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Queensland Herbarium

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Environmental Protection Agency

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A taxonomic revision of *Croton* L. (Euphorbiaceae) in Australia

Paul I. Forster

Summary

Forster, Paul I. (2003). A taxonomic revision of *Croton* L. (Euphorbiaceae) in Australia. *Austrobaileya* 6(3): 349–436. The genus *Croton* L. is revised for Australia. Twenty-seven native species (all shrubs, trees or lianes) are recognised: *C. acronychioides* F.Muell., *C. arnhemicus* Muell.Arg., *C. aridus* P.I.Forst. sp. nov., *C. brachypus* Airy Shaw, *C. byrnesii* Airy Shaw, *C. capitis-york* Airy Shaw, *C. caudatus* Geisel., *C. choristadenius* K.Schum., *C. densivestitus* C.T.White & W.D.Francis, *C. dockrillii* Airy Shaw, *C. habrophyllus* Airy Shaw, *C. insularis* Baill., *C. magneticus* Airy Shaw, *C. mamillatus* P.I.Forst. sp. nov., *C. minimus* P.I.Forst. sp. nov., *C. multicaulis* P.I.Forst. sp. nov., *C. multicaulis* subsp. *velutinus* P.I.Forst. subsp. nov., *C. mutabilis* P.I.Forst. sp. nov., *C. phebalioides* Muell.Arg., *C. rarus* P.I.Forst. sp. nov., *C. schultzii* Benth., *C. simulans* P.I.Forst. sp. nov., *C. stigmatosus* F.Muell., *C. stockeri* (Airy Shaw) Airy Shaw, *C. tomentellus* Airy Shaw, *C. triacros* F.Muell., *C. verreauxii* Muell.Arg. and *C. waterhouseae* P.I.Forst. sp. nov. All apart from *C. caudatus*, *C. choristadenius* and *C. insularis* are endemic. Three naturalised species are recorded: *C. capitatus* Hook., *C. glandulosus* L. and *C. setigerus* Hook., all being small herbaceous weeds. One species (*C. armstrongii* S.Moore) is of dubious origin with the type from Australia but no subsequent collections. An identification key is provided to all thirty-one species. All taxa are described and all native species and subspecies illustrated. Notes are provided on distribution, habitat, typification, affinities and conservation status for each taxon. Lectotypes are selected for the names *C. acronychioides* F.Muell., *C. affinis* Maiden & R.T.Baker, *C. arnhemicus* Muell.Arg., *C. stigmatosus* F.Muell. and *C. triacros* F.Muell. The new combination *Adriana urticoides* (A.Cunn.) Guymer is made for *Croton urticoides* A.Cunn.

Keywords: *Croton* - Australia; *Croton aridus*, *Croton caudatus*, *Croton choristadenius*, *Croton mamillatus*, *Croton minimus*, *Croton multicaulis*, *Croton multicaulis* subsp. *velutinus*, *Croton mutabilis*, *Croton rarus*, *Croton schultzii*, *Croton simulans*, *Croton waterhouseae*, *Adriana urticoides*

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Introduction

The genus *Croton* L. was described by Linnaeus (1753) and thirteen species were named at that time. Since then many species have been included in *Croton*, and although some have since been transferred to other genera, it is estimated that there are between 800 (Webster 1993) and 1200 (Berry 1999) species in the genus. *Croton* is second only to *Euphorbia* L. in number of species within the family.

Croton is included in Euphorbiaceae subfamily Crotonoideae, tribe Crotoneae with the Old World genera *Mildbraedia* Pax, *Moacroton* Croizat and *Paracroton* Miq. (sometimes listed as the invalid *Fahrenheitia* Reichb.f. & Zoll.) (Webster 1994). Occasionally the genera *Crotonopsis* Michx., *Eremocarpus* Benth. and *Julocroton* Mart. are also recognised in this tribe (Radcliffe-Smith 2001), although all three genera were reduced to sections of *Croton* by Webster (1992). *Croton* is distinguished from the other genera in the Crotoneae mainly by the filaments inflexed in the bud and the pistillate petals being reduced or absent (Webster 1994). The Crotoneae is probably derived within the Crotonoideae (Tokuoka & Tobe 1998); however, a comprehensive phylogeny for the group is yet to be proposed.

Species of *Croton* are found throughout the tropics and subtropics in both the Old and New Worlds, or as Hooker (1890) stated "in all hot countries". There are major concentrations of species in the Neotropics (J.Mueller 1873; Webster 1992; Berry 1999), Mexico (Webster 2001), Madagascar (Govaerts *et al.* 2000) and parts of Malesia (Airy Shaw 1980a), but lesser numbers in Africa (Radcliffe-Smith 1996, 1997), continental Asia (Hooker 1890; Chakrabarty & Balakrishnan 1997; Philcox 1997) and Australia (this paper). The last overall monograph of *Croton* was by J.Mueller (1866), and the sheer number of species makes the task of a modern monograph daunting.

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Australia is relatively "depauperate" with twenty-seven native species, three naturalised species and one species of doubtful origin. One species, *Croton armstrongii* S.Moore, is tentatively included, as only the type (there are no subsequent collections) is reputedly of Australian origin, hence it is excluded from most discussion below. The first recording of species for Australia that were referred to the genus *"Croton"* was by Labillardiére (1806) who described *C. quadripartitus* from Tasmania and *C. viscosus* from Western Australia. These taxa are now included in *Adriana* Gaudich. and *Beyeria* Miq. respectively. The first Australian species currently included in *Croton* was *C. verreauxii* described by Baillon (1858), soon followed by additional species in the 1860's (F.Mueller 1864, 1868; J.Mueller 1864, 1865, 1866). Bentham (1873) included nine species in *Croton*, and some additional species and infraspecific taxa were recognised before the revision and conspectus by Airy Shaw (1976, 1980b,c, 1981).

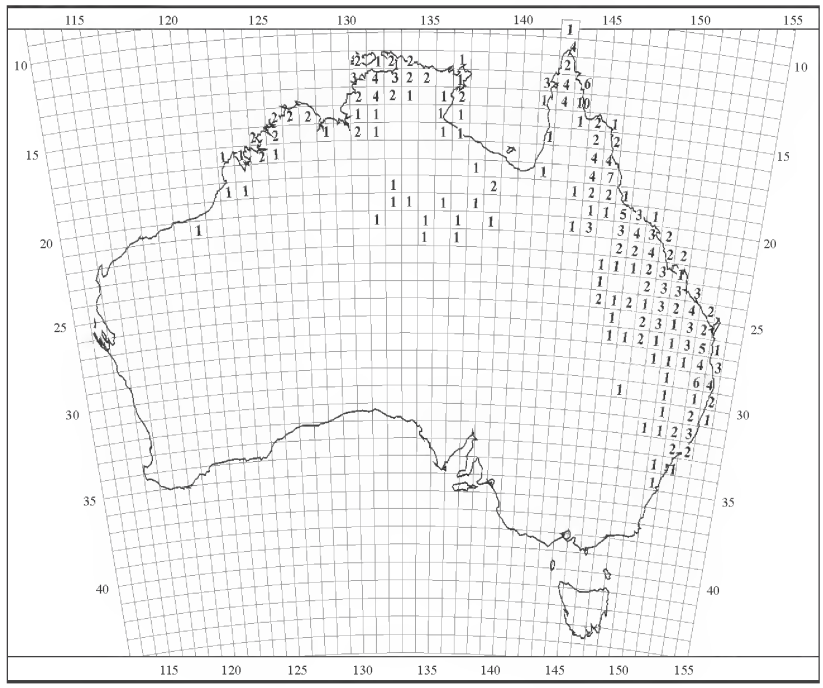
Airy Shaw (1981) recognised nineteen species of *Croton* for Australia, provided a species key, bibliographic details, and notes on distribution and habit. He did not resolve the typification of many species, provide detailed comparative descriptions, or adequately deal with variation in some taxa. In the present account several new taxa are described. Five of these (*Croton mamillatus, C. minimus, C. rarus, C. simulans* and *C. waterhouseae*) are narrow endemics and have been discovered subsequent to Airy Shaw's work or were not seen by him, whereas *C. aridus*, *C. mutabilis* and *C. multicaulis* were included by Airy Shaw within other species. *Croton caudatus* and *C. choristadenius* are newly recorded for Australia and occur also in Malesia. The presence of three species in Australia, notably *Croton argyratus*, *C. cocchymelophyllus* and *C. storckii* is refuted. The three naturalised herbaceous species *Croton capitatus*, *C. glandulosus* and *C. setigerus* are also included in this account.

The Australian species of *Croton* are largely tropical and subtropical in their distribution. The majority of species (twenty-two) occur in rainforest communities (sensu Webb & Tracey 1981, ranging from evergreen notophyll vineforests to deciduous vinethickets), although several taxa grow in woodland communities and one occurs in the arid zone on red sand-hills. Of the twenty-seven native species, all but three are endemic. The non-endemic native species occur elsewhere in Malesia or Melanesia, with two of them (*Croton caudatus* and *C. choristadenius*) known from single localities in far north Queensland. Several species are very widespread (e.g. *Croton arnhemicus, C. insularis* and *C. phebalioides*) and occur over 44–55 1° grid squares (**Map 1**). Six endemic species (*Croton brachypus, C. byrnesii, C. mamillatus, C. simulans, C. stockeri* and *C. waterhouseae* are very restricted in occurrence with distributions in only one or two 1° grid squares. The remaining species fall between these two extremes, with some such as *Croton acronychioides*, *C. habrophyllus* and *C. verreauxii* being also widely distributed (15–24 1° grid squares).

In Australia the McIlwraith Range (grid square 13°S, 142°E) has ten species present (**Map 1**). Lesser centres of diversity (six or seven species present) occur at Iron Range (grid square 12°S, 142°E), the southern part of the 'Wet Tropics' (grid square 17°S, 145°E) and south of Brisbane in, or adjacent to the McPherson Range (grid square 28°S, 152°E) (Map 1). These higher species densities are a reflection of diverse habitats (due to rainfall and altitude gradients, and diverse geology) being present in these grid squares, and this pattern is repeated in many other plant groups in eastern Australia.

At least one of the narrow endemics (*Croton mamillatus*) can be considered as Critically Endangered using the criteria of the IUCN (2001). This category would also apply to the Australian populations of *Croton caudatus* and *C. choristadenius.* Apart from several species that are listed as Vulnerable (*Croton magneticus*) or Rare (*C. brachypus, C. densivestitus* and *C. stockeri*), under Queensland Government legislation, the majority of species are not considered threatened.

Plant habit of Australian Crotons includes small, wiry herbs, (the three naturalised species) shrubs, lianes and small trees. Most of the native Australian species are shrubs, four are trees



Map 1. Distribution of *Croton* (native taxa) in Australia indicating the number of species in each 1° degree grid square.

and one a canopy liane. Some species may be common components in the habitats where they occur, forming dense thickets. A useful field indicator for species of *Croton* (at least in Australia, but also in South Africa, New Guinea and Thailand where I have encountered species) is the colour of the fallen leaves, which are orange. Some of the Australian species are seasonally deciduous (e.g. *Croton mutabilis, C. rarus, C. simulans*) with the mature foliage often being quite dissimilar to the young leaves that are present at flowering. This process of shedding of the old foliage just prior to flowering, followed by a flush of new foliage at the same time as the flowers, seems to be widespread in some groups or species of Euphorbiaceae (e.g. *Drypetes deplanchei* (Brongn. & Gris) Merr. (Forster 1997), *Mallotus surculosus* P.I.Forst. (Forster 1999), *Claoxylon* spp. (Forster unpubl.). Conversely, many Australian Crotons will hold inflorescences in an arrested state of development for months (e.g. *Croton insularis, C. magneticus, C. phebalioides*) until sufficient moisture is available for flower production.

All of the Australian species of *Croton* appear to be monoecious with the flowers in glomerules of one to many flowers. True dioecy is however, relatively widespread in non-Australian taxa (e.g. Decker & Pilson 2000). The Australian species usually have inflorescences with both male and female flowers, the females usually being few and single in the glomerules towards the base, and the males being many and in groups of 1 to many in the glomerules towards the apex. There are generally many more male flowers than female flowers in any inflorescence. It is also not unusual to observe inflorescences where the flowers are all of one sex. In these instances the flowers are usually all male and are being produced during drought. Occasionally both male and female flowers may be present in the same glomerule.

As yet we have little information on the reproductive biology of Australian Crotons. Casual observations of the flowers would tend to indicate that the female flowers towards the base of the inflorescence open first, followed by the males towards the top. In non-Australian

species the ratio between male and female may be related to the age of the plant (Shaanker & Ganeshaiah 1984). This pattern of non-synchronous floral development (or temporal dioecy) seems to be widespread in monoecious Euphorbiaceae and would tend to favour outcrossing (Bawa *et al.* 1982; Freitas *et al.* 2001). In many instances, however, there are both male and female flowers open at the same time in the one inflorescence, and certainly on the one individual. *Croton* flowers seem to be most suitable for bee pollination (Endress 1994) and I have seen hordes of native bees (viz. *Trigona* spp.) working the inflorescences of flowering individuals. Other insects such as various Coleoptera, Hymenoptera and Lepidoptera have also been recorded as pollinators of the Argentinian *Croton sarcopetalus* (Freitas *et al.* 2001), and it is not unreasonable to predict that such broad guilds of insects would also visit the flowers of Australian Crotons. The major reward for such attention is probably both pollen and nectar, and the small male flowers of Crotons perfectly fit what Endress (1994) termed as 'bowl' flowers that are mainly visited by diverse insects with short proboscises. Small ants are also common visitors to the flowers, and although they probably mainly act as pollen and nectar robbers, it is possible that they are more than incidental in pollination efficiency. Interestingly enough, for the herbaceous *Croton suberosus* H.B.K. from Mexico, it has been found that floral nectar seems mainly to attract ants that act as herbivore predators, rather than as pollinators (Dominguez *et al.* 1989).

Nearly all of the Australian Crotons have noticeable extrafloral nectaries at the base of the leaf lamina or distant end of the petiole and their role as sources of attraction to ants or other insects is unknown, although they do secrete small amounts of nectar (Jose & Inamdar 1989; Freitas *et al.* 2000, 2001). Certainly the position and gross morphological form of these organs have proved useful as taxonomic characters in the current account.

As with many Euphorbiaceae, in *Croton* the fruit are capsular and dehiscent. The presence of a fleshy caruncle on the seeds undoubtedly make them attractive to ants that may subsequently aid in dispersal. In the Indian *Croton bonplandianus* Baill. the female flowers bear nectar glands that only become active during fruit maturation and attract ants that may subsequently disperse the seeds (Ganeshaiah & Shaanker 1988). Whether this phenomenon is widespread in the genus is unknown. Likewise the presence and form of these nectaries in most species of *Croton* is unknown, but it is likely that further useful taxonomic characters could be found from their study.

Groupings of taxa

Webster (1993a) has proposed a new classification of *Croton* with forty sections. In the present account I have not followed his classification that is based mainly on New World taxa. Instead the Australian species are listed alphabetically. Some Australian species (e.g. *Croton stockeri*, *C. arnhemicus*) appear to have combinations of characters that transgress Webster's sections, many of which appear to be artificial and do not correlate with some of the New World taxa included. Nevertheless a number of groups in native Australian *Croton* can be inferred on the basis of morphology.

Group 1.

Lianes. Included species: *C. caudatus*.

Group 2.

Shrubs or trees. Foliage penninerved, not silver-white below, indumentum generally of scattered trichomes. Included species: *Croton acronychioides*, *C. brachypus, C. byrnesii, C. choristadenius, C. dockrillii, C. habrophyllus, C. mutabilis, C. rarus, C. triacros*, *C. verreauxii*.

Group 3.

Shrubs or trees. Foliage palminerved, not silver-white below, indumentum of dense trichomes (pubescent to velutinous). Included species: *Croton aridus, C. armstrongii, C. arnhemicus, C. minimus, C. multicaulis, C. waterhouseae*.

Group 4.

Shrubs. Foliage penninerved, not silver-white below, indumentum of dense trichomes (pubescent to velutinous). Included species: *Croton densivestitus, C. magneticus, C. stockeri*.

Group 5.

Shrubs or trees. Foliage penninerved, silver-white below, indumentum of dense adpressed trichomes. Included species: *Croton capitis-york, C. insularis, C. mamillatus, C. phebalioides, C. simulans, C. stigmatosus.*

Group 6.

Shrubs or trees. Foliage palminerved, silver-white below, indumentum of dense adpressed trichomes. Included species: *Croton schultzii, C. tomentellus.*

Materials and Methods

This revision is based on herbarium holdings at AD, BRI, CANB (including CBG), DNA, MEL, NSW, PERTH and QRS, selected type material at BM and BO, photographs or microfiche of types at BM, G-DC, K and P, and field collections and observations by the author. In some instances, where there is a paucity of Australian collections for a particular taxon (e.g. *Croton capitatus*, *C. caudatus*, *C. choristadenius*, *C. glandulosus* and *C. setigerus*), selected non-Australian collections have also been cited and used in formulating the descriptions.

