotypes).

Distribution (Map 5B)

P. chorisepala is endemic to the Northern Territory where it has been recorded from south of Mongrel Downs and west of Sandy Blight Junction.

Comments

In a few flowers, the number of stamens are found to be five or the number of corolla-lobes four. These variations, however, never occur together in the same flower. So far, such anomalies have not been observed in any other *Pityrodia* species.

According to field notes (*P.K. Latz 6543*) this taxon is "a rare odorous species growing in the narrow dune swale of red sand".

Affinity

P. chorisepala is closely allied to *P. hemigenioides* in its stem and leaves being cinéraceous tomentose; leaves sessile, contracted at the base; corolla white, almost glabrous outside, with tube abruptly dilated at the top; stamens and style exserted. Nevertheless, *P. chorisepala* may easily be distinguished by its leaves being ovate or elliptic-ovate, flat; flowers mostly 3-together in the axil of upper leaves; pedicels glandular, longer, (2-) 3-5 (-6) mm; calyx densely glandular outside with branched tomentose hairs along the lobe-margins, lobes linear, almost free to the base; ovary with minute gland-tipped hairs all over, style sparsely hairy towards the base; fruit more or less obovoid-pyriform with a shallow depression at the top forming two unequal rounded lobes in the upper half, distinctly corrugate along the reticulate venations, densely pubescent with short gland-tipped hairs.

20. **Pityrodia oldfieldii** (F. Muell.) Benth., Fl.Aust.5(1870)52; Diels & E. Pritz., Bot. Jahrb.Syst.35(1904)522; Gard., Enum.Pl.Aust.Occ.3(1931)112; Gard., Wildfls West. Aust.(1959)132; Mold, Résumé Verben.etc.(1959)210, 251, 335, 341; Beard (Ed.), W. Aust.Pl. edn 1(1965)92; Blackall & Grieve, West.Aust.Wildfls 3(1965)571; Beard (Ed.), W.Aust.Pl. edn 2(1970)114; Mold., Fifth Summary Verben.etc. 1 & 2(1971)348, 426, 603, 615; Gard., West.Aust.Wildfls B(1972)162, 163t; Erickson et al., Fls & Pl.West.Aust. (1973)103, t.305; Gard., Wildfls West.Aust. edn 11(1973)120 exclud. fig.

Type: *A. Oldfield s.n.*, Murchison River, undated (K, lectotype designated here; HBG, MEL 881 and MEL 882, W 3 spec. - isolectotypes).

Chloanthes oldfieldii F. Muell., Fragm.1(1859)234, *basionym*; F. Muell. Fragm.2(1861)182; F. Muell., Fragm. 6(1868)157 exclud. syn. *Quoya cuneata* Gaud.; F. Muell., Syst.Cens.Aust.Pl.1(1882)103; F. Muell., Sec.Syst. Cens.Aust.Pl.1(1889)172.

Type: As for *P. oldfieldii* (F. Muell.) Benth.

Quoya oldfieldii (F. Muell.) F. Muell., Fragm.4(1864)80, based on *Ch. oldfiedii* F. Muell.

Typification

P. oldfieldii (F. Muell.) Benth. is based on A. Oldfield's collection (s.n.), consisting of at least seven duplicates. Since the author did not choose any one of them as a type, it is,

therefore, necessary to select a type for this name. Of all the syntypes, the one preserved in Herb. K seems the best representative of this species. It bears the collector's name on his field label and is annotated in the author's hand. The specimen is particularly complete and well preserved and is designated here as the lectotype.

Description (Fig. 20)

An erect branched shrub of 0.5-1.5 m. *Stem* and branches densely woolly-tomentose with branched hairs, often reddish-brown or deep dark brown in the young apical parts, becoming yellowish-brown or pale brown on the older branches. *Leaves* sessile, deeply narrowed towards base, broadly elliptic-obovate or almost rhomboidal, very obtuse, minutely undulate or crenate along the margins, (1.5-) 2-4.5 (-5) cm long, (1-) 1.5-2.5 cm broad, densely woolly-tomentose with branched hairs, greyish-green above, yellowish-green underneath with primary and secondary veins distinct. *Flowers* pedicellate, solitary or more frequently 3-7 (-15) together in pedunculate axillary cymes towards the end of branches, disposed in a more or less leafy spike-like inflorescence; cyme-peduncle rather thick, densely tomentose, (0.5-) 1-2 cm long; pedicel covered with dense branched tomentum, 2-5 mm long; bracts sessile, elliptic or somewhat linear-oblong, tomentose on abaxial surface, glabrous on adaxial surface, 2-4 mm long, 1-1.5 mm broad; bracteoles ovate-oblong or elliptic, 1-2 mm long, 0.5-1 mm broad. *Calyx* clothed with greenish-yellow branched tomentum often changing to deep brown towards the tips, persistent, divided to nearly the middle into 5 lobes, tubular towards the base, 8-10 (-13) mm long, densely tomentose outside and on the inside (of at least the upper half) of the lobes, glabrous inside the tube; lobes more or less arranged in two lips, oblong-ovate, very obtuse, membranous when dry, 3-nerved, (2-) 3-5 (-7) mm long, 2-4 mm broad at the base; tube more or less campanulate, 3-6 mm long. *Corolla* pale pink with purple dots in throat, (15-) 18-23 mm long, pubescent outside, glabrous inside excepting the dense hairy ring above the ovary, and the sparse hairs extending to the large anterior lobe of the lower lip; the anterior lobe about twice the size of other 4-lobes, more or less orbicular in outline, (6-) 7-9 mm long, (7-) 9-10 mm broad; the other 4 lobes nearly equal, more or less orbicular in outline, (3-) 4-6 mm long, 5-6 mm broad at the base; tube much dilated, 12-15 (-17) mm long, 10-13 mm across at the top end. *Stamens* included; filaments filiform, mainly glabrous, the lower pair slightly longer and with a few hairs towards the base, 5-6 mm long, the upper pair 3-4 mm long; anthers (excluding the appendages) more or less orbicular in outline, the lower pair with well developed appendages at the lower ends of the lobes, lobes 2-2.5 mm long including the appendages, the upper pair without appendages or with very minute ones, lobes 1-1.5 mm long. *Ovary* globose, 1-2 mm in diameter, densely woolly-hirsute; style included, filiform, glabrous, 8-10 mm long, shortly 2-lobed at the apex. *Fruit* enclosed within the persistent calyx, elliptic-ovoid or globose, sometimes slightly oblique with the style lateral (as in *P. bartlingii*), densely pubescent with branched hairs, 3-4 mm long, (2-) 3-4 mm broad in the upper half.

Representative specimens

WESTERN AUSTRALIA (37 collections seen): *Ashby 307*, east of Yuna, ca. 34 km E of Northampton, 28.viii.1963 (AD). *Ashby 1901*, south of Eradu, 14.viii.1966 (AD, PERTH). *Beard 2079*, 30 miles E of Murchison River Mouth, 28.ix.1962 (PERTH, Kings Park Perth). *Blackall 2768*, between Geraldton and Mullewa, 23.ix.1932 (PERTH 2 spec.). *Blackall 4548*, 80 km N of Northampton, 3.ix.1940 (PERTH). *Blackall 4793*, between Yuna and Dartmoor, Sept. 1940 (PERTH 2 spec.). *Brockway s.n.*, 21 miles N of Ajana, Oct. 1947 (PERTH). *Burbidge 2213*, Ajana sandplain, 30.ix.1947 (CANB, MEL). *Burns 9*, 3 miles in along Casuarina Road, 14.viii.1966 (PERTH). *Burns 14*, Eradu, E of Geraldton on Mullewa Road, 24.x.1965 (MO, PERTH). *Burns 78*, East Yuna Reserve, 25.ix.1967 (PERTH). *Demarz 3053*, 390 miles N of Perth on NW Coastal Highway, 8.xii.1970 (PERTH, Kings Park Perth). *Drummond 6th coll. no. 139*, Murchison River, 1851 (CGE, G, K, MEL 2 spec., P, W). *Galbraith 554*, near Mullewa on railway line to Wilroy, Aug. 1964 (MEL 2 spec.). *Gardner 1953*, 12 miles NW of Northampton, 24.ix.1926 (PERTH). *Gardner 12730*, near Binnu, 7.ix.1960 (PERTH 2 spec.). *Gardner s.n.*, Baker's Well, N of Northampton, 11.i.1931 (PERTH). *Gardner & Blackall s.n.*, 19 km NW of Northampton, Sept. 1926 (PERTH). *Luff & Birrel s.n.*, 16 km from Three Springs on Eneabba Road, 7.x.1963 (AD). *Lullfitz 1953*, Binnu, 18.xii.1962 (PERTH). *Lullfitz 2961*, 6 miles from Murchison River

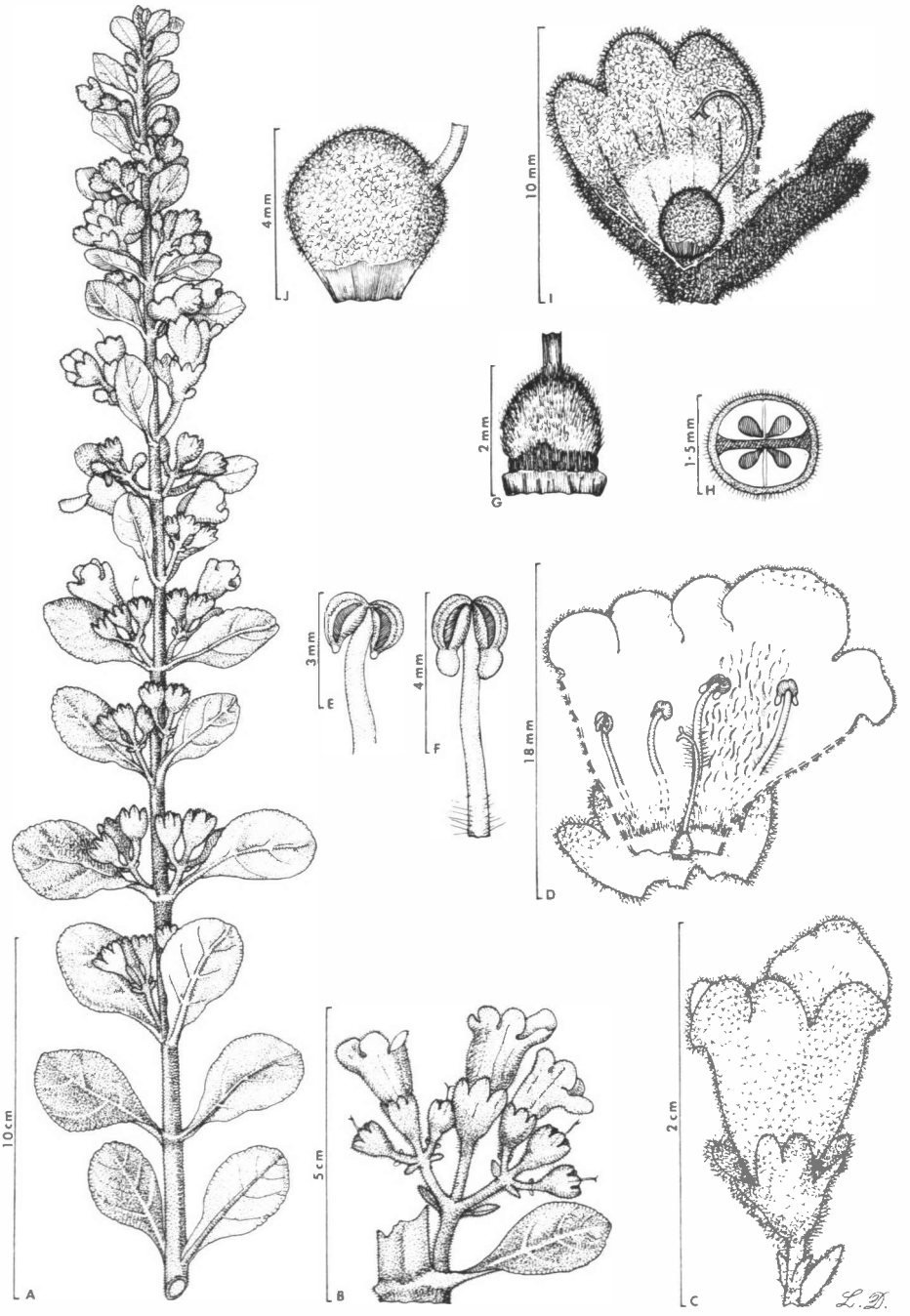
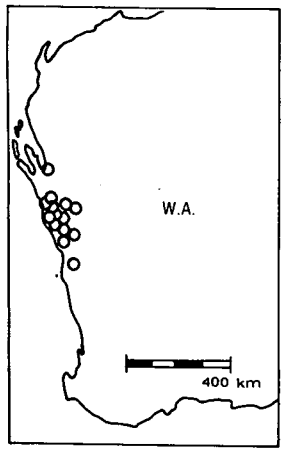


Fig. 20. *Pityrodia oldfieldii* (F. Muell.) Benth. (*J.Z. Weber 5107*: AD). A, flowering branch; B, cyme in the axil of a leaf; C, flower with a bract and two bracteoles; D, flower with calyx and corolla vertically cut open to show androecium and gynoecium; E, upper stamen; F, lower stamen; G, ovary; H, transverse section of ovary; I, 2-lipped persistent calyx cut open to show fruit; J, fruit.

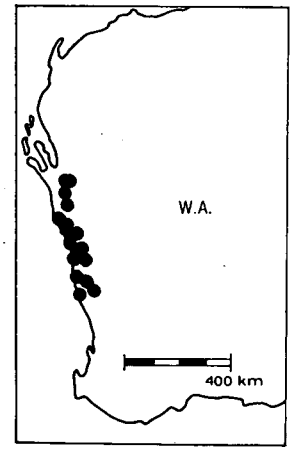
Mouth, 13.xi.1963 (Kings Park Perth). *Lullfitz 2975*, 36 miles E of Geraldton, 14.xi.1963 (Kings Park Perth). *F. Mueller s.n.*, Shark Bay, Oct. 1877 (MEL 69241). *Newbey 2213*, 2 miles E of Yuna, 28.viii.1965 (PERTH). *Oldfield s.n.*, Murchison River, undated (K, lectotype of *Chloanthes oldfieldii* F. Muell.; HBG, MEL 881 and 882, W 3 spec. - isolectotypes). *Phillips s.n.*, 18 miles N of Ogilvie, 26.ix.1962 (CBG 024097). *Shaw 614*, Kalbarri National Park, 20.x.1964 (AD). *Steenbohm & Lullfitz 2824*, 20 miles N of Ajana, 15.xi.1951 (PERTH). *Weber 5107*, c. 50 km E of Geraldton along the road to Mullewa, 15.x.1975 (AD 2 sp.). *Young 491*, 24.7 miles N of Murchison River Bridge, 17.xii.1967 (Kings Park Perth).

Distribution (Map 6A)

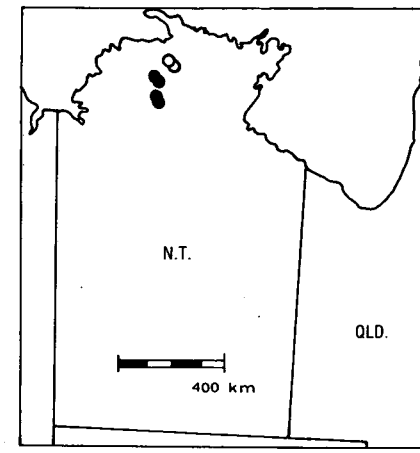
P. oldfieldii is endemic in the west-south-west of Western Australia where it seems restricted between latitude 26° and 30° S, and between longitude 114° and 116° E. The main distribution is between Geraldton and just north of the Murchison River along the North West Coastal Highway. It is also frequent around Yuna and between Geraldton and Mullewa. Elsewhere, one collection is known from south-west of Three Springs and another one from an unspecified locality near Shark Bay.



Map 6A.
P. oldfieldii ○



Map 6B.
P. verbascina ●



Map 6C.
P. pungens ●
P. gilruthiana ○

Comments

P. oldfieldii has the aspect of *P. verbascina* and both occur in the same general area. The former, however, can easily be recognized by its leaves being broadly elliptic-obovate or almost rhomboidal; cyme-peduncle thicker, shorter, (0.5-) 1-2 cm long; calyx divided only in the upper half, the lobes obtuse and arranged in two lips; corolla-lobes almost similar shaped; fruit broadly elliptic-obovoid and somewhat oblique with the apical end often shifted somewhat laterally.

The 2-lipped calyx of *P. oldfieldii* seems similar to that of *P. cuneata*, but the calyx in the latter is much more deeply divided and the lobes more or less acute.

In his key to *Pityrodia* species, Bentham (1870) recorded *P. oldfieldii* as having petiolate leaves. Actually, the leaves in this species are sessile but being narrow cuneate towards the base, appear to have a short petiole.

The date (year only) noted with the duplicates of J. Drummond's 6th collection no. 139 is "1853" or "1854", but according to Erickson (1969) the collecting of Drummond's 6th collection took place during 1851. The year 1853 or 1854 on the specimens, therefore, appear to be when these specimens were sent to or received by the institutions where they are now preserved.

The appendages of the lower pair of anthers are fairly well developed and in some flowers they almost equal the anther-lobes.

This species is locally called "Oldfield's Foxglove".

Affinity

P. oldfieldii is closely related to *P. verbascina* in its leaves being thick and soft with the veins concealed by the dense woolly tomentum, lamina not contracted near the middle; cymes on short peduncles in the axil of upper leaves; peduncles, young branches and upper leaves densely covered with golden-yellow or reddish-brown indumentum of branched hairs. Nevertheless, *P. oldfieldii* may easily be identified by its leaves being broadly elliptic-obovate or almost rhomboidal in outline, deep cuneate towards the base; calyx 2-lipped; calyx-lobes oblong-ovate, obtuse or rounded at the apex; style lateral on fruit and nutlets without humps.

21. **Pityrodia verbascina** (F. Muell.) Benth., Fl.Aust.5(1870)50; F. Muell., Fragm.9 (1875)5; Diels & E. Pritz., Bot.Jahrb.Syst.35(1904)522; Gard., Enum.Pl.Aust.Occ.3 (1931)112; Gard., Wildfls West.Aust.(1959)132; Mold., Résumé Verben.etc.(1959)210, 251, 335, 341; Beard (Ed.), W.Aust.Pl. edn 1(1965)93; Blackall & Grieve, West.Aust. Wildfls 3(1965)571; Beard (Ed.), W.Aust.Pl. edn 2(1970)114; Hodgson & Paine, Aust. Wildfls (1971)236; fig.p.237; Mold., Fifth Summary Verben. etc. 1 & 2(1971)348, 426, 603, 615; Erickson et al., Fls & Pl.West.Aust.(1973)187.

Type: *A. Oldfield s.n.*, at the Murchison River in bushy thicket near the Geraldine Mines, Western Australia, undated (MEL 69386, lectotype designated here; K, MEL 69387 - isolectotypes).

Chloanthes verbascina F. Muell., Fragm.1(1859)233, *basionym*; F. Muell., Fragm.6(1868)157; F. Muell., Syst. Cens.Aust.Pl.1(1882)103; F. Muell., Sec.Syst.Cens.Aust.Pl.1(1889)172.

Type: As for *Pityrodia verbascina* (F. Muell.) Benth.

Pityrodia verbascina (F. Muell.) Benth. var. *aurea* E. Pritz., Bot.Jahrb.Syst.35(1904)521; Mold., Résumé Verben. etc. (1959) 210; Blackall & Grieve, West.Aust.Wildfls 3(1965)571; Mold., Fifth Summary Verben. etc. 1(1971)348; Erickson et al., Fl. & Pl.West.Aust.(1973)187 - *syn.nov.*

Type: *L. Diels 5629*, in Irwin district in fruticetis arenosis pr. Champion Bay, W.Aust. ?Nov. 1901 (B, n.v.; probably destroyed during the war).

Pityrodia verbascina (F. Muell.) Benth. var. *leucocalyx* E. Pritz., Bot.Jahrb.Syst.35(1904)522; Mold., Résumé Verben.etc.(1959)210; Mold., Fifth Summary Verben.etc.1(1971)348 - *syn.nov.*

Type: *L. Diels 5775*, crescit in distr. Avon in fruticetis arenoso-glareosis pr. Moora, ?Nov. 1901 (B, n.v.; probably destroyed during the war).

Pityrodia oldfieldii sensu Gard., Wildfls West.Aust. edn 11 (1973) 120 p.p. quoad fig. on p. 120.

Typification

P. verbascina (F. Muell.) Benth. is based on an A. Oldfield (s.n.) collection, consisting of at least 3 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. Of the three syntypes, the one preserved in Herb. MEL (MEL 69386), where F. Mueller's herbarium and types are now preserved (Stafleu, 1967), was annotated by him and most certainly used by him in preparing the original description of this species. The specimen is particularly complete and well preserved and is selected here as the lectotype for this species.

Description (Fig. 21)

An erect branched woolly-tomentose shrub of 0.5-2.1 m. high. *Stem* and branches densely clothed with deep brownish-red or pale brownish-yellow tomentum of branched hairs, often floccose and assuming a golden-yellow, golden-red or greyish-yellow hue in the upper part of plant. *Leaves* sessile, sometimes contracted into a petiole, exceedingly

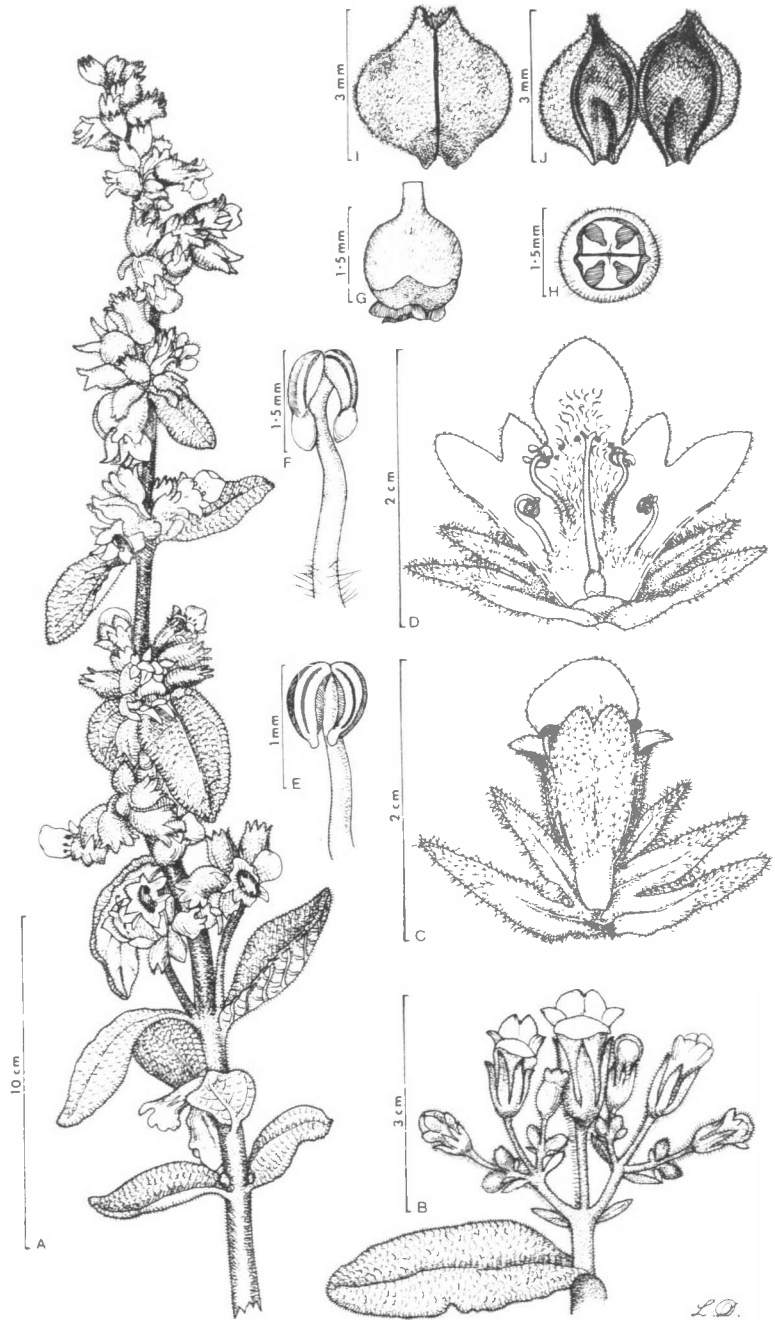


Fig. 21. *Pityrodia verbascina* (F. Muell.) Benth. (*D. & N. McFarland NM 1062*: AD). A, flowering twig; B, axillary cyme; C, flower with calyx vertically cut open to show corolla-tube; D, flower with calyx and corolla vertically cut open to show androecium and gynoecium; E, upper stamen; F, lower stamen; G, ovary; H, transverse section of ovary; I, fruit; J, fruit split open into two halves.

variable in shape and size, mostly elliptic, oblong or elliptic-oblong, obtuse, (2-) 3-7 (-10) cm long, (0.5-) 1-3 (-4) cm broad, thick and soft, the veins concealed by the dense branched woolly tomentum, the floral leaves smaller, the upper ones shorter than the calyx. *Flowers* pedicellate, (3-) 5-9 (-12) together in pedunculate axillary cymes towards the end of branches, disposed in a dense or interrupted more or less leafy spike-like inflorescence; cyme-peduncle thick, densely tomentose, (1-) 2-4 (-5) cm long; pedicel slender, densely tomentose, (2-) 3.5-10 (-15) mm long; bracts linear-lanceolate, tomentose on abaxial surface, glabrous on adaxial surface, 3-5 mm long, 0.5-1 mm broad; bracteoles smaller than bracts, (1-) 2-3 mm long. *Calyx* yellow, persistent, deeply divided into 5 lobes, shortly tubular at the base, 10-13 mm long, densely woolly-tomentose outside, sparsely so on the upper inner surface of the lobes, glabrous inside the tube; lobes linear-lanceolate, acute, 3-nerved, 9-12 mm long, 1-2 mm broad; tube 1-1.5 mm long. *Corolla* pinkish-white with pink spots inside the throat, 12-18 mm long, pubescent outside, glabrous inside excepting the dense hairy ring above the ovary, and the sparse long hairs extending to the large anterior lobe of the lower lip; the anterior lobe white, much larger and more than twice as broad as any of the others, more or less elliptic-orbicular in outline, 6-10 mm long, (6-) 8-12 mm broad; the 2 upper lobes pinkish, short, oblong, 3.5-5 mm long, 3-4 mm broad; the 2 lateral ones pinkish, smaller and triangular 1.5-3 mm long, 2-4 mm broad at the base; tube much dilated, 6-8 mm long, 7-9 mm across at the top end. *Stamens* included or shortly exserted; filaments filiform, glabrous, the lower pair 4-5 mm long, the upper pair ca. 3 mm long; anthers more or less orbicular in outline, the lower pair with well developed white appendages at the lower ends of the lobes, the upper pair without any or with small ones, lobes 1-1.5 mm long. *Ovary* globose, 1-2 mm in diameter, pubescent; style included, filiform, glabrous above, sparsely hairy towards the base, 8-9 mm long, shortly 2-lobed at the apex. *Fruit* enclosed within the persistent calyx, broadly ellipsoid-ovoid, somewhat oblique, densely silky pubescent, 2.5-3 mm long, 2-3 mm broad, splitting into two separate 1-seeded nutlets, each nutlet with a small hump on the back. *Seeds* one in each nutlet.

Representative specimens

WESTERN AUSTRALIA (67 collections seen): *Aplin 1305*, west of Moora, 30.xi.1961 (PERTH). *Ashby 1368*, East Dinner Hill, north of Badgingarra, 17.xi.1964 (AD). *Ashby 1864*, White Peak, c. 25 km N of Geraldton, 31.vii.1966 (AD, PERTH). *Ashby 2658*, Howatharra, 26.ix.1968 (AD, PERTH). *Beard 3027*, 435 mile peg, Carnarvon Highway, 25.viii.1963 (PERTH, Kings Park Perth). *Brockway s.n.*, 41 miles S of Ajana, Oct. 1947 (CANB, PERTH). *Burbidge 2072*, 14 miles N of Geraldton, 2.ix.1947 (CANB, MEL). *Burns 90*, 389 mile post on N.W. Coastal Highway between Geraldton and Carnarvon, 1.x.1967 (PERTH). *Canning 3169*, 13.2 miles towards The Casuarinas, S of Geraldton - Mullewa Road; 20.ix.1968 (CBG 030688). *Demarz 756*, 126 mile post on Eneabba road, 19.xi.1968 (PERTH). *Diels & E. Pritzel 501*, Geraldton, Victoria district, Nov. 1901 (PERTH). *Drummond 6th coll. no. 140*, Murchison River, 1851 (CGE, G, K, MEL, P). *Drummond s.n.*, loc. incert., undated (MEL 69388 & MEL 69395 - probably duplicates of 6th coll. no. 140). *Edmiston 297*, Oakajee Reserve, Feb. 1973 (PERTH). *Fairall 1471*, near Howatharra Gap, Moresby Ranges, 7.v.1964 (Kings Park Perth). *Gardner s.n.*, Baker's Well, Hutt Lagoon ("River"), N of Geraldton, Sept. 1926 (PERTH 2 spec.). *George 3218*, ± 12 miles SW of Three Springs, 10.xii.1961 (PERTH). *Gray s.n.*, Greenough Flats, 1869 (MEL 69392). *Guerin s.n.*, Champion Bay, 1871 (MEL 69394). *Halliday 130*, 15 km south-east of Mingenew on Geraldton Highway, 25.xi.1974 (AD). *Lullfitz 1961*, 410 mile peg NW Coastal Highway, 19.xii.1962 (PERTH 3 spec., Kings Park Perth 2 spec.). *McFarland 1062*, Howatharra Hill Res. ca. 30 km NNE of Geraldton, 25.ix.1977 (AD, PERTH, 3 spec.). *Morrison 13182*, Chapman River, 3.xi.1903 (K). *Oldfield s.n.*, at the Murchison River in bushy thicket near the Geraldine Mines, undated (MEL 69386, lectotype of *Chloanthes verbascina*; K, MEL 69387 - isolectotypes). *Phillips s.n.*, 3 miles from Walkaway towards Ellendale, 15.ix.1968 (AD 96922092, BRI 096160, CBG 025819, MEL 69398). *Phillips s.n.*, 14.5 miles S of Wannoo, 17.ix.1968 (CBG 025851, NSW, PERTH). *Saffrey 188*, Badgingarra Reserve Stn on Watheroo Rd, 22.xii.1968 (B, K, MEL, MO, PERTH). *Shaw 606*, 175 km north of Geraldton, 2.x.1966 (AD). *Spalding s.n.*, Geraldine, 1889 (MEL 69390). *Teakle s.n.*, Northampton district, Nov. 1932 (PERTH).

Distribution (Map 6B)

P. verbascina is endemic in the west-south-west of Western Australia, where it is restricted between latitude 26° and 31° S, and between longitude 114° and 116° E. The major distribution is between Carnarvon and Moora along North West Coastal Highway

and Geraldton Highway. The northern-most localities are to the south-south-east of Shark Bay towards the Murchison River, and the southern ones between Watheroo and Jurien Bay. Majority of collections, however, are recorded from around Geraldton.

Comments

P. verbascina was originally described by F. Mueller (1859) as *Chloanthes verbascina*, but in 1864 he considered referring it to *Quoya* Gaudich., if the latter is retained as a genus. Bentham (1870) recognized *Quoya* as a synonym of *Pityrodia* R.Br., and merged *Quoya* and its species into the latter genus. Following this, F. Mueller (1875) accepted the genus *Pityrodia* for *P. verbascina*, but afterwards (1882, 1889) regarded *Pityrodia*, *Quoya* and *Chloanthes* as congeneric and therefore, recorded both *Pityrodia* and *Quoya* as synonyms of *Chloanthes*. As a result, he placed *P. verbascina* back under the genus *Chloanthes*. The majority of subsequent botanists, however, have retained this species under *Pityrodia*.

E. Pritzel (1904) recorded under this species two new varieties viz. var. *aurea* and var. *leucocalyx*. He based both the varieties on L. Diels collections nos. D5629 and D5775, respectively. The specimens were collected by L. Diels from Western Australia and later deposited in the herbarium at Berlin (Herb. B). During the present study, the above (types) specimens are not available for examination; probably destroyed during World War II. In view of this difficulty, the present investigation into the status of these varieties is based chiefly on the information in their protologue and the wide range of material examined from different localities. According to the original descriptions of these taxa, they seem to have been distinguished mainly on the colour of the indumentum of the stem, leaves, inflorescence and calyces; presence or absence of leaves in the inflorescence; interrupted or non-interrupted spikes; sessile or pedunculate flowers and shape of leaves and flower-bracts. During present studies, the examination of wide range of material from different localities has shown that these characters are very variable within the species and apparently of little taxonomic value. The leaves are found to be exceedingly variable in size and shape, and so is the indumentum-colour. The gradation from broad to narrow leaves and whitish-grey to golden-yellow or brownish-yellow indumentum are found to correlate with latitude. Similarly, young inflorescences are generally dense, non-interrupted and without distinct floral-leaves, and their flowers with very short or no peduncle. These characters as a whole are found to prevail throughout this species. Therefore, they are unsuitable for the identification of infra-specific taxa of this species. Consequently, var. *aurea* E. Pritzel and var. *leucocalyx* E. Pritzel are regarded here indentical with the typical variety *verbascina*.

The thick woolly-tomentose indumentum on stem, leaves and other external parts of the plant, spicate inflorescence and somewhat similar looking leaves give this species the aspect of *Lachnostachys verbascifolia* F. Muell. or *Newcastelia hexarrhena* F. Muell. Nevertheless, *P. verbascina* may easily be distinguished by its indumentum being mostly golden-yellow in the upper parts of the branches, flowers zygomorphic, stamens only 4 and usually didynamous, and anthers-lobes with appendages at the lower end.

The date on some duplicates of J. Drummonds' 6th collection no. 141 is "1854", but according to R. Erickson (1869) the collecting of Drummond's 6th collection took place during 1851. The year "1854" with the specimens, therefore, seems to be the one when these specimens were acquired or communicated to those herbaria where they are now preserved.

Moldenke (1959, 1971) recorded the variety *leucocalyx* E. Pritzel only from Queensland, but there is no specimen or other record to confirm its occurrence in that state. As mentioned under the distribution, *P. verbascina* is endemic in the west-south-west of Western Australia, and so far there is no record to support its presence in eastern Australia.

Because of the golden-yellow indumentum on young shoots, inflorescence and calyces, this species is called by some "golden bush" or "golden-flowered bush".

Affinity

P. verbascina is nearest to *P. oldfieldii* in its young branches, peduncles and upper leaves densely covered with golden-yellow or reddish-brown indumentum of branched hairs; leaves thick and soft with the veins concealed by the dense woolly tomentum; cymes on short peduncles in the axil of upper leaves. However, *P. verbascina* may readily be distinguished by its leaves being oblong, elliptic or elliptic-oblong; calyx equally 5-lobed; calyx-lobes linear-lanceolate, acute; style apical on fruit and nutlets with a hump on the back.

22. **Pityrodia pungens** Munir, sp. nov.

Caules et rami teretes, dense glandulo-viscidi, pilis brevibus stellatis adspersis. Folia sessilia, opposita vel plerumque verticillata terna, linearia vel anguste lanceolata, pungentia, integra, margine vix recurvato, 0.8-6 cm longa, 2-6 mm lata, glanduloso-viscida, interdum pilis brevibus stellatis adspersis. Sepala corollam superantia vel aequantia, lobis lanceolatis, 3-6.5 mm longis, 1-2.5 mm latis, tubo 1-2 mm long. Corolla subalba. Stamina breviter exserta. Fructus obovoidei, pubescentes.

Type: *N. Byrnes 1829*, Katherine Gorge National Park, Northern Territory, Australia, 24.iii.1970 (AD, holotype; DNA, NT - isotypes).

Description (Fig. 22)

An erect spreading shrub of 40-75 cm. *Stem* and branches terete, densely glandular-viscid, sprinkled with short stellate hairs, the older stems often densely clothed with a short white tomentum of stellate hairs. *Leaves* sessile, opposite or more often in whorls of 3, sometimes scattered, linear or narrow-lanceolate, pungent, entire, almost flat or slightly recurved along the margins, (0.8-) 1-4 (-6) cm long, 2-4 (-6) mm broad, glandular-viscid, sometimes sprinkled with short stellate hairs, smooth above, with raised midrib underneath. *Flowers* sessile, axillary and solitary, shorter than the leaves; bracts represented by the upper leaves; bracteoles sessile, lanceolate, entire, acute, glandular-viscid all over, 4-9 mm long, (0.5-) 1-1.5 mm broad. *Calyx* persistent, about the length of corolla or slightly longer, more or less campanulate, longitudinally ribbed, divided more than halfway down into 5 lobes, 6-8 mm long, densely glandular all over outside and on the inside of the lobes, sometimes sparsely sprinkled outside and on the inside of the lobes with short stellate hairs, glabrous inside the tube; lobes lanceolate, ribbed, slightly recurved in the lower halves, acute, (3-) 4-6.5 mm long, (1-) 1.5-2.5 mm broad; tube campanulate, 1-2 mm long. *Corolla* off-white with the upper shorter lip streaked purple, almost equalling the calyx or somewhat shorter, (5-) 6-7 mm long, pubescent outside the lips (lobes) only, with a dense hairy ring inside the tube below the insertion of stamens and a few long hairs extending to the central lobe of the lower lip; the upper lip erect with 2 spreading lobes, much shorter than the lower, enclosed within the calyx-lobes, the lobes oblong-ovate with longitudinal deep purple streaks, 2-3 mm long, 1-1.5 mm broad; the lower lip spreading with 3 lobes, the central lobe larger than the two lateral, elliptic-orbicular in outline, 2.5-3 mm long, (2-) 2.5-3 mm broad, the lateral lobes more or less elliptic-obovate, 2.5-3 (-4) mm long, (1-) 1.5-2.5 (-3) mm broad; tube almost cylindrical in the lower half, much dilated at the top end, glabrous outside, 1.5-3 mm long, 1-2 mm broad at the top end. *Stamens* shortly exserted, inserted above the middle of the corolla-tube; filaments filiform, glabrous, the lower pair 2-2.5 mm long, the upper pair (1-) 1.5-2 mm long; anthers more or less orbicular in outline, 0.5-1 mm long, nearly as broad; lobes narrowly elliptic-oblong, shortly appendiculate at the lower ends, divergent in the lower halves. *Ovary* globose, densely tomentose, ± 1 mm in diameter; style shortly

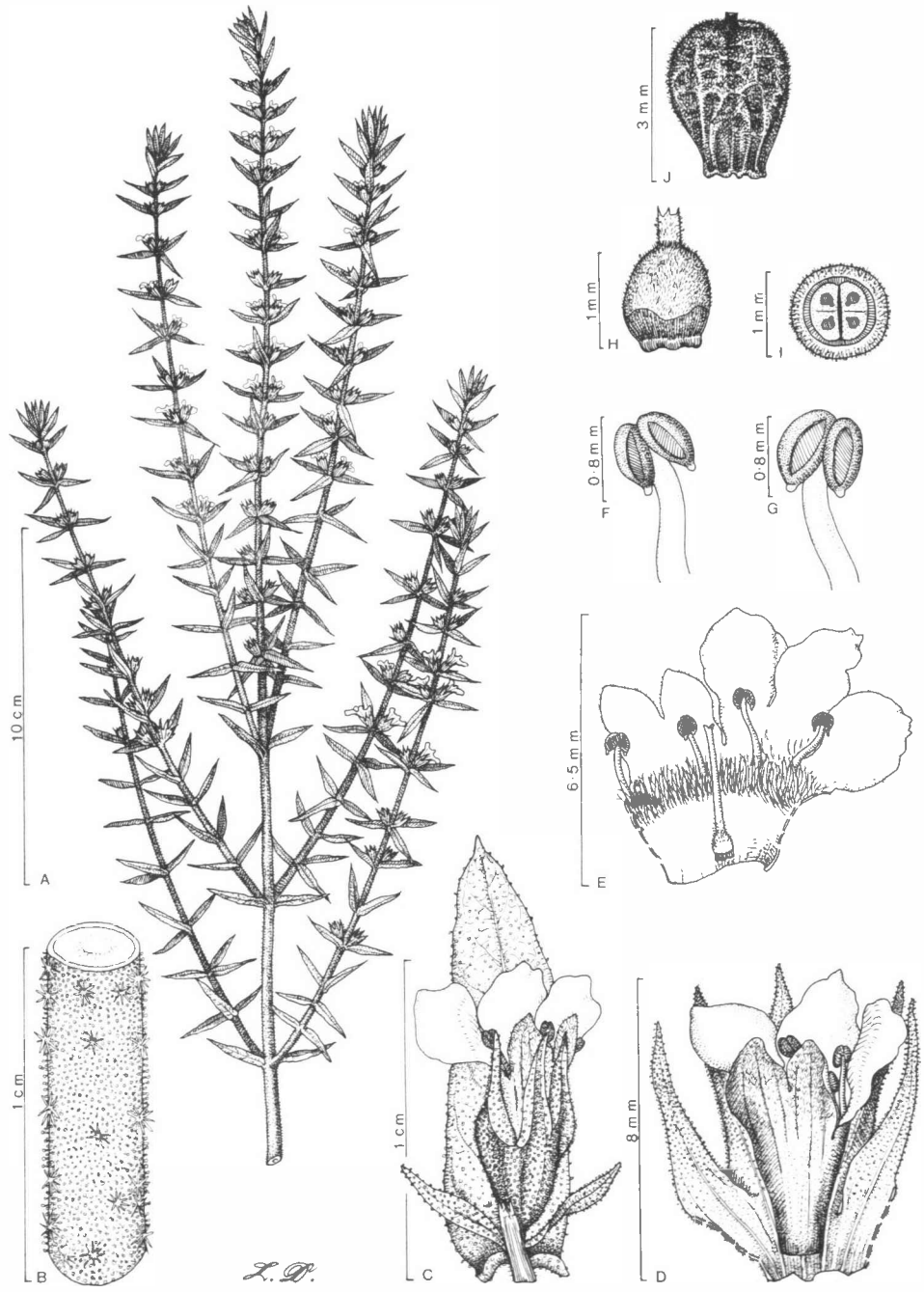


Fig. 22. *Pityrodia pungens* Munir (*N. Byrnes 1829*: DNA, isotype). A, flowering branch; B, portion of stem showing stellate and gland-tipped hairs; C, flower in the axil of leaf with two lateral bracteoles; D, flower with calyx vertically cut open to show short corolla-tube; E, corolla-tube vertically cut open to show androecium and gynoecium; F, upper stamen; G, lower stamen; H, ovary; I, transverse section of ovary; J, fruit.

exserted, filiform, glabrous, (2.5-) 3-4 mm long, minutely 2-lobed at the summit. *Fruit* obovoid, pubescent, 2.5-3 mm long, 1.5-2 mm broad, apparently non-dehiscent; seeds not seen.

Specimens examined

NORTHERN TERRITORY: *Adams 896*, Katherine Gorge, c. 32 km NE of Katherine, 8.iii.1964 (CANB, n.v., L n.v., NSW n.v., NT, US n.v.). *Balgooy & Byrnes 1399*, U.D.P. Falls (Waterfall Creek), W. Arnhem Land, 26.vii.1971 (CANB, L, MO). *N. Byrnes 1382*, U.D.P. Falls, South Alligator River, 20.ii.1968 (CANB, DNA, NT). *N. Byrnes 1829*, Katherine Gorge National Park, 24.iii.1970 (AD, holotype; DNA, NT - isotypes). *Gittins 2694*, above U.D.P. Falls, July 1973 (BRI). *Schodde AE545*, U.D.P. Falls, c. 11 km NW of El Sharana, 24.i.1973 (AD, CANB, DNA, NT).

Distribution (Map 6C)

P. pungens is endemic in the northern part of Northern Territory where it has been recorded from between 13° and 15° S, and between 132° and 133° E. The known distribution is to the north-east of Katherine in the Katherine Gorge National Park, and to the north-west of El Sharana towards the South Alligator River.

Comments

The calyx of *P. pungens* is unique within the genus in being equal to the corolla or in some cases even longer. A somewhat similar situation occurs in a closely related genus *Spartothamnella*, in which the calyx of one species, *S. puberula*, is longer than the corolla.

Of all the specimens examined, the leaves in Balgooy & Byrnes' collection (No. 1399) from U.D.P. Falls are the longest and with more recurved margins, and the main stem cottony-white due to the dense indumentum of short stellate hairs. In the type material, however, the stem and leaves are glandular with mostly sparse and short intermixed hairs. Since there is no difference in the arrangement or shape of vegetative or reproductive parts, therefore, the variation in the density of hairs on stem and leaves may be due to some ecological factor.

Affinity

P. pungens is closely related to *P. ternifolia* in its stem and leaves being glandular-viscid intermixed with hairs; leaves sessile, more or less similarly arranged on stems, pungently mucronate; flowers axillary solitary; calyx campanulate, ribbed, glabrous inside the tube; corolla pubescent outside the lips (lobes), the upper lip erect, with deep purple streaks, much shorter than the lower lip; stamens and style shortly exserted; fruit obovoid, pubescent. However, *P. pungens* may easily be distinguished by its stem and leaves being covered throughout with sessile glands and stellate hairs; leaves linear-lanceolate, 2-4 (-6) mm broad, entire, without strongly raised reticulation underneath; flowers sessile; calyx as long as corolla or slightly longer, tube short, 1-2 mm long; corolla white, tube 1.5-3 mm long; anther-lobes more distinctly appendiculate. In *P. ternifolia*, the leaves have distinctly toothed margins, flowers pedicellate, corolla mauve or pink-red, longer than calyx, glands on stem, leaves and flowers are mostly at the tip of short hairs and the hairs intermixed with the glands are long and irregularly branched, not stellate.

23. **Pityrodia gilruthiana** Munir, sp. nov.

Caules et rami teretes, viscidi, pubescentes. Folia sessilia, verticillata terna, interdum remota, linearia vel anguste lanceolata, integra, mucronata, margine vix recurvato, 6-30 mm longa, 1.5-4 mm lata, glabra, glutinoso-viscida. Sepala glanduloso-viscida, lobis lanceolatis, 4.5-7 mm longis, 1.5-3 mm latis, tubo 2-3 mm longo. Corolla subalba. Stamina breviter exserta. Fructus obovoidei, pubescentes.

Type: *M. Lazarides 8006*, c. 11 miles south-west of Mt Gilruth, Long. 132° 56'E, Lat. 13° 04' S, Northern Territory, Australia, 14.iii.1973 (CANB, holotype; BRI, CANB, K, L, NSW, NT - isotypes).

Description (Fig. 23)

A dark-green spreading shrub of 1-1.5 m. *Stem* and branches terete, viscid; the main stem usually densely clothed with a short tomentum of sessile stellate hairs sparsely intermixed with long and septate branched hairs; the branches more viscid, covered chiefly with septate hairs. *Leaves* sessile, in whorls of 3, rarely scattered, linear or narrow-lanceolate, entire, mucronate, usually flat, rarely with slightly recurved margins, (6-) 8-25 (-30) mm long, (1.5-) 2-4 mm broad, glabrous, glutinous-viscid all over, smooth above, with raised midrib underneath. *Flowers* sessile, axillary and solitary, usually shorter than the leaves; bracts represented by the upper leaves; bracteoles sessile, leafy, narrow linear-lanceolate, entire, acute, slightly recurved along the margins, glabrous but glutinous-viscid, 3-6 mm long, (0.5-) 1-1.5 mm broad. *Calyx* persistent, shorter than corolla, more or less campanulate, longitudinally ribbed, divided more than halfway down into 5 lobes, 7-10 mm long, glandular-viscid all over with a few gland-tipped hairs outside and on the inner surface of the lobes, glabrous inside the tube; lobes lanceolate, acute, slightly recurved along the margins, ribbed on the back, 4.5-7 mm long (1.5-) 2-3 mm broad at the base; tube more or less campanulate, 2-3 mm long. *Corolla* off-white with the upper lip streaked purple, 10-13 mm log, pubescent outside the lips and near the distal end of the tube, glabrous inside excepting the dense hairy ring below the insertion of stamens and a few long hairs extending to the central lobe of the lower lip; the upper lip 2-lobed, erect, shorter than the lower lip, the lobes oblong-ovate, 2-4 mm long, 1.5-2 mm broad; the lower lip 3-lobed, spreading, the central lobe larger than the two lateral, more or less obovate in outline, 3-4 mm long, ± 2.5 mm broad, the lateral lobes elliptic-oblong, 3-4 mm long, 1.5-2 mm broad; tube nearly cylindrical, projecting above the calyx, glabrous outside excepting the top end, 6-8 mm long, 1.5-2.5 mm broad at the top end. *Stamens* shortly exserted, inserted above the middle of the corolla-tube; filaments filiform, glabrous, the lower pair 2.5-3 mm long, the upper pair 2-2.5 mm long; anthers more or less orbicular in outline, 0.5-0.8 mm long, ± 1 mm broad; lobes narrowly elliptic-oblong, shortly appendiculate at the lower ends, divergent in the lower halves. *Ovary* globose, densely pubescent-tomentose, ± 1 mm in diameter; style shortly exserted, filiform, glabrous with a few sparse hairs towards the base, 6-9 mm long, minutely 2-lobed at the summit. *Fruit* enclosed within the persistent calyx, obovoid, pubescent, 3-4 mm long, 1.5-2 mm broad, apparently non-dehiscent; seeds not seen.

Specimens examined

NORTHERN TERRITORY: *Lazarides 7952*, 7 miles west of Mt Gilruth, 132° 54' E, 12° 57' S, 2.iii.1973 (AD, CANB, K, L, NT, US). *Lazarides 8006*, 11 miles south-west of Mt Gilruth, 132° 56' E, 13° 04' S, 4.iii.1973 (CANB, holotype; BRI, CANB, K, L, NSW, NT - isotypes).

Distribution (Map 6C)

P. gilruthiana is endemic in Arnhem Land, Northern Territory, where it has been recorded from near Mt Gilruth between the East Alligator and South Alligator Rivers.

Comments

Like a few other newly described *Pityrodia* species, *P. gilruthiana* is also represented by only two recent collections. In view of there being sufficient flowering and fruiting material in these collections, it is fairly easy to distinguish this species. According to collector's notes (*Lazarides 7952 and 8006*), this species is an aromatic shrub with extremely viscid, discolorous leaves and pale white corolla with dark purple strips. The fragrance in the dried leaves can be smelled by crushing.

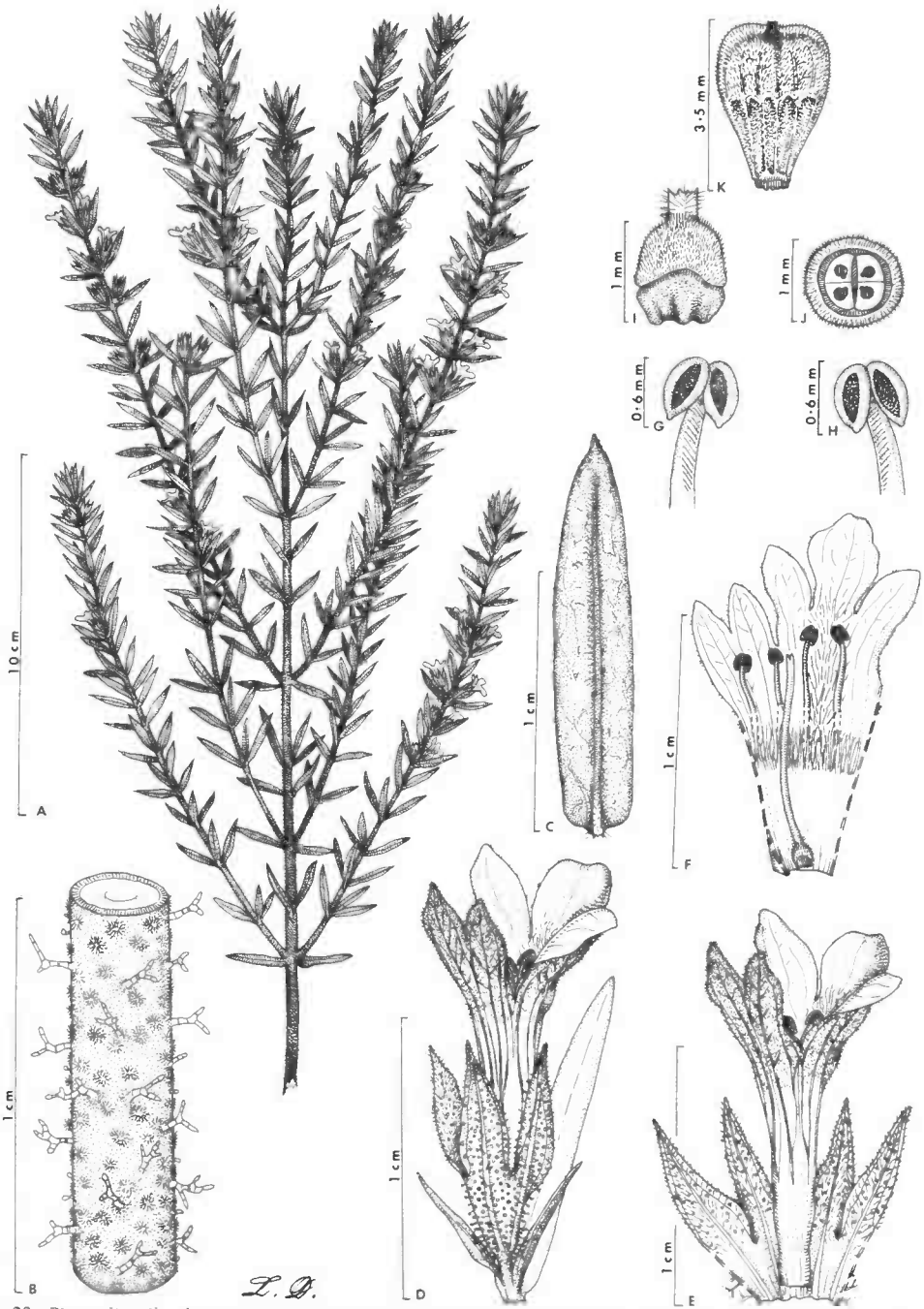


Fig. 23. *Pityrodia gilruthiana* Munir (*M. Lazarides 8006*: CANB, holotype). A, flowering twig; B, portion of stem showing hair-types; C, leaf; D, flower with a leafy bract and two bracteoles; E, flower with calyx vertically cut open to show corolla-tube; F, corolla-tube vertically cut open to show androecium and gynoecium; G, upper stamen; H, lower stamen; I, ovary; J, transverse section of ovary; K, fruit.

Affinities

P. gilruthiana is closely related to *P. pungens* in its leaves being sessile, linear-lanceolate, mostly in whorls of 3, glandular-viscid; flowers axillary and solitary; calyx longitudinally ribbed, glandular and hairy outside; corolla pale white with dark purple streaks on the upper lip; stamens and style shortly exserted; fruit obovoid, pubescent. Nevertheless, *P. gilruthiana* may easily be distinguished by its stem and leaves being much more glutinous; leaves dark green, non-pungent; corolla-tube cylindrical and longer than the calyx. The corolla of *P. pungens* is shorter than or only about the length of the calyx.

P. gilruthiana is also near to *P. puberula* in having more or less similar shaped leaves; flowers and fruit. The latter, however, can readily be distinguished by its stem and leaves being densely covered with a short pubescence of almost stellate hairs; leaves opposite, more deeply recurved along the margins, non-glutinous and the inflorescence more lax.

There is some similarity between *P. spenceri*, *P. ternifolia* and *P. gilruthiana* in their leaves being mostly in whorls of 3, flowers axillary and solitary, calyx ribbed, corolla-tube cylindrical and longer than the calyx-lobes, stamens and style shortly exserted and fruit obovoid. The two former species, however, can easily be identified by their leaves being ovate and more or less cordulate at the base. In *P. spenceri*, the leaves are densely clothed with a short cineraceous tomentum and in *P. ternifolia* they are prickly with toothed margins. Also, the flowers in *P. ternifolia* are pedicellate but they are sessile both in *P. gilruthiana* and *P. spenceri*.

24. **Pityrodia puberula** Munir, sp. nov.

Caules et rami teretes, glandulosi, pubescentes. Folia sessilia, opposita, linearilanceolata, mucronata, integra, margine recurvato, 8-40 mm longa, 2-8 mm lata, glandulosa, pubescentia. Sepala extus glandulosa et pubescentia, lobis lanceolatis, 4-6 mm longis, 1-2 mm latis. Corolla subalba. Stamina breviter exserta. Fructus obovoidei, dense pubescenti-tomentosi.

Type: *K. H. L. Key s.n.*, 16 km east of Mt Cahill, Arnhem Land, Northern Territory, Australia, 12° 50'S, 132° 51' E, 23.v.1973 (CANB 266144, holotype; CANB 2660145, isotype).

Description (Fig. 24)

A straggling shrub of about 0.5 m. *Stem* and branches terete, glandular and densely pubescent with short and branched more or less stellate hairs. *Leaves* sessile, decussate, linear or narrowly lanceolate, mucronate, with entire and recurved margins, (8-) 10-35 (-40) mm long, (2-) 3-6 (-8) mm broad, glandular and densely pubescent with short and more or less stellately branched hairs, smooth above, with raised midrib underneath. *Flowers* sessile, axillary and solitary, arranged in a spike-like inflorescence, usually longer than the floral-leaves (i.e. bracts); bracts represented by the upper leaves; bracteoles sessile, linear-lanceolate, entire, acute, with slightly recurved margins, glandular-viscid with sparse stellate hairs all-over, 3-6 mm long, 0.5-1 mm broad. *Calyx* persistent, shorter than corolla, more or less campanulate, longitudinally ribbed, divided more than half-way down into 5 lobes, 7-8 mm long, densely glandular and pubescent all-over outside and on the inside of the lobes, glabrous inside the tube; lobes lanceolate, slightly recurved along the margins, ribbed on the back, entire, acute, 4-6 mm long, (1-) 1.5-2 mm broad at the base; tube campanulate, 2-2.5 mm long. *Corolla* off-white with the upper lip streaked purple, longer than calyx, 10-13 mm long, pubescent outside the lips (lobes) and the distal part of the tube only, glabrous inside excepting the dense hairy ring above the ovary and a few hairs extending to the central lobe of the lower lip; the upper lip shorter than the lower, erect, 2-lobed, the lobes broadly ovate with purple streaks, 3-4 mm long, ± 1.5 mm broad; the lower lip 3-lobed, spreading, the central lobe larger than the two lateral,

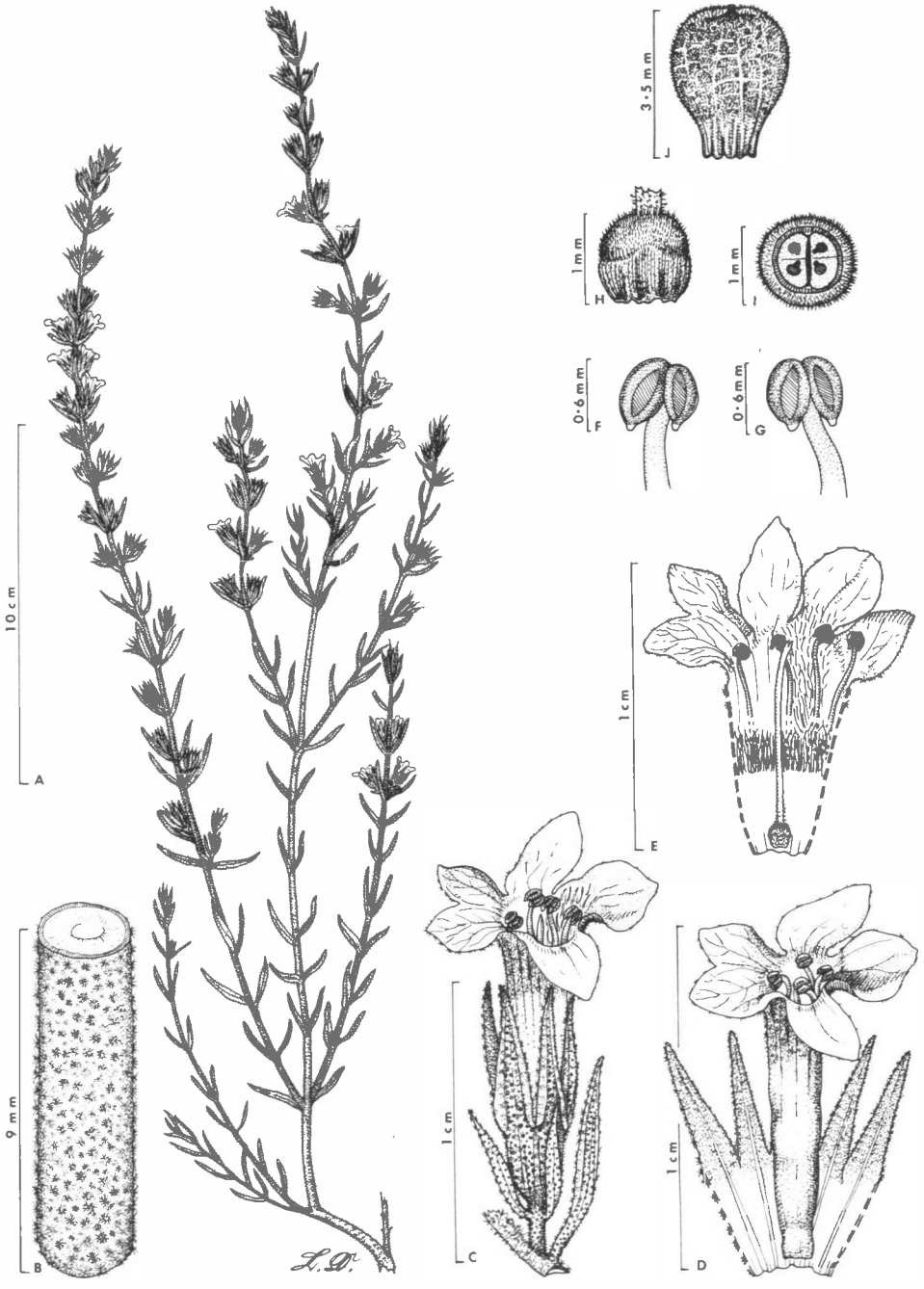


Fig. 24. *Pityrodia puberula* Munir (*K.H.L. Key s.n.*: CANB 233913). A, flowering branch; B, portion of stem showing stellate-hairs; C, flower with a leafy bract and two bracteoles; D, flower with calyx vertically cut open to show corolla-tube; E, corolla-tube vertically cut open to show androecium and gynoecium; F, lower stamen; G, upper stamen; H, ovary; I, transverse section of ovary; J, fruit.

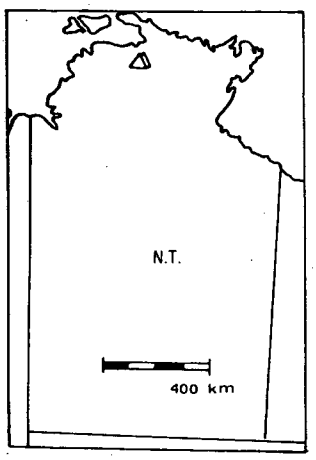
elliptic-orbicular or obovate in outline, (2.5-) 3-4 mm long, 2-3 mm broad, the lateral lobes elliptic-ovate, 3-4 (-5) mm long, 1.5-2 mm broad; tube almost cylindrical, glabrous outside excepting the distal end, 6-8 mm long, 1.5-2 mm broad at the top end. *Stamens* shortly exserted, inserted above the middle of the tube; filaments filiform, glabrous, the lower pair 2.5-3 mm long, the upper pair 2-2.5 mm long; anthers more or less orbicular in outline, 0.5-0.8 mm long, nearly as broad, lobes oblong, shortly appendiculate at the lower ends, divergent in the lower halves. *Ovary* globose, pubescent-tomentose, ± 1 mm in diameter; style shortly exserted, filiform, glabrous with a few hairs towards the base, 5-8 mm long, shortly 2-lobed at the apex. *Fruit* obovoid, densely pubescent-tomentose, somewhat rugulose, (2.5-) 3-4 mm long, (1.5-) 2-2.5 mm broad, apparently non-dehiscent; seeds not seen.

Specimens examined

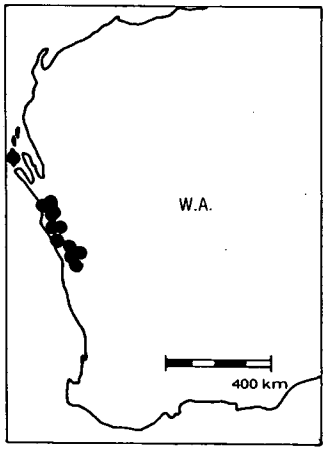
NORTHERN TERRITORY: *Key s.n.*, near Koongara, 12° 52′ S, 132° 50′ E, Arnhem Land, 7.iii.1973 (CANB 233912, CANB 233913). *Key s.n.*, 16 km east of Mt Cahill, 12° 50′ S, 132° 51′ E, 23.v.1973 (CANB 266144, holotype; CANB 266145, isotype). *Key s.n.*, 15 km east of Mt Cahill, 12° 52′ S, 132° 50′ E, 24.v.1973 (CANB 266146, p.p.; alter parte *P. jamesii* Specht).

Distribution (Map 7A)

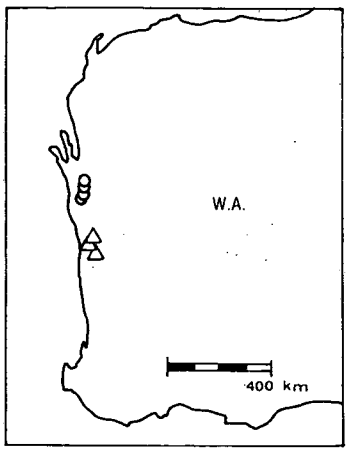
P. puberula is endemic in the Arnhem Land region of the Northern Territory, where it has been recorded from between 12° and 13° S, and 132° and 133° E. The main distribution is to the east-south-east of Mt Cahill towards the tributaries of the South Alligator River.



Map 7A.
P. puberula △



Map 7B.
P. hemigenioides ●



Map 7C.
P. glutinosa ○
P. viscida △

Comments

A few lower leaves in K.H.L. Key's collection (s.n., CANB 266146) are found to be somewhat flattish, partly or wholly dentate margined and with the primary lateral veins slightly raised on the undersurface. However, the majority of leaves are with entire and recurved margins, and their primary lateral veins not raised on either surface.

Calaby & Key (1973) observed the "late-instar" nymphs of the Australian grasshopper species *Petasida ephippigera* feeding on the foliage of *Pityrodia puberula* and *P. jamesii* Specht.

Affinities

P. puberula is closely related to *P. gilruthiana* in its leaves being sessile, linear-lanceolate; flowers axillary solitary, almost sessile; calyx ribbed, glandular and pubescent outside; corolla-tube cylindrical, protruding above the calyx, the upper lip erect with deep purple streaks; stamens and style shortly exserted; fruit obovoid and pubescent. Nevertheless, *P. puberula* may easily be identified by its stem and leaves being densely covered with a short pubescence of almost stellate hairs; leaves opposite, recurved along the margins, not glutinous-viscid and the upper leaves and inflorescence lax.

P. puberula is also near to *P. spenceri* and *P. ternifolia* in having axillary solitary flowers, ribbed calyx, almost cylindrical corolla-tube, erect and deeply purple-streaked upper lip of corolla, shortly exserted stamens and style and obovoid fruit. However, both the latter species can readily be distinguished by their leaves being ovate with more or less cordulate base.

P. puberula and *P. pungens* are also closely allied in having axillary solitary flowers, linear-lanceolate sessile leaves, ribbed calyx, deeply purple streaked upper lip of corolla, shortly exserted stamens and style and obovoid fruit. *P. pungens*, however, can easily be identified by its leaves being mostly in whorls of 3, glandular-viscid, pungent, flat; stem glandular-viscid, sprinkled with stellate hair and corolla about the length of calyx or more often shorter.

25. **Pityrodia hemigenioides** (F. Muell.) Benth., Fl.Aust.5(1870)48; Briq.in Engl.& Prantl., Pflanzenfam.4, 3a(1895)161; Diels & E. Pritz., Bot.Jahrb.Syst.35(1904)518; Gard., Enum.Pl.Aust.Occ.3(1931)112; Mold., Résumé Verben.etc.(1959)210, 251, 335, 341; Beard (Ed.), W.Aust.Pl. edn 1(1965)92; Blackall & Grieve, West.Aust.Wildfls 3 (1965)569; Beard (Ed.), W.Aust.Pl. edn 2(1970)114; Mold., Fifth Summary Verben.etc. 1 & 2(1971)348, 425, 603, 615; Chipp., Proc.Linn.Soc.N.S.W.96(1971)256.

Type: *J. Drummond s.n.*, in planitiebus arenosis flumen Murchison versus, Western Australia, undated (MEL 69330, lectotype designated here; K, MEL 69328, MEL 69333, MEL 69334 - isolectotypes). *A. Oldfield 310*, near Barrel Well, Murchison River, undated (MEL 69329, MEL 69331, MEL 69332 - syntypes).

Chloanthes hemigenioides F. Muell., Fragm.6(1868)156, *basionym*; F. Muell., Syst.Cens.Aust.Pl.1(1882)103; F. Muell., Sec.Syst.Cens.Aust.Pl.1(1889)172.

Type: As for *P. hemigenioides* (F. Muell.) Benth.

Quoya hemigenioides F. Muell., Fragm.6(1868)156, pro syn., sub *Chloanthes hemigenioides* F. Muell.

Typification

P. hemigenioides is based on two (syntype) collections, one by J. Drummond (s.n.) from near the Murchison River, and another by A. Oldfield (no. 310) from Barrel Well, near the Murchison River. The former consists of at least five duplicates and the latter three. Since the author did not choose any one of these as a type, it is, therefore, necessary to select a lectotype for this name. Both collections agree in all particulars with the type description. Annotations by Mueller indicate that he did examine all the syntypes in MEL. A duplicate of J. Drummond's collection in Herb MEL (no. MEL 69330), where F. Mueller's herbarium and types are now housed (Stafleu, 1967), was one of those almost certainly used by him in preparing the protologue of this species. This specimen is particularly complete and well preserved and is selected here as the lectotype for this species.