Species are defined as groups of populations (1-many) with discontinuities in two or more independent character states of morphology. Where a single character state difference is present and the discontinuity is geographically based, the rank of subspecies is used. This is a species definition that is widely used and understood (Stebbins 1950; Cronquist 1988) but would equate to the 'diagnostic species concept' of Judd *et al.* (2002). Characters most commonly used in the identification key are those of habit, indumentum type (**Fig. 1**), leaf lamina venation and marginal teeth number, extrafloral nectaries (position and form), stem stipules, flowers (particularly stamen number) and fruit shape. Collectors should ensure that at least both male and female flowers are collected when making specimens of Crotons.

Invariably my species concept is closely tied to habitat preferences and geographic distribution and has been largely arrived at from extensive fieldwork in northern Australia, particularly Queensland where twenty-four species are found. I have been fortunate to study twenty-four of the twenty-seven native species in the field.

Floral descriptions were prepared from material preserved in spirit (FAA or 70% alcohol and glycerol) or reconstituted by boiling in water and detergent. Fruit descriptions were prepared from spirit and dried material. Foliage, inflorescence and seed descriptions were prepared from dried material.

Indumentum cover is described using the terminology of Hewson (1988), except that 'scattered' is used instead of 'isolated'. Indumentum in Australian *Croton* species comprises multicellular, simple trichomes or compound trichomes (**Fig. 1**). The compound trichomes include sessile stellate trichomes, stalked stellate trichomes, peltate trichomes and peltate scales (lepidote). Peltate scales and stellate or peltate trichomes are usually sessile rather than stalked. Where no indication is given in the descriptions, it may be assumed that they are sessile. A system for trichome morphology in *Croton* has been proposed by Webster *et al.* (1996), but this has not been followed here, mainly because the trichome types in Australian crotons are not as diverse as the 120 species that they studied. The fruit of *Croton* species commonly have sessile and/or stalked trichomes, or rarely on a fleshy mamillate protuberance (*C. capitis-york, C. mamillatus, C. stigmatosus*), hence it is always specified as to the condition present.

The term 'foliar glands' is included in the descriptions and this refers to the small glands that are present at the apices of any teeth on the leaf lamina margins. If these foliar glands are stated to be 'prominent' this means that they are discernible with the naked eye. 'Inconspicuous' means that they are only discernible with a microscope. Most of the native Australian Crotons have extrafloral nectaries (Jose & Inamdar 1989; Freitas *et al.* 2000, 2001) at, or near to the base of the leaf lamina; these may be referred to as 'glands' in other works or keys.

Common abbreviations in the specimen citations are N.P. or N.P.R. (National Park), L.A. (Logging Area), S.F. or S.F.R. (State Forest or State Forest Reserve) and T.R. (Timber Reserve). Rainforest terminology follows Webb (1978).

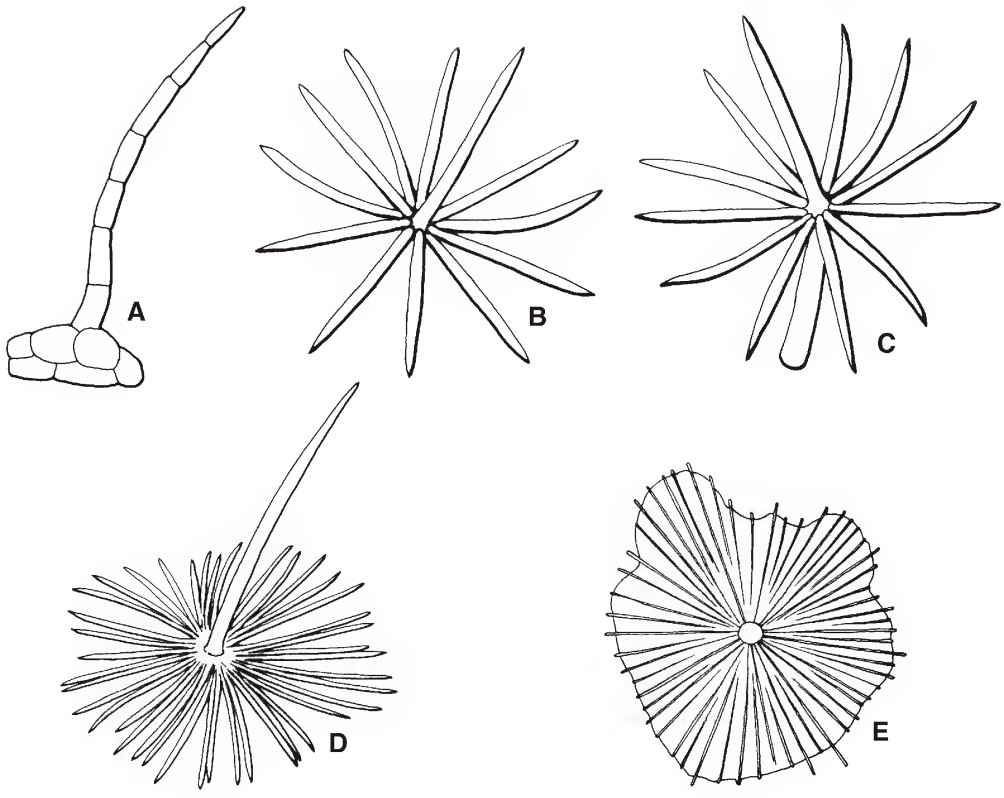


Fig. 1. Trichome types in Australian *Croton*. A. simple multicellular trichome. B. sessile stellate trichome. C. stalked stellate trichome. D. peltate trichome. E. peltate scale. Del. W. Smith.

The 'Wet Tropics' is defined as that area of north-eastern Queensland which encompasses the 'hot, humid vine forests' from near Cooktown in the north to Paluma in the south (Webb & Tracey 1981; Barlow & Hyland 1988). Conservation codings follow those that are listed in Queensland legislation, and are derived from those proposed by the IUCN (Anonymous 2001).

The taxa are mapped in 1° grid squares. This has enabled information to be gathered about centres of species richness and the restriction or otherwise of the individual taxa.

Taxonomy

Croton L., Sp. Pl. 1004 (1753). **Type:** *Croton tiglium* L. (lectotype chosen by Small 1913).

Derivation of name: From the Greek *kroton* (a tick), apparently a fanciful allusion to the 'tick-like' seeds.

Generic synonymy is listed in Webster (1994) and Radcliffe-Smith (2001); however, none of these names have been applied to Australian taxa so they are not repeated here. The following generic description is meant to be comprehensive for the taxa in Australia, but will also be largely applicable for the genus elsewhere.

Herbs, lianes, shrubs or small trees, annual or perennial, monoecious or dioecious, evergreen or deciduous; stems and foliage without latex. Indumentum of simple or compound trichomes and scales in various combinations, glandular trichomes absent,

stinging trichomes absent. Stipules entire or lobed, generally inconspicuous, deciduous. Leaves alternate to subopposite, sessile to petiolate, simple and usually elobate, palmi- or penninerved, entire or denticulate to crenate, often with sessile or stipitate glands at lamina base or on petiole. Inflorescences terminal or axillary, racemose or spicate, solitary, uni- or bisexual and androgynous, with flowers in bracteate glomerules. Male flowers sessile to pedicellate; calyx lobes 4–6, imbricate or valvate, ± equal; petals 4–6, free, usually shorter than sepals; stamens 5–50 (–100 plus), filaments free and attached to a slightly raised pilose receptacle, inflexed in bud, filiform or flattened; anthers dorsifixed, bilobate, thecae oblong and longitudinally dehiscent; pistillodes absent. Female flowers sessile to pedicellate; calyx lobes (0–) 4–6 (–8), imbricate or valvate; petals usually absent; disk annular, or of separate glands or absent; ovary 1–3(4)-locular, locules uniovulate; styles shortly connate at base, bifid to multifid. Fruits capsular, uni-, bi- or trilobate, surface smooth and variously pubescent, dehiscing septicidally into bivalved cocci, or rarely indehiscent. Seeds ovoid, obloid, ellipsoid or subglobose; testa crustaceous to woody; albumen fleshy; caruncles entire, non-arilloid; cotyledons broad, flat.

Over 800 species in the tropics and subtropics. Thirty-one species in Australia, with three naturalised and twenty-seven native species with twenty-two being endemic. One species is of dubious origin.

Webster (1967) chose to retypify *Croton* with *C. aromaticus* L. as the lectotype species, but this does not supersede the lectotypification of Small (1913) with *C. tiglium* L. and the status quo is maintained by Radcliffe-Smith (2001) and here.

Key to the Australian species of *Croton*

1. Herbs 2
   Lianes, shrubs or trees 4

2. Styles 1; fruits unilobate . . . . . **24. C. setigerus**
   Styles 3; fruits trilobate 3

3. Extrafloral nectaries 2 at top of petiole . . . . . **13. C. glandulosus**
   Extrafloral nectaries absent from leaf . . . . . **7. C. capitatus**

4. Lianes . . . . . **9. C. caudatus**
   Shrubs or trees 5

5. Leaf lamina palminerved 6
   Leaf lamina penninerved 13

6. Leaf lamina silver-white below 7
   Leaf lamina green below (not silver-white) 8

7. Stipules linear-lanceolate, 3–6 mm long; leaf lamina below with dense overlapping peltate scales . . . . . **23. C. schultzii**
   Stipules lanceolate, 1.2–1.8 mm long; leaf lamina below with dense stellate trichomes . . . . . **28. C. tomentellus**

8. Leaf lamina denticulate to crenate with 60–100 teeth . . . . . **4. C. arnhemicus**
   Leaf lamina denticulate to crenate with 30–52 teeth 9

9. Stipules lanceolate, 0.3–1 mm long . . . . . **3. C. armstrongii**
   Stipules linear to linear-lanceolate, 1.2–6 mm long 10

10. Leaf lamina with interlateral tertiary venation obscure below ..... **18. C. minimus**
Leaf lamina with interlateral tertiary venation well developed below 11

11. Leaf lamina with 32–40 teeth; male flowers with pedicels 10–12 mm long; stamens 32–38 ..... **31. C. waterhouseae**
Leaf lamina with 10–28 teeth; male flowers with pedicels 1.5–7 mm long; stamens 10–24 12

12. Male flower petals 4–4.5 mm long, 0.8–1 mm wide; fruit oblong-ovoid, 3–17 mm long; seed 8.5–10.5 mm long ..... **2. C. aridus**
Male flower petals 1.5–3.2 mm long, 0.5–1.5 mm wide; fruit depressed-globose, 5–8 mm long; seed 4–5 mm long ..... **19. C. multicaulis**

13. Foliage silver-white to silver-green below due to presence of dense adpressed silver scales and trichomes 14
Foliage green to ferruginous below due to the absence of indumentum or the presence of uncoloured or ferruginous indumentum 19

14. Leaf lamina with obscure lateral venation ..... **15. C. insularis**
Leaf lamina with discernible lateral venation 15

15. Branchlets with peltate scales only ..... **8. C. capitis-york**
Branchlets with stellate trichomes, or with admixture of stellate trichomes and peltate scales 16

16. Branchlets with stellate trichomes only 17
Branchlets with either peltate trichomes, or an admixture of peltate scales and stellate trichomes 18

17. Leaf lamina with the lateral veins not prominently raised below; extrafloral nectaries sessile, visible above only ..... **21. C. phebalioides**
Leaf lamina with the lateral veins prominently raised below; extrafloral nectaries stipitate to 1.8 mm long, visible above & below ..... **26. C. stigmatosus**

18. Branchlets and leaf petioles with peltate trichomes only; extrafloral nectaries absent or circular ..... **17. C. mamillatus**
Branchlets and leaf petioles with admixture of peltate scales and stellate trichomes; extrafloral nectaries ellipsoid ..... **25. C. simulans**

19. Leaf lamina below with indumentum of peltate scales or peltate trichomes 20
Leaf lamina below with indumentum of stellate trichomes 23

20. Leaf petioles 2–5 mm long; lamina narrow-ovate, oblanceolate or obovate, margins entire to sinuate ..... **5. C. brachypus**
Leaf petioles 4–36 mm long; lamina elliptic, lanceolate or ovate, margins denticulate to weakly crenate with 4–34 teeth per side of midrib 21

21. Extrafloral nectaries stipitate ..... **30. C. verreauxii**
Extrafloral nectaries sessile 22

22. Stipules 0.5–1 mm long; extrafloral nectaries 0.8–1.2 mm long; leaf lamina below with scattered peltate trichomes ..... **10. C. choristadenius**
Stipules 1–4 mm long; extrafloral nectaries 0.4–0.6 mm long; leaf lamina below with scattered peltate scales ..... **1. C. acronychioides**

23. Leaf lamina with dense velutinous indumentum below 24
Leaf lamina with scattered to sparse indumentum below 26

24. Leaf indumentum yellow; extrafloral nectaries stipitate ..... **11. C. densivestitus**
Leaf indumentum orange-brown or ferruginous-silver; extrafloral nectaries sessile 25

25. Leaf indumentum orange-brown; stipules lanceolate, 3–6 mm long; inflorescence bracts linear-lanceolate ..... **27. C. stockeri**
Leaf indumentum ferruginous-silver; stipules subulate, 0.3–0.9 mm long; inflorescence bracts lanceolate to oblanceolate ..... **16. C. magneticus**

26. Leaf lamina with 70–112 teeth ..... **14. C. habrophyllus**
Leaf lamina with 18–64 teeth 27

27. Leaf indumentum uncoloured to silver 28
Leaf indumentum ferruginous to yellow 29

28. Leaf lamina with 40–56 teeth, extrafloral nectaries stipitate; fruits globose, c. 4 mm long and 4 mm diameter ..... **12. C. dockrillii**
Leaf lamina with 18–34 teeth, extrafloral nectaries sessile; fruits depressed-globose, 4–5 mm long, 6–7 mm diameter ..... **20. C. mutabilis**

29. Stipules lanceolate, 4–4.5 mm long; male flower sepals 1.6–2 mm long ..... **29. C. triacros**
Stipules linear to linear-lanceolate, 0.7–3.9 mm long; male flower sepals 2–2.5 mm long 30

30. Male flower pedicels 1–2 mm long, sepals obovate; styles bifid; fruits globose, 4–5 mm long, 4–4.5 mm diameter ..... **22. C. rarus**
Male flower pedicels 2.5–7 mm long, sepals ovate; styles multifid, divided twice; fruits depressed-globose, 4.5–5 mm long, 6–7 mm diameter ..... **6. C. byrnesii**

1. Croton acronychioides F.Muell., Fragm. 4:142 (1864) ('acronychoides'). **Type:** Queensland. PORT CURTIS DISTRICT: [label 1 in unidentified hand] "A handsome shrub 14 or 15 feet high growing in the scrub nr Rockhampton" [label 2 in F.Mueller hand] "Rockhampton *Bowman*" (lecto [here chosen]: MEL231235).

Croton affinis Maiden & R.T.Baker, Proc. Linn. Soc. New South Wales, II, 9: 160, t. 12 (1894). **Type:** New South Wales. near Tintenbar, August 1893, *W. Baeuerlen s.n.* (lecto [here chosen]: NSW273894).