Description (Fig. 25)

A spreading shrub (22-) 30-60 (-95) cm. *Stem* and branches densely clothed with a cottony-white or cineraceous tomentum of short and branched hairs. *Leaves* sessile,

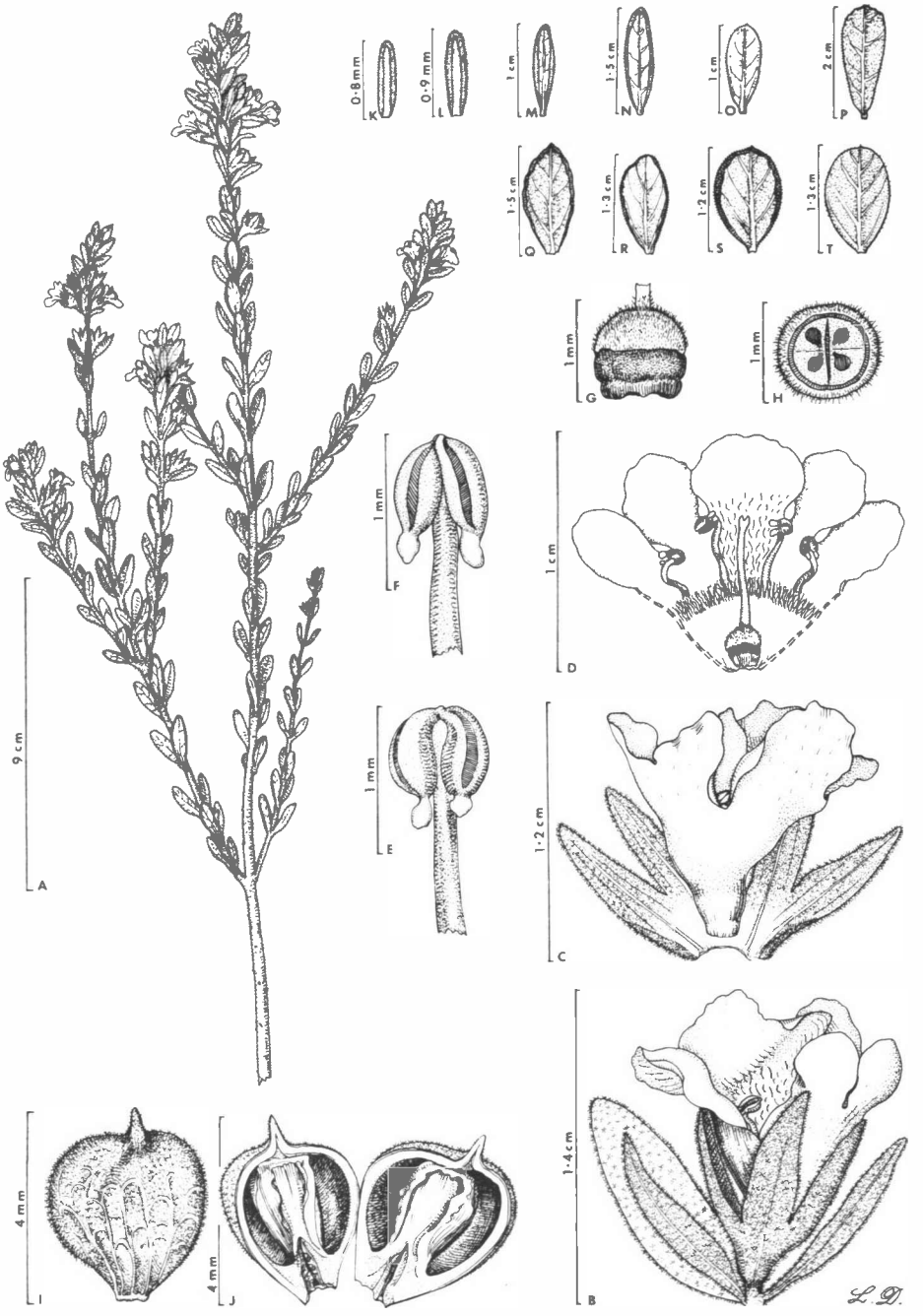


Fig. 25. *Pityrodia hemigenioides* (F. Muell.) Benth. (A-J, *M.E. Phillips*, CBG 037734: PERTH; K-T, 10 different collectors). A, flowering twig; B, flower with a leafy bract and two bracteoles; C, flower with calyx vertically cut open to show corolla-tube; D, corolla-tube vertically cut open to show androecium and gynoecium; E, upper stamen; F, lower stamen; G, ovary; H, transverse section of ovary; I, fruit; J, fruit split open into two halves; K-T, leaves from different collections showing range in shapes.

linear-oblong, elliptic or a few leaves almost obovate, contracted towards the base, rather crowded on branches, obtuse, the linear-oblong usually with recurved margins, the obovate scarcely or not recurved along the margins, (5-) 8-15 (-20) mm long, (2-) 4-8 (-11) mm broad, densely clothed with grey or cottony-white tomentum of branched hairs, but becoming glabrous and minutely rugose above, reticulate venation prominent underneath. *Flowers* axillary solitary, shortly pedicellate or almost sessile, forming a spike-like leafy inflorescence towards the end of branches; pedicels densely hairy, 1-2 mm long; bracts nearly leaf-like, sessile, linear-oblong or obovate, with a vestiture similar to leaves, 8-13 (-15) mm long, 3-5 (-7) mm broad; bracteoles linear, linear-lanceolate, leafy, tomentose, 4-8 (-10) mm long, (0.5-) 1-1.5 mm broad. *Calyx* persistent, turbinate-campanulate, divided to below the middle into 5-lobes, tubular towards the base, strongly ribbed, (5-) 7-10 mm long, densely clothed with short, branched, cineraceous tomentum, glabrous inside the tube; lobes lanceolate, ovate-lanceolate or narrowly elliptic-lanceolate, acute, (3-) 4.5-7 mm long, 1.5-2 (-3.5) mm broad near the base; tube 1.5-3 mm long. *Corolla* pale white, 9-12 mm long, puberulous outside, but often becoming glabrous at anthesis, glabrous inside excepting the dense hairy ring above the ovary, and the sparse hairs extending to the large anterior-lobe of the lower-lip; the anterior-lobe larger than the others, more or less elliptic-orbicular, 3-5 mm long, nearly as broad; the other 4-lobes almost equal, more or less elliptic-oblong or ovate, 3-5 (-6) mm long, 2-3 (-4) mm broad; tube dilated within or immediately above the calyx, 4-6 mm long, 3-5 mm broad above the calyx. *Stamens* slightly exceeding the tube (or almost included); filaments glabrous, the lower pair 2.5-3 mm long, the upper pair 1.5-2.5 mm long; anthers more or less orbicular in outline, lobes oblong, distinctly appendaged at the lower ends, ca. 1 mm long, one cell of each of the upper anther occasionally abortive. *Ovary* globose, 1-1.5 mm in diameter, densely tomentose; style shortly exserted, filiform, glabrous, (4-) 5-7 mm long, shortly 2-lobed at the summit. *Fruit* enclosed within the persistent calyx, broadly obovoid or almost globose, pubescent, with reticulate venation (3-) 4 (-5) mm long, 3-4 mm broad, splitting into two separate 2-celled nutlets; seeds not seen.

Representative specimens

WESTERN AUSTRALIA (40 collections seen): *Ashby 3045*, Casuarina Road, S of Indarra, 17.ix.1969 (PERTH). *Barker 2216*, Kalbarri National Park, 27° 46′ S, 114° 23′ E, 4.ix.1977 (AD). *Beard 2037*, 10 miles E of Murchison River mouth, 27.ix.1962 (PERTH). *Blackall 2724*, near Northampton, sandplains, 21.ix.1932 (PERTH). *Blackall 4721*, 30 miles N of Galena on Carnarvon Rd, 15.ix.1940 (PERTH). *Blackall 4791*, between Yuna and "Dartmoor", NE of Geraldton, 19.ix.1940 (PERTH). *Blake 18137*, 10-20 miles N of Northampton, 3.ix.1947 (BRI, CANB, PERTH). *Burbidge 2190*, 7 miles S of Ajana, 3.ix.1947 (CANB, MEL). *Burns 2*, Wicherina turnoff, Geraldton-Mullewa Rd, 17.vii.1966 (PERTH). *Burns 9*, Eradu, E of Geraldton, 20.x.1965 (PERTH). *Campbell s.n.*, Northampton, Sept. 1901 (PERTH). *Canning 3279*, 3.7 miles from Arrowsmith River Crossing on the Dongara - Three Springs Road, 22.ix.1968 (CBG 052156). *J. Drummond s.n.*, sandy plains towards the Murchison River, undated (MEL 69330, lectotype designated here; K, MEL 69328, MEL 69333, MEL 69334 - isolectotypes). *Fairall 1236*, 15 miles from Kalbarri on Ajana Rd, 5.ix.1963 (PERTH, Kings Park Perth). *Galbraith 502*, W of Mullewa, 23.viii.1964 (MEL 2 spec.). *Gardner 2004*, Ajana, near Murchison River, 27.ix.1926 (PERTH). *Gardner s.n.*, Bakers Well, 11.i.1931 (PERTH). *George 7886*, 24 miles N of Murchison River, 6.ix.1966 (PERTH). *Humphreys s.n.*, Kalbarri, Mouth of Murchison River, 21.ix.1966 (PERTH). *Humphreys s.n.*, 30 miles NE of Mingenew towards Mullewa, near Irwin River, 11.ix.1965 (PERTH). *Jackson 3166*, c. 20 km N of Whelarra, 28° 09′ S, 114° 56′ E, 5.ix.1977 (AD). *Milne s.n.*, Dirk Hartog's Island, undated (K). *F. Mueller s.n.*, Murchison River, Oct. 1877 (MEL 69335). *F. Mueller s.n.*, upper Murchison River, Nov. 1877 (MEL 69337). *A. Oldfield 310*, near Barrel Well, Murchison River, undated (MEL 69329, MEL 69331, MEL 69332 - syntypes of *Chloanthes hemigenioides* F. Muell.). *Phillips 1397*, 10 miles E of Murchison River mouth, 27.ix.1962 (CBG 05041). *Phillips s.n.*, 45 miles S of Wannoo, 17.ix.1968 (CBG 037734, PERTH). *Phillips s.n.*, 11 miles inland from Kalbarri, 19.ix.1968 (CBG 042693, PERTH). *Royce 7780*, Kalbarri National Park, 9.i.1963 (PERTH). *Storr s.n.*, 17 miles E of Murchison River, (PERTH 2 spec.). *Tindale 1343*, 39.6 miles W of Mullewa, March, 1970 (NSW, PERTH). *Wittwer 797*, Wilroy-Morawa, 27.viii.1969 (Kings Park Perth).

Distribution (Map 7B)

P. hemigenioides is endemic to the western part of Western Australia where it seems restricted chiefly between 27° and 30° S and between 114° and 116° E. The major

distribution is between Shark Bay and Geraldton, with only a few records further south between Dongara and Three Springs, and between Mullewa and Morawa. A solitary collection from outside the above areas has been collected from the Dirk Hartog's Island in the Shark Bay.

Comments

The specific epithet of this species apparently refers to the genus *Hemigenia*, with which it seems to have some visual resemblance. In the protologue, the epithet is found spelt as *"hemigenoides"*, which was corrected by Bentham (1870) to *hemigenioides*, to conform with the *Hemigenia* spelling. The orthographic correction has since been accepted by F. Mueller (1882, 1889) and all other botanists.

Ewart et al. (1917), Moldenke (1959, 1971) and Chippendale (1971) recorded this species from the Northern Territory, but so far its occurrence in that state has not been confirmed. The record of Ewart et al. (1917) is based on *Spencer et al. s.n.* from Edith Creek, Northern Territory, which is now recognized as a new species, *P. spenceri* Munir. Both Moldenke and Chippendale probably followed Ewart's publication in recording the distribution of this species.

A range of leaf-shape has been observed within this species (see fig. 25, K-T). In the type material and several other collections, the leaves are found to be linear, linear-oblong or narrowly oblong with usually recurved margins. The leaves in *Royce 7780* (PERTH) and *Storr s.n.* (PERTH), however, are broadly oblong or oblong-obovate with very slightly recurved margins. Furthermore, in *Fairall 1236* (PERTH), the leaves are mostly obovate with usually non-recurved margins. The variation in leaf-shape, however, seems to have no effect on the reproductive parts as the flowers are found to be similar throughout the species. Also, there seems no correlation between the variation in leaf-forms and the distribution pattern of this species.

The flower-colour is noted by the majority of collectors as "white", but the herbarium label of *Beard 2037* (PERTH) reads: "Fls pale mauve". The latter seems to be incorrect.

There are numerous minute white glands mixed up with the outside calyx-tomentum. These are only visible under the microscope when examined in the fresh state or after boiling the dried material.

Affinity

P. hemigenioides is closely allied to *P. spenceri* in having branched cineraceous tomentum all over the stem, leaves and calyces; axillary solitary flowers forming a spike-like leafy inflorescence towards the end of branches, and scarcely exserted stamens and style. Nevertheless, *P. hemigenioides* can easily be distinguished by its leaves being sessile, contracted and rounded towards the base; corolla-tube dilated within or immediately above the calyx, glabrous outside, lobes slightly puberulous or almost glabrescent on the back; stamens with distinct appendage at the lower ends of the lobes; fruit broadly elliptic or almost globose, often easily splitting into 2 separate nutlets.

26. **Pityrodia glutinosa** Munir, sp. nov.

Caules et rami teretes, glabri, glutinosi. Folia sessilia, opposita, oblonga vel anguste oblongo-obovoidea, obtusa, integra, margine distali leviter recurvato, 5-15 mm longa, 2-5 mm lata, glabra, glutinosa. Sepala glabra, glutinosa, extus sparsim glandulosa, lobis lanceolatis, 3-4.5 mm longis, 1-2 mm latis. Corolla extus glabra, alba. Stamina breviter exserta. Fructus obovoidei, pubescentes, apice sparsim glanduloso.

Type: *E.A. Shaw 608*, 175 km north of Geraldton, Western Australia, 2.x.1966 (AD, holotype; AD, CANB, MEL, PERTH - isotypes).

Description (Fig. 26)

A spreading shrub of 1-1.5 m. *Stem* and branches glabrous, glutinous all over. *Leaves* sessile, decussate, oblong or narrowly oblong-obovate, obtuse, almost entire, slightly recurved along the distal margins, (5-) 7-10 (-15) mm long, 2-3 (-5) mm broad, glabrous, glutinous all over. *Flowers* shortly pedicellate, solitary in the upper axils; pedicel glabrous, glutinous, 1-2 mm long; bracts leafy, sessile, oblong or narrowly oblong-obovate, entire with a few teeth-like projections towards the apex, flat or slightly recurved along the margins, 5-7 mm long, ± 1.5 mm broad; bracteoles sub-sessile, narrowly elliptic or elliptic-lanceolate, flat, entire, glutinous, 2.5-5 mm long, 0.5-1.5 mm broad. *Calyx* persistent, divided to below the middle into 5 lobes, 6-7 mm long, glabrous but glutinous all over, sparsely glandular outside; lobes lanceolate, 3-4.5 mm long, 1-2 mm broad at the base; tube narrowed towards the base. *Corolla* "white", 10-12 mm long, glabrous outside, with hairy ring inside the tube near the throat, and a few hairs extending to the large anterior-lobe of the lower lip; lobes entire or somewhat undulate; the anterior-lobe broadly elliptic-obovate or almost orbicular in outline, 5-6 mm long, (3-) 4-5 mm broad, the two lateral-lobes elliptic-obovate, 4-6 (-7) mm long, 2-2.5 mm broad, the two upper-lobes narrowly elliptic-oblong, 5-6 mm long, 2-2.5 mm broad; tube gradually dilated upwards, 4-5 mm long, 2.5-3 mm broad at the top end. *Stamens* inserted in the corolla throat, exserted above the tube; filaments glabrous, filiform, the lower pair (2.5-) 3-4 mm long, the upper pair (2-) 2.5-3 mm long; anthers more or less orbicular in outline, lobes oblong, appendaged at the lower end. *Ovary* globose, densely pubescent-tomentose, with a thick glabrous disk at the base; style scarcely exserted, glabrous, filiform, 4-6 mm long, shortly 2-lobed at the summit. *Fruit* obovoid, pubescent, sparsely glandular at the top, 4-5 mm long, 3-4 mm broad in the upper half, dehiscent into 2 nutlets; seeds not seen.

Specimens examined

WESTERN AUSTRALIA: *Bennett 1476*, 436 miles NW Coastal Highway, 2.x.1966 (PERTH). *Davies s.n.*, 50 miles N of Mary Springs HS, NW Coastal Highway, 14.ix.1960 (PERTH 2 spec.). *Goodall 1195*, 135 km N of Northampton on Carnarvon Rd, 14.vii.1964 (PERTH). *Lullfitz 2904*, 425 mile peg on Carnarvon Highway, 12.xi.1963 (Kings Park Perth). *Lullfitz 4331*, loc. cit., 3.xi.1965 (PERTH, Kings Park). *Olsen 568*, 175 miles S of Carnarvon, 4.viii.1967 (NSW 2 spec.). *Phillips CBG 038054*, c. 40.5 miles S of Wannoo, 17.ix.1968 (CBG - n.v., NSW). *Scrymgeour 1476*, 436 miles NW Coastal Highway, 2.x.1966 (PERTH). *E.A. Shaw 608*, c. 175 km N of Geraldton, 2.x.1966 (AD, holotype; AD, CANB, MEL, PERTH - isotypes).

Distribution (Map 7C)

P. glutinosa is endemic in the mid-coastal area of Western Australia where it seems restricted between latitude 27° and 28° S, and between longitude 114° and 115° E. The known distribution is to the north of Geraldton between the Murchison River and Shark Bay.

Affinities

P. glutinosa is closely related to *P. viscida* in its stem, leaves and calyx being viscid; leaves sessile, oblong-obovate; flowers axillary solitary; corolla white, glabrous outside, tube gradually dilated upwards, hairy ring near the throat inside; stamens and style identical, exserted above the corolla-tube; fruit obovoid, often not easily dehiscent. *P. glutinosa*, however, can readily be identified by its stem and ventral surface of leaf being devoid of any pubescence; bracteoles narrowly elliptic or elliptic-lanceolate; calyx glabrous and viscid, without pubescence, sparsely glandular outside; corolla-lobes almost entire or somewhat sub-undulate along the distal margins.

P. glutinosa is also allied to *P. hemigenioides* because both the species have almost similar shaped leaves, axillary solitary flowers and white corolla. The latter, however, may easily be distinguished by the white-cineraceous tomentum on its stem, leaves and calyx; abruptly dilated corolla-tube; scarcely exserted stamens and style; elliptic-obovoid or almost globose non-glandular fruit with faint reticulation all over the surface.

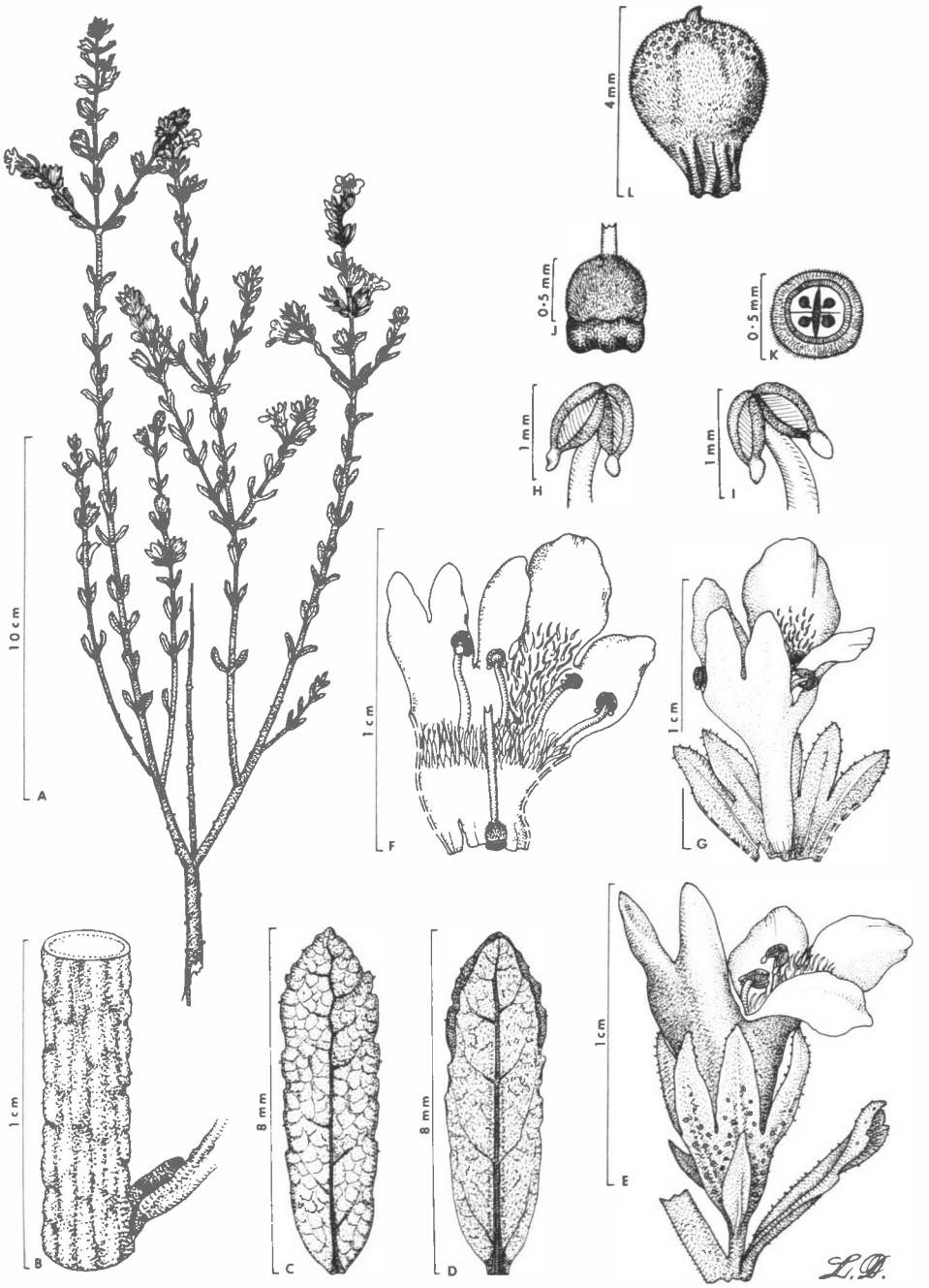


Fig. 26. *Pityrodia glutinosa* Munir (*E.A. Shaw 608*: AD, holotype). A, flowering branch; B, portion of stem showing texture; C & D, adaxial and abaxial views of a leaf; E, flower with a bract and two bracteoles; F, corolla-tube vertically cut open to show androecium and gynoecium; G, flower with calyx vertically cut open to show corolla-tube; H, upper anther; I, lower anther; J, ovary; K, transverse section of ovary; L, fruit.

27. **Pityrodia viscida** W.V. Fitzgerald, J.W.Aust.Natur.Hist.Soc.2(1904)30; Diels & E. Pritz., Bot.Jahrb.Syst.35(1904)517, fig. 58A & B; Gard., Enum.Pl.Aust.Occ.3(1931) 112; Mold., Résumé Verben.etc.(1959)210, 335; Beard (Ed.), W.Aust.Pl. edn 1(1965)93; Blackall & Grieve, West.Aust.Wildfls 3(1965)568; Beard (Ed.), W.Aust.Pl. edn 2(1970) 114; Mold., Fifth Summary Verben.etc.1 & 2(1971)348, 603.

Type: *W.V. Fitzgerald s.n.*, Arrino sand plains, north of Three Springs, Sept. 1903 (PERTH, lectotype designated here; NSW 3 spec., SING - isolectotypes).

P. muelleriana E. Pritz., Bot.Jahrb.Syst.35(1904)517; nom.nud., pro syn.

Typification

P. viscida is based on the author's (W.V. Fitzgerald) own collection consisting of at least 3 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. PERTH, where Fitzgerald's herbarium and types are now housed (Stafleu, 1976) was annotated by Fitzgerald and almost certainly used by him in preparing the original description of this species. This specimen is particularly complete and well preserved and is chosen here as the lectotype for this species.

Description (Fig. 27)

An erect branched shrub of 30-61 cm. *Stem* and branches invested with a short dingy viscid pubescence. *Leaves* sessile, mostly opposite, sometimes ternate, oblong-obovate or narrow-elliptic, obtuse, flat or with slightly recurved margins towards the apex, (5-) 7-13 (-16) mm long, 3-5 mm broad, glabrous and viscid above, densely covered with a yellowish-white pubescence beneath. *Flowers* subsessile or shortly pedicellate, solitary in the upper axils; pedicel densely covered with dingy viscid pubescence, 1-2 mm long; bracts leafy, sessile, obovate-oblanceolate, entire, glabrous and viscid above, yellowish-white pubescent beneath, 9-12 mm long, 3-4 mm broad; bracteoles sessile, linear, entire, viscid-pubescent all over, 4-5 mm long, ± 0.5 mm broad. *Calyx* persistent, divided to about the middle into 5 lobes, distinctly ribbed, 7-9 mm long, invested outside with dense viscid pubescence, glabrous inside excepting the viscid pubescence on the upper inner face of the lobes; lobes lanceolate, 4-6 mm long, 1.5-2.5 mm broad at the base; tube somewhat narrowed towards the base, 2-3 mm long. *Corolla* "white", 9-12 mm long, outside glabrous, inside with a dense hairy ring in the throat, and a few hairs extending to the large anterior lobe of the lower lip; the lobes unevenly undulate-dentate along the distal margins; the anterior lobe broadly elliptic-obovate or almost orbicular in outline, 5-6 mm long, 4-5 mm broad; the two lateral lobes of the lower lip elliptic-obovate, 3-5 (-7) mm long, 2-3.5 mm broad; the two lobes of the upper lip oblong or narrowly elliptic-oblong, 4-6 mm long, ± 2 mm broad; tube gradually dilated upwards, 4-5 mm long, 2-3.5 mm broad at the top end. *Stamens* inserted in the corolla-throat, exserted above the corolla-tube; filaments glabrous, filiform, the lower pair 3-4 mm long, the upper pair 2-2.5 mm long; anthers more or less orbicular in outline, ± 1 mm across, lobes oblong, distinctly appendaged at the lower end. *Ovary* globose, densely covered with short tomentum, with a thick glabrous disk at the base, ± 1 mm in diameter; style scarcely exserted above the corolla-tube, filiform, glabrous, with a few hairs towards the base, 5-7 mm long, shortly 2-lobed at the summit. *Fruit* obovoid, sparsely glandular and pubescent, 3.5-5 mm long, 2-3.5 mm broad in the upper half, apparently not easily splitting into 2 nutlets; seeds not seen.

Specimens examined

WESTERN AUSTRALIA: *Beard 7238*, 14 miles west of Yandanooka, 31.x.1974 (PERTH). *Blackall 4903*, Three Springs, 24.ix.1940 (PERTH 2 spec.). *Diels 4261*, Mingenew, 12.ix.1901 (PERTH 2 spec.). *Fitzgerald s.n.*, Arrino sand plains, north of Three Springs, Sept. 1903 (PERTH, lectotype; NSW 3 spec., SING - isolectotypes). *F. Mueller s.n.*, upper Irwin River, Nov. 1877 (MEL 886, MEL 69400).

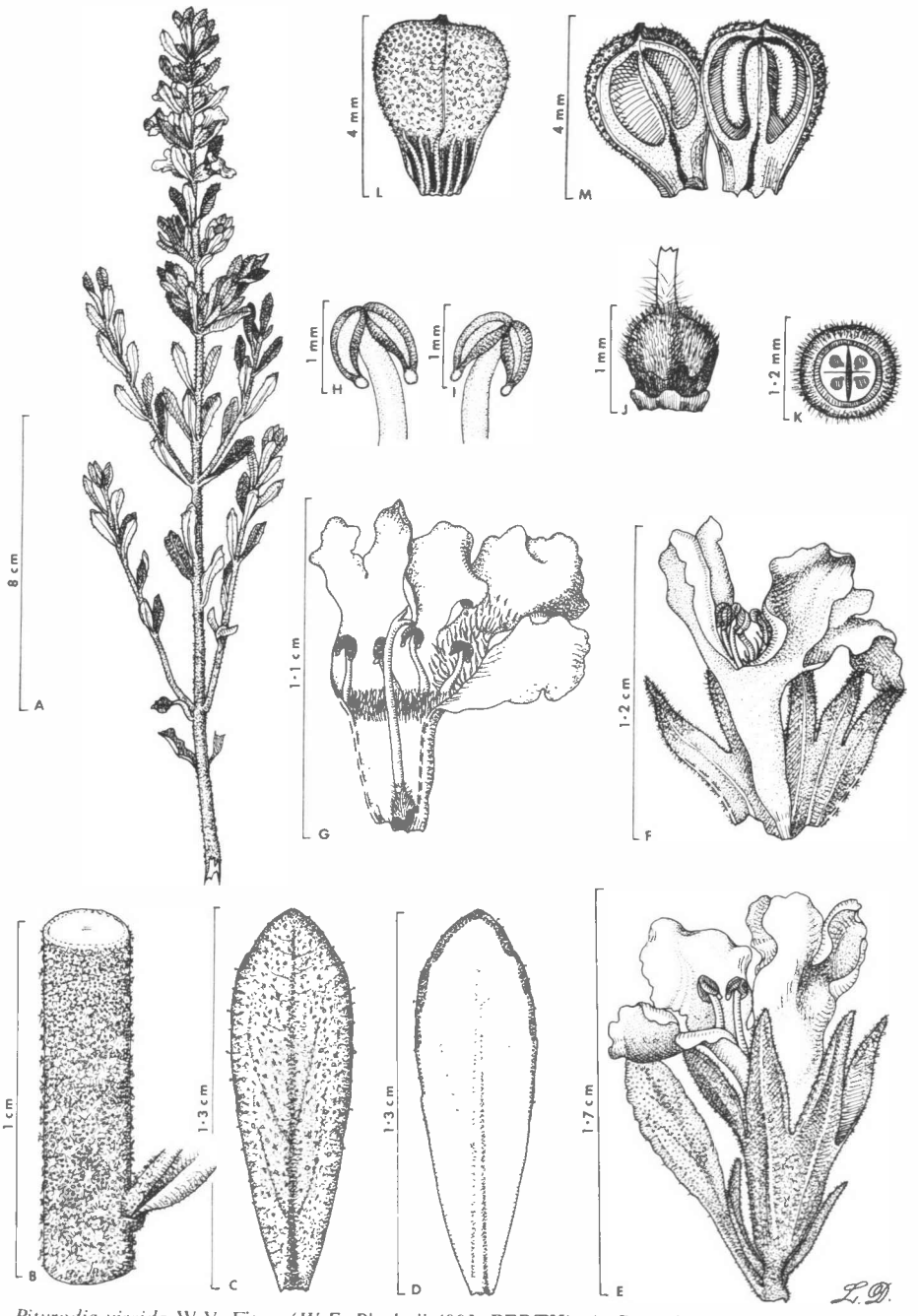


Fig. 27. *Pityrodia viscida* W.V. Fitzg. (*W.E. Blackall 4903*: PERTH). A, flowering twig; B, portion of stem; C & D, adaxial and abaxial views of a leaf; E, flower with a bract and two bracteoles; F, flower with calyx vertically cut open to show corolla-tube; G, corolla-tube vertically cut open to show androecium and gynoecium; H, lower stamen; I, upper stamen; J, ovary; K, transverse section of ovary; L, fruit; M, fruit vertically cut open into two halves.

Distribution (Map 7C)

P. viscida is endemic in the west-south-west of Western Australia where it seems restricted between latitude 28° and 30°S, and between longitude 115° and 116°E. The main distribution is in the area between Mingenew and Three Springs, but the locality of F. Mueller's collection from the upper Irwin River may be a few kilometres north of Mingenew.

Comments

A duplicate of F. Mueller's collection (s.n., MEL 886) from the Upper Irwin River has been erroneously placed in a type folder in the herbarium at Melbourne. The particular specimen and its duplicate are preserved respectively under the numbers MEL 886 and MEL 96400.

As described in the protologue, the leaves in the type and the majority of other specimens examined are found to be "opposite" (decussate). Nevertheless, the leaves in Blackall's collection no. 4903 (PERTH) and F. Mueller's s.n. (MEL 69400) are both decussate and ternate.

Naturally dehisced fruits have not been seen. The present author could not split mature fruit into two halves without cutting.

Affinities

P. viscida is nearest to *P. glutinosa* in its stem, leaves and calyx being invested with a sticky exudation; leaves sessile, oblong-obovate; flowers solitary in the upper axils; corolla white, glabrous outside, its tube gradually dilated upwards, the hairy ring inside the tube near the throat; stamens and style fairly identical in shape, exserted above the corolla-tube; fruit obovoid, apparently non-dehiscent. Nevertheless, *P. viscida* may easily be distinguished by its stem and ventral leaf-surface being covered with yellowish-white viscid pubescence; bracteoles narrow-linear; calyx with viscid-pubescence outside and on the upper inner half of the lobes, non-glandular; corolla-lobes unevenly undulate-dentate along the distal margins.

P. viscida is also close to *P. hemigenioides* in having more or less similar shaped leaves, axillary solitary flowers, linear bracteoles and white corolla. The latter, however, can readily be identified by its stem, leaves and calyx being invested with cottony-white or cineraceous tomentum; corolla-tube abruptly dilated within or immediately above the calyx; stamens and style scarcely exserted; fruit elliptic-obovoid or almost globose with faint reticulation all over the surface, splitting easily into two nutlets.

28. **Pityrodia loxocarpa** (F. Muell.) Druce in Rep.Bot.Exch.Cl.Brit.Isles 1916(1917) 640; Gard., Enum.Pl.Aust.Occ.3(1931)112; Mold., Résumé Verben.etc.(1959)335 pro syn.; Beard (Ed.), W.Aust.Pl. edn 1(1965)92; Blackall & Grieve, West.Aust.Wildfls 3 (1965)571; Beard (Ed.), W.Aust.Pl. edn 2(1970)114; Mold., Fifth Summary Verben.etc.2 (1971)603 pro syn.

Type: *A. Oldfield s.n.*, "In locis sabulosis ad flumen Murchison", undated (MEL 69314, lectotype designated here; K, isolectotype).

Chloanthes loxocarpa F. Muell., Fragm.2(1861)22, *basionym*; F. Muell., Fragm.5(1865)51 in obs.; F. Muell., Fragm.6(1868)157; F. Muell., Syst.Cens.Aust.Pl.1(1882)103; F. Muell., Sec.Syst.Cens.Aust.Pl.1(1889)172.

Type: As for *Pityrodia loxocarpa* (F. Muell.) Druce.

Pityrodia drummondii Turcz. in Bull.Soc.Nat.Mosc.36(2) (1863)213; Benth., Fl.Aust.5(1870)51; Diels & E. Pritz., Bot.Jahrb.Syst.35(1904)521; Mold., Résumé Verben.etc. (1959)210, 251, 335, 341; Mold., Fifth Summary Verben etc. 1 & 2(1971)347, 426, 603, 615.

Type: *J. Drummond 6th coll. no. 141*, between Moore River and Murchison River, 1851 (BM, CGE, K, MEL2 spec., P - syntypes).

P. petiolaris E. Pritz., Bot.Jahrb.Syst.35(1904)520; Gard., Enum.Pl.Aust.Occ.3(1931)112; Mold., Résumé Verben.etc.(1959)210; Blackall & Grieve, West.Aust.Wildfls 3(1965)570; Beard (Ed.), W.Aust.Pl. edn 2(1970) 114; Mold., Fifth Summary Verben.etc.1(1971)348; Erickson et al., Fl.& Pl.West.Aust.(1973)206 - *syn. nov.*

Type: *L. Diels 3670*, in distr. Austin litorali ad Shark Bay pr. Carnarvon, ?1901 (B, n.v.); *Clark s.n.*, ibidem ad Gascoyne River (B, n.v. - *syntypes*, probably destroyed during the War).

Typification

P. loxocarpa (F. Muell.) Druce is based on A. Oldfield's collection (s.n.), consisting of at least two specimens, both annotated by the author (F.v. Mueller). Since he did not nominate a type, it is, therefore, necessary to choose a type for this name. The syntype, in Herb. MEL (no. MEL 69314), where F. Mueller's herbarium and types are now preserved (Stafleu, 1967), was almost certainly used by him in preparing the protologue of this species. The specimen is particularly complete and well preserved and is selected here as the lectotype for this species.

Description (Fig. 28)

An erect branched shrub of 0.5-1.5 m. *Stem* and branches longitudinally striate, glabrous or loosely covered with branched tomentum. *Leaves* decussate, rarely in whorls of three, distinctly petiolate or contracted towards the base, elliptic-oblong, somewhat triangular or sometimes almost orbicular in outline, obtuse, often irregularly dentate-crenate, rarely entire, (1-) 2-4 (-5) cm long, (0.5-) 1-3 (-4) cm broad, loosely tomentose, becoming glabrescent above due to falling off tomentum, obscurely or distinctly rugose above, the floral-leaves small and smooth. *Flowers* pedicellate, solitary or more often 3-7 together on a slender cyme-peduncle in the upper axils; cymes arranged into lax panicle or sometimes condensed into sessile decussate-clusters forming a long interrupted terminal raceme-like panicle; peduncle glabrous or loosely tomentose, (1-) 2.5-8 (-10) cm; pedicel tomentose, 1.5-3 (-4) mm long; bracts sessile, narrowly elliptic, oblong or lanceolate, tomentose on abaxial surface, glabrous on adaxial surface, 3-5 mm long, 1-2 (-3) mm broad; bracteoles small, linear-oblong, 1.5-3 mm long. *Calyx* persistent, densely clothed outside with purplish branched tomentum, glabrous inside, divided to below the middle into 5 lobes, shortly tubular near the base, 4-6 mm long; lobes linear-lanceolate, acute, membranous, 3-5 mm long, 1-2 cm broad; tube 1-2 mm long. *Corolla* whitish-pink with purple spots in throat, (8-) 12-20 (-24) mm long, pubescent outside, glabrous inside excepting the dense hairy ring above the ovary, and the sparse villous hairs extending to the large anterior lobe of the lower lip; the anterior lobe almost twice as large as the others, more or less orbicular in outline, 5-8 mm long, 7-11 mm broad; the other 4 lobes almost equal, more or less oblong-ovate, 2-4 mm long, 2-3 mm broad at the base; tube much dilated above the calyx, 5-7 mm long, nearly as broad at the top end. *Stamens* included; filaments filiform, glabrous excepting a few hairs towards the base of the lower pair, 3-6 mm long; anthers more or less orbicular in outline, the lower pair with well developed appendages at lower ends of the lobes, the upper pair with short appendages, lobes 1-1.5 mm long including the appendages. *Ovary* globose, pubescent at the top, glabrous below, 1-1.5 mm long, about the same in diameter, usually with only 2 perfect ovules, each one attached to an exceedingly long filiform and several times folded funicle; style included, filiform, glabrous, 5-7 mm long, shortly 2-lobed at the apex. *Fruit* enclosed within the persistent calyx, obovoid, oblique, with a thin-walled concavity on one side, apparently non-dehiscent, 2.5-3 mm long, more or less 2 mm in diameter at the top end, pubescent at the top, smooth all over (i.e. not reticulate); seeds not seen.

Representative specimens

WESTERN AUSTRALIA (72 collections seen): *Andrews s.n.*, Oakabella, Sept. 1904 (PERTH). *Aplin A8*, Doorawarrah Stn, east of Carnarvon, 13.xi.1963 (MEL, NSW, PERTH). *Ashby 2928*, 98.5 miles north from Carnarvon & Gascoyne River Road junction, Onslow Road, 16.viii.1969 (AD, PERTH). *Beard 2965*, 20 miles east of Onslow, 22.viii.1963 (PERTH, Kings Park Perth). *Beard 3475*, 18 miles along road to Quobba from Carnarvon, 18.vii.1964 (PERTH, Kings Park Perth). *Beard 4388*, Kennedy Range, 4 miles west of Merlinleigh

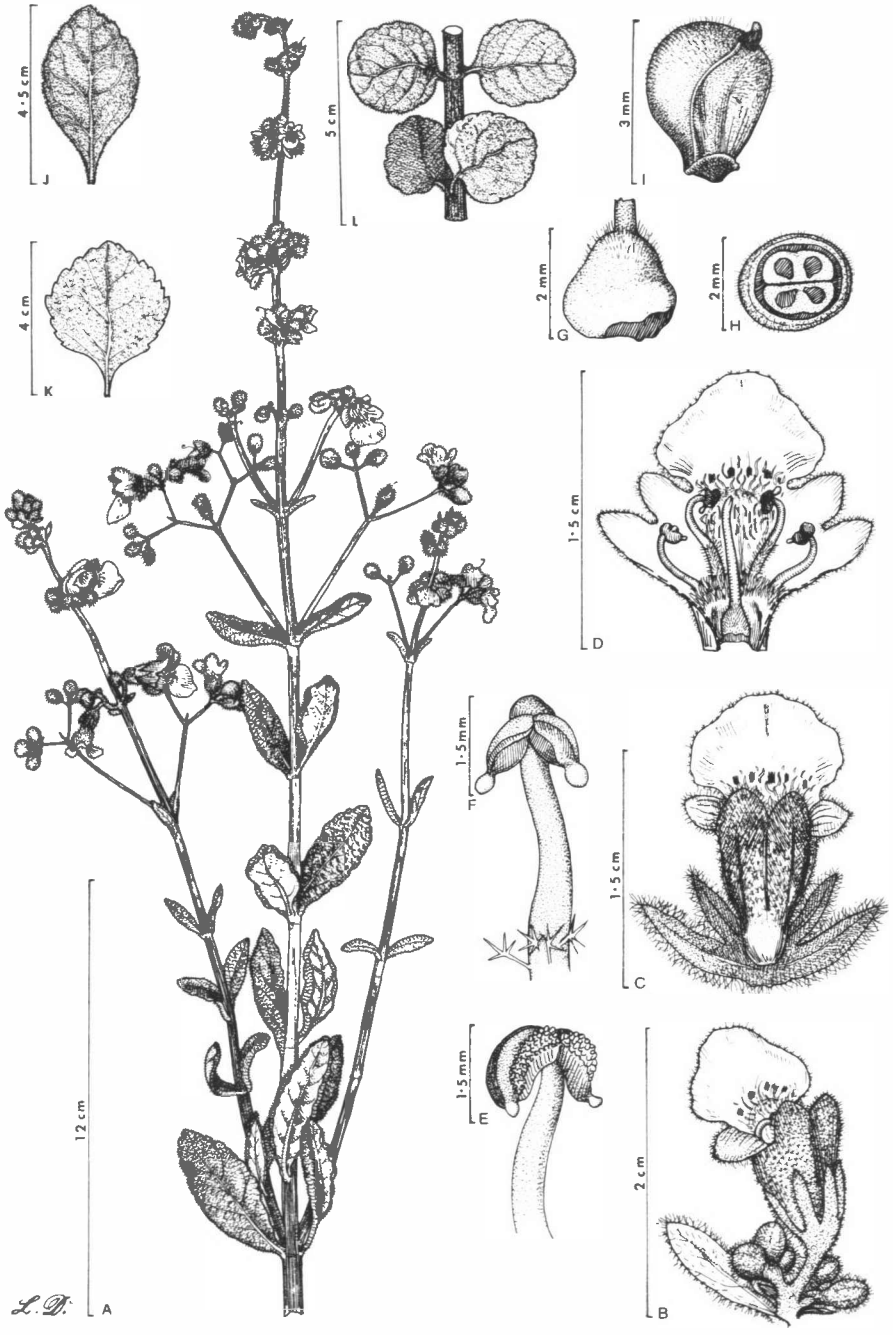


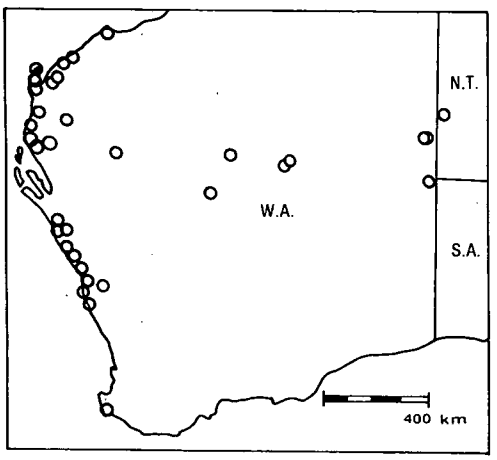
Fig. 28. *Pityrodia loxocarpa* (F. Muell.) Druce (A-I, *R. Goldthorp NM 1250*: AD; J, *D.E. Symon 2413*: PERTH; K, *C.A. Gardner 6067*: PERTH; L, *A.M. Ashby 3860*: AD). A, flowering branch; B, cyme; C, flower with calyx vertically cut open to show corolla-tube; D, corolla-tube vertically cut open to show androecium and gynoecium; E, upper stamen; F, lower stamen; G, ovary; H, transverse section of ovary; I, fruit; J-L, leaves showing different shapes.

Homestead, 23.viii.1965 (PERTH, Kings Park Perth). *Beard 6007*, 54 miles E of Carnarvon, 17.viii.1970 (NSW, PERTH). *Carolin 6283*, 10 miles S of "Bungabiddy", 2.viii.1967 (NSW, SYD). *Chinnock 3839*, 25.2 km S of Onslow, 30.viii.1977 (AD). *Collie s.n.*, Flinders Bay, undated (K). *Drummond 6th coll. no. 141*, between Moore and Murchison Rivers, 1851 (BM, CGE, K, MEL 2 spec., P - syntypes of *Pityrodia drummondii* Turcz.). *Drummond s.n.*, loc. incert. undated (MEL 69320, probably syntype of *P. drummondii* Turcz.). *Forde 1304*, 36 miles NE of Carnegie Homestead, 9.x.1960 (CANB). *A. Forrest s.n.*, Nickol River, 1878 (MEL 82201, W). *George 8299*, 6 miles S of Walter James Range, 4.x.1966 (PERTH). *George 8829*, 14 miles N of Walter James Range, 24.vii.1967 (PERTH). *George 9174*, 20 miles S of Learmouth, 5.viii.1967 (PERTH). *George 1207*, 3 miles E of Giralia Station, 29.viii.1960 (B, MO, PERTH 2 spec.). *Goldthorp for McFarland 1250*, near White Peak, 28° 38′ S, 114° 38′ E, 25.ix.1977 (AD). *Helms s.n.*, Geraldton, Oct. 1898 (M, NSW 142621 - 142622, PERTH). *Latz 884*, 69 miles NNW of Wingelinna Mining Camp, 30.x.1970 (AD, BRI, CANB, MEL, NSW, NT, PERTH). *Morrison s.n.*, Walkaway, S of Geraldton, 8.xi.1903 (E, K). *Morrissey 65*, Wiluna area, Dec. 1970 (PERTH). *F. Mueller s.n.*, Champion Bay, Oct. 1877 (MEL 69321, MEL 69323, MEL 69324, MEL 69326, MEL 69327). *F. Mueller s.n*, Greenough River, Nov. 1877 (MEL 69315, MEL 69319). *Oldfield s.n.*, in sandy places near Murchison River, undated (MEL 69314, lectotype; K). *Phillips s.n.*, near Green Head, 24.ix.1962 (CBG 024949). *Symon 2413*, 6 miles N of the eastern end of the Schwerin Mural Crescent, 128° 50′ E, 24° 50′ S, 2.viii.1962 (AD, ADW, PERTH). *Weber 4934*, c. 5 km N of Exmouth along the road, 3.x.1975 (AD). *Wittwer 1782*, Vlaming Head, 9.viii.1976 (PERTH, 2 spec., Kings Park Perth).

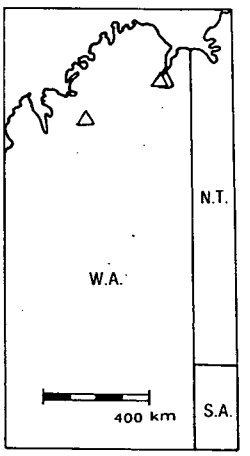
NORTHERN TERRITORY: *Maconochie 1374*, south of Davenport Hills, 23° 43′ S, 129° 17′ E, 8.iv.1972 (NT).

Distribution (Map 8A)

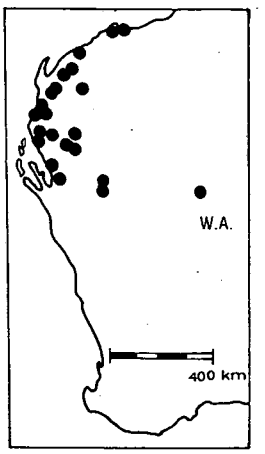
P. loxocarpa occurs mainly in Western Australia with only one record from the far south-western part of the Northern Territory near the Western Australian border. Distribution in Western Australia is mainly to the north of Perth where it has been recorded frequently from the coastal areas between the Hill River and Nickol Bay. One disjunct coastal locality in the extreme south-western tip of the state is near Flinders Bay, from where this species has not been recollected for over a hundred years. A few collections from the interior of the state have come from Wiluna and Carnegie areas and also from some unspecified locality along the Canning Stock Route. Close to the eastern border, it has been collected from the north-western end of Tomkinson Ranges towards the South Australian border, and from the eastern end of the Schwerin Mural Crescent near the Northern Territory border.



Map 8A.
P. loxocarpa ○



Map 8B.
P. obliqua △



Map 8C.
P. paniculata ●

Comments

In the protologue, F. Mueller (1861) considered this species close to *P. atriplicina* (F. Muell.) Benth., but in 1865 (Fragm. 5, p.51), he regarded it as nearer to *Chloanthes stachyodes* F. Muell. (= *P. terminalis* [Endl.] George). In both places, he did not name any character in common with these species.

The labels of the duplicates of J. Drummond's 6th collection no. 141, preserved in Herb. BM and P, have the collecting date "1854". According to Erickson (1969), however, J. Drummond returned to Hawthornden from his 6th and final collecting expedition at the end of 1851, and by the end of 1852 he had prepared 14 sets of 225 species for shipment to W.J. Hooker and other subscribers in England. The date (year only) mentioned with the above two duplicates, therefore, may be the one when these specimens were sent to or received by those institutions where they are now housed.

The obliquely obovoid fruit of *P. loxocarpa*, with a thin-walled concavity on the side, largely resembles the fruit of *P. bartlingii* (Lehm.) Benth. For more information see "Comments" under the latter species.

After examining all the available material, identified as *P. petiolaris* E. Pritz. or *P. loxocarpa* (F. Muell.) Druce, both of them are found to be conspecific. The former, therefore, is being regarded here as a new synonym of the latter. In view of the variation in leaf-shape and length of cyme-peduncles, this species may be mistaken for more than one taxon if a wide range of material from different localities is not examined.

This species is one of the most widespread in the genus.

Affinities

P. loxocarpa is closely allied to *P. paniculata* in its flowers being arranged in lax panicles. The former, however, may easily be distinguished by its stem being longitudinally strate, glabrous or loosely tomentose; leaves elliptic-oblong, distinctly petiolate or contracted towards the base; fruit obovoid, oblique, with a thin-walled concavity on the side. *P. loxocarpa* is also related to *P. bartlingii* in having included stamens and style and obovoid, oblique fruit with a thin-walled concavity on the side. The latter, however, can easily be identified by its linear-lanceolate leaves with revolute margins, spike-like woolly inflorescence and oblong anthers obscurely appendiculate at the lower ends.

29. **Pityrodia obliqua** W.V. Fitzgerald, J.& Proc.Roy.Soc.W.Aust.3(1918)208; Gard., Enum.Pl.Aust.Occ.3(1931)112; Mold., Résumé Verben.etc.(1959)210; Beard (Ed.), W. Aust.Pl. edn 1(1965)92; Beard (Ed.), W.Aust.Pl. edn 2(1970)114; Mold., Fifth Summary Verben.etc.1(1971)348.

Type: *W.V. Fitzgerald 1648*, Dillon Springs, E. Kimberley, Western Australia, Oct. 1906 (PERTH, lectotype designated here; E, NSW 2 spec. - isolectotypes).

Typification

P. obliqua is based on the author's (W.V. Fitzgerald) own collection from eastern Kimberley, Western Australia, consisting of at least three duplicates, all annotated by the author. Since the author did not choose any one of these as a type, it is, therefore, necessary to select a type for this name. Of all the syntypes, the one preserved in Herb. PERTH where Fitzgerald's herbarium and types are now preserved (Stafleu, 1967) was almost certainly used by him in preparing the original description of this species. The specimen is particularly complete and well preserved. It is selected here as the lectotype for this species.

Description (Fig. 29)

An erect shrub of 60-120 cm. *Stem* and branches densely clothed with greenish-grey

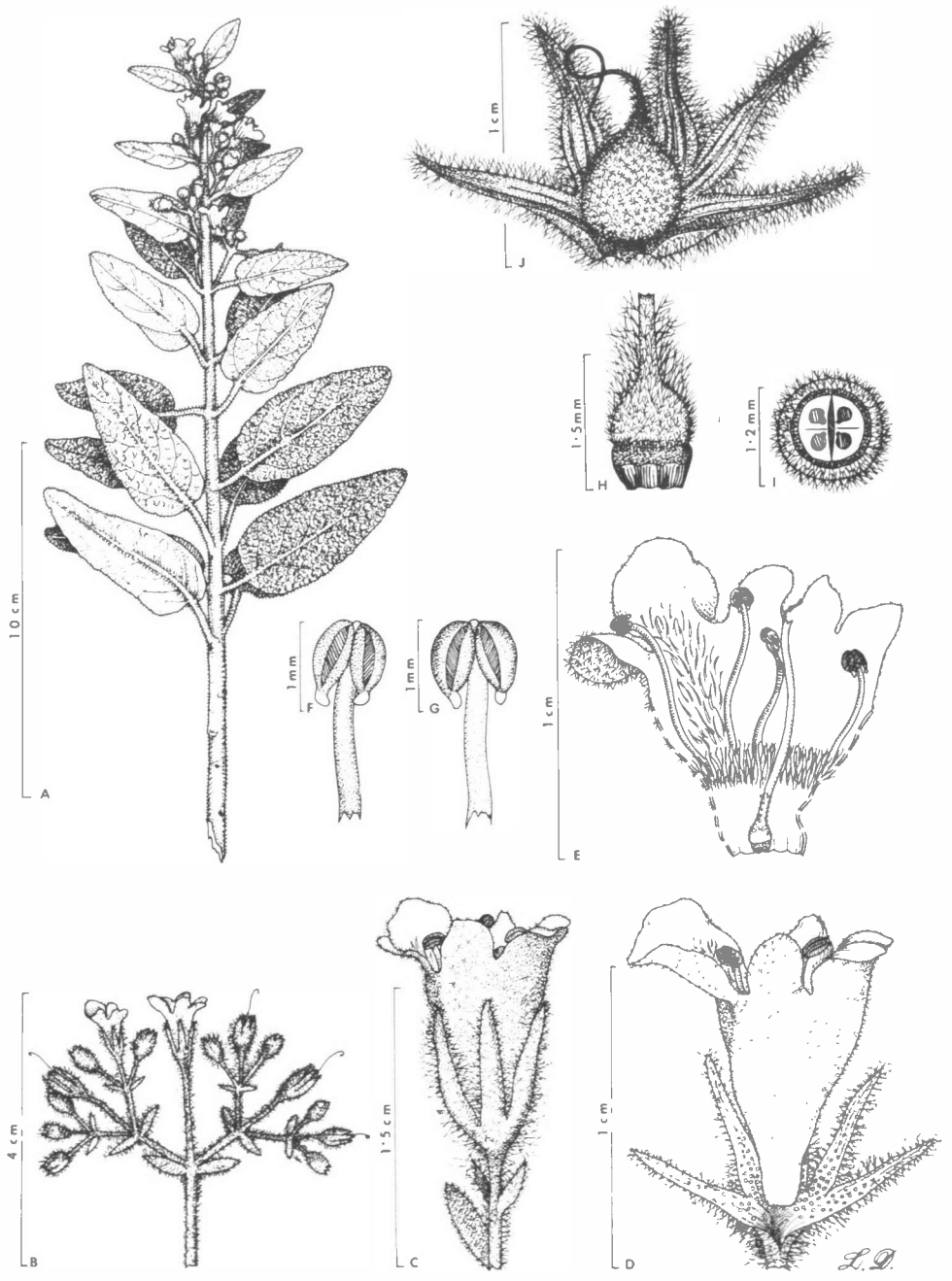


Fig. 29. *Pityrodia obliqua* W.V. Fitzg. (*W.V. Fitzgerald 1648*: E, isolectotype). A, flowering twig; B, cyme; C, flower with a bract and two bracteoles; D, flower with calyx vertically cut open to show corolla-tube; E, corolla-tube vertically cut open to show androecium and gynoecium; F, lower stamen; G, upper stamen; H, ovary; I, transverse section of ovary; J, fruiting calyx cut open to show fruit.

branched tomentum which often becomes yellowish upwards. *Leaves* conspicuously petiolate; lamina ovate or oblong-ovate with rounded or obtuse apices, more or less oblique and cordate or rounded at the base, (2-) 3-6 cm long, (0.7-) 1-2.5 cm broad, flat, crenulate, rugose above, the reticulate nerves conspicuous on the under surface, all over densely greenish-grey tomentose; petiole thick, tomentose, adaxially canaliculate, (0.5-) 1-1.8 cm long. *Inflorescence* cymose in the upper axils; cymes arranged into more or less lax leafy panicle, densely woolly-tomentose, rarely exceeding the leaves; primary peduncles (5-) 7-15 mm long. *Flowers* pedicellate, 3-7 or more in a cyme; pedicel woolly-tomentose, 2-4 mm long; bracts sessile, linear-lanceolate, woolly-tomentose on abaxial surface, glandular and hairy on adaxial surface, flat, entire, (1.5-) 2-4 (-5) mm long, 0.5-1 mm broad; bracteoles sessile, resemble bracts, 1-2 (-2.5) mm long, ± 0.5 mm broad. *Calyx* persistent, divided almost to the base into 5 lobes, 5-7 mm long, woolly-tomentose outside, glabrous but sparsely glandular inside; lobes linear, one-nerved, 4-6 mm long, 0.5-1 mm broad; tube shallow, 0.5-1 mm long. *Corolla* pink with purple streaks in the throat, (7-) 8-12 (-14) mm long, sparsely glandular and tomentose outside, glabrous inside excepting the dense hairy ring above the ovary, and sparse villous hairs extending to the large anterior lobe of the lower lip; the anterior lobe broadly elliptic or almost orbicular in outline, entire, 3-5 mm long, 4-6 mm broad, the two lateral lobes broadly ovate, 1.5-2 mm long, 2-3 mm broad, the two upper lobes oblong-ovate, 2-3 mm long, 2-2.5 mm broad at the base; tube abruptly dilated within the calyx, about as long as the calyx, (5-) 7-9 mm long, 4-5 (-6) mm broad at the top end. *Stamens* slightly exserted; filaments glabrous, filiform, the lower pair (3.5-) 4-6 mm long, the upper pair 3-4 mm long; anthers more or less orbicular in outline, ± 1 mm long, 0.5-1 mm broad, lobes oblong, appendaged at the lower ends of both the cells. *Ovary* globose, densely tomentose, seated on a thick glabrous disk, ± 1 mm in diameter; style slightly exserted, glabrous with a few hairs towards the base, filiform, 6-9.5 mm long, shortly 2-lobed at the apex; ovules attached near the top with short funicles. *Fruit* black, ovoid-globose, tomentose with branched hairs, 2-3 mm long, 2-2.5 mm in diameter, apparently non-dehiscent; seeds not seen.

Specimens examined

WESTERN AUSTRALIA: *Byrnes 358*, Mt Bell, King Leopold Ranges, 25.v.1967 (DNA, NT). *Carr 3304 & Beauglehole 47082*, S side of Cockburn Range, ± 13 km W of King River, 10.vii.1974 (AD, Herb. Beauglehole). *W.V. Fitzgerald 1648*, Dillon Springs, E. Kimberley, Oct. 1906 (PERTH, lectotype; E, NSW 4 spec. - isolectotypes). *Jackson 951*, near summit of Mt Bell, 23.v.1967 (AD). *Maconochie 221*, loc. cit. 23.v.1967 (NT).

Distribution (Map 8B)

P. obliqua is endemic in the Kimberley region of Western Australia, where it has been recorded from the middle section of King Leopold Ranges, north-eastern end of Saw Range and southern side of Cockburn Range.

Comments

P. obliqua was described by W.V. Fitzgerald (1918) who placed it in the Myoporaceae. Previously, however, he had described *Pityrodia viscida* as a new species which he recorded under the family Verbenaceae. Both species were based on the author's own collections from Western Australia.

The duplicates of the type collection in Herb. E and NSW are without collection number, but the syntype, (now lectotype) in Herb. PERTH has the number "1648". The number and other particulars on the herbarium label seem to be in the collector's own handwriting, therefore, the number "1648" is regarded here as the collection number for all the type duplicates.

Affinity

This species is closely allied to *P. paniculata* in its flowers being arranged into

panicles; corolla more or less similar coloured with purple streaks or spots in throat, tube dilated within or immediately above the calyx; stamens and style slightly exserted above the corolla-tube and anthers more or less orbicular in outline. Nevertheless, *P. paniculata* may easily be distinguished by its stem, leaves and inflorescence being densely covered with short cineraceous tomentum; leaves sessile, oblong-obovate, non-rugose; inflorescence much more lax; calyx 2-lipped, lobes spathulate or obovate, obtuse, non-glandular but pubescent within, membranous in infructescence.

30. **Pityrodia paniculata** (F. Muell.) Benth., Fl.Aust.5(1870)53; Diels & E. Pritz., Bot. Jahrb.Syst.35(1904)520; Gard., Enum.Pl.Aust.Occ.3(1931)112; Junell, Sym.Bot.Upsal. 4(1934)68; Mold., Résumé Verben.etc.(1959)210, 251, 335, 341; Beard (Ed.), W.Aust.Pl. edn. 1(1965)92; Blackall & Grieve, West.Aust.Wildfls 3(1965)569; Beard (Ed.), W.Aust. Pl. edn 2(1970)114; Mold., Fifth Summary Verben.etc.1 & 2(1971)348, 426, 603, 615; Erickson et al (Ed.), Fl.Pl.West.Aust.(1973)206.

Type: *M. Brown s.n.*, near Shark Bay, 1863 (MEL 9352, holotype).

Quoya paniculata F. Muell., Fragm.4(1864)80, *basionym.*

Type: As for *Pityrodia paniculata* (F. Muell.) Benth.

Chloanthes paniculata [F. Muell., Fragm.4(1864)80, pro syn. sub. *Quoya paniculata* F. Muell.]; (F. Muell.) F. Muell., Syst.Cens.Aust.Pl.1(1882)103; F. Muell., Trans.& Proc.Roy.Soc.Vic.23(1887)6; F. Muell., Sec.Syst. Cens.Aust.Pl.1(1889)172.

Description (Fig. 30)

A much branched shrub of 0.6-1.5 m, hoary with a dense but close and short greyish-glaucous tomentum. *Stem* and branches mainly greyish-glaucous, sometimes light purplish-red in young flowering shoots. *Leaves* sessile, oblong-oblanceolate or obovate, obtuse, generally entire, very rarely denticulate in the upper half, (1-) 1.5-3.5 (-5) cm long, (5-) 7-12 (-20) mm broad, densely clothed with a short cineraceous tomentum, the venation prominent on the lower surface. *Flowers* pedicellate, solitary or more frequently 3-7 (-15) in a cyme; cymes pedunculate, arranged into more or less pyramidal lax panicle; cyme-peduncles hoary with dense but short greyish tomentum, (0.5-) 1-2.5 (-3) cm long; pedicel hoary with indumentum similar to that of peduncle, 1-3 mm long; bracts sessile, elliptic-oblong, obtuse, hoary, 2-3 (-4) mm long, (0.5-) 1-2 mm broad; bracteoles similar to bracts but smaller, 1-2 mm long, 0.5-1 mm broad. *Calyx* persistent, 2-lipped, deeply divided into 5-lobes, shortly tubular towards the base, (4-) 5-9 mm long, densely clothed with short but branched cineraceous tomentum, glabrous inside the tube; lobes oblong-spathulate or almost obovate, obtuse, membranous in infructescence, (3-) 4-8 mm long, (1-) 2-4 (-5) mm broad; tube short, 0.5-1 mm long. *Corolla* pale mauve or pale lilac with purple spots in the throat, (13-) 15-18 mm long, pubescent outside, glabrous inside excepting the dense hairy ring above the ovary, and the sparse villous hairs extending to the large anterior-lobe of the lower lip; the anterior-lobe almost twice as large as the other 4-lobes, more or less elliptic-orbicular, (6-) 7-10 mm long, (7-) 8-10 mm broad; the other 4-lobes almost equal, more or less ovate, (2-) 3-5 mm long, 2-3 (-4) mm broad; tube dilated within or immediately above the calyx, 5-6 mm long, nearly as broad at the top end. *Stamens* almost included or scarcely exserted; filaments filiform, glabrous, the lower pair longer than the upper, 3-4 mm long, the upper pair 2-3 mm long; anthers more or less orbicular in outline, the lower pair with well developed appendages at the lower ends of the lobes, 1-1.5 mm long, the upper pair with short or obscure appendages, c. 1 mm long. *Ovary* globose, c. 1 mm in diameter, densely tomentose; style included or scarcely exserted, filiform, glabrous with only a few hairs near the base, 5-8 mm long, shortly 2-lobed at the summit. *Fruit* enclosed within the persistent calyx, broadly ellipsoid-obovoid or almost globose, pubescent with branched hairs, (2-) 2.5-3.5 mm long, 2.5-3.5 mm broad, splitting into two separate 2-celled nutlets; seeds not seen.

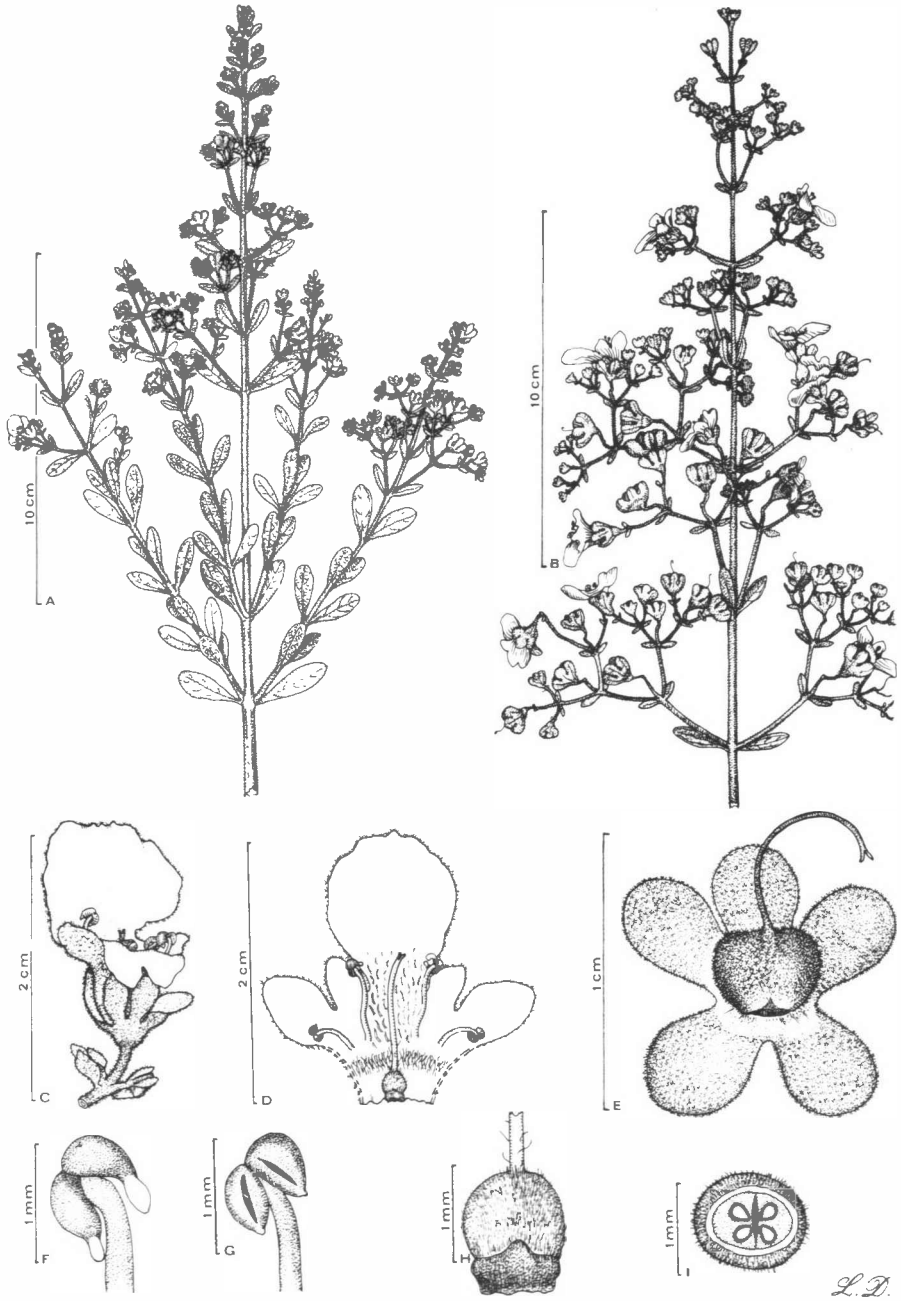


Fig. 30. *Pityrodia paniculata* (F. Muell.) Benth. (A, *A.M. Ashby 1539*: AD; B-I, *D.E. White 630807*: PERTH). A, flowering branch; B, inflorescence; C, flower; D, corolla-tube vertically cut open to show inside; E, fruit with 2-lipped calyx; F, lower stamen; G, upper stamen; H, ovary; I, transverse section of ovary.