***Illustrations*:** Floyd (1989: 141); James & Harden (1990: 419); Hauser (1992: 180).

Shrub to 5 m high, monoecious, evergreen, perennial. Indumentum ferruginous-yellow. Branchlets rounded, with scattered to sparse peltate trichomes and scales when young, glabrescent. Stipules lanceolate, 1–4 mm long, 0.3–0.8 mm wide, entire and with dense peltate scales. Leaves alternate, petiolate, discolorous; petioles 4–13 mm long, 0.5–1 mm wide, with dense peltate scales when young, glabrescent; lamina elliptic to ovate, 20–140 mm long, 10–60 mm wide, penninerved with 8–14 lateral veins each side of midrib, tertiary reticulate veins obscure; upper surface glossy green, lateral veins weakly visible, with scattered peltate scales when young, glabrescent; lower surface matt green, lateral veins prominent, with scattered and ± persistent peltate scales, neither scabrous or velutinous; margins denticulate to weakly crenate with 12–26 teeth up to 0.3 mm long, foliar glands prominent; tip acute, obcordate or retuse; base cuneate; extrafloral nectaries 2 at base, sessile, circular to elliptic, 0.4–0.6 mm long, 0.3–0.4 mm wide, visible above and below. Inflorescence up to 40 mm long,

unbranched, often unisexual but occasionally bisexual and androgynous, pedunculate up to 10 mm; axis with sparse to dense peltate scales; bracts lanceolate, 0.5–1 mm long, 0.2–0.3 mm wide, with sparse to dense peltate trichomes. Male flowers 2.8–3 mm long, 3.5–5 mm diameter, held singly on inflorescence, spaced up to 2 mm apart; pedicels 2–3.7 mm long, 0.3–0.5 mm wide, with scattered peltate trichomes at base or glabrous; sepals valvate, 5, lanceolate-ovate, 1.8–2.3 mm long, 1.2–1.6 mm wide, glabrous or lanate in upper half; petals 5, lanceolate to lanceolate-ovate, 2–2.8 mm long, 0.9–1.3 mm wide, lanate in upper half; stamens 6, filaments ± flattened, 1.8–2 mm long, 0.4–0.6 mm wide, with dense simple trichomes at base, anthers oblong, 0.7–1.1 mm long, 0.7–0.9 mm wide. Female flowers 3–3.5 mm long, 3–5 mm diameter, held singly and spaced up to 5 mm apart; pedicels 1.5–4 mm long, c. 1 mm diameter, with sparse peltate trichomes; sepals valvate, 5, lanceolate, 2–3 mm long, 0.5–1.5 mm wide, glabrous or with scattered marginal cilia; petals absent; styles 3, linear to obloid, up to 2 mm long, bifid once for up to 1.5 mm long, connate at base for c. 0.4 mm, glabrous; ovary 3-locular, 2.3–2.5 mm long, 2.3–2.5 mm diameter, with dense, sessile peltate scales. Fruits trilobate, globose, 7–9 mm long, 6–8 mm diameter, with sparse, sessile peltate scales. Seeds ± obloid, 6–6.8 mm long, 3.5–4.5 mm wide, 2.7–3 mm thick, pale brown to glossy dark brown, adaxial surface bifacial, abaxial surface rounded, micropylar ridge 3.5–5 mm long; caruncle crescent shaped, 1–1.5 mm long, 1.5–1.8 mm wide, cream-yellow. **Fig. 2.**

***Selected additional specimens*: Queensland.** North Kennedy District: Cromarty, ridge above Bruce Highway in Bowling Green Bay N.P., 19°28'S, 147°53'E, Jan 1993, *Forster* PIF12748 & *Bean* (BRI). South Kennedy District: S.F. 658 Carawatha, 20°47'S, 148°34'E, Apr 1991, *Forster* PIF8190 & *McDonald* (BRI, K, L, MEL, QRS). Leichhardt District: Melaleuca Creek Scrub, "Rookwood", 23°12'S, 149°46'E, Apr 1991, *Forster* PIF7953 & *McDonald* (BRI, K, L, MEL, QRS). Port Curtis District: Yaparabah, 10 km SSE of Mardale, 24°39'S, 150°42'E, Dec 1982, *Forster* PIF1481 & *Marshall* (BRI); S.F. 53, Dan Dan Scrub, Dec 1987, *Gibson* 1006 (BRI, NSW); Mt Archer road, 23°21'S, 150°35'E, Nov 1986, *Hoy* 129 (BRI); Mt Etna, 23°10'S, 150°27'E, May 1990, *Vavryn* 101 (BRI). Burnett District: Scientific Area 33, Coominglah S.F. 28, 24°54'S, 151°00'E, Apr 1990, *Forster* PIF6696 (BRI, MEL, QRS); Sanderson's Scrub, Mt Blandy, 4 km W of Mingo Crossing, 25°24'S, 151°44'E, Mar 1999, *Forster* PIF24148 & *Booth* (BRI, QRS); S.F. 695 Kalpowar, Burnett Range road, 24°40'S, 151°21'E, Mar 2000, *Forster* PIF25415 & *Booth* (BRI, K, L, MEL, QRS). Wide Bay District: 1 km SW of Booyal, 25°13'S, 152°02'E, Nov 1987, *Forster* PIF3287 (BRI); Oakview S.F. 220 Malmaison, 12 km ESE of Kilkivan, 26°08'S, 152°20'E, Dec 2002, *Forster* PIF29213 (A, BRI, L, MEL, NSW, WIS); Black Gin Creek, T.R. 580, 25°29'S, 151°55'E, Apr 1990, *Forster* PIF6601 (BRI, CBG, MEL, QRS); Fairlies Knob N.P., 25°30'S, 152°17'E, Dec 1992, *Forster* PIF12593 & *Smyrell* (BRI, MEL, QRS). Darling Downs District: S.F.197 Diamondy, Craig Range, 32 km NE of Jandowae, 26°35'S, 151°20'E, Mar 1999, *Forster* PIF24094 & *Booth* (BRI, QRS). Moreton District: Pullen Creek, Moggill S.F., Feb 1980, *Bird* [AQ331172] (BRI); Commissioner's View, Blackbutt Range, 26°52'S, 152°13'E, Nov 1987, *Forster* PIF3251 & *Bird* (BRI, NSW, SAN, SAR). **New South Wales.** Wiangaree S.F., Jan 1981, *Bird* [AQ345019] (BRI); Oxley River (Middle Arm Creek), just beyond end of Butler's Road, NW of Tyalgum, 29°19'S, 153°09'E, Jul 1981, *Guymer* 1585 & *Jessup* (BRI); 23 km NW of Kyogle, Toonumbar Forest Road, Toonumbar S.F., 28°29'S, 152°48'E, Dec 1991, *Halford* Q823 (BRI, MEL, NSW).

***Distribution and habitat*:** *Croton acronychioides* is widespread in south-eastern Queensland and north-eastern New South Wales, but is present in only a few populations in the South Kennedy and North Kennedy districts (**Map 3**). The species has been recorded from a total of seventeen 1° squares. Plants grow in microphyll to notophyll vineforests on a variety of volcanic substrates and may be sympatric with *C. insularis* and *C. phebalioides*.

***Phenology*:** Flowering occurs from November to May and commences after storm rain. Fruiting occurs from November to August.

***Notes*:** F.Mueller (1864) cited two elements in the protologue of *Croton acronychioides*, one collected at Fitzroy River by Thozet and the other collected at Broad Sound by Bowman. There are three sheets at MEL (MEL231221, 231235, 231233) that are possible syntypes. MEL231221 is sterile and MEL231233 has two conflicting dates ("155/62" and "166/62") indicating a mixed collection. MEL231235 is fertile, but lacks a date and the locality of Broad Sound or Fitzroy River. The labels do indicate that MEL231235 was collected by Bowman near Rockhampton. Mueller (1864) definitely described a fertile plant, hence a lectotype is chosen from MEL231235 as it fulfills more criteria to qualify as a syntype of the name than do the other contenders.

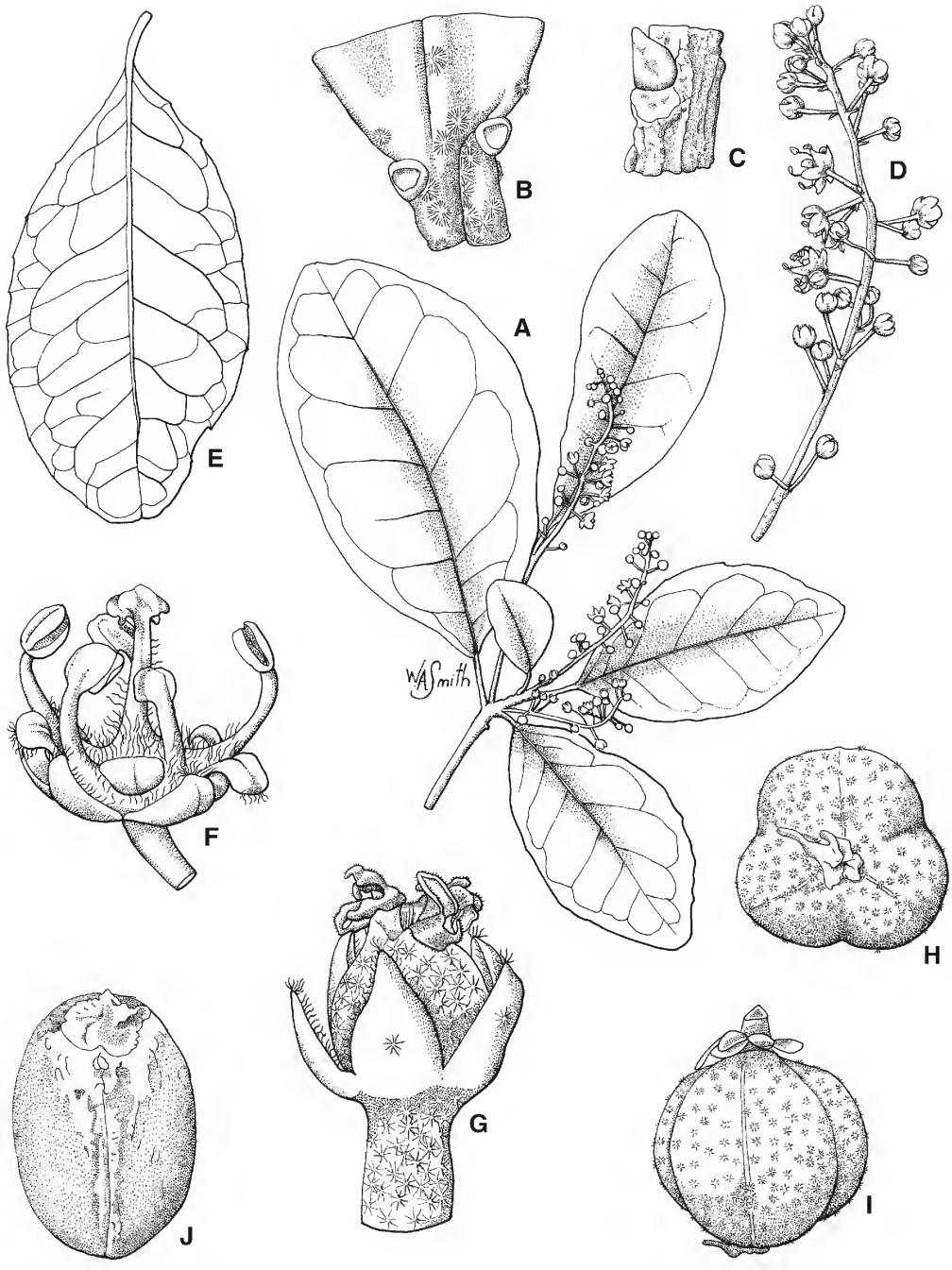


Fig. 2. ***Croton acronychioides***. A. flowering branchlet. × 0.8. B. base of leaf lamina showing extrafloral nectaries. × 16. C. node with stipule. × 4. D. inflorescence with male flowers. × 2. E. undersurface of leaf. × 1. F. male flower (lacking one stamen). × 8. G. female flower. × 8. H & I. fruits. × 4. J. seed. × 6. A, B, D from *Forster* PIF3251 (BRI); C & G. from *Forster* PIF12616 (BRI); E, H–J from *Forster* PIF3287 (BRI); F from *Forster* PIF12593 (BRI). Del. W. Smith.

There are three specimens that may be considered as candidates for a type of *Croton affinis* because they were all collected at Tintenbar by Baeuerlen. There are two at NSW, NSW273959 and NSW273894, only the latter has a date - Feb 1894. There is also one specimen at MEL dated Aug 1893. A lectotype is selected from the Feb 1894 specimen at NSW as this would appear to predate the publication of the name.

***Conservation status*:** Widespread and common, but infrequent and usually disjunct in the northern parts of its range. Present in at least 20 conservation reserves in south-eastern Queensland alone (Forster *et al.* 1991).

***Etymology*:** The specific epithet probably refers to a resemblance of the foliage of this plant to that of some species of *Acronychia* (Rutaceae).

2. Croton aridus P.I.Forst., **sp. nov.** affinis *C. arnhemico* Muell.Arg. a qua foliis 20–36–dentatis, fructibus oblongis majoribusque (13–17 × 10–13 mm), et seminibus oblongiovoideis majoribusque (8.5–10.5 mm longis) differt. **Typus:** Northern Territory. c. 130 km S of Tennant Creek on Stuart Highway, 20 July 1968, *J.Z. Weber* 1084A (holo: AD [1 sheet]; iso: BRI, DNA, MEL).

Croton sp. (Barkly Downs S.L.Everist 3379) (Forster & Henderson 1997: 72; Forster & Halford 2002: 70)

Subshrub to 1.5 m high, multistemmed, monoecious, evergreen, perennial. Indumentum silver. Branchlets rounded, with dense stellate trichomes when young, glabrescent. Stipules linear-lanceolate, 3–5 mm long, 0.4–0.6 mm wide, entire and with dense stellate trichomes. Leaves alternate, discolorous, petiolate; petioles 5–15 mm long, c. 1 mm wide, with dense stellate trichomes when young, rarely glabrescent; lamina ovate to broadly ovate, 15–80 mm long, 10–80 mm wide, palminerved with 3–5 veins from base and 6–8 lateral veins per side of midrib further up lamina, tertiary reticulate veins present; upper surface silver-green, venation weakly visible, with dense stellate trichomes when young, becoming sparse with age; lower surface pale silver-green, lateral and reticulate venation prominent, with dense and ± persistent stellate trichomes, velutinous; margins crenate with 10–18 teeth up to 3 mm long, foliar glands prominent; tip obtuse to acute; base cordate to truncate; extrafloral nectaries at lamina base often absent or obscure, if present then 1 or 2 at lamina base, sessile, elliptic, c. 0.3 mm long and 0.2 mm wide, visible below only. Inflorescence up to 40 mm long, unbranched, usually androgynous, often reduced to single female flower, pedunculate up to 5 mm; axis with dense stellate trichomes; bracts linear-lanceolate to lanceolate, 1–2.5 mm long, 0.3–1 mm wide, with dense stellate trichomes. Male flowers 3–4 mm long, 5–6 mm diameter, densely clustered in upper portion of inflorescence; pedicels 6–7 mm long, c. 0.5 mm wide, with dense stellate trichomes; sepals valvate, 5, lanceolate-ovate, 3–4 mm long, 1.5–2.5 mm wide, with dense stellate hairs; petals 5, oblanceolate, 4–4.5 mm long, 0.8–1 mm wide, lanate in upper half; stamens 20, filaments ± filiform, 2.2–3 mm long, c. 0.1 mm wide, glabrous; anthers oblong, 0.7–0.8 mm long, 0.6–0.7 mm wide. Female flowers 5–6 mm long, 4–5 mm diameter, held singly and spaced 6 mm apart; pedicels 3–8 mm long, c. 1 mm diameter, with dense stellate trichomes; sepals valvate, 5, lanceolate, 3–3.5 mm long, 1.7–2 mm wide, with dense stellate trichomes; petals absent; styles 3, linear-obloid, up to 3 mm long, bifid once for up to 2.8 mm long, ± free at base, glabrous; ovary 3-locular, c. 3 mm long and 3 mm diameter, with dense, ± sessile stellate trichomes. Fruits trilobate, oblong-ovoid, 13–17 mm long, 10–13 mm diameter, with dense, ± sessile stellate trichomes. Seeds ± obloid, 8.5–10.5 mm long, 7–9 mm wide, 4–6 mm thick, matt brown, ventral surface bifacial or ± rounded, dorsal surface rounded, micropylar ridge 8–8.8 mm long; caruncle ovate, 1.5–mm long, c. 1.8 mm wide, cream. **Fig. 3**.