Representative specimens

WESTERN AUSTRALIA (54 collections seen): *Aplin A9*, Doorawarrah Stn E of Carnarvon, 13.xi.1963 (E, PERTH). *Ashby 1539*, Carnarvon Tracking Stn, 26.viii.1965 (AD, B, PERTH). *Beard 2964*, 20 miles E from Onslow, 22.viii.1963 (PERTH, Kings Park Perth). *Beard 4368*, 11 miles N of Gascoyne Junction, 22.viii.1965 (PERTH, Kings Park Perth). *Beauglehole 11625 & 11628*, 70 miles S of Onslow on NWC Highway, 19.viii.1965 (PERTH 2 spec.). *Berstor 68*, Woodleigh Stn near Shark Bay, June 1963 (PERTH). *M. Brown s.n.*, near Shark Bay, 1863 (MEL 9352, holotype of *Quoya paniculata* F. Muell.). *Butler 108*, North West Cape, 1963 (PERTH). *Carey s.n.*, near Roebourne ?Aug. 1884 (MEL 69356, MEL 69359). *Carey s.n.*, near Lyndon River, Lat. 23° 10′ S, Long. 114° 35′ E, 1885 (MEL 69357). *Chinnock 3837*, 25.2 km SE of Onslow, 30.viii.1977 (AD). *Demarz 197*, 48 miles N of Carnarvon, 29.vii.1968 (PERTH, Kings Park Perth). *Demarz 694*, 11 mile stone from Barradale, 15.xi.1968 (Kings Park Perth). *Demarz 701*, 33 mile stone Minilya River, 16.xi.1968 (Kings Park Perth). *Fairall & Lullfitz L281*, 112 m. post from Onslow to Carnarvon, 26.x.1963 (Kings Park Perth). *Diels & Pritzel 438*, Gascoyne Junction, Aug. 1901 (PERTH). *Fitzgerald s.n.*, Carnarvon, Dec. 1906 (NSW 135938). *A. Forrest s.n.*, Nickol River, 1878 (MEL 69360, W731, WU). *J. Forrest s.n.*, Minilya River, N of Shark Bay, 1882 (MEL 69353). *J. Forrest s.n.*, Gascoyne River, 1882 (MEL 69354). *Gardner 3204*, "Mia Mia Minilya River", 28.viii.1932 (PERTH 5 spec.). *Gardner 6068*, 8 miles SE of Carnarvon, 19.xi.1941 (PERTH 3 spec.). *George 1193*, 45 miles E of Bullara HS, 29.viii.1960 (PERTH). *Jones s.n.*, Gascoyne River, 1880 (MEL 69361). *King s.n.*, between the Gascoyne and Fortesque River, 1885 (MEL 69362). *Morrissey 65*, Wiluna area, Dec. 1970 (PERTH). *Morrison s.n.*, between Minderoo and Globe Hill, 29.ix.1905 (BRI, E, K, PERTH 3 spec.). *Pollack s.n.*, Gascoyne River, 1882 (K, M, MEL 69355). *E. Pritzel 543*, Shark Bay, Aug. 1901 (A, AD, B, BM, BR, E, G 2 spec., HBG, K, L, M, MO, NSW, NY, P, PR, S, US, W). *Tyson s.n.*, Mt Narryer Murchison River, Feb. 1901 (K). *Weber 4865*, on N.W. Coastal Highway between Yanray and Towera, Lat. 22° 54′ S, Long. 114° 56′ E, 1.x.1975 (AD).

Distribution (Map 8C)

P. paniculata is endemic in the west-north-west of Western Australia. The major distribution is along the North West Coastal Highway between Port Hedland and the south-eastern end of Shark Bay. One inland collection is known from an unknown locality in the Wiluna area, and a few others have come from the upper reaches of the Gascoyne and Murchison River.

Comments

Bentham (1870) recorded *P. paniculata* and *P. atriplicina* as two distinct but nearly allied species. However, he did point out that the former is perhaps a variety or even a different state only of the same species. This may have been because Bentham knew this species only from a small fragment of the type material. During present studies, these species were found to be fairly close to each other because both of them have paniculate inflorescences and close cineraceous indumentum on stem and leaves. However, their leaf-shape and some flower and fruit characters do differ. Both the species are known to grow in the same general area, though they are not found growing together in any single locality. The most northern distribution limit of *P. atriplicina* is just below the most southern distribution limit of *P. paniculata*.

The leaves of *P. paniculata* are generally entire and mostly up to 3.5 by 1.2 cm. However, a few leaves in Gardner's collection (no. 6068) in Herb. PERTH are found to be denticulate at the apex and measure up to 5 by 2 cm. The denticulate leaf apices are also noticed in some leaves of Tyson's collection (No. 21) in Herb. MEL and in Beauglehole's collection no. 11727 in Herb. PERTH.

The locality of Gardner's collection (no. 3204) in Herb. PERTH is noted: "Mia Mia Minilya River", which seems to be either a mix up of two localities or an error in its record. The place Mia Mia is in fact more close to Lyndon River than Minilya River. Mia Mia is located to the north of the Lyndon River, and the Minilya River is about 50 to 60 km south of the Lyndon River. The distribution of this species, however, is recorded from around both the rivers.

Affinities

P. paniculata is closely allied to *P. atriplicina* in the majority of flower characters, and with the same dense cineraceous-indumentum on stem and leaves. Nevertheless, it can

readily be distinguished by its leaves being oblong-oblanceolate, never orbicular; inflorescence much more lax with longer cyme-peduncle; calyx deeply divided into lobes; lobes distinctly arranged into 2 lips, oblong-spathulate or almost obovate, with close cineraceous indumentum on both surfaces; fruit elliptic-obovoid or almost globose, without distinct conical top.

P. paniculata is also related to *P. cuneata* in having more or less similar shaped leaves and flowers. The 2-lipped calyx seems to be a peculiarity of both the species. The latter, however, may easily be identified by its leaves being bullate-rugose with venation prominent underneath; cyme-peduncle shorter; pedicel much longer, mostly 3-5 mm long; calyx-lobes oblong-ovate, with distinct reticulate veins on the inner face.

31. **Pityrodia axillaris** (Endl.) Druce, Rep.Bot.Exch.Cl.Brit. Isles 1916 (1917) 640, exclud.syn. *Dasymalla terminalis* Endl., *Quoya racemosa* Turcz. and *Pityrodia racemosa* (Turcz.) Benth.; Gard., Enum.Pl.Aust.Occ.3(1931)112 p.p. exclud. syn. *P. racemosa* (Turcz.) Benth.; Gard., Wildfls West.Aust.(1959)130, 132 p.p. exclud. descr. and fig. p. 130; Mold., Résumé, Verben. etc. (1959)210; Blackall & Grieve, West.Aust.Wildfls 3 (1965)570 p.p. exclud. syn. *P. racemosa* (Turcz.) Benth., descr. and fig.; Beard (Ed.), W. Aust.Pl. edn 2 (1970) 114 p.p. quoad descr. and distrib.; Mold., Fifth Summary Verben. etc. 1 & 2 (1971)347, 367, 426, 475, 603, 615-p.p. exclud. syn. *Chloanthes stachyodes* F. Muell., *Dasymalla terminalis* Endl., *P. racemosa* (Turcz.) Benth. and *Quoya racemosa* Turcz.; Gard., West.Aust.Wildfls Vol. B(1972)158 p.p. excl. descr. and fig. p. 159 bottom half; George, Nuytsia 1(1972)289.

Type: *J.S. Röe s.n.*, interior of Western Australia, undated (W, holotype; MEL 41226).

Dasymalla axillaris Endl. in Endl. & Fenzl, Nov.Stirp. Dec. 2(1839) n. 12, *basionym*; Walp., Rep.Bot.Syst.4 (1845)139; DC., Prod.11(1847)704.

Type: As for *Pityrodia axillaris* (Endl.) Druce.

P. racemosa sensu Benth., Fl.Aust.5(1870) 50 p.p. quoad syn. *Dasymalla axillaris* Endl.

P. spectabilis Gard., J.Roy.Soc.W.Aust.47(1964)63; Blackall & Grieve, West.Aust.Wildfls 3(1965)572; Beard (Ed.), W.Aust.Pl. edn 2(1970) 114; Mold., Fifth Summary Verben. etc. 1(1971)348; Gard., West.Aust.Wildfls Vol.B(1972)164, 165.

Type: *C.A. Gardner 12033*, prope Buntine in arenosis apertis, 2.xii.1958 (PERTH, holotype).

Description (Fig. 31)

Diffuse tomentose undershrub up to 30 cm high. *Stem* and branches densely clothed with white-woolly indumentum of branched hairs. *Leaves* sessile, obovate or oblong-obovate, cuneate towards base, obtuse, entire, (1.5-) 2-4 (-5) cm long, (0.5-) 1-1.5 (-1.8) cm broad in the upper half, densely woolly-tomentose, rugose under the indumentum. *Flowers* axillary solitary or often in cymes of 3 to 5, pedicellate, forming terminal leafy raceme; pedicel 3-6 (-8) mm long, woolly tomentose; bracts sessile, oblong-obovate, obtuse, abaxially tomentose, adaxially glabrous, 5-8 mm long, 2-3 (-4) mm broad; bracteoles sessile, more or less similar to bracts in shape and vestiture, 2-4 mm long, 1-1.5 mm broad. *Calyx* persistent, 5-partite almost to the base, shortly tubular near the base, (12-) 14-18 mm long, densely woolly-tomentose outside, glabrous inside; lobes oblong-oblanceolate or oblong-obovate, obtuse, entire, reticulate, 10-15 mm long, (2.5-) 3-5 mm broad; tube 1-2 (-3) mm long. *Corolla* deep red or yellowish-scarlet, (2-) 2.5-3 (-3.5) cm long, almost glabrous outside, glabrous inside excepting the dense hairy ring above the ovary, and with minute clavate hairs extending to the large central lobe of the lower lip; lobes spreading, more or less sub-orbicular, undulate-denticulate, the central lobe of the lower lip somewhat larger than the others, 7-12 mm long, 9-15 (-18) mm broad, the other lobes almost equal, (5-) 6-10 mm long, (7-) 9-15 mm broad; tube dilated within or immediately above the calyx, 11-15 (-18) mm long, (7-) 8-15 mm broad near the top

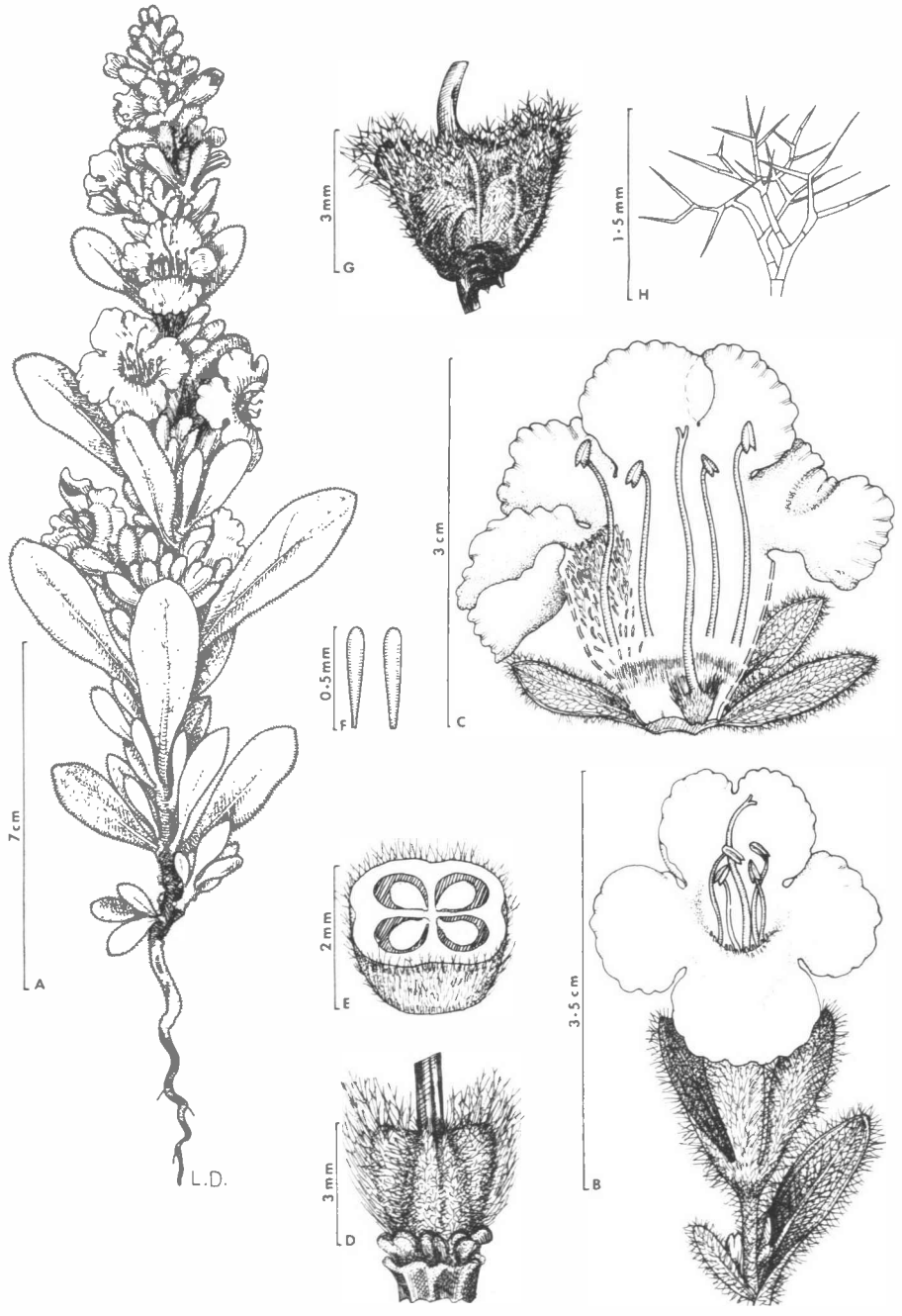


Fig. 31. *Pityrodia axillaris* (Endl.) Druce) A, *C.A. Gardner 12023*: PERTH; B-H, *W.E. Blackall 2860*: PERTH). A, habit drawing; B, flower with a bract and two bracteoles; C, flower with calyx and corolla cut open to show androecium and gynoecium; D, ovary; E, transverse section of ovary; F, clavate hairs from corolla-throat; G, fruit; H, calyx-hair.

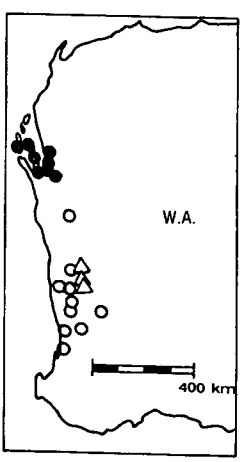
end. *Stamens* exserted, sub-didynamous; filaments glabrous, filiform, (10-) 12-16 (-18) mm long; anthers oblong, c. 2 mm long, 1 mm broad, lobes linear, free in the lower halves, each with a short appendage at the lower end. *Ovary* more or less globose when young, with two lateral humps when old, 1-2 mm in diameter, densely tomentose; style exserted, glabrous, filiform, (13-) 16-27 (-30) mm long, shortly 2-lobed at the summit. *Fruit* enclosed within the persistent calyx, somewhat obovoid, slightly compressed, with two opposite short humps at the top, densely tomentose, splitting into two separate two-celled nutlets, 2-3 mm long, 2-4 mm broad at the top end.

Specimens examined

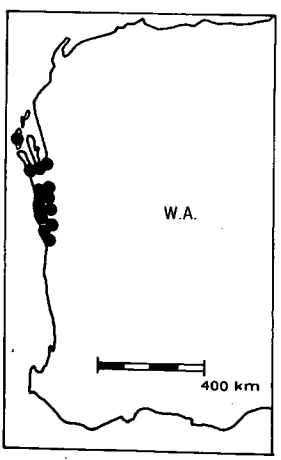
WESTERN AUSTRALIA (15 collections seen): *Blackall 2860*, between Perenjori and Dalwallinu, 25.ix.1932 (PERTH 2 spec.). *Burns 52*, 205 mile peg Wongan road, 9.ix.1971 (PERTH). *Gardner s.n.*, Buntine, July 1927 (PERTH 3 spec.). *Gardner 12023*, prope Buntine in arenosis lutosis, 2.xii.1958 (PERTH, holotype of *Pityrodia spectabilis* Gard.). *Herbert s.n.*, Pithara, 2.x.1961 (PERTH 2 spec.). *Humphreys s.n.*, Maya, 23.ix.1961 (PERTH). *Lullfitz 1626*, above Perenjori towards Morawa, 2.x.1962 (PERTH, Kings Park Perth). *Lullfitz 1457*, Wubin near 2000 acre reserve, 31.vii.1963 (Kings Park Perth). *O'Grady s.n.*, "Guangarra", 1953 (PERTH). *Perry s.n.*, near Caron, Oct. 1961 (PERTH 2 spec., paratypes of *Pityrodia spectabilis* Gard.). *Robinson 277*, Lake Moore, 27.x.1966 (PERTH). *Phillips 1737*, N. of Wubin, 2.x.1962 (CBG). *Röe s.n.*, interior of South West Australia, undated (W, holotype; MEL 41226 isotype - of *Dasymalla axillaris* Endl.). *Rogerson 8027*, between Bunjil and Latham, Oct. 1961 (PERTH). *Sargent s.n.*, Latham, 23.x.1921 (PERTH). *Stacey 217*, 1 mile S. of Caron, 15.x.1972 (PERTH).

Distribution (Map 9A)

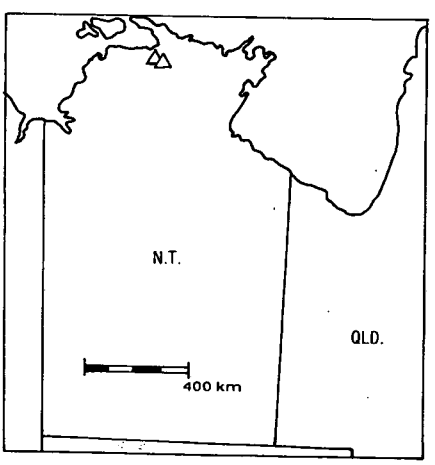
P. axillaris is endemic in the south-west of Western Australia where it is restricted between latitude 29° 31° S, and between longitude 116° and 118° E. The main distribution is between Pithara and Morawa, with only one record from near Lake Moore.



Map 9A.
P. axillaris △
P. dilatata ○
P. cuneata ●



Map 9B.
P. atriplicina ●



Map 9C.
P. byrnesii △

Comments

Bentham (1870) recorded this species as a synonym of his illegitimate combination *P. racemosa* (Turcz.) Benth. (= *Quoya racemosa* Turcz.).

Druce (1917) identified *Dasymalla axillaris* Endl. as a *Pityrodia* R.Br. and made a new combination *P. axillaris* (Endl.) Druce within which he treated *Dasymalla terminalis* Endl. as a synonym. The correct application of the name *P. axillaris* (Endl.) Druce was realized by George (1972) who, after examination of the types and original descriptions,

distinguished *P. axillaris* (Endl.) Druce and *P. terminalis* (Endl.) George as two separate species. (For more details see "comments" under *P. terminalis*).

The detailed English description, habit sketch and analytical drawings of its flowers are the first published for this species. The majority of previously published coloured plates, labelled *P. axillaris* are of *P. terminalis*. A coloured plate of *P. axillaris* was published by Gardner (1972, p. 165) as *P. spectabilis* Gard. which is regarded here as a synonym of this species.

Moldenke (1959, 1971) recorded this species from Queensland and New South Wales, but no collection has been made outside Western Australia. *P. axillaris* seems to be one of the rarest species in the genus.

According to Gardner (1964), this species is by far the largest flowered member of the genus.

Affinities

P. axillaris is closely related to *P. terminalis* in its flowers being pedicellate, arranged in a raceme-like terminal inflorescence; calyx tomentose outside, lobes almost free to the base; corolla-tube abruptly dilated within or immediately above the calyx; anthers oblong and fruit with two opposite humps. Nevertheless, *P. axillaris* may be easily distinguished by its leaves being oblong-obovate; calyx-lobes obovate; corolla deep red or yellowish-scarlet, tube almost glabrous outside and with clavate hairs inside below the central lobe of the lower lip, lobes undulate-denticulate; stamens and style much exserted; fruit ± obovoid with two opposite humps at the top.

P. axillaris is also allied to *P. augustensis* in having similar indumentum on stem and leaves, deeply lobed calyx and the corolla-tube abruptly dilated within or immediately above the calyx. Nevertheless, *P. augustensis* can readily be identified by its leaves being narrowly elliptic, cuneate towards both ends; calyx-lobes linear-oblong; corolla deep lilac with branched villous hairs inside the tube, tube glandular and sparsely woolly outside, lobes entire; stamens and style included; fruit more or less globular without any hump, pubescent all over.

32. **Pityrodia dilatata** (F. Muell.) Benth., Fl.Aust.5(1870) 51; Briq., Mém.Soc.Phys. Genéve, 32(2), no. 8 (1896)78; Diels & E. Pritz., Bot.Jahrb.Syst.35(1904)521; Gardner, Enum.Pl.Aust.Occ.3(1931)112; Junell, Bot.Upsal.4(1934)68, fig. 114; Mold., Résumé Verben.etc.(1959)210, 251, 335, 341; Beard (Ed.), W.Aust.Pl. edn 1(1965)92; Blackall & Grieve, West.Aust.Wildfls 3(1965)570; Beard (Ed.), W.Aust.Pl. edn 2(1970)114; Mold., Fifth Summary Verben.etc.1 & 2(1971)347, 367, 425, 603, 615; Gard., West.Aust.Wildfls vol. B(1972)160, 161t.

Type: *J. Drummond 2nd coll. no. 210*, near Murchison River, ?1843 (K, lectotype designated here; A, BM, E, G, K 2 spec., LE, M, MEL 2 spec., P, W, WU - isolectotypes).

Chloanthes dilatata F. Muell., Fragm.6(1868)157, *basionym*; F. Muell., Syst.Cens.Aust.Pl.1(1882)103; F. Meull., Sec.Syst.Cens.Aust.Pl.1(1889)172.

Type: As for *P. dilatata* (F. Muell.) Benth.

Quoya dilatata F. Muell., Fragm.6(1868)157, pro syn. sub. *Chloanthes dilatata* F. Muell.

Typification

P. dilatata is based on J. Drummond's 2nd coll. no. 210, from Western Australia, consisting of at least 14 duplicates all agreeing with the type description. Since the author did not select any of them as a type, it is, therefore, necessary to select a lectotype for this name.

Only the duplicates in K have both the collector's number and Mueller's annotation. Other specimens (in MEL) although annotated by Mueller have not been considered due to the lack of the Drummond number necessary to ensure that the specimen is a duplicate of the type collection. A specimen at K, which is particularly complete, is selected as the lectotype.

Description (Fig. 32)

A low spreading shrub of 30-60 cm. *Stem* and branches densely clothed with a branched woolly white tomentum. *Leaves* sessile, obovate or oblong-spathulate, narrowed below the middle, dilating and stem-clasping at the base, entire when young, later crenate, obtuse, flat or nearly so, (1-) 1.5-3 (-3.8) cm long, (4-) 7-11 (-15) mm broad, woolly-tomentose, glabrescent when old, thick and bullate-rugose on the upper surface, reticulate underneath. *Flowers* mostly solitary or on short axillary peduncles, pedicellate, forming a long spike-like leafy inflorescence towards the end of branches; peduncle (2-) 3-6 (-10) mm long, tomentose; pedicel slender, densely tomentose, 2-4 mm long; bracts leaf-like, of the shape and size of the upper smaller leaves; bracteoles short, leafy, linear-lanceolate, tomentose on abaxial surface, glabrous on adaxial surface, 3-5 mm long, 1-2 mm broad. *Calyx* persistent, divided almost to the base into 5 narrow lobes, very shortly tubular at the base, 8-12 mm long, very thickly woolly-tomentose outside, glabrous inside; lobes oblong-spathulate, narrowed below the middle, membranous, reticulate, non-ribbed, 8-11 mm long, 1-2 mm broad; tube 0.5-1 mm long. *Corolla* orange-red, 2-2.5 cm long, densely pubescent outside, glabrous inside excepting the dense hairy ring above the ovary, and a few subulate and clavate hairs only at the base of the largest anterior-lobe of the lower lip; anterior-lobe much larger than any of the others, more or less ovate-deltoid, reflexed, 5-7 mm long, 4-6 mm broad at the base; the other 4-lobes almost equal, the upper two more or less ovate, erect, the lateral deltoid, reflexed, (2-) 3-4 (-5) mm long; tube gradually dilated upwards and slightly curved, 12-15 mm long, 6-9 mm broad above the calyx. *Stamens* exserted; filaments glabrous, filiform, the lower pair longer, (9-) 10-14 mm long, the upper pair (5-) 6-8 (-9) mm long; anthers oblong, with minute appendages at the lower ends of the lobes, 1-1.5 (-2) mm long, c. 1 mm broad. *Ovary* globose, very densely tomentose, seated on a thick glabrous disk, 1-1.5 mm in diameter; style exserted, filiform, glabrous with a few hairs towards the base, (12-) 15-22 (-28) mm long, shortly 2-lobed at the summit. *Fruit* enclosed within the persistent calyx, almost globose in outline but somewhat tetracristate or tetraquetrous with almost round or blunt short edges, 2-3 mm long, 2-2.5 mm in diameter, all over tomentose; seeds not seen.

Representative specimens

WESTERN AUSTRALIA (31 collections seen): *Andrews 681*, Northam, 30.ix.1902 (BM, K). *Beard 3142*, 2 miles S. of Mogumber, 25.xi.1963 (Kings Park Perth). *Blackall 2937*, between Moora and Gingin via Mogumber, 20.ix.1932 (PERTH 2 spec.). *Cleland s.n.*, Moora, Oct. 1908 (NSW 89905). *J. Drummond 2nd coll. no. 210*, near Murchison River, ? 1843 (K lectotype; A, BM, E, G, K 2 spec., LE, M, MEL 2 spec., P, W, WU - isolectotypes). *J. Drummond s.n.*, loc.cit., undated (MEL 41259, MEL 41260, MEL 69390 probably type duplicate, MEL 69310, MEL 69311, MEL 69312). *Fitzgerald s.n.*, Mogumber, Oct. 1903 (NSW 135886, NSW 135887). *Gardner s.n.*, 6 miles W. of Watheroo, Sept. 1926 (PERTH). *Gardner s.n.*, Coomberdale, Sept. 1963 (PERTH). *George 6825*, 1 mile S. of Mogumber, 17.ix.1965 (PERTH). *George 6837*, 5 miles E. of Wannamal, 25.ix.1965 (MO, PERTH). *Gimenez 792*, New Norcia, Oct. 1923 (PERTH). *Koch 2443*, Cowcowing, 1904 (PERTH). *Kretchmar s.n.*, Babilion Hills near Moore River, Nov. 1961 (PERTH 2 spec.). *Morrison 13181*, between New Norcia and Mogumber, near Moore River, 15.x.1903 (K, PERTH). *Morrison 16104*, Carnamah, 2.xi.1906 (K). *Morrison s.n.*, Carnamah, 7.xi.1906 (BM, BRI, E, PERTH). *Morrison s.n.*, Watheroo, 9.xi.1906 (BM, K). *Maiden s.n.*, Perth, Aug. 1909 (G). *Maiden s.n.*, district Murray, Sept. 1909 (G). *E. Pritzel 737*, Moore River, Oct. 1901 (A, AD, B, BR, E, G 2 spec., HBG, K 2 spec., L, M, MO, NSW, NY, PR, S, US, W). *E. Pritzel s.n.*, Watheroo, 1901 (B). *Rogerson 7*, Badingarra, Jan. 1963 (PERTH). *Royce 9751*, Watheroo National Park, W. of Watheroo, 8.x.1971 (PERTH). *Staer s.n.*, Mogumber, Oct. 1905 (E). *Steedman s.n.*, Watheroo, Sept. 1932 (PERTH). *Whibley 4879*, 15 km N. of Moora, 2.xi.1974 (AD).

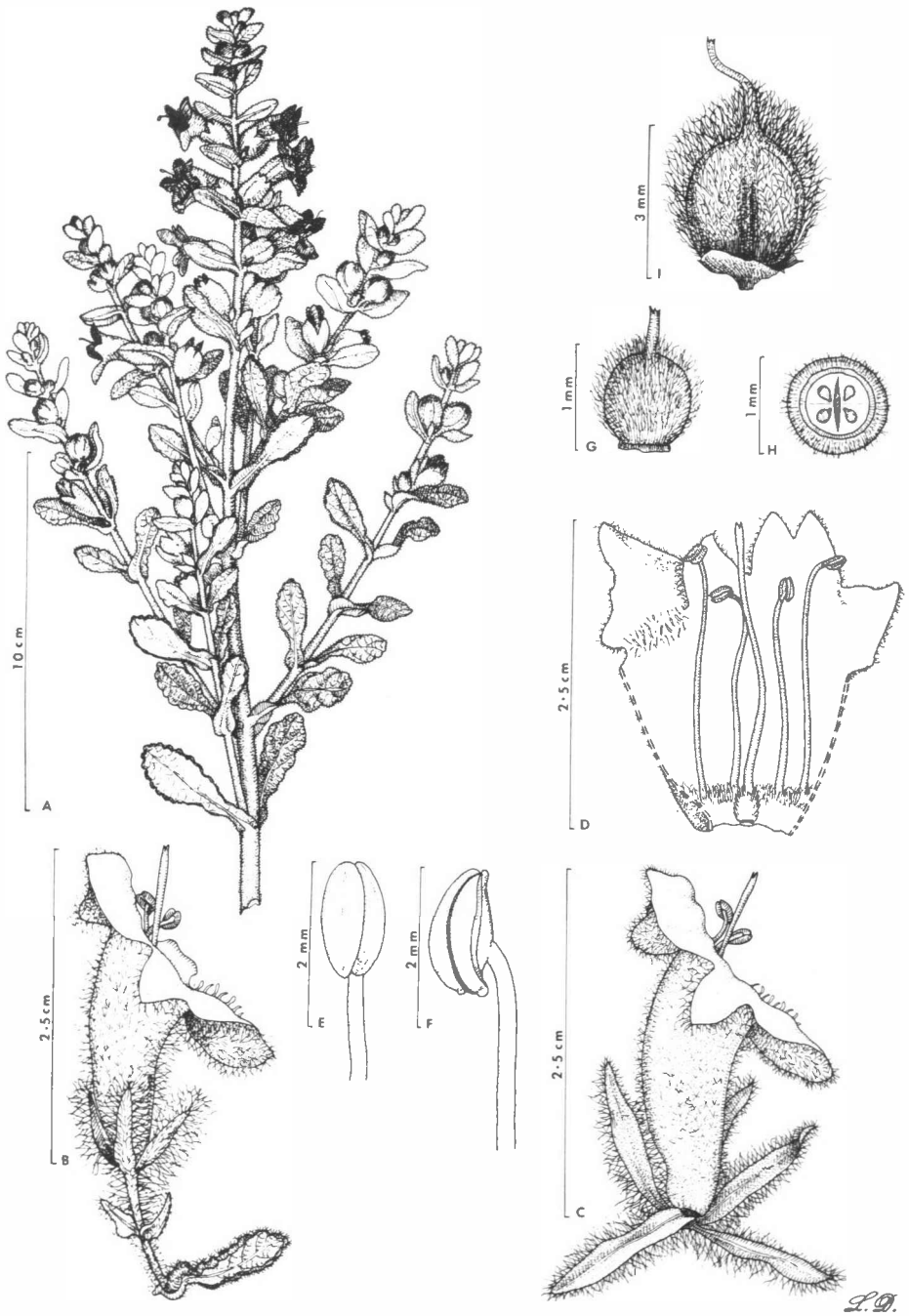


Fig. 32. *Pityrodia dilatata* (F. Muell.) Benth. (A-H, *R.D. Royce 9751*: PERTH; I, *A. Morrison 16104*: K). A, flowering branch; B, flower with a bract and two bracteoles; C, flower with calyx cut open to show androecium and gynoecium; E, upper stamen; F, lower stamen; G, ovary; H, transverse section of ovary; L, fruit.

Distribution (Map 9A)

P. dilatata is endemic in the west-south-west of Western Australia. The major distribution is to the north of Perth, chiefly between Perth and Carnamah. However, one collection from east-north-east of Perth has come from Northam, and another from near Cowcowing. The presence of this species in the vicinity of the Murchison and the Murray Rivers has not been confirmed by any collection since the type collection, ? 1843.

Comments

The flower arrangement, corolla colour and gradual upwards dilation of the corolla-tube give this species the aspect of *Chloanthes*. However, it may easily be identified by its non-decurrent flat leaves and appendaged anther-lobes. Inside the corolla-tube, there is no extension of hairs from the hairy ring to the anterior-lobe of the lower-lip. Instead, there are a few subulate and clavate (villous) hairs at the base of the anterior-lobe.

The calyx of *P. dilatata* is so deeply divided that there is hardly any tube at the base.

One of Drummond's collection in Herb. MEL (no. MEL 69309) is probably a duplicate of his 2nd collection no. 210 from the Murchison River (the type of *P. dilatata*), but it lacks a collector's number. Otherwise, it matches well with all the type duplicates of this number. In fact, this is the only specimen of Drummond's collection of *P. dilatata* in MEL with the author's determination, and it has, in addition, copious descriptive notes by Mueller. It also contains dissected flowers and some loose plant material enclosed in two packets with the species name written by F. Mueller. This particular specimen seems, therefore, to have been used by Mueller in preparing the original description of this species and to be likely to belong to the type collection.

Affinity

P. dilatata is closely allied to *P. quadrangulata* in having more or less similar looking flat bullate-rugose leaves, pedicellate flowers, membranous and reticulate calyx, gradually upwards dilated corolla-tube, oblong anthers with minute appendages at the base of the lobes, thick glabrous disk below the ovary and more or less tetraquetrous fruit. Nevertheless, *P. dilatata* can easily be identified by its leaves being dilated and stem-clasping at the base, shorter, measuring up to 3 (-3.8) by 1.1 (-1.5) cm; flowers mostly axillary, solitary, arranged into a spike-like leafy inflorescence; calyx-lobes oblong-spathulate, glabrous inside, with hardly 1 mm long tube at the base; corolla orange-red, with subulate and clavate (villous) hairs inside at the base of the largest reflexed anterior-lobe; ovary neither ridged nor corrugated; disk corrugated and flat; fruit almost globose in outline, densely tomentose.

33. **Pityrodia cuneata** (Gaudich.) Benth., Fl.Aust.5(1870)51; Diels & E. Pritz., Bot. Jahrb.Syst.35 (1904)521; Gard., Enum.Pl.Aust.Occ.3(1931)112; Mold., Résumé Verben. etc. (1959)210, 335, 341; Blackall & Grieve, West. Aust.Wildfls 3(1965)570; Beard (Ed.), W.Aust.Pl. edn 2 (1970)114; Mold., Fifth Summary, Verben.etc.1 & 2(1971)347, 603, 615; Burbidge & George, J.Roy.Soc.W.Aust.60(1978)83.

Type: *C. Gaudichaud s.n.*, Shark Bay, Western Australia, 1817-20 (P, lectotype designated here; FI, G Herb. DC - isolectotypes).

Quoya cuneata Gaudich. in Freyc. Voy.Bot.(1828) 11, 12, t. 66; ibid(1829)454, *basionym*; Presl, Rep.Bot.Syst.1 (1834)143; Walp., Rep.Bot.Syst.4(1845)37; Schauer in DC., Prod.11(1847)697; Bocq., Rev.Verbén.(1863)133, t,3, fig. 1-7.

Type: As for *Pityrodia cuneata* (Gaudich.) Benth.

Chloanthes cuneata (Gaudich.) F. Muell., Syst.Cens.Aust.Pl.1(1882)103, based on *Quoya cuneata* Gaudich.; F. Muell., Sec.Syst.Cens.Aust.Pl.1(1889)172.