***Additional specimens*: Western Australia.** Near Edgar Range, SE of Broome, 18°28'S, 123°03'E, Aug 1976, *Kenneally* 5733 (CANB); c. 40 km NE of Callawa Station HSD, E of Shay Gap, 20°26'S, 120°47'E, Aug 1997, *Mitchell* PRP1823 (BRI); 79 km SE of Broome on Dampier Downs road, NW of Edgar Ranges, 18°15'S, 122°45'E, Jul 1989, *White* 150 (PERTH); 9 miles [15 km] N of Bonney Well, Aug 1963, *Winkworth* 1579 (DNA). **Northern Territory.** Barkly Tablelands, Barkly Stock route, 19°52'S, 137°07'E, Mar 1988, *Brock* 375 (DNA); 16 km WSW Soudan, 20°05'S, 136°48'E, Jun 1960, *Chippendale* NT7284 (AD, BRI, CANB, MEL); Barkly Tableland, 40 km WNW

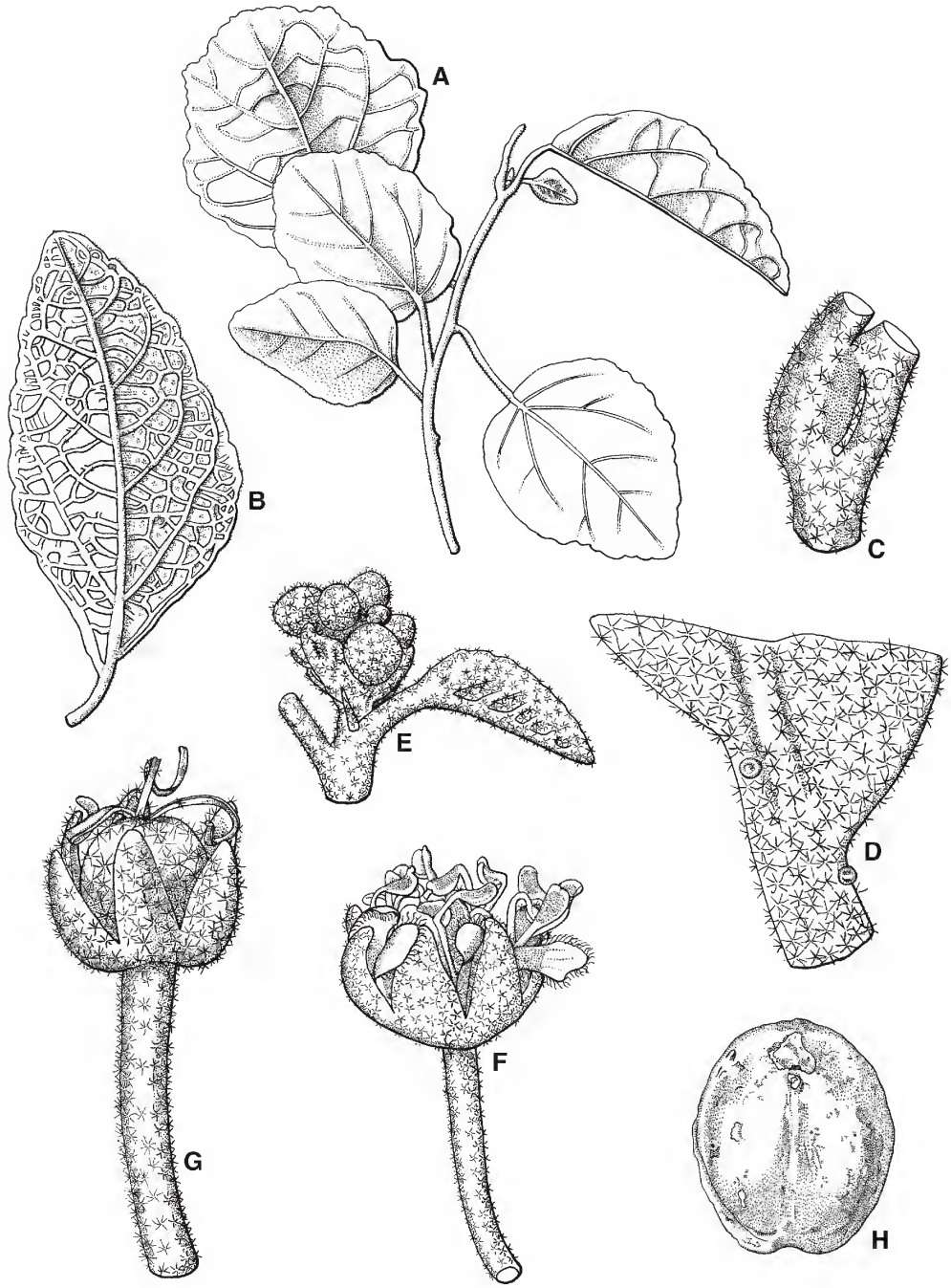


Fig. 3. ***Croton aridus***. A. branchlet. × 1. B. undersurface of leaf. × 1.5. C. node showing stipule. × 6. D. base of leaf lamina showing extrafloral nectaries. × 12. E. node with inflorescence. × 3. F. male flower. × 6. G. female flower. × 6. H. seed. × 3. A–D, H from *Everist* 4243 (BRI); E from *Chippendale* 7284 (BRI); G & F from *Weber* 1084 (BRI). Del. W. Smith.

Frewena, 19°18'S, 135°02'E, Jun 1960, *Chippendale* NT7349 (BRI, CANB, DNA); Singleton, 240 miles [400 km] N of Alice Springs, Jan 1950, *Everist* 4243 (BRI); 98 km N of Annitowa, 20°24'S, 136°50'E, Mar 1981, *Henshall* 3454 (DNA); 10 km S of Wauchope, 20°45'S, 134°15'E, Jul 1977, *Latz* 7511 (AD, DNA); 2 km W of Lake Surprise, 20°13'S, 131°46'E, May 1984, *Latz* 9908 (DNA, PERTH); 2 km W of Lake Surprise, Tanami Desert, 20°12'S, 131°45'E, Jun 1985, *Latz* 10073 (AD, DNA); c. 35 km W of Green Swamp Well No. 4 on road to Lajamanu, 19°14'S, 132°19'E, Sep 1985, *Leach* 815 (DNA); c. 55 km NE of Green Swamp Well No. 4, 18°49'S, 132°54'E, Sep 1986, *Leach* 868 (DNA); 102.5 km W of the Stuart Highway on track to Lajamanu, 19°22'S, 133°20'E, Mar 1988, *Leach* 1708 (DNA); 82 miles [131 km] S of Tennant Creek Jul 1968, *Must* 282 (AD, DNA). **Queensland.** BURKE DISTRICT: Red Sand hills NE of Barkly Downs Homestead, Jul 2002, *Bailey & Kelman* 1 (BRI); Barkly Downs, c. 50 miles [83.3 km] SW of Camooweal, Dec 1947, *Everist* 3379 (BRI, CANB).

***Distribution and habitat*:** *Croton aridus* is widespread in arid central Australia in Western Australia, the Northern Territory and Burke district in Queensland (**Map 2**). The Western Australian populations are markedly disjunct from those in central Australia. Although the species has only been recorded from fourteen 1° squares, it is likely that many further populations will be found. Plants grow on red sand plains or ridges in *Triodia* hummock grasslands, mulga shrublands or open woodland dominated by *Ventilago viminalis*.

***Phenology*:** Flowering occurs sporadically throughout the year following storm rain. Fruits mature two or three months after flowering.

***Notes*:** *Croton aridus* is allied to *C. arnhemicus* and may be a sister-taxon that has adapted to the arid-zone. *Croton aridus* differs most markedly from *C. arnhemicus* in the leaves with 20–36 marginal teeth, the larger (13–17 mm long, 10–13 mm diameter) oblong fruit with larger (8.5–10.5 mm long) oblong-ovoid seed. *Croton arnhemicus* has leaves with 60–100 marginal teeth, globose fruit (6–11 mm long, 7–11 mm diameter) and smaller, obloid to ovoid seeds (4–7 mm long).

***Conservation status*:** *Croton aridus* is widespread and common in its known range.

***Etymology*:** The specific epithet refers to the distribution of this species in arid parts of Australia.

3. Croton armstrongii S.Moore, J. Linn. Soc., Bot. 45: 219 (1920). **Type:** Northern Territory. Port Essington, *Armstrong s.n.* (holo: BM).

Shrub, height unknown, monoecious, ?evergreen or deciduous, perennial. Indumentum uncoloured. Branchlets ± rounded, with scattered stellate trichomes, glabrescent. Stipules lanceolate, 0.3–1 mm long, 0.2–0.3 mm wide, entire and with scattered stellate trichomes. Leaves alternate, discolorous, petiolate; petioles 1–5 mm long, 0.5–0.8 mm wide, with sparse stellate trichomes; lamina ovate, 15–55 mm long, 5–25 mm wide, palminerved with 3–5 lateral veins from base and 5 or 6 lateral veins per side of midrib further up lamina, tertiary reticulate veins poorly developed; upper surface dark green, lateral veins not visible, with scattered stellate trichomes; lower surface pale green, venation weakly developed, with scattered to sparse stellate hairs, neither scabrous nor velutinous; margins crenate with 15–20 teeth 0.5–1.5 mm long, foliar glands prominent; tip acute; base truncate; extrafloral nectaries 1 or 2 at lamina base, subulate, c. 0.6 mm long and 0.2 mm wide, visible above only. Inflorescence up to 50 mm long, unbranched, usually androgynous, pedunculate for up to 2 mm; axis with sparse stellate trichomes; bracts lanceolate, 0.9–1.2 mm long, 0.4–0.5 mm wide, with scattered stellate trichomes. Male flowers c. 2.5 mm long, 3.5–4 mm diameter, densely clustered towards the inflorescence tip; pedicels 1–1.5 mm long, c. 0.2 mm wide, with sparse stellate trichomes; sepals valvate, 5, lanceolate-ovate, 1.8–2 mm long, 1.2–1.3 mm wide, with sparse stellate trichomes; petals 5, oblanceolate, c. 1.6 mm long and 1 mm wide, lanate in upper half and with scattered stellate hairs on backs; stamens 12, filaments ± flattened, 1.4–1.7 mm long and c. 0.1 mm wide, glabrous; anthers oblong, c. 0.8 mm long and 0.6 mm wide. Female flowers c. 3.5 mm long and 5 mm diameter, held singly 1–5 mm apart; pedicels 1.5–2 mm long, 0.7–0.8 mm diameter, with dense stellate trichomes; sepals valvate, 5, lanceolate-obovate, c. 4 mm long and 2 mm wide, with sparse stellate trichomes; petals absent; styles 3, linear, 1.8–2 mm long, multifid, twice divided over 1.4–1.8 mm, connate at base for c. 0.3 mm long, with scattered simple and stellate trichomes; ovary 3-locular, c. 2 mm long

and 2.5 mm diameter, with dense stellate trichomes. Fruits and seeds not seen.

***Specimens examined*:** Known only from the type.

***Distribution and habitat*:** Apparently at Port Essington, Northern Territory (**Map 6**).

***Phenology*:** Unknown.

***Notes*:** *Croton armstrongii* remains an enigma. Airy Shaw (1980) reduced his own *Croton habrophyllus* to synonymy with the earlier name, but did not consult the type specimen of *C. armstrongii* at BM. Wilmot-Dear (1987) subsequently reinstated *Croton habrophyllus* demonstrating that the type of *C. armstrongii* is not conspecific with that of the later name.

The type collection of *Croton armstrongii* was supposedly made at Port Essington. No further collections that are conspecific with the type have been made in the Northern Territory, despite an intensive survey of closed forests by staff of the Northern Territory Conservation Commission in the late 1980s. This may indicate that the taxon is not present in Australia and that the type specimen is incorrectly labelled. There is circumstantial evidence for the BM specimen being incorrectly labelled. An *Armstrong* collection at NSW (NSW270599) that is labelled as *Croton armstrongii*, is conspecific with the type of *C. habrophyllus*. Armstrong also collected in Vanuatu and the Banks Islands (Lanjouw & Stafleau 1954), hence it is possible that the type of *Croton armstrongii* originates from one of these regions. Nevertheless the BM type is of a distinct taxon warranting recognition. Whether the taxon is native to Australia remains to be determined. Until this is resolved there seems little choice but to include the taxon as Australian.

***Conservation status*:** Unknown.

***Etymology*:** Named for Sir Alexander Armstrong (1818–1899) who made plant collections in Melanesia and at Port Essington.

4. Croton arnhemicus Muell.Arg., Linnaea 34: 112 (1865); *Oxydectes arnhemicus* (Muell.Arg.) Kuntze, Rev. Gen. Pl. 2: 611 (1891). **Type:** Queensland. Cape York, *MacGillivray* 514 (lecto [here designated]: K *n.v.*, photo at BRI!); Northern Territory. 'in Arnhemsland Novae-Hollandiae septentrionalis', *F. Mueller* (lectopara: G-DC *n.v.*, fiche at BRI!); Sea Range, towards the Fitzmaurice, October 1855, *F. Mueller* (lectopara: MEL231274 & MEL231258).

Croton arnhemicus var. *urenifolius* Baill., Adansonia 6: 300 (1866). **Type:** Queensland. Port Denison, *E. Fitzalan* (syn: MEL231243, MEL231249 & MEL231251); Edgecombe Height, Aug 1863, *Dallachy* (syn: MEL231246).

Croton arnhemicus var. *typicus* Domin, Biblioth. Bot. 89: 329 (1827), **nom. inval. Type:** same as *C. arnhemicus* Baill.

***Illustrations*:** Brock (1988: 129); Dunlop (1995: 214, fig. 71).

Shrub to 5 m high, monoecious, evergreen, perennial. Indumentum ferruginous-silver. Branchlets rounded, with dense overlapping, stellate trichomes when young, glabrescent. Stipules linear to linear-lanceolate, 1.7–11 mm long, 0.2–0.8 mm wide, entire and with dense stellate trichomes. Leaves alternate, discolorous, petiolate; petioles 3–75 mm long, 0.9–2 mm wide, with dense stellate trichomes when young, rarely glabrescent; lamina elliptic, orbicular, ovate, obovate, 20–240 mm long, 10–200 mm wide, palminerved with 3–5 veins from base and 5–7 lateral veins per side of midrib further up lamina, tertiary reticulate veins present; upper surface grey-green, venation weakly visible, with scattered to sparse stellate trichomes; lower surface ferruginous-silver, lateral and reticulate venation prominent, with sparse to dense, overlapping stellate trichomes, scabrid or velutinous; margins denticulate to weakly crenate with 30–50 teeth up to 2 mm long, foliar glands prominent; tip acute to rounded; base cordate, cuneate, rounded or truncate; extrafloral nectaries 2 at lamina base, sessile or stipitate to 1 mm long, ellipsoid, 0.5–2 mm long, 0.5–1.2 mm wide, visible above and below. Inflorescence up to 200 mm long, unbranched, usually androgynous, pedunculate up to 24 mm; axis with dense stellate trichomes; bracts linear to lanceolate, 0.5–2 mm long, 0.2–0.7 mm wide, with dense stellate trichomes. Male flowers 3.5–6 mm long, 3–7 mm diameter, held singly or rarely in groups

of 2–5 in upper portions of inflorescence; pedicels 1.5–10 mm long, 0.5–1 mm wide, with dense stellate trichomes; sepals valvate, 5, lanceolate-ovate to ovate, 2–4.5 mm long, 1–2 mm wide, with sparse to dense stellate hairs; petals 5, oblanceolate to obovate, 2–4.2 mm long, 0.6–2.5 mm wide, lanate in upper half; stamens 20–44, filaments ± filiform, 1.5–4.5 mm long, 0.1–0.2 mm wide, glabrous; anthers oblong, 0.6–1.1 mm long, 0.4–1 mm wide. Female flowers 3–6 mm long, 3.5–6 mm diameter, held singly and spaced up to 20 mm apart; pedicels 1–7 mm long, 0.4–2 mm diameter, with dense stellate trichomes; sepals valvate, 5, lanceolate-ovate to ovate, 2.2–3.5 mm long, 1–2.2 mm wide, with dense stellate trichomes; petals absent; styles 3, linear, 1.8–5.5 mm long, bifid for 1.7–5.3 mm, connate at base for c. 0.1 mm, with sparse stellate trichomes; ovary 3-locular, 2–4 mm long, 2–4 mm diameter, with dense, sessile and stalked stellate trichomes. Fruits trilobate, globose, 6–11 mm long, 7–11 mm diameter, with dense, sessile and stalked stellate trichomes. Seeds obloid to ovoid, 4–7 mm long, 3–5 mm wide, 2.2–4 mm thick, brown-black, ventral surface bifacial, dorsal surface rounded, micropylar ridge 3–5 mm long; caruncle ellipsoid-ovate, 0.8–1.5 mm long, 1.3–2.2 mm wide, cream. **Fig. 4**.

***Selected additional specimens*: Northern Territory.** Humpty Doo, 12°32'S, 130°50'E, Sep 1984, *Brock* 19 (DNA); c. 12 miles [20 km] S of Katherine, Jan 1973, *Byrnes 2875* (BRI, CANB, DNA); Stuart Highway, Edith Falls turnoff, 14°15'S, 132°01'E, Dec 1990, *Evans 3476* (BRI, CANB, DNA); Vicinity of El Sharana, Jan 1973, *Martensz & Schodde* AE400 (BRI, CANB); Upper East Alligator River, 13°01'S, 133°25'E, Nov 1987, *Russell-Smith* 4151 & *Lucas* (DNA); 9 km S Koolpinyah Homestead, 12°28'S, 131°10'E, *Russell-Smith* 8126 & *Lucas* (BRI, CANB, DNA). **Queensland.** Cook District: Mt Scatterbrain, Butchers Hill Station near Lakeland, 15°52'S, 144°53'E, Jan 1992, *Forster* PIF9523 (BRI, K, L, MEL, QRS); 13 km past Chillagoe on Mungana road, 17°06'S, 144°24'E, Jan 1992, *Forster* PIF9578 (BRI, DNA, L, MEL, QRS); Mt Eliza, 8 km NW of Mt Surprise, 18°06'S, 144°15'E, Jan 1993, *Forster* PIF12799 (BRI, MEL, QRS); Agate Creek, Robinhood Station, 18°50'S, 143°25'E, Apr 1996, *Forster* PIF19076 *et al.* (BRI); Badu Island, Torres Strait, 10°07'S, 142°07'E, Dec 1979, *Garnett* 253 (BRI); Archer River Crossing on Peninsula Development road, 13°26'S, 142°55'E, Nov 1986, *Jessup* 768 (BRI). North Kennedy District: Harold Island, 20°14'S, 149°09'E, Nov 1985, *Batianoff* 3456 & *Dalliston* (BRI); Turkey Scrub, Whitewater, 18°10'S, 144°38'E, Jan 1993, *Fensham* 343 (BRI); Mingela Bluff, 19°53'S, 146°45'E, Jan 1992, *Forster* PIF9414 & *Bean* (A, B, BRI, DNA, K, L, MEL, MO, NY, QRS); Swamp Bay, Conway Range N.P., 20°16'S, 148°46'E, Jan 1993, *Forster* PIF12738 (BRI, MEL, QRS); Nellie Bay, Dingo Beach, 20°05'S, 148°30'E, Dec 1999, *Forster* PIF25263 & *Booth* (BRI, JE, MEL, QRS); 23 km NNE of Proserpine, 11 km from Bruce Highway on road to Dingo Beach, Box Creek crossing, 20°14'S, 148°31'E, Nov 1991, *Halford* Q671 (BRI, K, MEL, QRS); Mt Inkerman, 12 km S of Home Hill, 19° 46'S, 147°30'E, Mar 1992, *Halford* Q877 (BRI, MEL). SOUTH KENNEDY DISTRICT: on hill above Lake Elphinstone, 21°33'S, 148°14'E, Jan 1978, *Anderson* 271 (BRI); Havilah, 20°58'S, 147°52'E, Dec 1992, *Fensham* 542 (BRI).

***Distribution and habitat*:** *Croton arnhemicus* is widespread in northern Australia in the "Top end" of the Northern Territory and northern Queensland (**Map 2**). This species has been recorded from forty-six 1° grid squares and is undoubtedly the most widespread of the Australian *Croton* taxa. Plants grow in deciduous vinethickets or in open eucalypt woodland on a variety of soil types but predominantly hard laterites or limestone.

***Phenology*:** Flowering and fruiting occurs throughout the year following storm rain. Most flowering records are from the October to February period.

***Notes*:** J. Mueller (1865) listed several syntypes in the protologue of *Croton arnhemicus*. All of these have been located and a lectotype is selected from the best available specimen.

Croton arnhemicus is an extremely variable species in terms of its habit and vegetative morphology. Some variation seen in specimens may be explained by its deciduous habit, resulting in the early flowers of the season often being collected with young foliage. Later flowers and fruit are always collected with older and more mature foliage. Plants in deciduous vinethickets grow into quite large shrubs or small trees up to 6 m in height, whereas those that occur in the eucalypt woodlands in the Northern Territory are often multistemmed due to regular burning back of the above ground parts. These Northern Territory plants develop into small trees if fire is excluded, whereas the allied *Croton multicaulis* P.I.Forst. in Queensland always retains the multistemmed subshrub habit. *Croton arnhemicus* and *C. multicaulis* are superficially similar, and apart from the difference in habit, *C. arnhemicus* has leaves

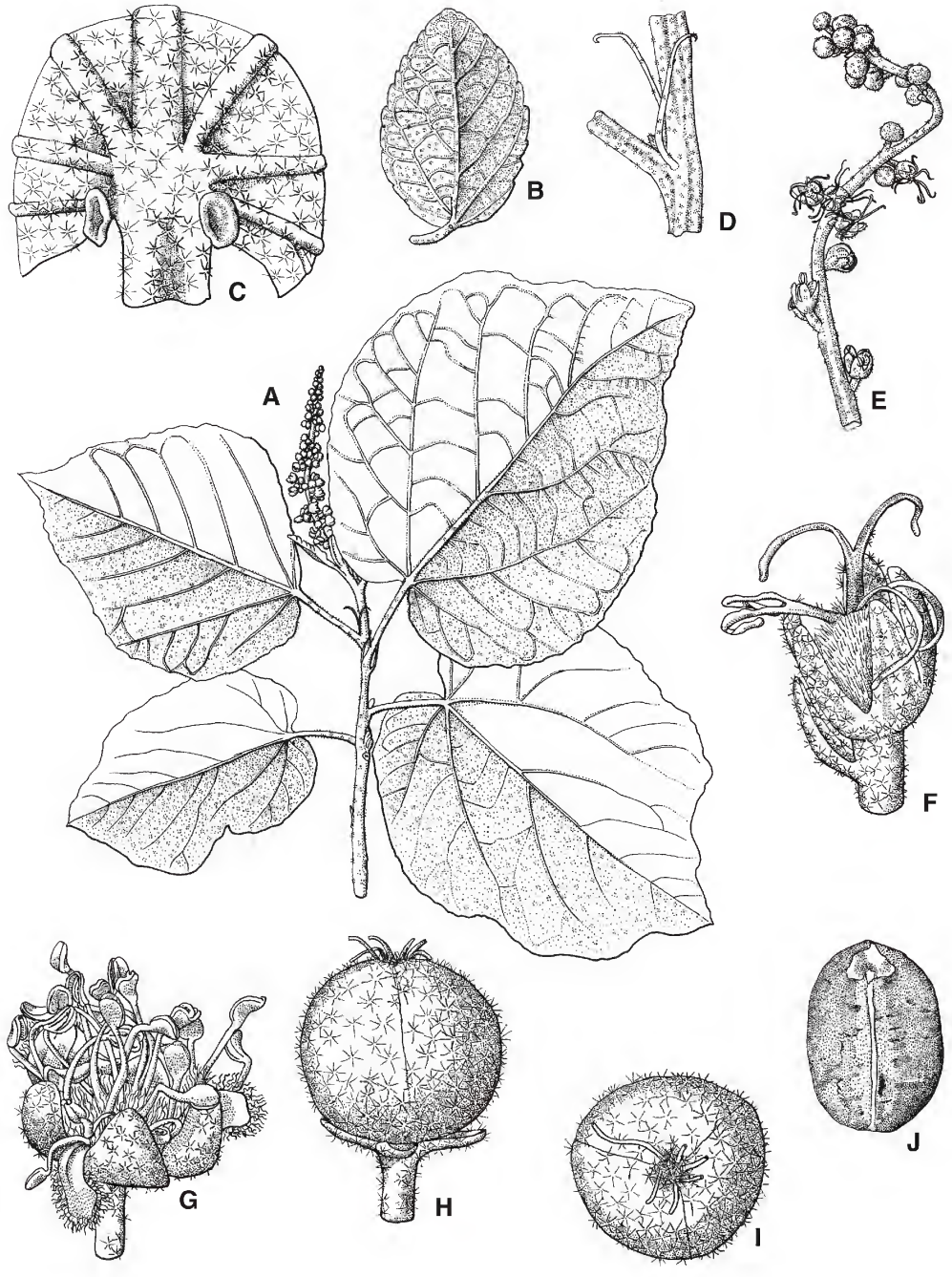


Fig. 4. ***Croton arnhemicus***. A. flowering branchlet. × 0.5. B. undersurface of leaf. × 1. C. base of leaf lamina showing extrafloral nectaries. × 6. D. node showing stipules. × 2. E. inflorescence with female flowers in lower half and male flower buds in upper half. × 1. F. female flower. × 6. G. male flower. × 6. H & I. fruits. × 3. J. seed. × 4. A, C, D from *Champion* 319 (BRI); B, E, F, G from *Forster* PIF9414 (BRI); H–J from *Forster* PIF9523 (BRI). Del. W. Smith.

with 60–100 marginal teeth and male flowers with 20–44 stamens, whereas *C. multicaulis* has leaves with 32–56 marginal teeth and male flowers with 11–24 stamens.

Croton arnhemicus was included in *C.* section *Cascarilla* Griseb. by Webster (1993a), but transgresses the character states for this section in the palmate venation (versus pinnate) and the stamen number.

***Conservation status*:** Very common.

***Etymology*:** The specific epithet alludes to one of the original syntypes being collected in Arnhem Land.

5. Croton brachypus Airy Shaw, Muelleria 4: 224 (1980). **Type:** Queensland. Cook District: Tozer Range, 0.5 mile [0.8 km] east of Mt Tozer, 6 July 1948, *L.J. Brass* 19462 (holo: K *n.v.*; iso: BRI, CANB).

Shrub to 3 m high, monoecious, evergreen, perennial. Indumentum ferruginous. Branchlets rounded, with scattered to sparse peltate scales when young, glabrescent. Stipules linear-lanceolate, c. 1.7 mm long, c. 0.7 mm wide, entire and with sparse peltate scales. Leaves alternate, discolorous, petiolate; petioles 2–5 mm long, 1–1.4 mm wide, with sparse peltate scales; lamina narrow-ovate, oblanceolate or obovate, 18–180 mm long, 12–70 mm wide, penninerved with 7–11 lateral veins per side of midrib, tertiary reticulate veins weakly developed; upper surface matt dark green, venation not visible, glabrous; lower surface pale green, lateral and tertiary reticulate veins weakly developed, glabrous or with scattered peltate scales when young, neither scabrid nor velutinous; margins entire or weakly sinuate, foliar glands prominent; tip acute to shortly acuminate; base cordate to truncate; extrafloral nectaries 2 at lamina base, shortly stipitate to 0.5 mm long, circular, 0.4–0.5 mm long, 0.4–0.5 mm wide, visible below only. Inflorescence up to 65 mm long, unbranched, usually androgynous, pedunculate up to 12 mm; axis with scattered peltate scales; bracts lanceolate, 0.5–0.8 mm long, 0.2–0.3 mm wide, with scattered to sparse peltate scales. Male flowers 2–2.5 mm long, 3.5–4 mm diameter, sparsely to densely clustered on inflorescence; pedicels 2–2.5 mm long, c. 0.4 mm wide, with sparse peltate scales; sepals valvate, 5, lanceolate, 1.5–2 mm long, c. 1 mm wide, lanate in upper half; petals 5, lanceolate, 1.8–2.4 mm long, 0.8–1 mm wide, lanate in upper half; stamens 10–11, filaments filiform, 2.3–2.5 mm long, c. 0.1 mm wide, glabrous or with scattered simple trichomes at base, anthers oblong, c. 0.8 mm long and 0.4 mm wide. Female flowers 3–3.5 mm long, 5–6 mm diameter, held singly and spaced 2–6 mm apart; pedicels 0.8–1 mm long, c. 0.5 mm diameter, with sparse peltate scales; sepals valvate, 5, lanceolate, 1.8–2 mm long, 0.5–0.8 mm wide, with sparse peltate scales; petals absent; styles 3, linear, 2.3–2.5 mm long, bifid for 1.8–2 mm, connate at base for c. 0.6 mm, glabrous; ovary 3-locular, 1–1.3 mm long, 1–1.3 mm diameter, with dense, ± sessile peltate scales. Fruits trilobate, globose, 5–6 mm long, 5–6 mm diameter, with sparse, ± sessile peltate scales. Seeds ovoid, 4–5 mm long, 3–4 mm wide, c. 3.5 mm thick, brown and white blotched, ventral surface bifacial, dorsal surface rounded, micropylar ridge 2.8–3.8 mm long; caruncle obloid, 1.2–1.5 mm long, c. 0.4 mm wide, cream. **Fig. 5.**

***Additional specimens*: Queensland.** Cook District: Tozer Range, north end, Jun 1948, *Brass* 19355 (CANB); Lower northern slopes of Mt Tozer, 12°45'S, 143°15'E, Jun 1972, *Dockrill* 441 (BRI, QRS); Iron Range N.P., 1.3 km NE of Mt Tozer, 12°44'S, 143°13'E, May 1994, *Fell* DGF4083 et al. (BRI); at base of Paps, Tozer Gap, 12°43'S, 14°3°12'E, Jul 1991, *Forster* PIF9093 (BRI, K, L, MEL, QRS); Garraway Creek area, 12°43'S, 143°08'E, Jul 1993, *Forster* PIF13552 & *Tucker* (BRI, K, L, MEL, QRS); ditto, Jul 1994, *Forster* PIF15441 (BRI); Puffdelooney Ridge, 12°45'S, 143°13'E, Jul 1972, *Irvine* 249 (BRI, QRS); 8.3 km E of Garraway Creek on road to Portland Roads, 12°45'S, 143°14'E, Jul 1991, *Neldner* 3538 & *Clarkson* (BRI, DNA, MBA, QRS); Hill E of Mt Tozer, Iron Range area, 12°45'S, 143°13'E, Nov 1977, *Tracey* 14211 (BRI); Mt Tozer near Iron Range, 12°45'S, 143°12'E, Nov 1977, *Tracey* 14849 (BRI).

***Distribution and habitat*:** *Croton brachypus* appears to be endemic to the Iron Range area of northern Cape York Peninsula in Queensland (**Map 3**) and is known from only a single degree square. Plants grow on creek banks or on ridges in notophyll to mesophyll semi-deciduous vineforest on volcanic substrates.

***Phenology*:** Flowering occurs sporadically throughout the year with records in October, November, December, June and July. Fruiting probably occurs two or three months later.

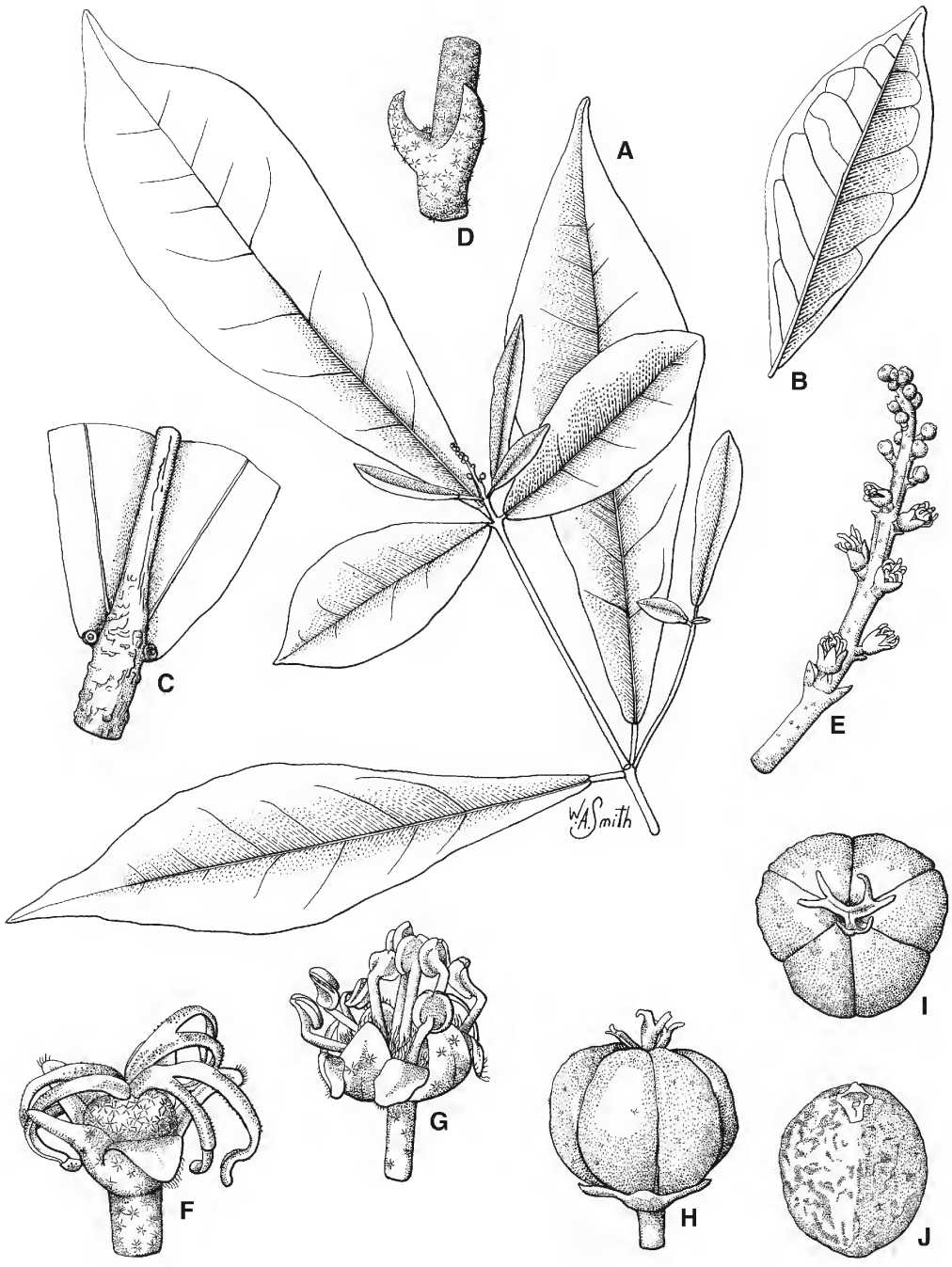


Fig. 5. *Croton brachypus*. A. flowering branchlet. × 0.6. B. undersurface of leaf. × 0.6. C. base of leaf lamina showing extrafloral nectaries. × 4. D. node showing stipules. × 8. E. inflorescence with female flowers towards base and male flowers towards tip. × 2. F. female flower. × 8. G. male flower. × 8. H & I. Fruit. × 4. J. seed. × 6. A–G from *Forster* PIF13552 (BRI); H–J from *Sankowsky* 1445 (BRI). Del. W. Smith.

***Notes*:** *Croton brachypus* is distinctive amongst Australian taxa of *Croton* most notably in the leaves with short petioles.

***Conservation status*:** This species is apparently endemic to a small area of Cape York Peninsula but is locally common. The species is quite common in Iron Range National Park. No conservation coding is thought necessary.

***Etymology*:** The specific epithet is derived from the Greek *brachy* (short) and *-pus* (footed) and presumably alludes to the leaves of this species.