Chloanthes oldfieldii sensu F. Muell., Fragm.6(1868)157 p.p. quoad syn. *Quoya cuneata* Gaudich.

Typification

The protologue of this species, which is based on *Quoya cuneata* Gaudich. comprises plate 66 and the particulars of its drawings on pages 11 and 12 (Gaudich. in Freyc.Voy. Bot.(1828)t.66, p.11 & 12). Over a year later, the name *Quoya cuneata* reappeared on page 454 of the above publication with a reference to plate 66. It also contained brief information about the place of (type) collection and mention of the name of the Surgeon-major, Doctor Quoy, who accompanied the author during the expedition as a zoologist, and after whom the new genus was named.

The above plate appears to be of a fresh specimen bearing flowers and fruit, but the syntypes in Herb. FI, G-DC and P are leafy twigs without any flower or fruit. Bentham (1870), therefore, regarded the above (Gaudichaud's) type specimens as "far advanced" and Schauer (1847) considered the one in Herb. G-DC as "imperfect". In view of this, Bentham (1870) took the flower details chiefly from Gaudichaud's above plate and perhaps a similar procedure was adopted by Schauer (1847). During present investigation, the flowering specimen upon which the plate 66 was based is not available from the herbaria where Gaudichaud's types or their duplicates are now preserved. It seems, therefore, that the specimen was probably discarded after preparing the drawings and is not extant. The available syntypes, however, certainly belong to the type collection of which the one in Herb. P is well preserved and can be easily identified. This specimen is designated here as the lectotype for this species.

Description (Fig. 33)

A divaricate shrub of 0.6-3.5 m high. *Stem* and branches densely clothed with branched woolly tomentum of pale white or brownish hairs. *Leaves* sessile, obovate or cuneate, obtuse, entire or denticulate along the distal end, contracted below the middle, sometimes dilated at the base, bullate-rugose on both surfaces, woolly tomentose, (6-) 8-15 (-25) mm long, (3-) 5-7 (-10) mm broad above the middle, the venation prominent underneath. *Flowers* pedicellate, axillary solitary or 3 together in pedunculate cymes; pedicel 3-5 mm long, densely tomentose; bracts sessile, elliptic-ovate or somewhat oblong-obovate, obtuse, shorter than pedicel, tomentose on abaxial surface, glabrous on adaxial surface, 2-3 mm long, 1-1.5 mm broad; bracteoles short, sessile, oblong-ovate, tomentose on abaxial surface, c. 1 mm long, c. 0.5 mm broad. *Calyx* persistent, 5 lobed with a very short tube at the base, 5-6 (-7) mm long, reticulate inside, densely clothed with branched woolly tomentum outside, sparsely hairy inside on the free portions of the lobes; lobes more or less distinctly arranged into two lips, membranous and more deeply 2-lipped in fruit, oblong-ovate, obtuse, (2-) 3-5 mm long, 1.5-2 mm broad; the 3-lobed upper lip larger than the lower lip; tube short, 0.5-1 mm long. *Corolla* blue, but becoming white, with purple spots in throat and tube, 8-12 (-14) mm long, pubescent outside, villous inside on the large 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, 5-6 (-8) mm long, 6-7 (-9) mm broad; the other 4 lobes elliptic-ovate or broadly ovate, 2-3 (-4) mm long, 2-3 mm broad at the base; tube dilating within or immediately above the calyx, broadly campanulate above the inner ring of hairs, c. 5 mm long, 4-6 mm broad at the top end. *Stamens* shortly exserted; filaments glabrous, filiform, 2-3 (-4) mm long; anthers more or less orbicular in outline; lobes oblong, free in the lower halves, 1-1.5 mm long, c. 0.5 mm broad, lobes of the two lower anthers with prominent appendages at the lower ends, the upper anthers with short tubercles at the lower tip. *Ovary* more or less globose, c. 1 mm long, nearly as broad, densely woolly; style included or scarcely exserted, filiform, glabrous with a few sparse hairs towards the base, 5-7 mm long, shortly 2-lobed at the summit. *Fruit* enclosed within the persistent calyx, broadly ellipsoid-globose, slightly compressed, splitting into two separate 2-celled hemispherical nutlets, pubescent

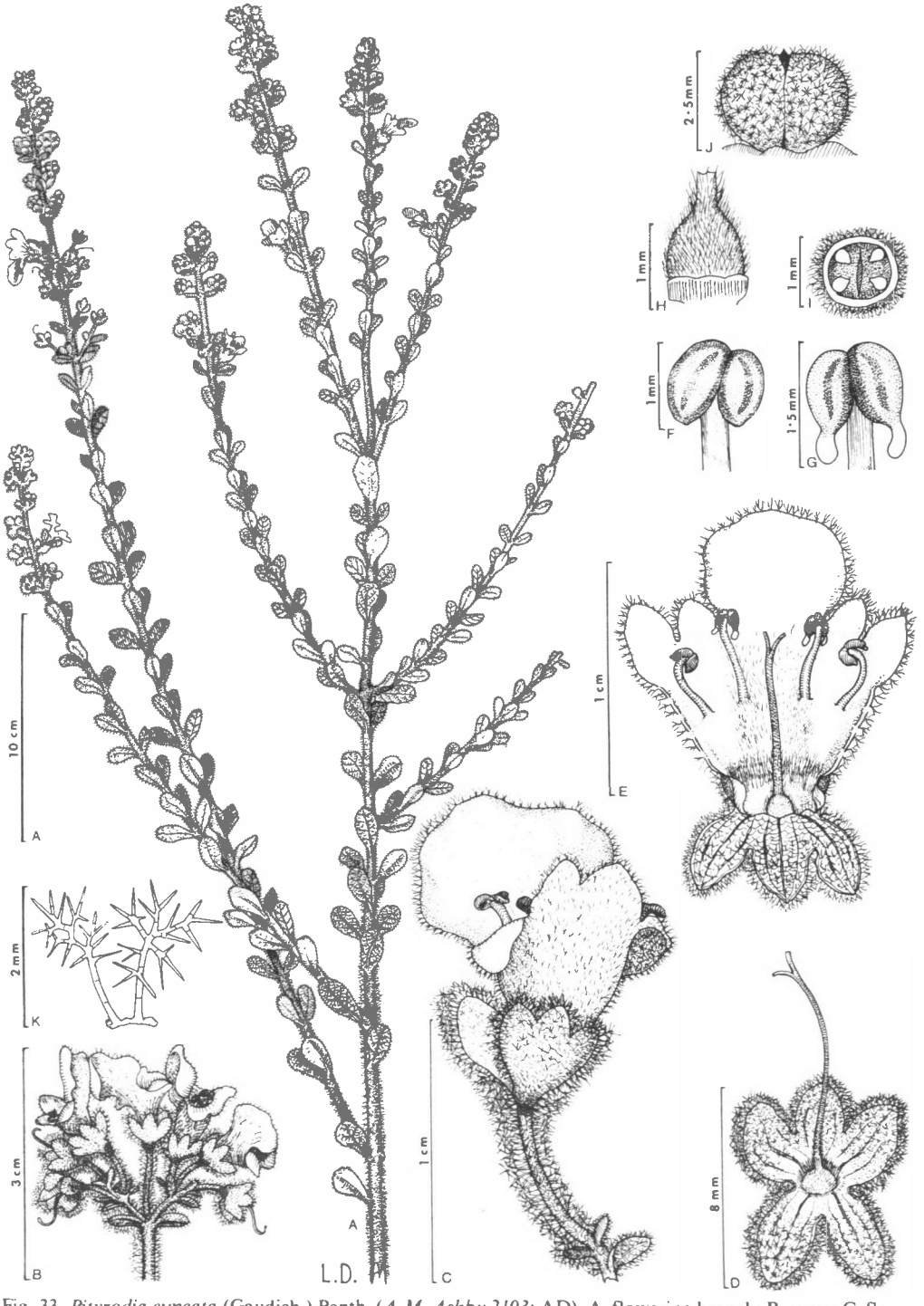


Fig. 33. *Pityrodia cuneata* (Gaudich.) Benth. (*A.M. Ashby 2193*: AD). A, flowering branch; B, cyme; C, flower with a bract and two bracteoles; D, calyx spread open to show its 2-lips and gynoecium inside; E, flower with corolla-tube vertically cut open to show androecium and gynoecium; F, upper stamen; G, lower stamen; H, ovary; I, transverse section of ovary; J, fruit; K, calyx-hairs.

with faint reticulation all over, 2-2.5 mm long, 2-3 mm broad in the upper half.

Specimens examined

WESTERN AUSTRALIA (23 collections seen): *Ashby 2193*, 185 km north of Geraldton, 30.vii.1967 (AD). *Beard 3025*, 468 miles Carnarvon Highway, 25.viii.1963 (Kings Park Perth). *Beard 6784*, Nanga Station, 10.x.1973 (NSW, PERTH). *Bennett 1475*, 436 miles N.W. Coastal Highway, 2.x.1966 (PERTH). *Blackall 4619*, Shark Bay, 6-7.ix.1940 (PERTH). *Burns 25*, 430 m.p. on Great Northern Highway, 11.viii.1968 (PERTH). *Carr 378*, 1.5 miles from turnoff from Denham road on Tamala Station road, 16.iii.1968 (PERTH). *Clyne s.n.*, half-way between Carnarvon and Geraldton, Sept. 1969 (NSW 138372). *Demarz 4038*, Shark Bay road, 38 miles from turn-off, 17.x.1972 (PERTH, Kings Park Perth). *Gardner 2572*, 20 miles south of Shark Bay, 29.viii.1931 (PERTH 3 spec.). *Gardner 13196*, Murchison River, 19.viii.1961 (PERTH 2 spec.). *Gardner 13518*, near Peron Peninsula, 24.viii.1961 (PERTH 2 spec.). *Gardner & Blackall 568*, 70 miles S. of Hamelin Pool, N. of Geraldton, 28.viii.1931 (PERTH). *Gaudichaud s.n.*, Shark Bay, 1817-20 (FI, G-DC, P - syntypes of *Quoya cuneata* Gaud.). *George 11555*, Dirk Hartog Island, 5.ix.1972 (PERTH). *George 11615*, c. 56 km S of Denham, 9.ix.1972 (PERTH). *George 9551*, 34 miles S of Denham, 26.viii.1969 (PERTH). *George 10364*, 4 miles N of Wannoo Roadhouse, ± 114° 35′ E, 26° 44′ S, 9.ix.1970 (PERTH). *Milne s.n.*, Shark Bay, waste places, undated (K, PERTH). *F. Mueller s.n.*, loc.cit., Oct. 1877 (MEL 2 spec.). *Rogerson 296*, Peron Peninsula, road from Shark Bay to the Overlander, Oct. 1966 (PERTH). *Shaw 611*, 175 km north of Geraldton, 2.x.1966 (AD). *Short 399*, near the bridge on N.W. Coastal Highway, 27° 05′ S, 114° 38′ E, 9.viii.1977 (AD 3 spec.).

Distribution (Map 9A)

P. cuneata is endemic to Western Australia. The main distribution is restricted around Shark Bay with only one record near the Murchison River along the North West Coastal Highway.

Comments

In Blackall & Grieve (1965), all four stamens in the cut open flower-drawing are shown to have an appendage at the lower end of their lobes. Actually, only the lower two stamens beside the large middle corolla-lobe are appendiculate.

The fruit of *P. cuneata* closely resembles that of *Chloanthes* R.Br., but its 2-lipped persistent calyx is not found in any member of the latter genus. The 2-lipped calyx seems similar to those in the Lamiaceae, but the rest of the flower characters resemble more closely *Pityrodia* than Lamiaceae.

Affinities

P. cuneata seems nearest to *P. atriplicina* and *P. paniculata* in the majority of flower characters, but its 2-lipped calyx place it more close to *P. paniculata*. From both of these species, however, *P. cuneata* may readily be distinguished by its stem and leaf indumentum being woolly, pale white or brownish; leaves bullate-rugose on both surfaces, with distinct venation underneath; cyme-peduncle shorter; pedicel longer, mostly 3-5 mm long; calyx distinctly 2-lipped as in *P. paniculata*, but the lobes oblong-ovate with distinct reticulate venation on the inner surface. Calyx-lobes in *P. paniculata* are oblong-spathulate or obovate and without distinct venation.

34. **Pityrodia atriplicina** (F. Muell.) Benth., Fl.Aust.5(1870)52; F. Muell., Fragm.9 (1875)5; Briq., Mém.Soc.Phys.Genève, 32(2), no. 8 (1896)78; Diels & E. Pritz., Jahrb.Syst.35(1904)522; Gard., Enum.Pl.Aust.Occ.3(1931)112; Gard., Wildfls West. Aust.(1959)132; Mold., Résumé Verben.etc. (1959)210, 251, 335, 341; Beard (Ed.), W. Aust.Pl. edn 1(1965)92; Blackall & Grieve, West.Aust.Wildfls 3(1965)572; Beard (Ed.), W.Aust.Pl. edn 2(1970)114; Mold., Fifth Summary Verben.etc.1 & 2(1971)347, 425, 603, 615; Burb. & George, J.Roy.Soc.W.Aust.60(1978)83.

Type: *A. Oldfield s.n.*, "In campsi arenosos ad flumen Murchison", undated (MEL 69245, lectotype designated here; BR, GOET, K, MEL 41219, MEL 69246, W - isolectotypes).

Chloanthes atriplicina F. Muell., Fragm.1(1859)235, *basionym*; F. Muell., Fragm.2(1860)23, in obs; F. Muell., Fragm.6(1868)157; F. Muell., Syst.Cens.Aust.Pl.1(1882)103; F. Muell., Sec.Syst.Cens.Aust.Pl.1(1889)172; Ewart & Davies, Fl.N.Terr.(1917)239, in obs.

Type: As for *Pityrodia atriplicina* (F. Muell.) Benth.

Typification

P. atriplicina (F. Muell.) Benth. is based on A. Oldfield's collection (s.n.), consisting of at least seven duplicates. Since the author did not select any one of them as a type, it is, therefore, necessary to choose a lectotype for this name. The syntype preserved in Herb. MEL(no. MEL 69245), where F. Mueller's herbarium and types are now housed (Stafleu, 1967), was annotated by F. Mueller and almost certainly used by him in preparing the original description of this species. The specimen is particularly complete and well preserved. It is chosen here as the lectotype for this species.

Description (Fig. 34)

A much-branched shrub 1-2.5 m tall. *Stem* and branches canescent-hoary with dense but close and short-tomentum, sometimes looser and almost floccose on the branches. *Leaves* sessile or contracted into a short petiole, broadly elliptic or almost orbicular, obtuse, entire, 1-2.5 (-3.5) cm long, (0.5-) 1-2.5 (-3) cm broad, the venation often concealed by the short cineraceous tomentum. *Flowers* pedicellate, usually 3-7 together in pedunculate axillary cymes towards the end of branches, rarely solitary, forming often a short broad leafy panicle; cyme-peduncle densely canescent-hoary, (5-) 8-15 mm long; pedicel densely covered with canescent-hoary tomentum, 2-4 (-5) mm long; bracts sessile, narrowly elliptic-oblong or ovate, tomentose on abaxial surface, glabrous on adaxial surface, (1.5-) 2-3 mm long, more or less 1 mm broad; bracteoles smaller but similar to bracts, 1-1.5 mm long, ca. 0.5 mm broad. *Calyx* persistent, divided to above the middle into 5 lobes, tubular towards the base, 6-8 (-10) mm long, densely canescent-hoary outside and on the upper inner halves of the lobes, glabrous inside the tube; lobes oblong-ovate, obtuse, 3-5 mm long, 2-3 mm broad at the base; tube narrowing towards the base, 2-3.5 (-5) mm long. *Corolla* pink with purple spots in throat, 1.5-2.5 cm long, pubescent outside with branched tomentum, glabrous inside excepting the dense hairy ring above the ovary, and the sparse villous hairs extending to the large anterior lobe of the lower lip; the anterior lobe almost twice as large as the others, more or less orbicular in outline, 6-10 mm long, (6-) 8-11 (-12) mm broad; the other 4 lobes nearly equal, more or less ovate, 3-5 (-6) mm long, 4-5 (-6) mm broad at the base; tube much dilated within or immediately above the calyx, 6-9 mm long, 8-11 mm broad at the top end. *Stamens* included or shortly exserted; filaments filiform, glabrous, the lower pair with a few hairs towards the base, 4-5 mm long, the upper pair 3-4 mm long; anthers (excluding appendages) more or less orbicular in outline, the lower pair of anthers with well developed appendages at lower ends of the lobes, lobes oblong, 2-2.5 mm long (including appendages), the upper pair of anthers usually without enations, lobes 1-1.5 mm long. *Ovary* globose, 1-1.5 mm in diameter, densely tomentose; style included, filiform, glabrous, 6-8 mm long, shortly 2-lobed at the apex. *Fruit* enclosed within the persistent calyx, more or less ellipsoid or ovoid, densely hairy with branched tomentum, 3-4 mm long, nearly the same in diameter, splitting longitudinally into two separate nutlets.

Representative specimens

WESTERN AUSTRALIA (52 collections seen): *Ashby 303*, west of Yuna ca. 34 km east of Northampton, 28.viii.1963 (AD). *Ashby 1832*, Kalbarri, Murchison Sand Plain Reserve, 15.vii.1966 (AD, PERTH). *Beard 6743*, 24 m. N of Murchison River on N.E. Coastal Highway, 7.x.1973 (NSW, PERTH). *Beard 6791*, between Hamelin and Tamala, 10.x.1973 (NSW, PERTH). *Blackall 4673*, Nilemah, near Shark Bay, Sept. 1940 (PERTH). *Blackall & Gardner 579*, 48 km N of Ajana, 28.viii.1931 (PERTH 2 spec.). *Brockways.n.*, 32 km N of Ajana, Oct. 1947 (CANB, PERTH). *M. Brown s.n.*, near E. shore of Western Harbour, Shark Bay, 1863 (MEL 69249). *Burbidge 2210*, Ajana sand plain, 2.ix.1947 (AD, CANB, MEL). *Burns 1*, Murchison River Reserve, Kalbarri, 22.x.1965 (PERTH). *Burns 7*, Spalding Park, 3 m. N of Geraldton, 7.ix.1965 (PERTH). *Burns 40, 41,*

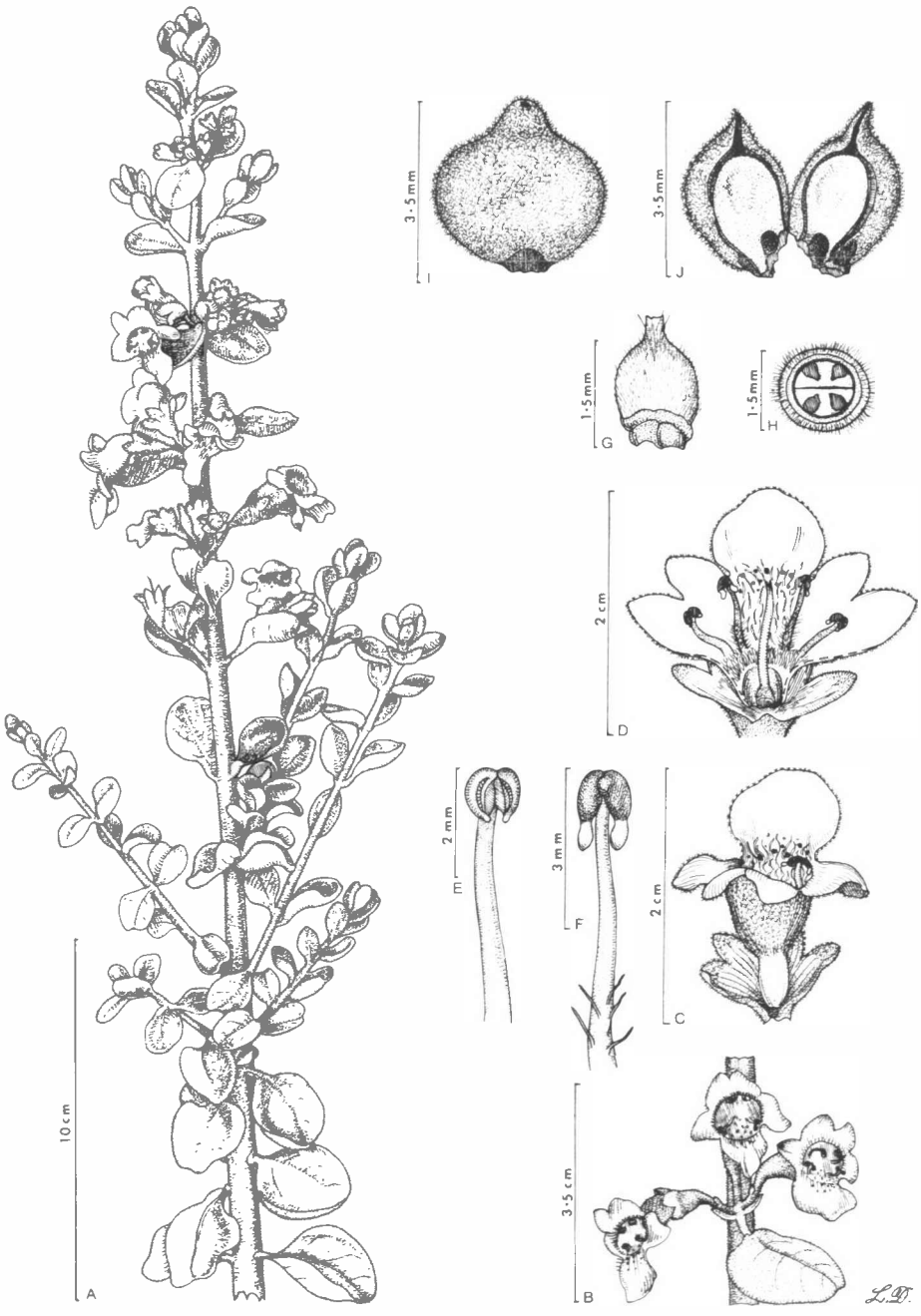


Fig. 34. *Pityrodia atriplicina* (F. Muell.) Benth. (*D & N. McFarland NM 1238*: AD). A, flowering branch; B, cyme; C, flower with calyx vertically cut open to show corolla-tube; D, flower with calyx and corolla vertically cut open to show androecium and gynoecium; E, upper stamen; F, lower stamen; G, ovary; H, transverse section of ovary; I, fruit; J, fruit split open into two halves.

42, between Mumby and Balline, W of Northampton, 27.ix.1970 (PERTH). *Cunningham 249*, Dirk Hartog Island, 1821-2 (BM). *Demarz 732*, 30 mile post on Kalbarri Road, 18.xi.1968 (PERTH). *Drummond 6th coll. no. 138*, Murchison River, 1851 (CGE, E, G, K, MEL 2 spec., NSW, P, W). *Gardner 2582*, lower Murchison River, 30.viii.1931 (PERTH 4 spec.). *Gardner 6002*, 29 m. N of Galena, Murchison River, 17.ix.1941 (PERTH). *Gardner 8598*, Ajana sand plain, 2.ix.1947 (PERTH). *George 11549*, Dirk Hartog Island, 5.ix.1972 (PERTH). *George 9560*, 7 miles along Tamala road from Hamelin-Denham road, 26.viii.1969 (PERTH). *Gray s.n.*, Greenough Flats, undated (MEL 69250). *Lullfitz 4296*, 410 mile peg S of Carnarvon, 20.x.1965 (L, PERTH, Kings Park Perth). *McFarland 1238*, Howatharra Hill Reserve, 28° 32′ S, 114° 38′ E, 25.ix.1977 (AD 4 spec.). *F. Mueller s.n.*, Murchison River, Oct. 1877 (MEL 69251-2). *F. Mueller s.n.*, Shark Bay, Oct. 1877 (MEL 69228). *F. Mueller s.n.*, Greenough Flats, undated (M). *Oldfield s.n.s*, in sandy plain towards Murchison River, undated (MEL 69245, lectotype of *Chloanthes atriplicina* F. Muell.; BR, GOET, K, MEL 41219, MEL 69246, W - isolectotypes). *Phillips 1314*, 11 miles inland from Kalbarri, 19.ix.1968 (CBG). *E. Pritzel 637*, in the thicket between the Moore River and Murchison River, Sept. 1901 (B, BM, BR, E, G, GH, HBG, K, L, M, MO, NSW, S, US, W). *Went 30*, N of Northampton, 7.ix.1962 (GH, MO, PERTH, US). *Wittwer 1813*, Tamala, 12.viii.1976 (PERTH).

Distribution (Map 9B)

P. atriplicina is endemic in the west-south-west of Western Australia where it seems to be restricted between 26° and 29° S, and between 113° and 115° E. The main distribution is between Geraldton and Shark Bay. Elsewhere, it is known from Greenough Flats, south of Geraldton, and from Dirk Hartog Island in the Shark Bay.

Comments

P. atriplicina was originally described by F. Mueller (1859) as a species of *Chloanthes* R.Br., but in 1875 he noted it as *Pityrodia* R.Br. species. In his subsequent publications, however, F. Mueller (1882, 1889) recorded all *Pityrodia* species under the genus *Chloanthes*. (See further "Comments" under *P. verbascina*).

Bentham (1870) considered the calyx-lobes shorter than the tube, but in fact the calyx-tube is found to be shorter than its lobes. The misunderstanding seems to have been caused by the dense woolly calyx tomentum which completely fill the space between the lobes in the lower halves, and superficially gives the aspect of a calyx-tube.

Abnormal leaves are noticed in F. Mueller's collection (no. MEL 69252) from the Murchison River in which some leaves are found to be up to 5.5 by 3 cm. This is more than double the average leaf-size in the species.

P. atriplicina seems to grow in the same general area where *P. cuneata*, *P. oldfieldii* and *P. verbascina* are found. Nevertheless, *P. atriplicina* has been recorded from neighbouring Dirk Hartog Island where none of these species occur.

According to Ewart & Davies (1917), this species is "recorded from Northern Australia in National Herbarium Census". During present investigations, *P. atriplicina* is found to grow nowhere outside Western Australia. Even within Western Australia, the distribution is limited to the west-south-west.

Beard (1965, 1970) recorded this species from Gardner & Bennett's (1956) botanical district Darling in the South Western Province. This area seems too far south from its known habitat and there is no record to confirm its occurrence there. The main distribution is found to be in the Irwin district of the South Western Province and in its adjacent areas of the Austin district in the Eremean Province.

Affinity

P. atriplicina is nearly allied to *P. paniculata* in the majority of flower characters and in having the same close cineraceous indumentum on stem, leaves and peduncle. Nevertheless, it can easily be identified by its leaves being broadly ovate-obovate or almost orbicular; inflorescence not lax; cyme-peduncle shorter; calyx divided into lobes to above the middle only; lobes not arranged into 2-lips, oblong-ovate, glabrous on the lower inner halves; fruit elliptic-ovoid, shortly conical at the top.

35. **Pityrodia byrnesii** Munir sp. nov.

Caules et rami teretes, dense glandulosi et pubescentes; pilis ferrugineo-aurantiacis. Folia sessilia, verticillata terna, oblonga vel anguste elliptica, integra, breviter mucronata, 1.2-3 cm longa, 4-10 mm lata, glanduloso-viscida, sparsim pubescentia. Sepala extus glandulosa et pubescentia, lobis lanceolatis, acutis, 4-7 mm longis, 1.5-3 mm latis, tubo 3-4.5 mm longo. Corolla albi; tubus subcylindricus. Stamina breviter exserta. Fructus obovoidei, glandulosi, pubescentes.

Type: *V. Balgooy & N. Byrnes 1306*, 5 km south-east of East Alligator River Crossing, Arnhem Land, Northern Territory, Australia, 27.vii.1971 (L, holotype; CANB, MO - isotypes).

Description (Fig. 35)

A branched glandular shrub of about 1 m. *Stem* and branches terete, densely clothed with an indumentum of glands and more or less short stellate hairs interspersed with long-stalked septate hairs branching at the top, the old stem ferrugineous-orange. *Leaves* sessile, in whorls of 3, oblong or narrowly elliptic, flat, entire, shortly mucronate, (1.2-) 1.5-3 cm long, 4-10 mm broad, glandular-viscid, sparsely sprinkled with short and branched hairs, smooth above, with raised midrib underneath. *Flowers* sessile or shortly pedicellate, axillary and solitary, shorter than the leaves; pedicel glandular and tomentose, 1-2 mm long; bracts represented by the upper leaves; bracteoles sessile, oblong-lanceolate, entire, acute, glandular, sparsely sprinkled with a short pubescence, 6-11 mm long, 1.5-2.5 mm broad. *Calyx* persistent, more or less campanulate, longitudinally ribbed, divided more than half-way down into 5 lobes, 8-12 mm long, densely glandular and pubescent outside, pubescent inside the lobes, glabrous inside the tube; lobes lanceolate, ribbed on the back, acute, 4-7 mm long, 1.5-3 mm broad; tube campanulate, 3-4.5 mm long. *Corolla* off-white with deep purple streaks on the upper lip, 11-13 mm long, pubescent outside on the lobes only, with a dense hairy ring inside the tube below the insertion of stamens and a few sparse villous hairs extending to the central lobe of the lower lip; the upper lip erect, 2-lobed, shorter than the lower, the lobes oblong-elliptic or ovate-elliptic, with longitudinal purple veins, 3-4 mm long, 1.5-2 mm broad; the lower lip spreading, 3-lobed, the central lobe larger than the two lateral, more or less oblong-elliptic, 4-5 mm long, 1.5-2 mm broad, the lateral lobes narrowly elliptic-oblong, 3.5-4 (-5) mm long, 1.5-1.8 mm broad; tube almost cylindrical, glabrous outside, 5-8 mm long, 1.5-2.5 mm broad at the top end. *Stamens* shortly exserted, inserted in the corolla throat; filaments filiform, glabrous, the upper pair 2-2.5 (-3) mm long, the lower pair 2.5-3 mm long; anthers more or less orbicular in outline, 0.8-1 mm long, nearly as broad; lobes narrowly elliptic-oblong, shortly appendiculate at the lower ends, free and divergent in the lower halves. *Ovary* globose, glandular and densely pubescent-tomentose, 1-1.3 mm in diameter; style shortly exserted, filiform, glabrous, 7-10 (-12) mm long, minutely 2-lobed at the top. *Fruit* obovoid, glandular and pubescent, 3-4 mm long, 2.5-3 (-3.5) mm broad, apparently non-dehiscent; seeds not seen.

Specimens examined

NORTHERN TERRITORY: *Balgooy & Byrnes 1306*, 5 km south-east of East Alligator River Crossing, Arnhem Land, 27.vii.1971 (L, holotype; CANB, MO - isotypes). *Byrnes 916*, north bank of East Alligator River, 12° 25′ S, 133° 00′ E, 4.ix.1968 (BRI, DNA, L, NT).

Distribution (Map 9C)

P. byrnesii is endemic in Arnhem Land, Northern Territory, where it has been recorded from about 10 km south-west of Oenpelli near the East Alligator River.

Comment

The shrubs of this species are fragrant (*Van Balgooy & Byrnes 1306*).

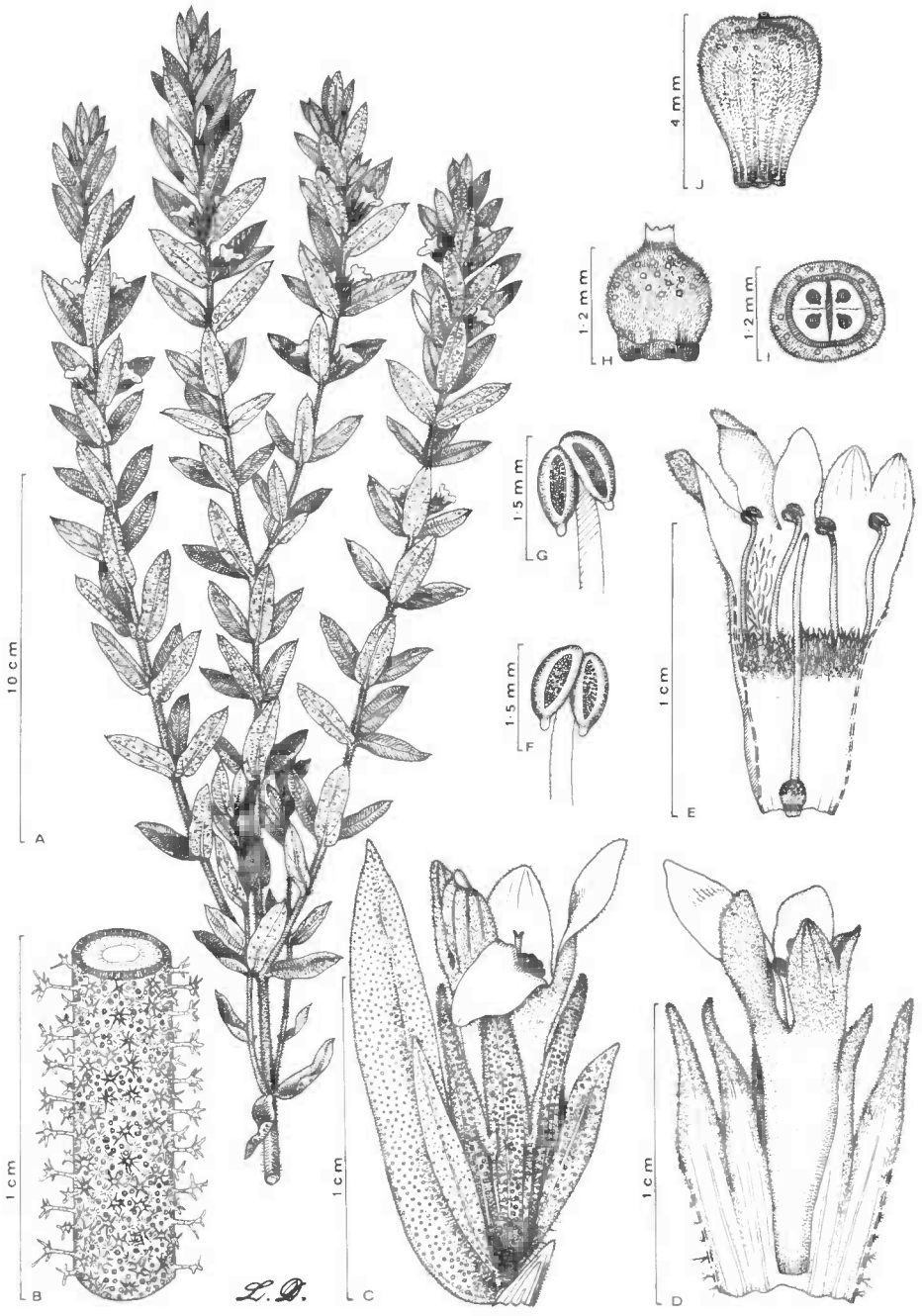


Fig. 35. *Pityrodia byrnesii* Munir (*V. Balgooy & N. Byrnes 1306*: CANB, isotype). A, flowering twig; B, portion of stem showing hair types; C, flower in the axil of a leaf with two bracteoles; D, flower with calyx vertically cut open to show corolla-tube; E, corolla-tube vertically cut open to show androecium and gynoecium; F, lower stamen; G, upper stamen; H, ovary; I, transverse section of ovary; J, fruit.

Affinities

P. byrnesii is closely related to *P. ternifolia* in its stem being densely clothed with a short glandular tomentum intermixed with long and branched spreading hairs; leaves sessile, in whorls of 3, glandular; flowers axillary and solitary; calyx campanulate, ribbed, glandular and hairy outside; corolla-tube almost cylindrical, with the upper lip erect and streaked purple; stamens and style shortly exserted; anthers more or less orbicular in outline; fruit obovoid, pubescent. Nevertheless, *P. byrnesii* may easily be distinguished by its stem and leaves being covered with sessile glands, much less sticky; leaves entire, ovate-oblong, or narrowly elliptic; calyx-lobes not glandular inside; corolla pale white; stamens inserted in the corolla-throat; anther-lobes more distinctly appendiculate; ovary and fruit with glands mixed with the pubescence. In *P. ternifolia*, the glands are mostly on the tip of short hairs, leaves are very sticky and prickly with dentate margins, calyx-lobes glandular on the inside as well, corolla mauve or pink-red and ovary and fruit without any glands.

P. byrnesii is also close to *P. gilruthiana* and *P. pungens* in its leaves being sessile in whorls of 3; flower axillary and solitary; calyx ribbed; corolla pale white with the upper lip erect and deeply streaked purple; stamens and style shortly exserted; anther more or less orbicular in outline and fruit obovoid. However, both *P. gilruthiana* and *P. pungens* differ from *P. byrnesii* in their leaves being narrowly linear-lanceolate and ovary and fruit without any glands. *P. pungens* may be further distinguished by its very pungent leaves and corolla equal to the calyx or shorter.

36. **Pityrodia terminalis** (Endl.) George, Nuytsia, 1(1972) 289; R. Erickson et al., Fl. Pl.West.Aust.(1973)114, t.342; Gard., Wildfls West.Aust. edn 11(1973)119, 120.

Type: *J.S. Röe s.n.*, interior of Western Australia, undated (W, holotype).

Dasymalla terminalis Endl., in Endl. & Fenzl, Nov.Strirp. dec.2(1839) n. 12, *basionym*; Walp., Rep.Bot.Syst.4 (1845)139; DC., Prod.11(1847)705.

Type: As for *Pityrodia terminalis* (Endl.) A.S. George.

Pityrodia racemosa (Turcz.) Benth., Fl.Aust.5(1870)50 exclud.syn. *D.axillaris* Endl.; Briq., Mém.Soc.Phys. Genève 32(2), no. 8(1896)78; Diels & E. Pritz., Bot.Jahrb.Syst.35(1904)521; S. Moore, J.Linn.Soc. London 45 (1920)189; Mold., Résumé Verben.etc. (1959)210.

Type: *J. Drummond 3rd coll. no. 141*, Swan River Colony, Western Australia, 1845 (BM, G, K, LE, MEL 2 spec., W - syntypes); *J. Drummond Suppl. 5th coll. no. 73*, loc.cit, 1848 (BM, FI, G 2 spec., K 3 spec., LE, MEL 3 spec., P, PERTH, W - syntypes).

Quoya racemosa Turcz., Bull.Soc.Nat.Mosc.36(2) (1863)194, *basionym* of *P. racemosa* (Turcz.) Benth.

Type: As for *Pityrodia racemosa* (Turcz.) Benth.

Chloanthes stachyodes F. Muell., Fragm.5(1865)50; F. Muell., Fragm.6(1868)158 exclud. syn. *Dasymalla axillaris* Endl.; F. Muell., Syst.Cens.Aust.Pl.1(1882)103; F. Muell., Syst.Cens.Aust.Pl.1, edn 2(1889)172; Mold., Résumé Verben.etc. (1959)251.

Type: *F.v. Mueller s.n.*, near Mt Walter, Lat. 30° 15′ S, Long. 118° 45′ E, undated (MEL 69254, holotype).

Quoya stachyodes F. Muell., Fragm.5(1865)50, nom.nud. pro syn. *Chloanthes stachyodes* F. Muell.

Chloanthes grandiflora Mold., Phytologia 2(1947)310; Mold., Résumé Verben. etc. (1959)208; Mold., Fifth Summary Verben. etc. 1(1971)345.

Type: *J. Mauritzon s.n.*, Western Australia, Sept. 1936 (S, holotype; LD, isotype).

Pityrodia axillaris sensu Druce, Rep.Bot.Exch.Cl.Brit.Isles 1916 (1917)640 p.p. quoad syn. *Quoya racemosa* Turcz. and *Dasymalla terminalis* Endl.; Gard., Enum.Pl.Aust.Occ.3(1931)112 p.p. quoad syn. *P. racemosa* (Turcz.) Benth.; Gard., Wildfls West.Aust. (1959)132 p.p. quoad description and t. page 130; Blackall & Grieve, West.Aust.Wildfls 3(1965)570 p.p. quoad syn. *P. racemosa* (Turcz.) Benth. and t. at the front; Beard (Ed.), W.Aust.Pl. edn 2 (1970) 114 p.p. quoad descrip. et distrib.; Mold., Fifth Summary Verben. etc. 1 & 2 (1971) 475, 603 p.p. quoad syn. *D. terminalis* Endl. and *P. racemosa* (Turcz.) Benth.; Gard., West.Aust.Wildfls Vol. B (1972)158, 159 lower plate.

Description (Fig. 36)

An erect shrub of about 0.5-1 (-1.5) m high. *Stem* and branches densely covered with white woolly indumentum of branched hairs. *Leaves* sessile, sometimes stem-clasping, oblong or narrowly elliptic-oblong, obtuse, entire, (1.5-) 2-3.5 (-5) cm long, rarely up to 7.5 cm long, (0.5-) 0.8-1.5 (-2) cm broad, thick and soft, rugose, the rugae concealed by the dense indumentum of branched hairs. *Flowers* axillary solitary or more frequently in cymes of 3 to 5, pedicellate, forming an interrupted terminal leafy raceme; pedicel 3-5 (-7) mm long, densely tomentose; bracts sessile, elliptic-ovate or oblong-lanceolate, abaxially tomentose, adaxially glabrous, 4-6 mm long, 1-2.5 mm broad; bracteoles sessile, oblong-ovate or more or less lanceolate, tomentose on abaxial surface, glabrous on adaxial surface, 2-4 mm long, 0.5-1 mm broad. *Calyx* persistent, 5-partite almost to the base, shortly tubular at the base, 1-1.2 (-1.5) cm long, densely clothed with branched woolly tomentum outside, glabrous inside with sparse hairs on the upper-inner half; lobes linear-lanceolate, reticulate, (6-) 8-10 mm long, 2-3 mm broad; tube 1-2 mm long. *Corolla* deep purple-pink to claret-red, occasionally pale pink, 1.8-2.7 cm long, puberulous outside, glabrous inside excepting the dense hairy ring above the ovary, and with minute sparse hairs extending to the large anterior lobe; the central lobe of the lower lip almost twice as broad as the other 4 lobes, more or less orbicular in outline, 4-7 mm long, 6-10 mm broad; the other 4 lobes nearly equal, spreading, broadly ovate-suborbicular, (2-) 3-5 (-6) mm long, 4-6 mm broad at the base; tube dilated within or immediately above the calyx, (14-) 15-20 mm long, 8-10 mm broad in the upper half. *Stamens* included; filaments glabrous, filiform, 5-8 (-9) mm long; anthers oblong, (1-) 1.5-2 mm long, c. 1 mm broad, the two anterior somewhat smaller than the two posterior, lobes linear, free in the lower halves, at length diverging, each with a short appendage at the lower end. *Ovary* globose, with two lateral humps when old, 1-1.5 mm in diameter, pubescent in the upper half, glabrous below; style included or scarcely exserted, glabrous, filiform, (14-) 16-20 mm long, 2-lobed at the summit. *Fruit* enclosed within the persistent calyx, somewhat isodiametric, conical at the tip and with a hump on the back of each carpel, splitting into two separate 2-celled hemispherical nutlets, 4-5 mm long, nearly as broad, pubescent.

Representative specimens

WESTERN AUSTRALIA (248 collections seen): *Adams s.n.*,"Nangowine", 1891 (MEL 69221). *Anway 507*, 38 miles east of Southern Cross, 10.x.1965 (AD, NY, PERTH). *Aplin 1930*, 470 km E of Perth on Gt East. Hway, 11.ix.1962 (L, PERTH). *E. Ashby 2707*, Kojonup to Collier, Sept. 1930 (BM, NSW). *Bailey 304*, 1 mile N of Tandagin, Sept. 1947 (CANB, PERTH). *Barrow 53*, Hyden, 6.ix.1966 (Kings Park Perth, PERTH). *Beard 5180*, 10 m E of Southern Cross, 23.x.1967 (PERTH, Kings Park Perth). *Blockley 464*, 50 m S. of Payne's Find, 28.x.1966 (PERTH, Kings Park Perth). *Brockway s.n.*, Murchison district, Oct. 1947 (CANB, PERTH). *Burbidge 4696*, 2 mile N Perenjori, 8.xii.1955 (CANB, PERTH). *Burns 1053*, 390-394 mile peg N of Geraldton, 23.x.1966 (MO, PERTH). *Canning 2725-6*, 22.5 mile W of Moorine Rock, 10.ix.1968 (CBG 2 spec.). *Demarz 3181*, 229 mile post Newdegate Rd, 17.i.1971 (PERTH, Kings Park Perth). *Donner 1391*, 2 km W of Nulla Nulla, 30.ix.1965 (AD). *Drummond Suppl. 5th Coll. no 73*, Swan River Colony, 1848 (BM, FI, G 2 spec., K 3 spec., LE, MEL 3 spec., P, PERTH, W - syntypes of *Quoya racemosa* Turcz.). *Drummond 3rd coll. no. 141*, Swan River colony, 1845 (BM, G, K, LE, MEL 2 spec., W - syntypes of *Quoya racemosa* Turcz.). *Fontteroy & Grasby s.n.*, Dowerin, 5.i.1918 (BRI 190697-8, NSW 135905). *Forrest s.n.*, near Lake Deborah, 1889 (MEL 69268, NSW 135904). *Gardner 2027*, Bendering, 15.xi.1923 (PERTH). *George 121*, 3.4 km W of Bullaring, 7.ix.1976 (PERTH). *Haegi 998*, 90 km NE of Lake King on track to Norseman, 16.ix.1976 (AD). *Helms s.n.*, Elder Expl.Exped., near "Warangering" Wallangering, Nov. 1891 (AD 96323029, AD 97608116, AD 97726002, MEL 69270, NSW 135902). *Koch 1539*, Cowcowing, Oct. 1904 (AD, K, MEL, NSW). *Lullfitz 5563*, W of Lake King, 8.x.1966 (PERTH, Kings Park Perth). *Mauritzon s.n.*, loc. incert. Sept. 1936 (S, holotype of *Chloanthes grandiflora* Moldenke; F photo of holotype; LD, isotype). *F. Mueller s.n.*, near Mt. Walter "Lat. 30° 15' S, Long. 118° 45' E", undated, probably 1864 (MEL 69254, holotype of *Chloanthes stachyodes* F. Muell.). *Munir 5239*, 95 km W of Coolgardie, 5.ix.1973 (AD). *Munir 5265*, 25 km S of Narembeen, 7.ix.1973 (AD). *Newby 994*, 1 mile S of Kukerin, 29.ix.1963 (PERTH). *Paust 1022*, 9.2 mile E of Bindi Bindi towards Ballidu, 28.ix.1971 (PERTH). *Phillips s.n.*, 3 mile from Bencubbin towards Trayning, 19.ix.1962 (CBG 012029). *J.S. Röe s.n.*, interior of Western Australia, loc.incert., undated (W, holotype of *Dasymalla terminalis* Endl.). *Stoward 392*, Kununoppin, 1916 (BM). *Thiselton-Dyer 120*, between Cunderdin and "Wedari", 1903 (K). *J. Young s.n.*, near Mt Churchman, undated (MEL 69281).

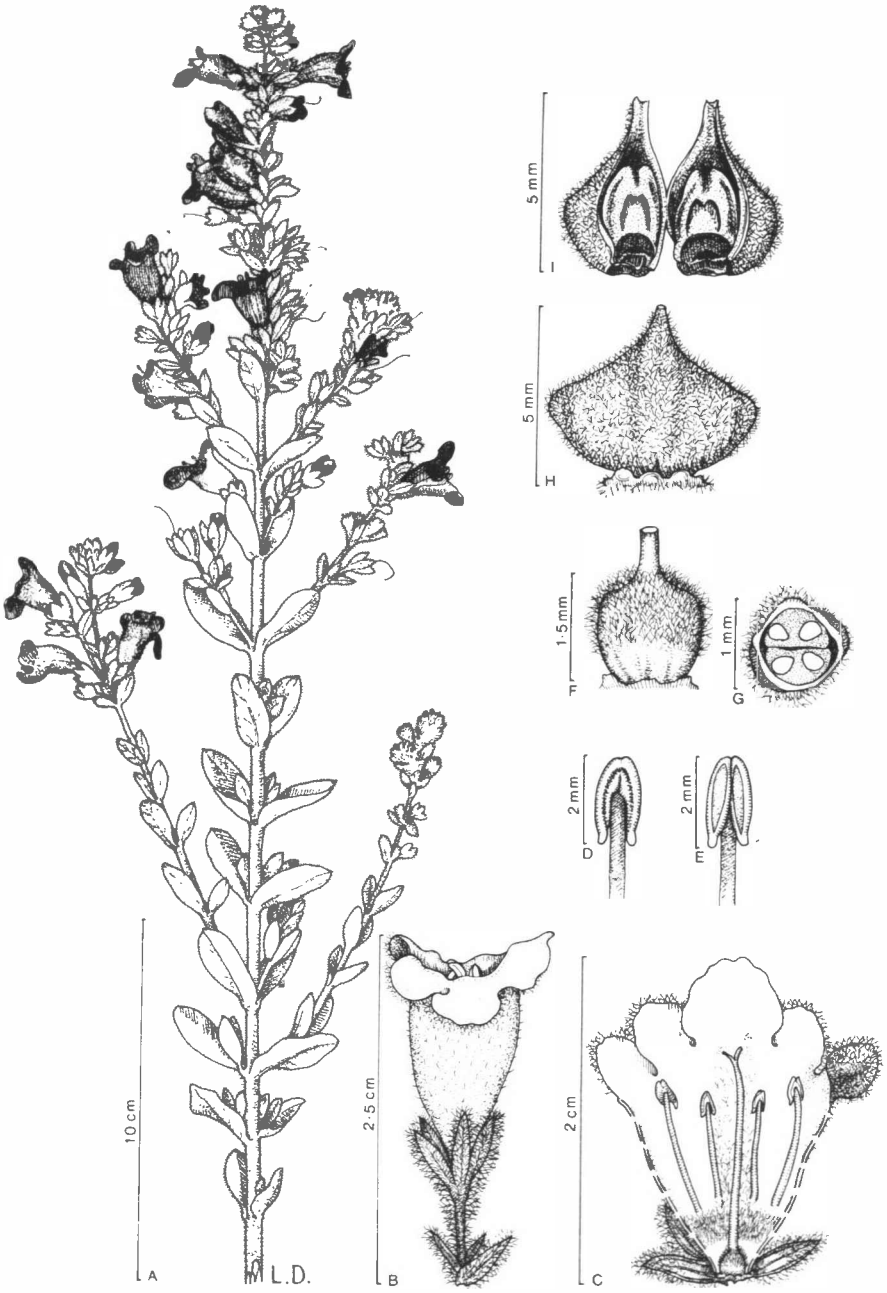
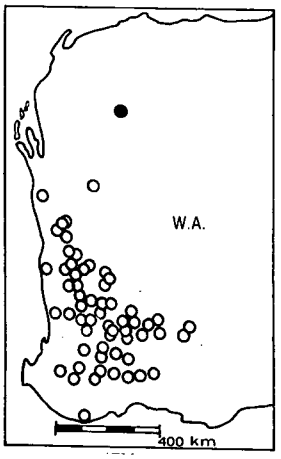


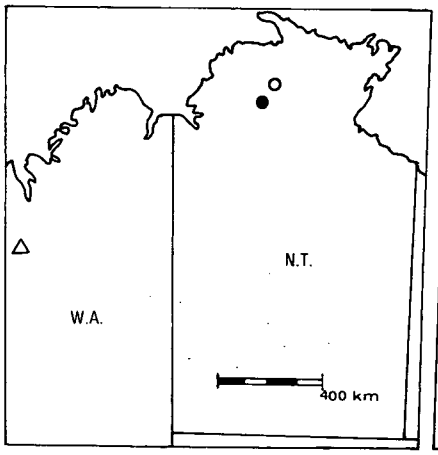
Fig. 36. *Pityrodia terminalis* (Endl.) A.S. George (*J.Z. Weber 5111*: AD). A, flowering branch; B, flower with a bract and two bracteoles; C, flower with calyx and corolla vertically cut open to show androecium and gynoecium; D, lower stamen; E, upper stamen; F, ovary; G, transverse section of ovary; H, fruit; I, fruit split open into two halves.

Distribution (Map 10A)

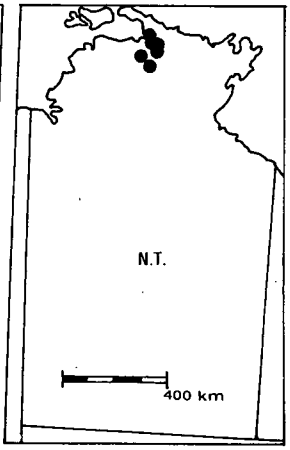
P. terminalis is endemic to south-west of Western Australia. The main areas of its occurrence are in the South Western Province (as defined by Gardner & Bennetts, 1956) and in the Austin and Coolgardie districts of the Eremean Province. The distribution within these areas seems to be restricted between latitude 26° and 35° S, and between longitude 114° and 122° E. In the north it is known from around the Murchison River, extending southwards to King George Sound. The western-most records are from near Geraldton and Perth, spreading eastwards to Kalgoorlie and Lake Lefroy.



Map 10A.
P. terminalis ○
P. augustensis ●



Map 10B.
P. ovata △
P. lanuginosa ○
P. spenceri ●



Map 10C.
P. jamesii ●

Comments

For many years, *P. terminalis* (Endl.) George, *P. axillaris* (Endl.) Druce and *P. racemosa* (Turcz.) Benth., which are based respectively on *Dasymalla terminalis* Endl. (1839), *D. axillaris* Endl. (1839) and *Quoya racemosa* Turcz. (1863) have been erroneously regarded as conspecific. These taxa therefore, have been incorrectly referred to as *P. axillaris* (Endl.) Druce, and before the publication of that combination as *P. racemosa* (Turcz.) Benth. The latter combination was found to be illegitimate because it was not based on Endlicher's earliest available epithet in *Dasymalla* Endl. Therefore, Druce (1917) made a new combination *P. axillaris* (Endl.) Druce, based on *D. axillaris* Endl., with *P. racemosa* (Turcz.) Benth. (= *Quoya racemosa* Turcz.) as a synonym, and following Bentham (1870) and Index Kewensis (1895), incorrectly merged *D. terminalis* Endl. into *D. axillaris* Endl. The name *P. axillaris* (Endl.) Druce, however, was accepted for the species by many subsequent botanists.

The treatments of this species by Bentham (1870) and Druce (1917) indicate that either they had a broad concept of this species or else they could not distinguish these taxa from their original description. Apparently, they did not see the types of *Dasymalla* which are preserved in Herb. W.

George (1972) examined the types and original descriptions of both *Dasymalla* species and segregated them as two distinct taxa. Consequently, he made a new combination *P. terminalis* (Endl.) George, based on *D. terminalis*, with *P. racemosa* (Turcz.) Benth. as a synonym. This combination is accepted in the present revision.

This is one of the most widespread and common species of this genus. Moldenke (1959, 1971) recorded it from Queensland and New South Wales, but so far its occurrence in these states has not been confirmed.

The pedicels of the terminal flowers are always longer than the laterals. Similarly, the filaments of the two anterior stamens beside the large anterior corolla-lobe are longer than those at the posterior. The anthers of the two anterior stamens, however, are smaller than the two at the posterior.

Bentham (1870) described the calyx-lobes as "3-nerved segments". Actually, each calyx-segment (or lobe) has a main central vein with two less prominent veins running parallel along the margin. This seems no peculiarity as such a venation pattern is also present in the calyx-segments of other species of this genus.

Transverse sections of ovary and fruit show that their humps are due to the thickening of their walls along the distal (parietal) ends of septa.

A detailed description and illustration of fruit are presented here for the first time.

This species is popularly called "Native Foxglove" or "Woolly Foxglove".

Affinities

P. terminalis is closely allied to *P. augustensis* in its flowers being pedicellate, arranged in a raceme-like terminal inflorescence of more or less similar shape and colour; stem, leaves and outside calyx densely clothed with similar indumentum; calyx-lobes almost free to the base; corolla-tube abruptly dilated within or immediately above the calyx; stamens and style included; anthers oblong. Nevertheless, *P. terminalis* may easily be distinguished by its leaves being elongate-ellipsoidal and somewhat stem-clasping; calyx and corolla without glands and fruit somewhat isodiametric with a conical tip and a hump on the back of each nutlet.

P. terminalis is also near to *P. axillaris* in its stem and leaves having a similar indumentum, inflorescence terminal, raceme-like, calyx-lobes almost free to the base, corolla-tube abruptly dilated within or immediately above the calyx. However, *P. axillaris* can readily be identified by its leaves being oblong-obovate; calyx-lobes obovate; corolla deep red or yellowish-scarlet, tube almost glabrous outside and with clavate hairs inside below the central lobe of the lower lip, lobes undulate-denticulate; stamens and style much exserted; fruit obovoid with two opposite humps at the top.

37. **Pityrodia ovata** Munir, sp. nov.

Caules et rami teretes, dense tomentosi. Folia sessilia, opposita, ovata, integra, obtusa, marginibus raro leviter recurvatis, 5-15 mm longa, 3-6 mm lata, viscida, pilis densibus glandiferis. Sepala extus glandulosa, lobis lineatis vel lineari-oblongis, fere discretis, lobis linearibus vel lineari-oblongis, margine ciliato, 3-4 mm longis, 0.5-1 mm latis, tubo 0.5-1 mm longo. Corolla alba. Stamina exserta. Ovarium globosum, dense glandulosum; pilis minutis glanduliferis. Fructus visus non.

Type: *J.S. Beard 5686*, 16 km west of McLarty Hill's Oil Camp, Western Australia, 4.vii.1968 (PERTH, holotype; Kings Park Perth, isotype).

Description (Fig. 37)

Dense shrub to 1.21 m. *Stem* and branches cylindrical, densely clothed with a dense yellowish-grey indumentum of branched hairs. *Leaves* sessile, decussate, ovate, entire, obtuse, flat, rarely slightly recurved along the margins, (5-) 7-12 (-15) mm long, 3-6 mm broad, somewhat viscid, densely covered all over with short gland-tipped hairs, smooth above, honey-combed beneath. *Flowers* sessile or shortly pedicellate, solitary or more often 3 together in the axil of upper leaves; pedicel glandular-glutinous, ±1 mm long;

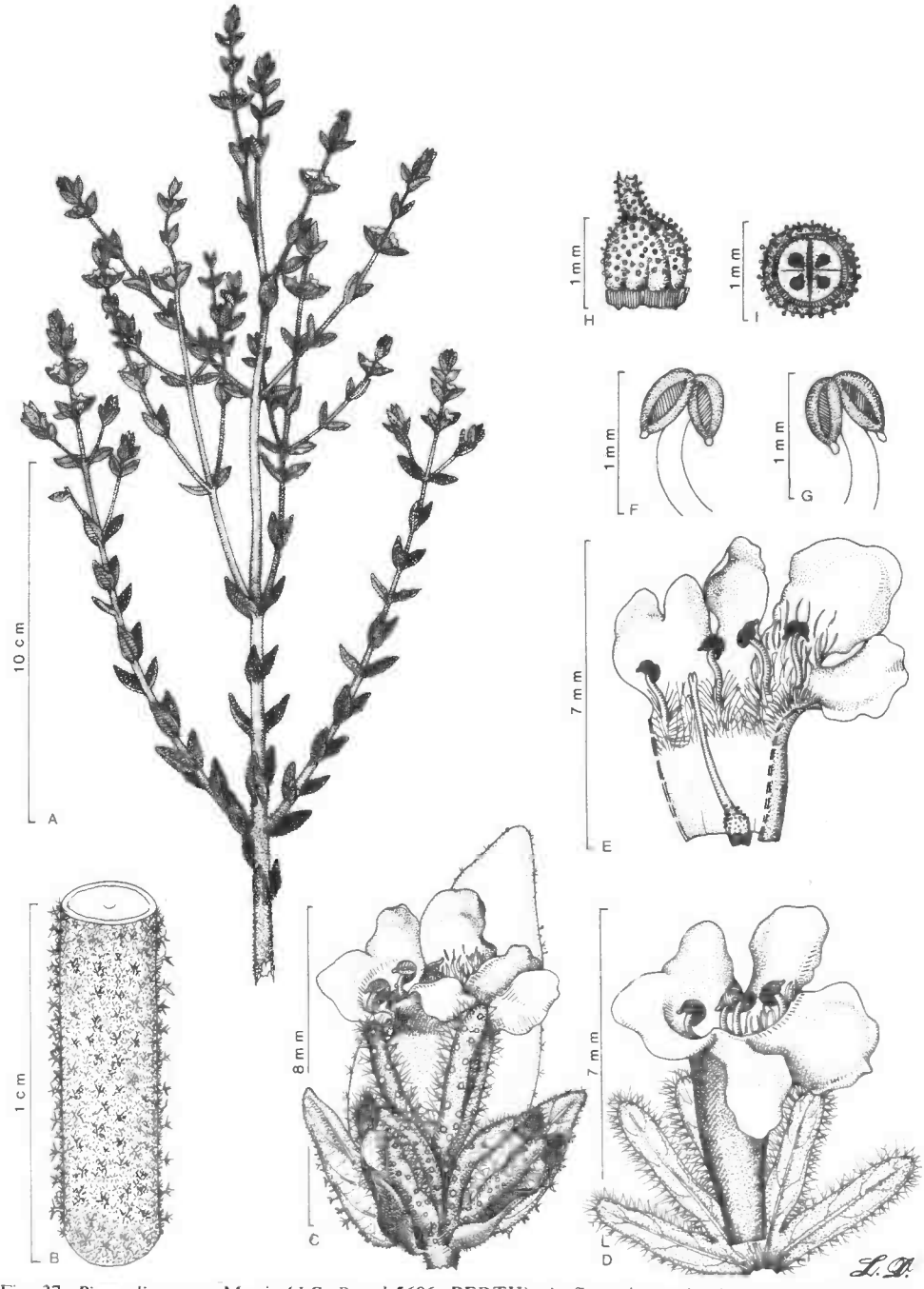


Fig. 37. *Pityrodia ovata* Munir (*J.S. Beard 5686*: PERTH). A, flowering twig; B, portion of stem showing indumentum; C, cyme in the axil of a leaf; D, flower with calyx vertically cut open to show corolla-tube; E, corolla-tube vertically cut open to show androecium and gynoecium; F, upper stamen; G, lower stamen; H, ovary; I, transverse section of ovary.

bracts leafy, sessile, ovate, densely covered with minute gland-tipped hairs, 4-6 mm long, 2-3 mm broad; bracteoles smaller than the bracts, 3-3.5 mm long, 1-1.5 mm broad. *Calyx* persistent, deeply 5-lobed, 3.5-5 mm long, glandular outside excepting the ciliate lobe-margins, glabrous inside the tube; lobes linear or linear-oblong, almost free to the base, obtuse, flat, 3-4 mm long, 0.5-1 mm broad; tube 0.5 (-1) mm long. *Corolla* white, 5-7 mm long, glabrous outside, with a dense hairy ring in the throat below the stamens and a few villous hairs extending to the large central lobe of the lower lip; the central lobe almost elliptic-orbicular in outline, rounded at the apex, 2.5-3 mm long, 2-2.5 mm broad; the lateral lobes of the lower lip narrowly elliptic-oblong, rounded at the apex, 2-2.5 mm long, ± 1.5 mm broad; the lobes of the upper lip ovate, obtuse, 1-1.5 mm long, nearly as broad at the base; tube more or less cylindrical in the lower half, dilated at the top within or immediately above the calyx, 3-3.5 mm long, 2-2.5 mm broad at the top end. *Stamens* exserted; filaments filiform, with a few sparse short gland-tipped hairs, the lower pair 2-2.5 mm long, the upper pair 1-1.5 mm long; anthers more or less orbicular in outline, 0.5-0.8 mm long, nearly as broad, lobes free and divergent in the lower halves, appendiculate at the lower ends. *Ovary* globose, densely covered with glands and minute gland-tipped hairs, ± 1 mm in diameter; style exserted above the corolla-tube, filiform, glabrous, with a few gland-tipped minute hairs towards the base, 4-5 mm long, shortly 2-lobed at the top. *Fruit* not seen.

Specimens examined

The type collection is the only material available for examination.

Distribution (Map 10B)

P. ovata is endemic to the north-north-west of Western Australia, where it has been recorded from west of McLarty Hills in the Great Sandy Desert.

Comments

The description of *P. ovata* was prepared from the type material which lacks fruit. However, the major flower characters, especially the ovary, so closely resemble *P. chorisepala* that it is very likely that their fruits may also be similar.

The location of the dense hairy ring in the corolla-throat is a peculiarity of this species because the hairy ring inside the corolla-tube is generally just above the ovary.

Affinity

P. ovata seems nearest to *P. chorisepala* in its leaves being sessile and more or less of the same shape and size; flowers often 3 together in the axil of upper leaves; pedicel and outside of calyx glandular-glutinous; calyx-lobes linear-oblong, almost free to the base, with tomentum of branched ciliate hairs along the margins; corolla white, glabrous outside; stamens and style shortly exserted, filaments and basal portion of style with a few sparse gland-tipped hairs; ovary glandular with minute gland-tipped hairs. Nevertheless, *P. ovata* may easily be distinguished by its leaves being honey-combed underneath, not contracted at the base, covered all over with short gland-tipped hairs; leaves and inflorescence lax, not crowded towards the apex; pedicel short, ± 1 mm long; calyx-lobes obtuse with rounded tip.

38. **Pityrodia augustensis** Munir, sp. nov.

Caules et rami teretes, pilis densibus, ramosis, viridi-albis. Folia opposita, sessilia, anguste elliptica vel elliptico-lanceolata, versus extrema amba cuneata, obtusa, integra, 3-6 cm longa, 0.6-1.5 cm lata, dense lanuginosa-tomentosa. Sepala atropurpurea, fere discreta; lobis lineari-oblongis, cuneatis, 8-11 mm longis, 2-3 mm latis, tubo 0.5-1 mm longo. Petala extus glandulosa et sparsim lanuginoso-tomentosa, violacea. Stamina

inclusa vel interdum vix exserta. Fructus plus minusve lobosi, pubescentes, vix depressi saepe apice.

Type: *J.Z. Weber 4834*, northern slopes of Mount Augustus, North-West Division, Western Australia, 29.ix.1975 (AD, holotype; CANB, K, MEL, PERTH - isotypes).

Description (Fig. 38)

A branched tomentose shrub of about 1 m. *Stem* and branches terete, densely clothed with greenish-white indumentum of branched hairs. *Leaves* opposite, sessile, narrowly elliptic or elliptic-lanceolate, cuneate towards both ends, obtuse, entire, 3-6 mm long, 0.6-1.5 cm broad, thick and soft due to dense woolly tomentum, the reticulation concealed by the tomentum. *Flowers* pedicellate, solitary or more frequently in cymes of 3 to 5, forming terminal woolly racemes of 5-15 cm long; pedicel woolly-tomentose, glandular, usually 2-5 mm long, sometimes more; bracts sessile, narrowly elliptic, glandular and woolly-tomentose on abaxial surface, sparsely so on adaxial surface, usually 3-8 mm long, 1.5-4 mm broad; bracteoles sessile, narrowly elliptic or linear-lanceolate, glandular and woolly-tomentose on abaxial surface, almost glabrous or sparsely hairy on the adaxial surface, usually 2-4 mm long, 0.5-1.5 mm broad. *Calyx* deeply purple-lilac, persistent, divided almost to the base into 5 3-nerved lobes, shortly tubular at the base, 9-12 mm long, glandular and woolly-tomentose outside and on the inner surface of the lobes, glabrous inside the short basal tube; lobes linear-oblong, slightly narrowed at both ends, entire, reticulate, 8-11 mm long, 2-2.5 (-3) mm broad; tube 0.5-1 mm long. *Corolla* deep lilac, 18-25 mm long, 2-lipped, with a broad tube, the upper lip 2-lobed, the lower lip 3-lobed, lobes and tube glandular and sparsely woolly hairy outside, glabrous inside excepting the dense hairy ring above the ovary and a few villous hairs extending to the large central lobe of the lower lip; lobes spreading, more or less sub-orbicular in outline; the central lobe of the lower lip almost twice as broad as the other 4 lobes, 5-7 mm long, 8-11 mm broad; the other 4 lobes almost equal, 3.5-5.5 mm long, 4-5 mm broad; tube abruptly dilated within or immediately above the calyx, 13-16 mm long, 7-10 mm broad. *Stamens* included, sometimes shortly exserted, sub-didynamous; filaments filiform, glabrous, the upper pair 5-7 mm long, the lower pair 8-10 mm long; anthers oblong, the upper pair longer than the lower, ± 3 by 1-1.5 mm, the lower pair 2-2.5 by 1-1.5 mm, lobes in all anthers linear-oblong, free and divergent in the lower halves, shortly appendiculate at the lower ends. *Ovary* globose, pubescent-tomentose, 1-1.5 mm in diameter; style included, sometimes shortly exserted above the corolla-tube, filiform, glabrous, 14-18 mm long, 2-lobed at the summit. *Fruit* enclosed within the persistent calyx, more or less globular, pubescent, with often a shallow depression at the top, 2-3.5 mm long, 2-3 mm broad, apparently non-dehiscent; seeds not seen.

Specimens examined

WESTERN AUSTRALIA: *Weber 4834*, northern slopes of Mt Augustus, North-West Division, 24° 19′ S, 116° 53′ E, 29.ix.1975 (AD, holotype; CANB, K, MEL, PERTH - isotypes). *Wittwer 1089*, loc. cit. 24° 20′ S, 116° 50′ E, 19.viii.1973 (PERTH, Kings Park Perth). *Wittwer S.1761 (43)*, loc. cit. western summit, Sept. 1971 (Kings Park Perth).

Distribution (Map 10A)

P. augustensis is endemic to Western Australia where it has been recorded only from the Mount Augustus area in the North West Division.

Comments

Superficially this species may be mistaken for its closest allies *P. axillaris* and *P. terminalis*, both of which have somewhat similar inflorescence and flowers. Nevertheless, *P. augustensis* can readily be identified by its narrowly elliptic leaves cuneate towards both ends. *P. augustensis* occurs in the North West Division, while the other two species grow in the South West Division.