6. Croton byrnesii Airy Shaw, Muelleria 4: 225 (1980). **Type:** Northern Territory. Cannon Hill, 18 December 1972, *N. Byrnes* 2833 (holo: DNA; iso: BRI, CANB; K *n.v.*).

Shrub to 4 m high, monoecious, deciduous, perennial. Indumentum ferruginous to yellow. Branchlets ± rounded, with scattered stellate trichomes when young, glabrescent. Stipules linear, 0.7–2.5 mm long, c. 0.2 mm wide, entire and with scattered stellate trichomes. Leaves alternate, discolorous, petiolate; petioles 10–45 mm long, 0.5–1 mm wide, with sparse stellate trichomes; lamina elliptic, ovate, lanceolate-ovate, 40–170 mm long, 15–90 mm wide, penninerved with 11–13 lateral veins per side of midrib and indistinct tertiary reticulate veins; upper surface dark matt-green, lateral veins weakly visible, glabrous; lower surface pale green, venation weakly developed, with scattered stellate trichomes, neither scabrid nor velutinous; margins crenate with 20–29 short teeth up to 0.5 mm long, foliar glands prominent; tip acute, acuminate; base cuneate, rounded; extrafloral nectaries 2 on petiole 0.4–1 mm below lamina base, sessile or stipitate up to 0.5 mm, ellipsoid, 0.7–1 mm long, 0.5–0.8 mm wide, visible above and below. Inflorescence up to 150 mm long, unbranched, androgynous or with mixed glomerules, pedunculate up to 30 mm; axis with scattered stellate trichomes; bracts lanceolate, 0.8–1.2 mm long, 0.3–0.4 mm wide, with scattered stellate trichomes. Male flowers 2.2–2.5 mm long, 3–4 mm diameter, in dense glomerules of many flowers clustered towards top of inflorescence; pedicels 2.2–4 mm long, 0.4–0.5 mm wide, glabrous or with scattered stellate trichomes; sepals valvate, 5, ovate, 2–2.5 mm long, 1.3–1.5 mm wide, with lanate tip; petals 5, oblanceolate, 2–3 mm long, 0.7–0.8 mm wide, with lanate tip; stamens 9–11, filaments flattened, 1.5–2 mm long, c. 0.2 mm wide, glabrous, anthers oblong, 0.8–1 mm long, c. 0.7 mm wide. Female flowers 3.8–4 mm long, 3.5–3.8 mm diameter, densely clustered with males, sometimes single and up to 15 mm apart; pedicels 2.5–7 mm long, 0.5–0.9 mm diameter, with scattered stellate trichomes; sepals valvate, 5, lanceolate to lanceolate-ovate, 2–3 mm long, 1–2.5 mm wide, with lanate tip; petals absent; styles 3, linear, 1.8–2.7 mm long, multifid, twice divided for 1–1.5 mm, connate at base for 0.2–0.3 mm, glabrous; ovary 3-locular, 1.5–2.3 mm long, 2–2.3 mm diameter, with dense, sessile stellate trichomes. Fruits trilobate, depressed-globose, 4.5–5 mm long, 6–7 mm diameter, with scattered, sessile stellate trichomes. Seeds ± obloid, 3.5–4.5 mm long, 3.2–4 mm wide, 2.5–2.8 mm thick, tan-brown, ventral surface rounded to weakly bifacial, dorsal surface rounded, micropylar ridge 2.3–2.5 mm long; caruncle crescent-shaped, 1–1.5 mm long, 1.7–2.5 mm wide, cream. **Fig. 6.**

***Additional specimens*: Northern Territory.** Cannon Hill, 12°22'S, 132°56'E, Nov 1976, *Airy Shaw* (DNA1079); East Alligator River, 12°29'S, 133°03'E, Feb 1973, *Dunlop* 3235 (DNA); East Alligator River, 12°50'S, 133°22'E, Dec 1989, *Dunlop* 7628 (AD, BRI, CANB, DNA, MEL, NSW) 1 mile [1.7 km] SW Cannon Hill, Feb 1973, *Martensz & Schodde* AE648 (BRI, CANB, DNA); 2.5 miles [4.2 km] N Cannon Hill airstrip, Feb 1973, *Martensz* AE812 (BRI, DNA); 10 km S Cannon Hill, 12°28'S, 132°55'E, Nov 1983, *Russell-Smith* 845 (BRI, CANB, DNA); Upper East Alligator River, 12°49'S, 133°22'E, Oct 1987, *Russell-Smith* 3860 & *Lucas* (BRI, DNA); Upper East Alligator River, Arnhem Land, 12°50'S, 133°20'E, Apr 1988, *Russell-Smith* 5283 & *Lucas* (DNA); 12 km E of Mudginberri Homestead, Kakadu N.P., 12°35'S, 132°59'E, Jan 1991, *Russell-Smith* 8402 & *Brock* (BRI, DNA, MEL).

***Distribution and habitat*:** *Croton byrnesii* is restricted to the headwaters of the Alligator River in Arnhem Land (**Map 4**) where it has been collected from two 1 degree grid squares. Plants grow in fragmented vinethickets, often dominated by *Allosyncarpia ternata* S.T.Blake and *Lophostemon lactifluus* (F.Muell.) Peter G. Wilson & Waterhouse, along streams in sandstone gorges.

***Phenology*:** Flowering occurs from November to April, following storm or wet season rain. Fruiting occurs two or three months later.

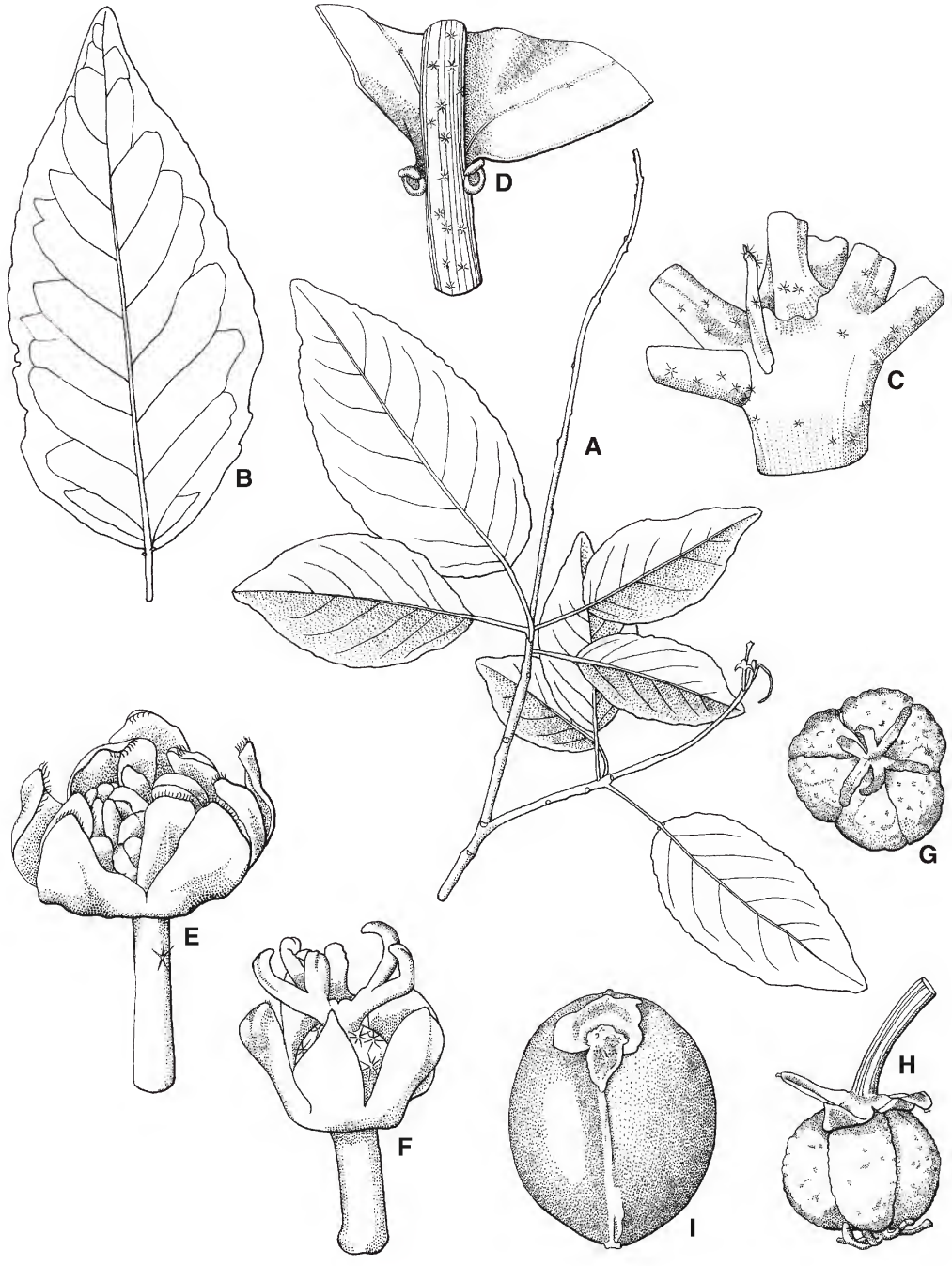


Fig. 6. ***Croton byrnesii.*** A. fruiting branchlet. × 0.8. B. undersurface of leaf. × 1. C. node showing stipule. × 8. D. base of leaf lamina showing extrafloral nectaries. × 8. E. male flower. × 12. F. female flower. × 8. G & H. fruit. × 4. I. seed. × 8. A,B,I from *Brock* 8402 (BRI); C–F from *Russell-Smith* 845 (BRI); G & H from *Dunlop* 7628 (BRI). Del. W. Smith.

***Notes*:** *Croton byrnesii* is a distinctive species that has been confused at times by collectors with *C. habrophyllus*. As noted by Airy Shaw (1981), *Croton byrnesii* differs from that species in the near glabrescence of the foliage (the trichomes ferruginous to yellow) and the long stipitate foliar glands that are on the petiole 0.4–1 mm below the lamina base.

***Conservation status*:** *Croton byrnesii* is restricted in its distribution but appears relatively common in its known range. The species is present in Kakadu N.P. No conservation coding is thought necessary.

***Etymology*:** The epithet honours the late Norm Byrnes (1922–1998), former botanist at DNA and BRI, and first collector of the species. Norm made many pioneering collections of plants in eastern Arnhem Land while resident botanist at DNA, including the type of this species.

7. Croton capitatus Michx., Fl. Bor.-Amer. 2: 214 (1803); *Pilinophytum capitatum* (Michx.) Klotzsch in Wiegmann, Arch. Naturges. 7: 255 (1841). **Type:** United States of America. Illinois, *Michaux* (holo: P-Michaux *n.v.*, fiche at BRI!; iso: P-JU *n.v.*, fiche at BRI!).

***Illustrations*:** Small (1913: 454, fig. 2714); James & Harden (1990: 420).

Erect herb to 80 cm high, monoecious, annual. Indumentum silver. Stems rounded, with dense sessile and stalked stellate trichomes. Stipules linear, 2–3 mm long, c. 0.1 mm wide, entire and with dense stellate trichomes. Leaves alternate, discolorous, petiolate; petioles 5–48 mm long, 0.7–0.8 mm wide, with dense sessile and stalked stellate trichomes; lamina lanceolate-ovate, oblong to ovate, 18–55 mm long, 9–25 mm wide, palminerved with 3 veins at base and 3–5 lateral veins per side of midrib further up the lamina, tertiary reticulate veins obscure; upper surface dark silver-green, venation obscure, with sparse to dense stellate trichomes; lower surface silver, venation weakly visible, with dense stellate trichomes; margins entire to weakly sinuate, foliar glands inconspicuous; tip acute to rounded; base cuneate to truncate; extrafloral nectaries absent at leaf lamina base. Inflorescence up to 20 mm long, androgynous, ± sessile; axis with dense sessile and stalked stellate trichomes; bracts linear, 3–4 mm long, c. 0.1 mm wide, with dense stalked stellate trichomes. Male flowers 2–3 mm long, 2–4 mm diameter, held singly or in glomerules of 2–3 flowers on inflorescence, spaced up to 2 mm apart; pedicels 1.8–2.5 mm long, c. 0.2 mm wide, with dense stalked stellate trichomes; sepals valvate, 5, obovate, c. 1.6 mm long and 1.2 mm wide, with dense stalked stellate trichomes; petals 5, oblanceolate, 1.6–2.2 mm long, 0.4–0.5 mm wide, lanate; stamens 10–12, filaments flattened, 1.8–2 mm long, c. 0.2 mm wide, glabrous, anthers oblong, 0.7–0.8 mm long, 0.4–0.5 mm wide. Female flowers c. 11 mm long and 12 mm diameter, held singly and spaced up to 3 mm apart, ± sessile; sepals valvate, 6–8, oblanceolate to obovate, 4–4.8 mm long, 0.5–2 mm wide, with dense stalked stellate trichomes; petals absent; styles 3, linear, 3–3.5 mm long, multifid, thrice divided, connate at base for c. 0.2 mm, with sparse sessile stellate trichomes; ovary 3-locular, c. 2.5 mm long and 4 mm diameter, with dense stalked and sessile stellate trichomes. Fruits trilobate, globose, 7–9 mm long, 7–9 mm diameter, with dense, sessile and stalked stellate trichomes. Seeds orbicular, c. 5 mm long, 4–4.5 mm wide, 2.5 mm thick, orange-brown, ventral surface bifacial, dorsal surface rounded, micropylar ridge 4.5–5 mm long; caruncle crescent shaped, c. 0.7 mm long and 0.7 mm wide, brown-red.

Additional specimens: **United States of America.** OHIO: near Cincinnati, Sep 1880, *Lloyd* [AQ206109] (BRI). MISSOURI: St Louis, Aug 1878, *Martindale* [AQ206110] (BRI). **Australia. New South Wales.** Dubbo to Collie road, 35 miles NW of Dubbo & 15 miles S of Collie, Feb 1955, *Wheeler* (NSW293822).

***Distribution and habitat*:** *Croton capitatus* is native to the United States of America where it is known from New Jersey, Illinois, Kentucky, Missouri, Arkansas, Louisiana, Tennessee, Texas, Oklahoma, Kansas, Iowa, Alabama and North Carolina (Ferguson 1901; Small 1913; Johnston 1959). It is reported as being sparingly naturalised in agricultural land in southern New South Wales south of Collie (**Map 9**) (James & Harden 1990). I have seen only the cited specimen and it needs to be determined if this plant is still naturalised in Australia.

***Phenology*:** Unknown in Australia.

***Notes*:** Michaux (1803) did not specify a herbarium location for the single cited collection from Illinois and no mention of type material for *Croton capitatus* was made by Ferguson (1901). Johnston (1959) saw a photo at GH of a specimen in P but was not specific as to the location within that herbarium. There is a Michaux collection of *Croton capitatus* from Illinois that is present in P-Michaux and P-JU. This collection is presumed to be the type with the P-Michaux sheet considered as the holotype.

Webster (1993a) placed *C. capitatus* in *Croton* section *Pilinophyton* (Klotzsch) A.Gray.

8. Croton capitis-york Airy Shaw, Muelleria 4: 226 (1980). **Type:** Queensland. Cook District: Silver Plains Holding between Rocky River and Massey Creek, 13 September 1973, *G.C. Stocker* 1077 (holo: QRS; iso: BRI, CANB).

Croton capitis-york var. *pilosus* Airy Shaw, Muelleria 4: 226 (1980). **Type:** Queensland. Cook District: 2 km south of Temple Bay Outstation, 12°22'S, 143°05'E, Sep 1976, *B. Hyland* 8995 (holo: QRS).