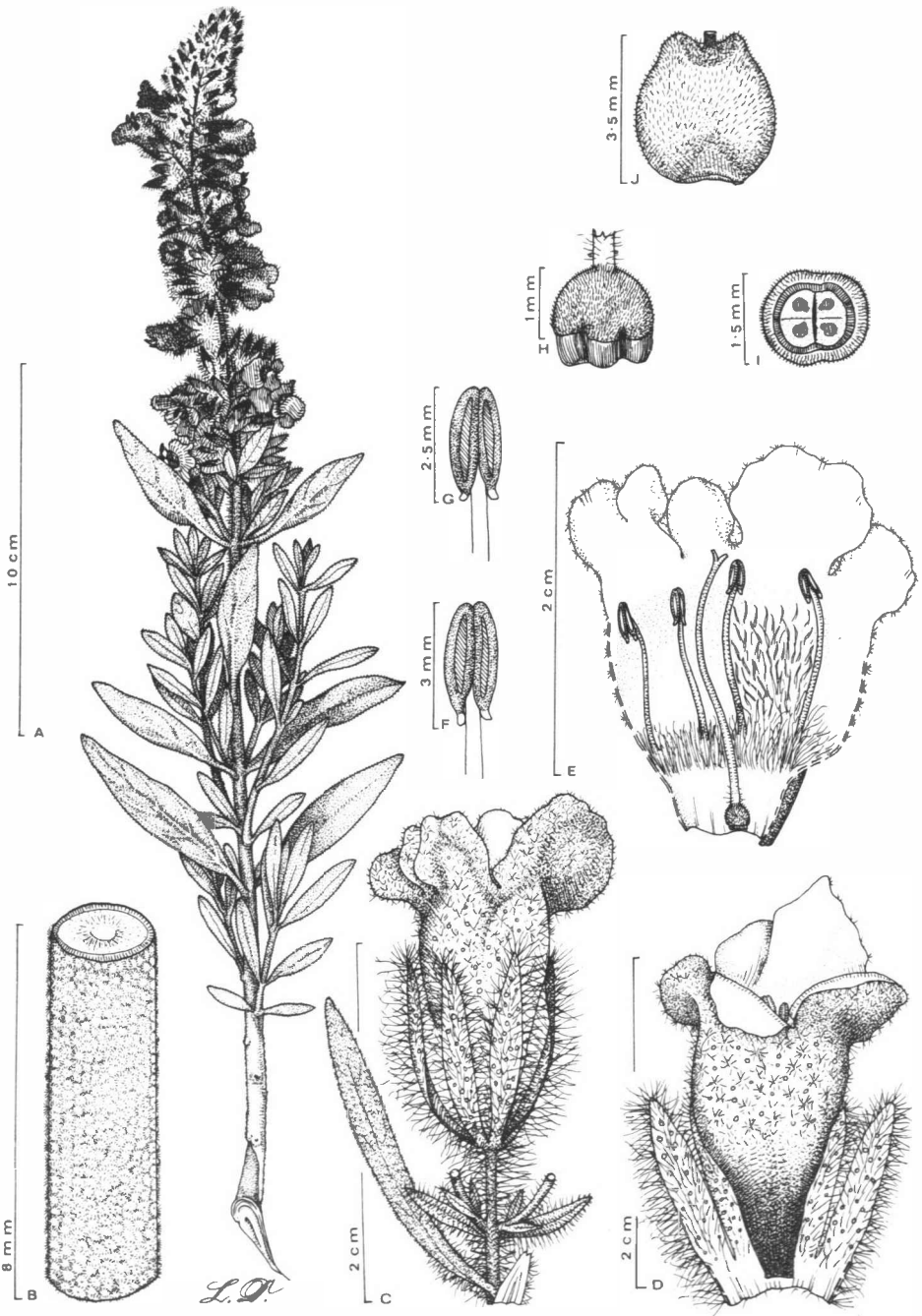


Fig. 38. *Pityrodia augustensis* Munir (A-I, *E. Wittwer 1089*: PERTH; J, *J.Z. Weber 4834*: AD). A, flowering branch; B, portion of stem; C, cyme with two lateral flowers removed; D, flower with calyx vertically cut open to show corolla-tube; E, corolla-tube vertically cut open to show androecium and gynoecium; F, upper stamen; G, lower stamen; H, ovary; I, transverse section of ovary; J, fruit.

Unlike several other *Pityrodia* species, the anthers on the upper pair of stamens are longer than the lower pair. The filaments of the lower pair, however, are longer than the upper pair which is in common with the rest of the species.

Affinities

P. augustensis is closely related to *P. terminalis* in its pedicellate flowers being arranged in a terminal raceme-like inflorescence of more or less similar shape and colour; stem and leaves densely clothed with similar indumentum of branched hairs; calyx tomentose outside with the lobes almost free to the base; corolla-tube abruptly dilated within or immediately above the calyx; stamens and style included; anthers oblong. Nevertheless, *P. augustensis* may easily be distinguished by its leaves being narrowly elliptic, cuneate towards both ends; calyx-lobes glandular and tomentose outside and inside; corolla-tube glandular and sparsely woolly outside; fruit more or less globular. The leaves in *P. terminalis* are mostly elongate-ellipsoidal and somewhat stem-clasping, and the fruit is isodiametric with a conical tip and a hump on the back of each nutlet.

P. augustensis is also allied to *P. axillaris* in having similar indumentum on stem and leaves, terminal raceme-like inflorescence, deeply lobed calyx and abruptly dilated corolla-tube within or immediately above the calyx. *P. axillaris*, however, can easily be identified by its leaves being oblong-obovate; calyx-lobes obovate; corolla deep red or yellowish-scarlet, with clavate hairs inside below the central lobe of the lower lip, tube almost glabrous outside; lobes undulate-denticulate; stamens and style much exserted; fruit obovoid but slightly compressed and with two opposite short humps at the top, tomentose all over.

39. **Pityrodia lanuginosa** Munir, sp. nov.

Caules et rami teretes, dense lanuginoso-tomentosa. Folia opposita, sessilia, anguste ovato-lanceolata, integra, acuminata, 8-25 mm longa, 2-6.5 mm lata, sparsim lanuginoso-tomentosa, glandulis adspersis. Sepala extus glandulosa et sparsim tomentosa, lobis lanceolatis, 3-5 mm longa, 1.5-2 mm lata, tubo 1.5-2 mm longo. Corolla subalba. Stamina exserta. Fructus obovoidei, pubescentes.

Type: *Martensz & Schodde AE579*, 2-3 miles (c. 4 km) north of El Sharana, Arnhem Land, Northern Territory, Australia, 25.i.1973 (NT, holotype; BRI 2 spec., CANB, DNA - isotypes).

Description (Fig. 39)

A woolly-tomentose spreading shrub to 30 cm. *Stem* and branches terete, densely clothed with woolly tomentum of dendriform hairs. *Leaves* sessile, decussate, narrowly ovate-lanceolate, entire, acuminate, almost flat or slightly recurved along the margins, (8-) 10-20 (-25) mm long, (2-) 3-5 (-6.5) mm broad, sparsely woolly-tomentose, sprinkled with minute glands, smooth above, the midrib and primary lateral veins raised underneath. *Flowers* sessile, axillary and solitary, shorter than the leaves; bracts represented by the upper leaves; bracteoles sessile, lanceolate, entire, acute, sparsely glandular and tomentose, 3-7 mm long, 1-1.5 mm broad. *Calyx* persistent, longer than the upper corolla-lip, more or less campanulate, ribbed, divided more than halfway down into 5 lobes, 5-7 mm long, glandular and sparsely tomentose outside, sparsely hairy on the inner surface of the lobes, glabrous inside the tube; lobes lanceolate, slightly recurved along the margins, acute, 3-5 mm long, 1.5-2 mm broad; tube more or less campanulate, 1.5-2 mm long. *Corolla* off-white with the upper lip streaked dark purple, 7-9 mm long, pubescent outside on the back of lobes, a dense hairy ring inside the tube below the insertion of stamens and a few villous hairs extending to the central lobe of the lower lip; the upper lip erect, 2-lobed, shorter than the calyx, the lobes oblong-ovate with dark purple streaks,

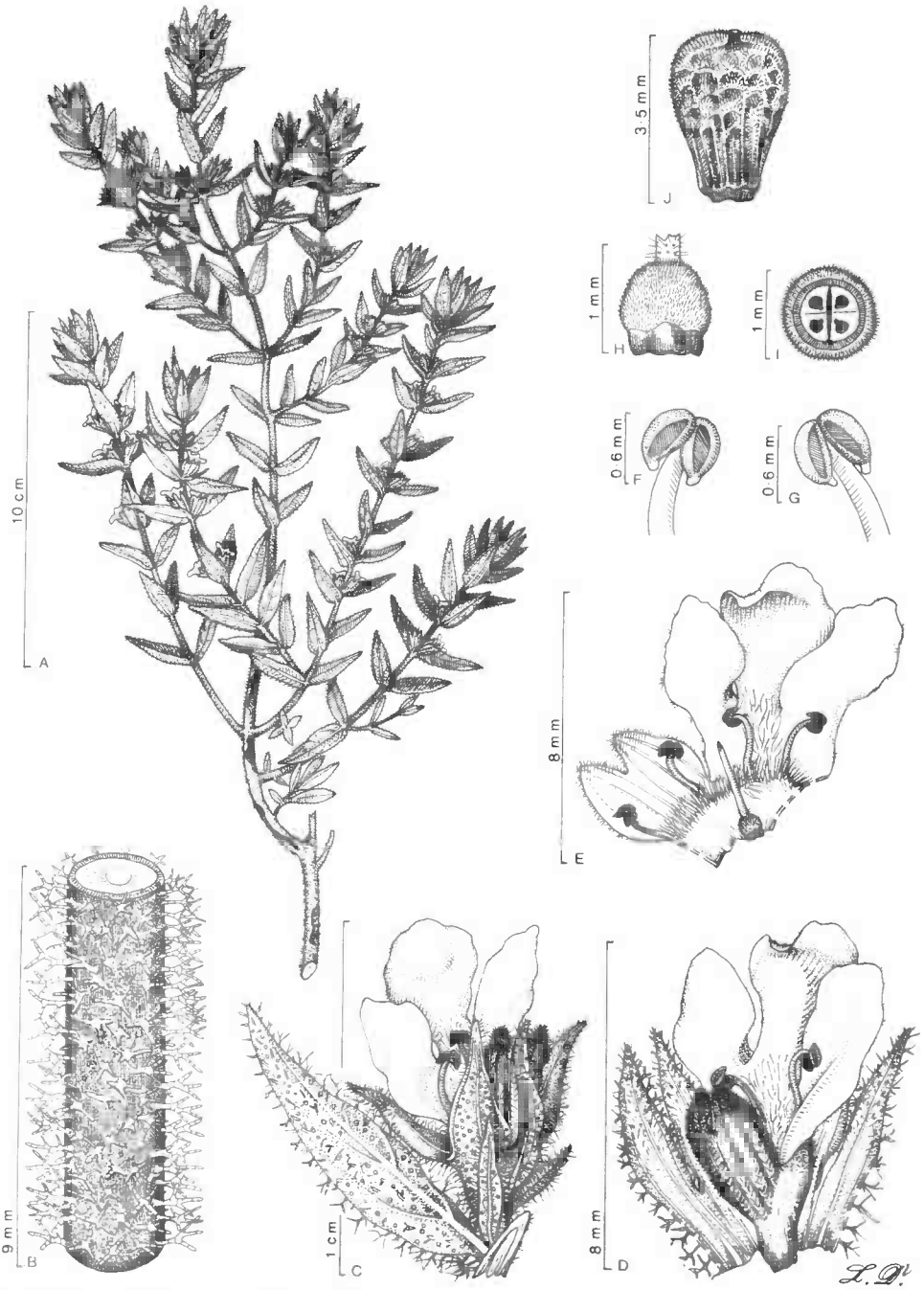


Fig. 39. *Pityrodia lanuginosa* Munir (*Martensz and R. Schodde AE 579*: NT, holotype). A, flowering twig; B, portion of stem showing branched hairs; C, flower in the axil of a leaf; D, flower with calyx vertically cut open to show short corolla-tube and the short upper lip; E, corolla vertically cut open to show androecium and gynoecium; F, lower stamen; G, upper stamen; H, ovary; I, transverse section of ovary; J, fruit.

3-3.5 mm long, ± 1.5 mm broad; the lower lip 3-lobed, spreading, the central lobe larger than the two lateral, more or less obovate, 3.5-5 mm long, 2.5-3.5 mm broad, the lateral lobes more or less elliptic-oblong, 3-5 mm long, 2-2.5 mm broad; tube much shorter and dilated within the calyx, glabrous outside, 2-2.5 mm long, 1.5-2 mm broad at the top end. *Stamens* exserted, inserted in the corolla-throat; filaments filiform, glabrous, the upper pair 1.5-2 mm long, the lower pair 2-2.5 mm long; anthers more or less orbicular in outline, 0.6-0.8 mm long, 0.8-1 mm broad; lobes narrowly elliptic-oblong, shortly appendiculate at the lower ends, divergent in the lower halves. *Ovary* globose, tomentose, ± 1 mm in diameter; style shortly exserted, filiform, glabrous, (2.5-) 3-4 mm long, minutely 2-lobed at the top. *Fruit* obovoid, pubescent, 3-4.5 mm long, ± 2 mm in diameter, apparently non-dehiscent; seeds not seen.

Specimens examined

The type collection is the only material available for examination.

Distribution (Map 10B)

P. lanuginosa is endemic to Arnhem Land, Northern Territory, where it has been recorded from north of El Sharana near the South Alligator River.

Comments

P. lanuginosa is unique in its upper corolla-lip being much shorter than the lower, enclosed within the calyx-lobes and the corolla-tube only slightly longer than the calyx-tube. The upper corolla-lip is also much more deeply streaked purple than in any other closely related species.

Affinities

P. lanuginosa is closely related to *P. pungens* in its flowers being axillary and solitary; the upper corolla-lip erect, streaked purple, shorter than the lower lip, enclosed within the calyx-lobes; stamens and style shortly exserted; anthers more or less orbicular in outline; fruit obovoid, pubescent. Both the species are endemic to the northern part of Northern Territory. Nevertheless, *P. lanuginosa* may easily be identified by its stem, leaves and calyces being woolly-tomentose; leaves decussate, ovate-lanceolate and non-pungent. The stem and leaves in *P. pungens* are glandular-viscid and sprinkled with stellate hairs; leaves mostly in whorls of 3, linear-lanceolate and pungent.

P. lanuginosa and *P. jamesii* are also near to each other in their stem, leaves and calyces being covered with dendriform hairs; leaves sessile, ovate-lanceolate, with their midrib and primary lateral veins prominent underneath; flowers axillary and solitary; stamens and style exserted and fruit obovoid. Both the species are endemic to the northern part of Northern Territory. *P. jamesii*, however, can readily be identified by its stem-tomentum being dendriform hairs, interspersed within a dense mat of fulvous and appressed stellate hairs; leaves appressed against the stem, amplexicaul, cordate at base; corolla-tube nearly twice in length; the upper corolla lip almost equalling the lower, not enclosed within the calyx-lobes; anther-lobes oblong, longer and very minutely appendiculate at the lower ends.

40. **Pityrodia jamesii** Specht in Specht & Mountford (Ed.) Rec. Amer.-Aust.Sc. Exped.Arnhem Land, 3, Bot.& Pl.Ecol.(1958)289, fig. 17, t. 5; Chipp., Proc.Linn.Soc. N.S.W.96(1971)256; Calley & Key, J.Aust.Entom.Soc.12(1973)163.

Type: *Stewart James s.n.*, Oenpelli, 12° 18′ S, 133° 04′ E, Arnhem Land, Northern Territory, Australia, March, 1951 (BRI, holotype; NSW, isotype).

Description (Fig. 40)

A divaricate shrub of 0.5-1.82 m. *Stem* and branches cylindrical, yellowish-brown,

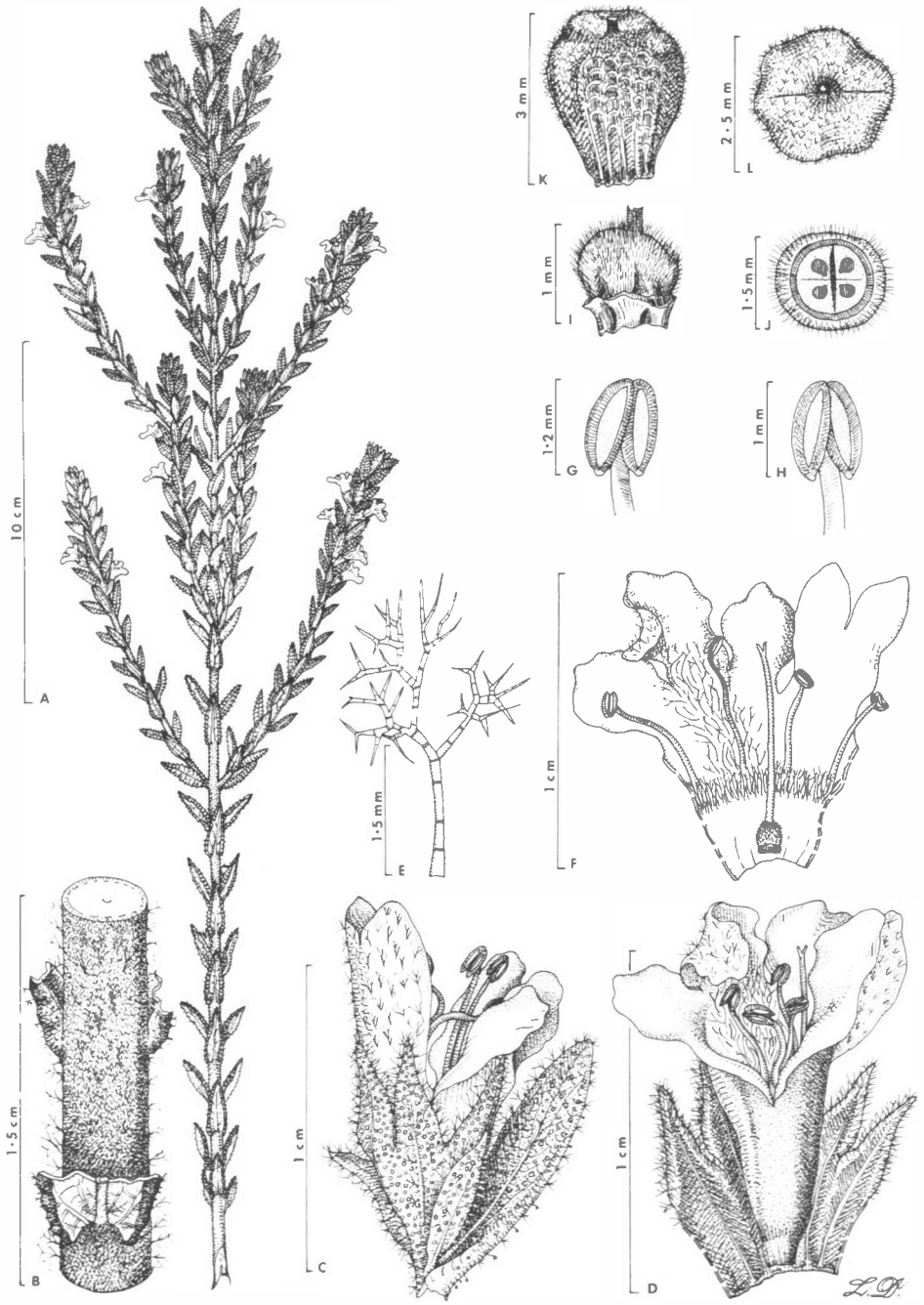


Fig. 40. *Pityrodia jamesii* R.L. Specht (*N.M. Henry 872*: AD). A, flowering branch; B, portion of stem with amplexicaul leaf-bases; C, flower with a leaf and two bracteoles; D, flower with calyx vertically cut open to show corolla-tube; E, hair from a leaf; F, corolla-tube vertically cut open to show androecium and gynoecium; G, lower stamen; H, upper stamen; I, ovary; J, transverse section of ovary; K, fruit; L, top view of fruit.

pubescent-tomentose with branched hairs, interspersed within a dense mat of fulvous and appressed stellate hairs. *Leaves* sessile, ovate, oblong-ovate or ovate-lanceolate, with an amplexicaul cordate base, acute at the apex, recurved-revolute along the crenate margins, appressed against the stem, overlapping and crowded towards the apex, (0.5-1) 1.5-3.5 (4-7.5) cm long, (2-) 3-8 (10-15) mm broad, crustaceous, viscid all over when fresh, glandular underneath, pubescent with spreading, branched hairs, the midrib and reticulate nerves prominent on the under surface. *Flowers* arranged in a spike-like inflorescence, solitary in the axils of the upper leaves, shortly pedicellate or nearly sessile; pedicel pubescent, glandular, ± 0.5 mm long; bracts leaf-like, sessile, about the size and shape of a small leaf, 7-12 mm long, 2-3 mm broad; bracteoles leafy, elliptic-lanceolate, recurved along the margins, glandular and pubescent on abaxial surface, almost glabrous or puberulous on adaxial surface with long, branched tomentum on the recurved margins, 3-5 (-6) mm long, (1-) 1.5-2.5 mm broad. *Calyx* persistent, more or less campanulate, strongly ribbed, divided to about the middle into 5 lobes, 6-8 mm long, densely glandular and tomentose outside, glabrous inside the tube, non-glandular and tomentose along the margins and distal inside parts of the lobes; lobes lanceolate, 3-5 mm long, 1.5-3 mm broad; tube 1.5-3 mm long. *Corolla* white, 8-12 mm long, pubescent outside the lobes, glabrous inside excepting the dense hairy ring below the stamens and a few villous hairs extending to the anterior-lobe of the lower lip, the lobes longer than the tube, oblong-elliptic or obovate, obtuse; the 3 lower (i.e. anterior) lobes are free and mostly shorter than the 2 upper, 3.5-6 (-7) mm long, 2-4 mm broad; the 2 upper (i.e. posterior) lobes united to greater part of their length, 5-8 mm long, 2-2.5 (-3) mm broad; tube almost cylindrical or gradually dilated upwards, shorter than the calyx, 3-4.5 (-5) mm long, 2-3 mm broad at the top end. *Stamens* exserted; filaments filiform, glabrous, the lower pair 4-6 (-7) mm long, the upper pair 3-4 (-5) mm long; anthers more or less orbicular in outline, minutely appendaged at the lower ends of the lobes, 1-1.2 mm long, about the same wide, lobes more or less oblong. *Ovary* globose, 1-1.5 mm in diameter, densely tomentose; style exserted, filiform, glabrous, (5-) 6-11 mm long, shortly 2-lobed at the top. *Fruit* enclosed within the persistent calyx, obovoid, flat or almost truncate at the top, rugose-corrugate, pubescent, 3-4 mm long, 2-3 mm in diameter at the apex, splitting into two 2-celled nutlets with one seed in each nutlet.

Specimens examined

NORTHERN TERRITORY: *Byrnes 1906*, 10 miles N of Mudginbarry, 12° 36′ S, 132° 52′ E, 14.v.1970 (BRI, CANB, DNA, NSW, NT). *Chippendale 8090*, Cooper Creek, 28 miles N of Oenpelli, 15.vii.1961 (BRI, CANB, NSW, NT). *Fox 2520*, Deaf Adder ("Gorge") Creek, 13° 02′ S, 133° 05′ E, 22.ii.1977 (AD, BRI, CANB, DNA, NT). *Henry 872*, Nourlangie Rock Area, 12° 52′ S, 132° 50′ E, 4.vii.1973 (AD, NT, PERTH). *Key s.n.*, 15 km east of Mt Cahill, 12° 52′ S, 132° 50′ E, 24.v.1973 (CANB 266146, p.p.; alter parte *P. puberula* Munir). *Key s.n.*, ca. 1.5 km W of Koongarra, Noranda Mining Camp area, 29.x.1972 (CANB 2 spec.). *Lazarides 7753*, east of Oenpelli, 133° 26′ E, 12° 20′ S, 17.ii.1973 (CANB, NSW). *Lazarides 7772*, south-east of Oenpelli, 133° 19′ E, 12° 32′ S, 19.ii.1973 (CANB). *Lazarides 7937*, south-east of Mt Cahill, 133° 02′ E, 13° 03′ S, 28.ii.1973 (AD, CANB). *Martensz & Schodde AE712*, 1 1/4 mile east-south-east of Cannon Hill, 12° 23′ S, 132° 57′ E, 3.ii.1973 (BRI, CANB, DNA, K, NT). *Specht, R.L. s.n.*, Oenpelli, 12° 18′ S, 133° 04′ E, 23.x.1948 (AD, BRI, NSW). *Stewart James s.n.*, loc. cit., March, 1951 (BRI, holotype; NSW, isotype). *Story 7717A*, 140 miles, 88° from Darwin, undated (CANB).

Distribution (Map 10C)

P. jamesii is endemic to Arnhem Land, Northern Territory, where it is known to occur between 12° and 14° S, and between 132° and 134° E. The main distribution, however, has been recorded from the area between the sources of the East and the South Alligator Rivers.

Comments

In the original description, the corolla-lobes was said to be "about as long as the tube". During present investigations, however, the corolla-tube has been found to be not only much shorter than the lobes, but in a few cases almost half the length of the longest lobes.

It has also been noticed, that unlike several other *Pityrodia* species, the anterior (i.e. middle) corolla-lobe of the lower lip is not always the largest in this species.

According to Calaby & Key (1973), the "late-instar" nymphs of the Australian grasshopper species *Petasida ephippigera* feed on the foliage of *Pityrodia jamesii*.

Affinities

P. jamesii shows close affinities with *P. hemigenioides* in its stem, leaves and calyx being tomentose; leaves sessile with usually recurved margins; flowers axillary solitary forming a spike-like leafy inflorescence; calyx turbinate-campanulate, strongly ribbed; corolla white, deeply lobed; anthers more or less orbicular in outline. Nevertheless, *P. jamesii* may readily be distinguished by its stem being clothed with a yellowish-brown or fulvous mat of appressed hairs with interspersed branched hairs; leaves crustaceous, ovate-lanceolate with an amplexicaul cordate base and acute apex; calyx with numerous sessile glands interspersed between the outside tomentum; corolla-tube almost cylindrical, apparently not dilated upwards, shorter than the lobes, the anterior-lobe scarcely larger than the others; stamens and style much exserted, anther-lobes minutely appendaged at the lower ends; fruit distinctly obovoid, almost flat topped.

P. jamesii seems also near to *P. spenceri* in having more or less similar shaped leaves, inflorescence, calyx, anthers and fruit. The latter, however, can easily be identified by its stem being covered with a cineraceous mat of appressed hairs; calyx-lobes often with slightly recurved margins, pubescent on both the surfaces; corolla-tube much longer than the lobes, gradually dilated upwards, densely pubescent outside; stamens and style scarcely exserted; fruit with more or less domed top.

41. **Pityrodia spenceri** Munir, sp. nov.

P. hemigenioides auct.non (F. Muell.) Benth.: sensu Ewart et al., Fl.N.Terr.(1917)236 (quoad *Spencer & Gilruth s.n.*: Edith Creek, N.T., July-August, 1911)

Caules et rami teretes, dense cineraceo-tomentosi. Folia breviter petiolata, verticillata terna vel remota; laminae ovatae, cordatae, mucronatae, margine recurvato, 8-22 mm longae, 3-8 mm latae, dense cineraceo-tomentosae. Sepala extus breviter cineraceo-tomentosa, lobis lanceolatis, 4-5 mm longis, 1.5-2 mm latis, tubo 2-3 mm longo. Corolla extus pilosissima, alba. Stamina breviter exserta. Fructus obovoidei, pubescentes.

Type: *W.B. Spencer et al. s.n.*, Edith Creek, Northern Territory, Australia, July-August, 1911 (NSW 135940, holotype; MEL 69338, NT 30264, NT 30265 - isotypes).

Description (Fig. 41)

An erect branched shrub, densely clothed with branched cineraceous tomentum. *Stem* and branches terete. *Leaves* shortly petiolate or subsessile, in whorls of 3 or scattered, cordate or ovate-cordate, mucronate, recurved along the margins, (8-) 10-20 (-22) mm long, (3-) 5-8 mm broad, densely clothed with a short tomentum of branched and cineraceous hairs, the midrib and reticulate nerves prominent on the under surface; pedicel 1-2 mm long, densely tomentose. *Flowers* axillary solitary, sessile in the axils of the upper leaves; bracts leaf-like, of the shape and size of the upper smaller leaves; bracteoles linear, leafy, 3.5-5 mm long, 1-1.5 mm broad. *Calyx* persistent, turbinate-campanulate, 5-lobed in the upper half, tubular towards the base, strongly ribbed, 7-8 mm long, densely clothed with short cineraceous tomentum, glabrous inside the tube; lobes lanceolate, 4-5 mm long, 1.5-2 mm broad near the base; tube 2-3 mm long. *Corolla* white, 8-10 mm long, pubescent outside, glabrous inside excepting the dense hairy ring above the ovary, and the villous hairs extending to the large anterior-lobe of the lower lip; the anterior-lobe elliptic-obovate, ca. 3 mm long, ± 2 mm broad; the other 4-lobes narrowly ovate-elliptic or oblong, (1-) 2 (-3) mm long, 1-2 mm broad; tube almost

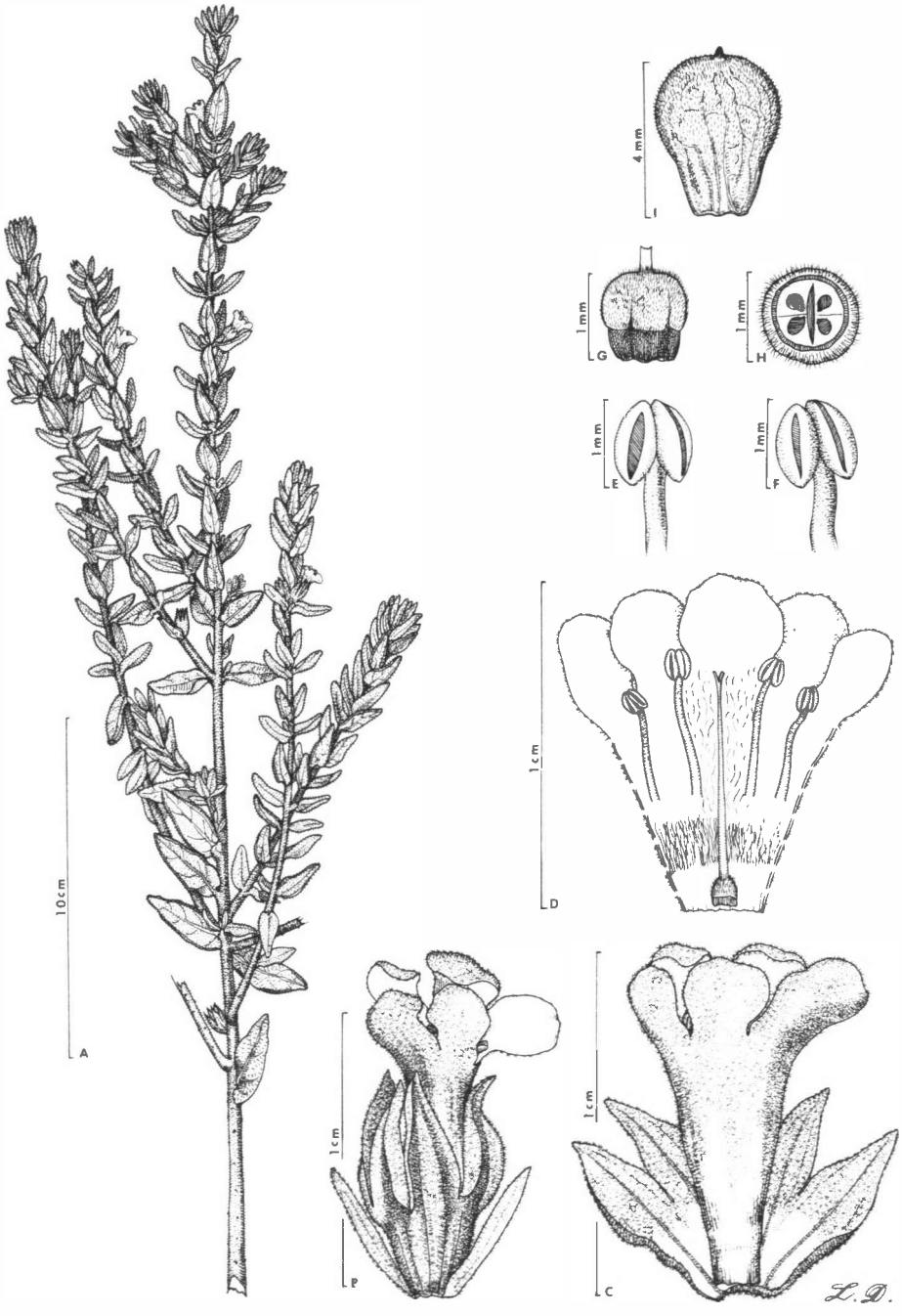


Fig. 41. *Pityrodia spenceri* Munir (*W. B. Spencer et al. s.n.*: NSW 135940). A, flowering twig; B, flower with two bracteoles; C, flower with calyx vertically cut open to show corolla-tube; D, corolla-tube vertically cut open to show androecium and gynoecium; E, lower stamen; F, upper stamen; G, ovary; H, transverse section of ovary; I, fruit.

cylindrical or gradually dilated upwards, 5-6 mm long, 2-3 mm broad at the top end. *Stamens* slightly exceeding the corolla-tube; filaments glabrous, 1.5-3 mm long; anthers more or less orbicular in outline, lobes oblong, with a minute or no appendage at the lower end. *Ovary* globose, ca. 1 mm in diameter, densely tomentose; style slightly exserted, filiform, glabrous, 5-7 mm long, shortly 2-lobed at the summit. *Fruit* enclosed within the persistent calyx, obovoid, pubescent, 3-4 mm long, 2-3 mm broad in the upper half.

Specimens examined

The type collection, consisting of four duplicates, is the only material available for examination.

Distribution (Map 10B)

This species is endemic to the northern part of the Northern Territory. The only known locality is near Edith Creek, which is about 200 km south-east of Darwin along the Stuart Highway.

Comments

The type of *P. spenceri* is the earliest *Pityrodia* collection from the Northern Territory. The species is one of the most northerly in the genus. In view of its resemblance to *P. hemigenioides*, it was erroneously identified by Ewart et al. (1917) with that species.

Affinity

P. spenceri is nearest to *P. hemigenioides* in having similar indumentum all over the plant, axillary solitary flowers forming a spike-like leafy inflorescence, and scarcely exserted stamens and style. Nevertheless, *P. spenceri* may easily be distinguished by its leaves being shortly petiolate, cordate; corolla-tube gradually dilating upwards, densely pubescent outside, lobes pubescent on the back; stamens with minute or no distinct appendages at the ends of the lobes; fruit obovoid, often not easily splitting into 2 nutlets.

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P. chrysocalyx	= II	*P. gilruthiana*	= XXIII
P. canaliculata	= III	*P. puberula*	= XXIV
P. loricata	= IV	*P. hemigenioides*	= XXV
P. lepidota	= V	*P. glutinosa*	= XXVI
P. angustisepala	= VI	*P. viscida*	= XXVII
P. quadrangulata	= VII	*P. loxocarpa*	= XXVIII
P. megalophylla	= VIII	*P. obliqua*	= XXIX
P. lanceolata	= IX	*P. paniculata*	= XXX
P. halganiacea	= X	*P. axillaris*	= XXXI
P. scabra	= XI	*P. dilatata*	= XXXII
P. exserta	= XII	*P. cuneata*	= XXXIII
P. uncinata	= XIII	*P. atriplicina*	= XXXIV
P. bartlingii	= XIV	*P. byrnesii*	= XXXV
P. glabra	= XV	*P. terminalis*	= XXXVI
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P. serrata	= XVII	*P. augustensis*	= XXXVIII
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