***Illustrations*:** Airy Shaw (1981: 619, fig. 2A); Forster (1991: 571).

Shrub to 5 m high, monoecious, evergreen, perennial. Indumentum silver. Branchlets rounded, with dense peltate scales. Stipules minute, triangular, < 0.3 mm long and 0.3 mm wide, entire. Leaves alternate, discolorous, petiolate; petioles 3–27 mm long, c. 1 mm wide, with dense stellate trichomes when young, glabrescent; lamina elliptic-ovate, chartaceous, 30–160 mm long, 12–60 mm wide, penninerved with 7–11 lateral veins per side of midrib, tertiary reticulate veins absent; upper surface grey-green, lateral veins indistinct, with scattered to sparse peltate scales; lower surface pale grey-green to silver, lateral veins strongly developed, with sparse to dense peltate scales, neither scabrid nor velutinous; margins entire or weakly sinuate, foliar glands inconspicuous; tip acute, acuminate; base cuneate, truncate; extrafloral nectaries 2, just below leaf lamina base, stipitate to 0.6 mm long, ellipsoid, c. 0.9 mm long and 0.5 mm wide, visible above and below. Inflorescence up to 70 mm long, unbranched, mainly unisexual but occasionally androgynous, pedunculate up to 20 mm; axis with dense peltate scales; bracts lanceolate, c. 0.8 mm long and 0.3 mm wide, with dense peltate trichomes. Male flowers 1.8–2.3 mm long, 3.5–4 mm diameter, densely clustered on inflorescence in glomerules of 3–5 flowers, or spaced to 5 mm apart; pedicels 1.4–1.5 mm long, c. 0.5 mm wide, with dense peltate scales; sepals valvate, 5, lanceolate-ovate, 1.9–2 mm long, 1.3–1.4 mm wide, lanate in upper half; petals 5, lanceolate-ovate, 1.4–1.5 mm long, c. 0.6 mm wide, lanate in upper half; stamens 10–12, filaments filiform, 1.5–2.2 mm long, c. 0.1 mm wide, glabrous, anthers oblong, 0.8–0.9 mm long, 0.4–0.5 mm wide. Female flowers not seen; styles 3, obloid, up to 1.3 mm long and 0.2 mm wide, bifid for up to 0.8 mm long, glabrous. Fruits trilobate, subglobose, 6–7 mm long, 7–8 mm diameter, with dense, stellate trichomes on mamillate protuberances. Seeds ± obloid, 4.9–5 mm long, 3.2–3.3 mm wide, c. 3 mm thick, pale glossy brown, ventral surface bifacial, dorsal surface rounded, micropylar ridge c. 3.4 mm long; caruncle weakly crescent shaped, c. 1.4 mm long and 1 mm wide, tan-yellow. **Fig. 7.**

***Selected additional specimens*: Queensland.** Cook District: 4 km SW of Cape Weymouth - Scrubby Creek, 12°38'S, 143°24'E, May 1990, *Fell* DGF2118 (BRI, QRS); Scrubby Creek, between the Rocky and Chester Rivers, Silver Plains, 13°46'S, 143°30'E, Dec 1990, *Fell* DGF2286 (BRI); Kalpowar Pastoral Holding, 10 km ESE of the Normanby River mouth, 14°26'S, 144°13'E, Nov 1992, *Fell* DGF2750 & *Stanton* (BRI, QRS); 4.5 km WSW of the Nesbit River mouth, 57 km NE of Coen, 13°33'S, 143°22'E, Aug 1993, *Fell* DGF3451 *et al.* (BRI); Carron Valley road, 44 km from Moreton Telegraph Station, 12°29'S, 142°57'E, Jun 1988, *Forster* PIF4547 & *Tucker* (BRI); Maloneys Springs, 40 km E by road of Moreton Telegraph Station, 12°28'S, 142°55'E, Jun 1989, *Forster* PIF5468 (BRI, DNA, LAE); 2 km NW of Bolt Head, Temple Bay, 12°15'S, 143°04'E, Jul 1991, *Forster* PIF8957 (BRI, DNA, K, MEL, QRS); 27 km along road to Leo Creek mine, McIlwraith Range, 13°42'S, 143°17'E, *Forster* PIF10050 *et al.* (BRI, K, L, MEL, QRS); 31 km along road to Leo Creek mine, McIlwraith Range, 13°42'S, 143°18'E, Jun 1992, *Forster* PIF10262 *et al.* (BRI, QRS); T.R. 9, Lankelly Creek, 13°53'S, 143°14'E, Jun 1992, *Forster* PIF10331 *et al.* (BRI, MEL, QRS); 3 km N of Massy Creek Crossing, Silver Plains Station, 13°53'S, 143°31'E, Jun 1992, *Forster* PIF10579 *et al.* (BRI, QRS); 3 km SSW of Rocky River Crossing, Silver Plains, 13°49'S, 143°27'E, Jul 1993, *Forster* PIF13668 *et al.* (BRI); Captain Billy Landing turnoff, on Coen to Bamaga road, 11°41'S, 142°41'E, Jun 1994, *Forster* PIF15360 (BRI, MEL, NSW, QRS); West Claudie River, 12°45'S, 143°15'E, Jun 1972, *Hyland* 6170 (BRI, QRS); Olive River, 12°10'S, 143°05'E, Sep 1974, *Hyland*

7449 (BRI, QRS); 0.5 km from main Peninsula road, on Captain Billy road, 11°41'S, 142°42'E, Feb 1992, *Johnson* 4945 (BRI, DNA); Nesbit River, 13°26'S, 143°10'E, Sep 1974, *Tracey* 14103 (BRI); North bank of Olive River near mouth, 12°07'S, 143°05'E, Sep 1974, *Tracey* 14488 (BRI); Bamaga Mission, 11.2 km SW of Cape York, Jan 1965, *Smith* 12393 (BRI); Mt Tozer, Iron Range area, 12°45'S, 143°15'E, Oct 1968, *Webb & Tracey* 8702 (BRI).

***Distribution and habitat*:** *Croton capitis-york* is restricted to northern Cape York Peninsula in Queensland (**Map 5**) where it has been collected from five 1° grid squares. Plants grow in semi-deciduous or evergreen microphyll to notophyll vinethickets and vineforest on sandy soils derived from sandstone.

***Phenology*:** Flowering records are few and have been made in April and June. Fruiting probably occurs two or three months later. This species generally has buds present for most of the year and probably flowers after storm or wet season rain.

***Notes*:** The recognition of varieties in *Croton capitis-york* has been previously refuted (Forster 1991). A putative hybrid individual between this species and *Croton dockrillii* was found at the Rocky River, Silver Plains (*Forster* 13669 *et al.*: BRI, QRS).

At Bolt Head there appears to exist a mixed population of typical *C. capitis-york* and atypical plants that are more densely silver pubescent below. These atypical plants [*Forster* PIF19391 (BRI, MEL) & PIF19406 (A, BRI, K, MEL, QRS)] also have leaf lamina glands that are visible only from below due to their position at the base of the leaf lamina. In typical *Croton capitis-york* these glands are at the junction of the petiole and lamina and are visible from both above and below the leaf. These atypical plants have not been collected in a fertile state so their status cannot be adequately resolved at this stage, although it is likely that they may represent an undescribed taxon.

Croton capitis-york shares the unusual character of fruit with stellate trichomes on mamillate protuberances, as found also in *C. mamillatus* and *C. stigmatosus* from southern Queensland.

***Conservation status*:** *Croton capitis-york* is not rare or threatened. It is present in conservation reserves at Iron Range and Heathlands National Parks.

***Etymology*:** The specific epithet alludes to the occurrence of this plant on Cape York Peninsula.

9. Croton caudatus Geisel., Croton. Monograph. 73 (1807). **Type:** ex India orient., *Dr. Rottler* (holo: C *n.v.*, fiche at BRI!).

Woody scrambler or liane, monoecious, deciduous, perennial. Indumentum uncoloured. Branchlets somewhat angular, with dense stellate trichomes when young, glabrescent. Stipules linear-subulate, 2.6–8 mm long, 0.3–0.58 mm wide, entire or divided and with dense stellate trichomes. Leaves alternate, discolorous, petiolate; petioles 2–3 mm long, c. 1 mm diameter, with dense stellate trichomes; lamina elliptic to ovate, 12–140 mm long, 5–100 mm wide, palminerved with 5 veins at base and 3–6 lateral veins per side of midrib further up the lamina, tertiary reticulate veins obscure; upper surface dark matt-green, lateral veins weakly visible, with scattered to sparse, stellate trichomes; lower surface pale silver-green, venation weakly visible, with dense stellate trichomes, glabrescent, neither scabrid nor velutinous; margins crenate with 25–30 short teeth up to 2 mm long, foliar glands prominent; tip acute, acuminate; base cuneate, cordate, lobate; extrafloral nectaries 2 at lamina base, sessile or stipitate up to 1 mm, circular, c. 0.6 mm diameter, visible above and below. Inflorescence up to 250 mm long, unbranched, usually unisexual but occasionally androgynous, pedunculate up to 50 mm; axis with dense stellate trichomes; bracts linear-lanceolate, 1.2–6 mm long, 0.2–0.3 mm wide, with sparse to dense stellate trichomes. Male flowers 5–7 mm long, 6–8 mm diameter, held singly or in glomerules of 1–6 flowers on inflorescence, spaced up to 2 mm apart; pedicels 3–9 mm long, c. 0.5 mm wide, with dense stellate trichomes; sepals valvate, 5, lanceolate-ovate, 2–3 mm long, 1.2–1.8 mm wide, with dense stellate trichomes; petals 5, obovate, 2.5–3.5 mm long, 1.2–1.7 mm wide, lanate; stamens 23–36, filaments filiform, 3–5.5 mm long, c. 0.1 mm wide, glabrous, anthers oblong, 0.8–0.9 mm long, 0.6–0.7 mm wide. Female flowers 3.5–4 mm long, 5–7 mm diameter, held singly and spaced up to 10 mm apart; pedicels 1–3.5 mm long, 1–1.2 mm diameter, with sparse stellate trichomes; sepals valvate, 5, lanceolate to lanceolate-ovate, 2.8–6 mm long, 1.5–2.5 mm wide, with stellate trichomes; petals absent; styles 3, linear, 3–5.5 mm long, bifid for 2.5–5 mm, connate at base for

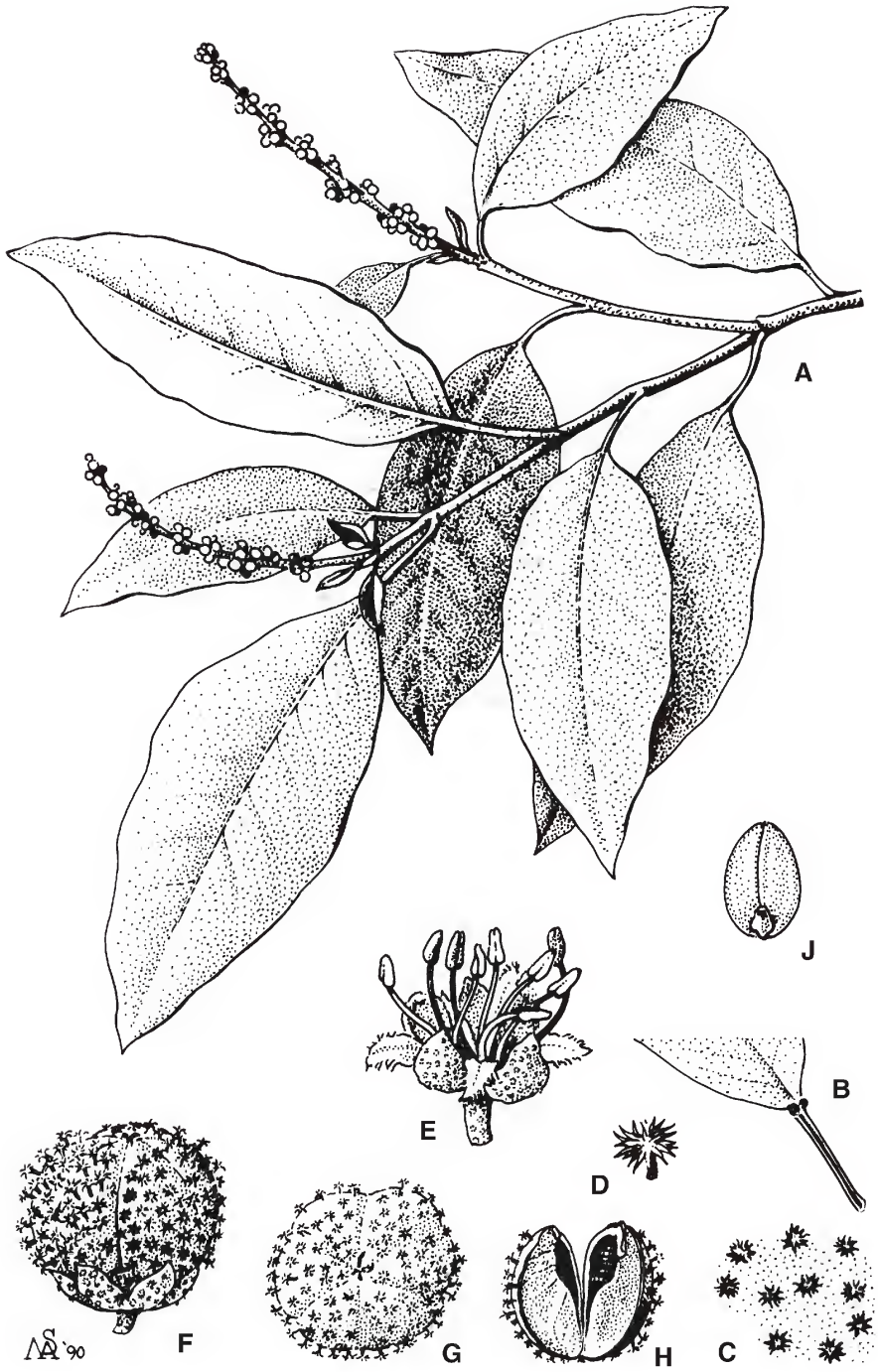


Fig. 7. ***Croton capitis-york.*** A. habit. × 0.75. B. leaf base showing extrafloral nectaries. × 0.75. C. detail of leaf surface showing stellate trichomes. × 12. D. stalked stellate trichome from leaf. × 25. E. male flower. × 6. F & G. fruit. × 3. H. dehisced coccus. × 3. J. seed. × 3. A–E. from *Clarkson* 3641 (BRI); F–J from *Morton* 905 (BRI). Del. M. Saul. Plate reproduced with permission from Forster (1991: 571).

0.2–0.6 mm, with scattered stellate trichomes in lower half; ovary 3-locular, 2.8–3.5 mm long, 2.8–3.5 mm diameter, with dense, sessile and stalked stellate trichomes. Fruits ± globose, 14–22 mm long, 14–24 mm diameter, with dense, sessile and stalked stellate trichomes. Seeds ± ovoid, c. 9 mm long, 7 mm wide, 5 mm thick, brown, ventral surface rounded to weakly bifacial, dorsal surface rounded, micropylar ridge c. 7 mm long; caruncle flattened-ovate, 1–1.5 mm long, c. 2.5 mm wide, pale-brown. **Fig. 8**.

***Selected additional specimens*: Malaysia.** S. Pahang, Fort Iskandar, Mar 1959, *Woods* 1716 (L); Sumatra, Palembang, forest N of G. Roepit, *Forbes* 2572 (L); Sarawak, G. Berloban, 10 km from Tebakang, Tebedu road, Jul 1982, *Yii & Othman* S46180 (L); Sabah, Limbuah darat Banggi Island, Aug 1964, *Ampuria* SAN40384 (L); Hap Seng Plantation road to Sg. Tangkulap, Karamuak, Jun 1982, *Sundaling* SAN90427 (L). **Singapore.** Bukit Timah Nature Reserve, Nov 1982, *Maxwell* 82–286 (L). **Indonesia,** Kalimantan, East Kutai Resrve, vicinity of Sengata & Mentoko rivers, 0°30'N, 117°20'E, Dec 1978, *Leighton* 354 (L); Java, Prov. Besuki, 1895, *Koorders* 20572(L); Sulawesi, northern central part, near Palu, 0°53'S, 119°53'E, Apr 1975, *Meijer* 9200 (L). **Philippines.** Palawan, May 1913, *Merrill* 1243 (BRI, L). **Australia. Christmas Island.** Bordering settlement, Poon San road, 10°26'S, 105°42'E, Sep 1984, *Mitchell* 167 (CANB). **Queensland.** Cook District: Chili Creek, 12°39'S, 143°23'E, Jul 1993, *Forster* PIF13570 *et al.* (BRI, MEL); ditto, Jan 1982, *Hyland* 11568 (QRS); ditto, Mar 1982, *Hyland* 11742 (QRS); ditto, Dec 1982, *Hyland* 12432 (QRS).

***Distribution and habitat*:** *Croton caudatus* is widespread in western parts of Malesia and Asia (Bangledesh, Bhutan, China, India, Myanmar, Nepal, Pakistan, Sri Lanka, Thailand) (Chakrabarty & Balakrishnan 1997), but is known in mainland Australia only from one population at Chili Creek on Cape York Peninsula (**Map 7**). It is also recorded from Christmas Island in the Indian Ocean, an Australian territory (Du Puy & Telford 1993). Plants grow as canopy lianes in semi-deciduous notophyll vineforest.

***Phenology*:** In Australia flowering occurs from December to January and fruiting from March to April.

***Notes*:** Geiseler (1807) based his taxa on specimens in the Vahl herbarium. This herbarium is now deposited at C and sheet 15 appears to represent type material of *Croton caudatus*. A long list of synonyms is given for this species by Chakrabarty & Balakrishnan (1997) and is not repeated here.

Croton caudatus is the only climbing *Croton* in Australia and this lifeform is very rare in the genus throughout its range (Chakrabarty & Balakrishnan 1997; Secco & Rosa 1992).

***Conservation status*:** *Croton caudatus* is very restricted in its Australian occurrence and has perhaps arrived in Australia by accidental human intervention at some time. The only known population is within the Iron Range National Park. No conservation coding is thought necessary at this stage, however, the population could be construed as being endangered due to its proximity to a road.

***Etymology*:** The specific epithet is derived from Latin and probably refers to the shape of the leaf base in this species.

10. Croton choristadenius K.Schum., Nachtr. 295 (1905). **Type**: Papua New Guinea. Augusta-Station, September 1887, *M. Hollrung* 705 (syn: K *n.v.*, photo at BRI!; L *n.v.*); Ramufluss, 15 July 1898, *Tappenbeck* 116 (syn: *n.v.*).

Croton philombros Croizat, J. Arnold Arb. 23: 371 (1942). **Type**: Papua New Guinea. Western Province: Penzara, between the Morehead & the Wassi Kussa Rivers, December 1936, *L.J. Brass* 8455A (holo: A *n.v.*; iso: BRI; L *n.v.*).

Croton pusilliflorus Croizat, J. Arnold Arb. 23: 374 (1942). **Type**: Papua New Guinea. Western Province: Palmer River, below the junction with the Black River, July 1936, *L.J. Brass* 7226 (holo: A *n.v.*; iso: BRI; L *n.v.*).

Croton semunculus Croizat, J. Arnold Arb. 23: 374 (1942). **Type**: Papua New Guinea. Central Province: Nakeo district, Baroka, 10 April 1933, *L.J. Brass* 3770 (holo: A *n.v.*; iso: BRI).

Shrub or tree to 10 m high, monoecious, evergreen, perennial. Bark nondescript, somewhat tessellated; blaze reddish-pink; wood straw. Indumentum silver or silver-ferruginous. Branchlets ± rounded, with admixture of dense stellate trichomes, peltate trichomes and peltate

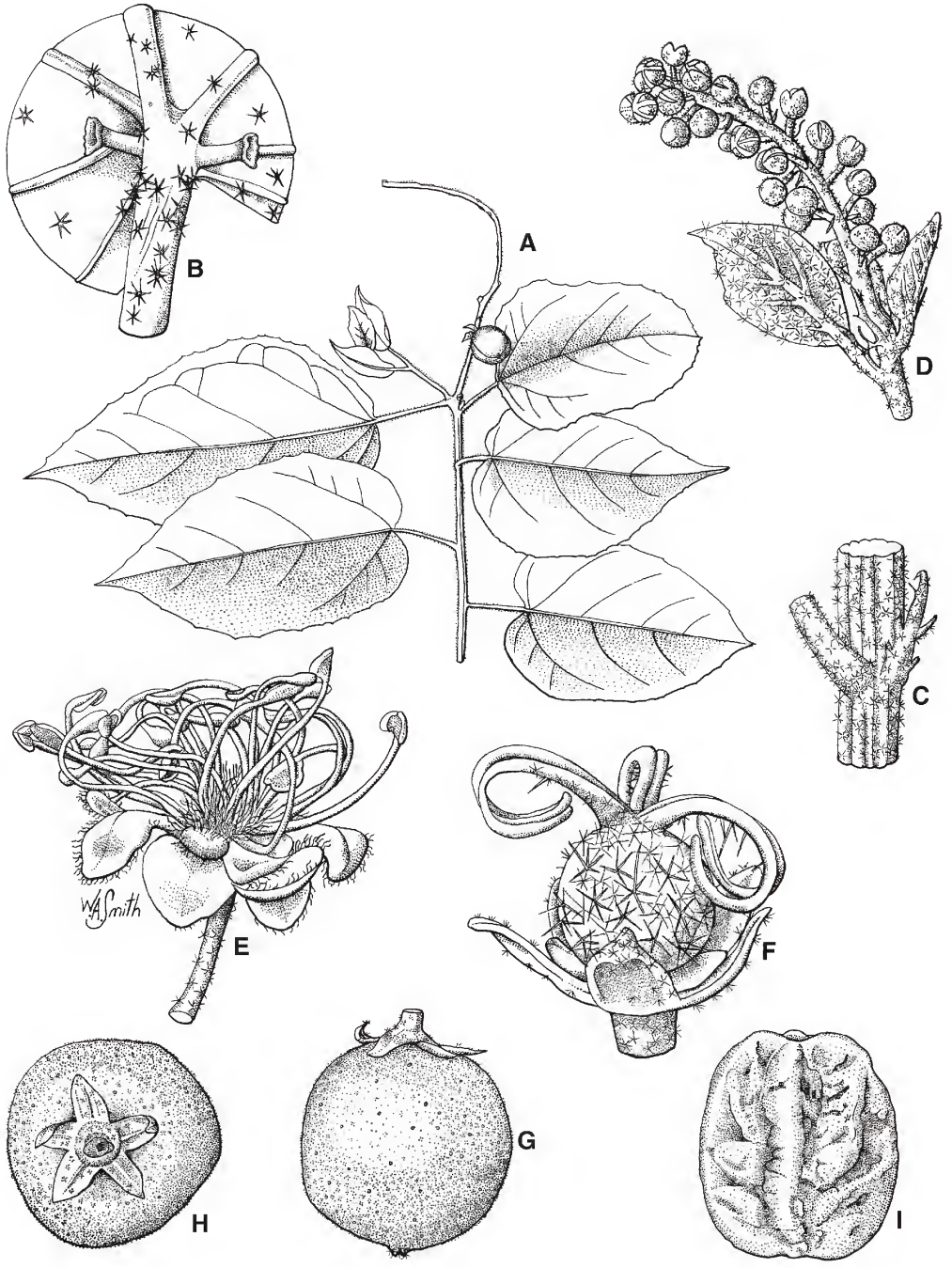


Fig. 8. ***Croton caudatus***. A. fruiting branchlet. × 0.5. B. base of leaf lamina showing extrafloral nectaries. × 8. C. node showing stipule. × 4. D. inflorescence with male flower buds. × 2. E. male flower. × 6. F. female flower. × 8. G & H. fruits. × 1.5. I. seed. × 3. A, B, G, H from *Hyland* 11568 (BRI); C from *Forster* PIF13570 (BRI); D–F from *Hyland* 12432 (QRS); I from *Hyland* 11742 (QRS). Del. W. Smith.

scales, glabrescent. Stipules linear, 0.5–1 mm long, 0.1–0.2 mm wide, entire and with sparse to dense peltate scales. Leaves alternate, discolorous, petiolate; petioles 10–40 mm long, 0.7–1 mm wide, with scattered peltate trichomes and peltate scales; lamina elliptic to ovate, 30–110 mm long, 15–40 mm wide, penninerved with 10–12 lateral veins per side of midrib, tertiary reticulate veins indistinct; upper surface dark green, venation weakly visible, glabrous; lower surface pale green, lateral veins weakly prominent, with widely scattered, peltate trichomes, neither scabrid nor velutinous; margins crenate to denticulate with 20–36 teeth up to 0.2 mm long, foliar glands prominent; tip acute, short to long acuminate; base rounded; extrafloral nectaries 2 at base of lamina, sessile, ellipsoid, 0.8–1.2 mm long, 0.7–0.8 mm wide, visible below only. Inflorescence up to 120 mm long, androgynous, pedunculate up to 20 mm; axis with sparse peltate trichomes; bracts linear-lanceolate, 0.8–1.3 mm long, 0.2–0.5 mm wide, with sparse, peltate trichomes. Male flowers 2.5–3 mm long, 2.5–3 mm diameter, evenly distributed in upper 3/4 of inflorescence; pedicels 1.5–2 mm long, c. 0.4 mm wide, with sparse peltate trichomes; sepals valvate, 5, lanceolate-triangular, 1.3–1.5 mm long, 0.7–0.8 mm wide, with scattered peltate trichomes, lanate at tip; petals 5, oblanceolate, 1.8–2 mm long, c. 0.5 mm wide, lanate near tip and near base; stamens 11 or 12, filaments filiform, 1.2–1.5 mm long, c. 0.1 mm wide, glabrous, anthers oblong, 0.5–0.6 mm long, 0.5–0.8 mm wide. Female flowers 2.5–3 mm long, 2.5–3 mm diameter, held singly and spaced up to 7 mm apart; pedicels 1–1.5 mm long, c. 1 mm diameter, with sparse to dense, peltate trichomes; sepals valvate, 5, lanceolate, 1.5–1.8 mm long, 1.2–1.3 mm wide, with scattered peltate trichomes and stellate trichomes; petals absent; styles 3, linear-flabellate, 1–1.2 mm long, bifid for 0.7–0.9 mm, with scattered peltate trichomes near base; ovary 3-locular, 1.8–2 mm long, 1.4–1.5 mm diameter, with dense, peltate trichomes and occasional stellate trichomes. Fruits trilobate, depressed-globose, 4–5 mm long, 5–6 mm diameter, with sparse, sessile stellate trichomes. Seeds ± obloid, 3–3.5 mm long, 2.5–2.8 mm wide, 2–2.2 mm thick, glossy brown, ventral surface bifacial, dorsal surface rounded, micropylar ridge 1.8–2 mm long; caruncle ellipsoidal, c. 1.8 mm long and 1 mm wide, yellowish. **Fig. 9**.

***Additional specimens*: Papua New Guinea.** Morobe Province: Lower Inokanda L.A., Bulolo, 7°10'S, 146°40'E, Jun 1962, *Havel* NGF9168 (BRI); Crooked Creek L.A., Bulolo, Jul 1964, *Havel* NGF25550 (BRI); Bulolo Valley, 7°10'S, 146°40'E, Oct 1955, *McVeigh & Ridgwell* NGF7368 (BRI); Busu River, 7°25'S, 147°10'E, Aug 1970, *Streimann* NGF45101 (BRI). Central Province: c. 2 miles W of Kanosia Plantation, Jul 1962, *Darbyshire* 602 (BRI); Cape Rodney, TP107, near P.I.T. Sawmill, Jun 1968, *Henty* NGF38618 (BRI). Northern Province: near Davatutu Village, Jul 1953, *Hoogland* 3396 (BRI); Oive Ridge, Jul 1964, *Millar* NGF23521 (BRI). **Australia, Queensland**. Cook District: Macrossan Range, Turrel Hill, Silver Plains, 13°30'S, 143°30'E, Jul 1997, *Forster* PIF21326 et al. (A, AD, BRI, DNA, L, MEL, MO, NSW, QRS); ditto, *Forster* PIF21327 et al. (A, AD, BRI, DNA, MEL, NSW, QRS).

***Distribution and habitat*:** *Croton choristadenius* occurs in Papua New Guinea in the Morobe, Central and Northern Provinces and is here newly recorded from a single locality on Cape York Peninsula in Queensland (**Map 3**) in the most speciose grid square in Australia for *Croton* taxa. At Turrel Hill *Croton choristadenius* forms a canopy tree in low semi-deciduous complex notophyll vineforest on metamorphic derived substrate.

***Phenology*:** Flowers were recorded in July in Queensland. Specimens from Papua New Guinea have had flowers in the months of June-August and fruit in the months of July and October.

***Notes*:** *Croton choristadenius* was renamed several times by Croizat (1942) based on a series of collections by Brass in southern New Guinea. These names were subsequently reduced to the synonymy of *C. choristadenius* by Airy Shaw (1980a).

This species was included in *Croton* section *Tiglium* (Klotzch) Baill. by Webster (1993a), but transgresses the characters given for that section in the admixture of peltate scales and stellate trichomes (versus stellate trichomes only).

Croton choristadenius is one of four Australian species of *Croton* that form small trees, the others being *C. insularis, C. phebalioides* and *C. stigmatosus*. Consequently I have included brief descriptors on bark, blaze and wood in the descriptions for these taxa.

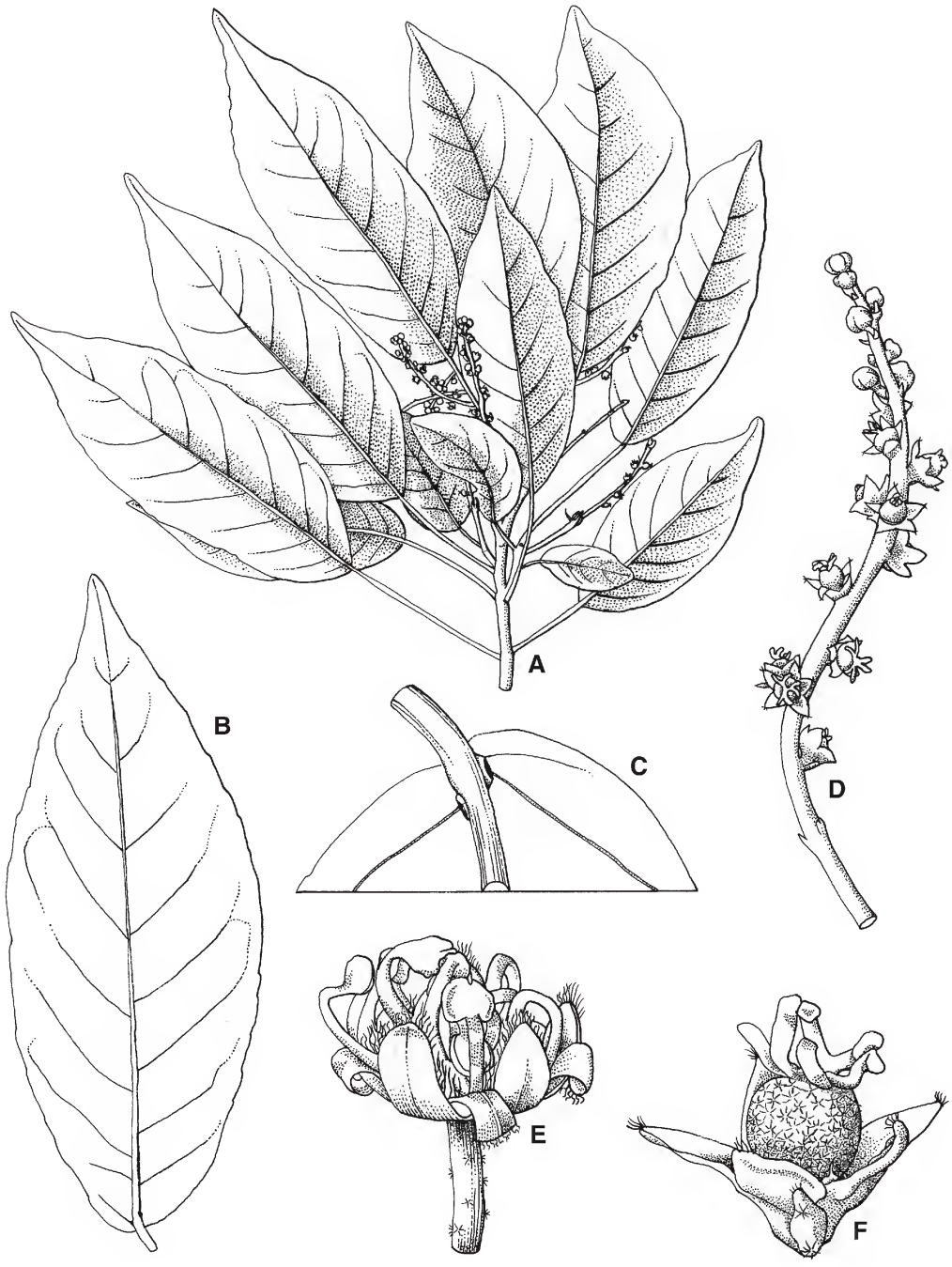


Fig. 9. ***Croton choristadenius***. A. flowering branchlet. × 0.6. B. undersurface of leaf. × 1. C. base of leaf lamina showing extrafloral nectaries. × 6. D. inflorescence with female flowers in lower half and male flower buds in upper half. × 2. E. male flower. × 10. F. female flower. × 10. A–D, F from *Forster* PIF21326 (BRI); E from *Forster* PIF21327 (BRI). Del. W. Smith.

***Conservation status*:** In Queensland *Croton choristadenius* is a very rare tree and has only been seen on one ridge of Turrel Hill where it was locally common over about a hectare. Further investigation of other parts of Turrel Hill and the adjacent Xena Hill in 1998 did not reveal further individuals of this species. Further unexplored hills in the Macrossan Range require examination for additional populations of this species. *Croton choristadenius* has not been found in Iron Range and surrounds or near Bamaga, so it may be reasonable to assume that it is truly restricted in its Queensland occurrence. Turrel Hill is now included in Aboriginal controlled land and the future of land management in favour of rare plants in this area remains uncertain.

***Etymology*:** From the latin *chorisis* (to split into parts) and *adenius*, and probably referring to the leaf lamina glands.

11. Croton densivestitus C.T.White & W.D.Francis, Proc. Roy. Soc. Queensland 35: 80–83, fig. 9 (1923) ('densivestitum'). **Type:** Queensland. Cook District: Harvey's Creek, 1889, *F.M. Bailey* (holo: BRI; iso: MEL).

Croton pubens Domin, Biblioth. Bot. 89: 882, t. 31, fig. 11–19 (1928). **Type:** Queensland. Cook District: Harvey's Creek and near estuary of Russell River, 1909–10, *Domin* (holo: ?PR *n.v.*).

Shrub to 3 m high, monoecious, evergreen, perennial. Indumentum yellow. Branchlets rounded, with dense stellate trichomes. Stipules linear-lanceolate, 3.5–4 mm long, 0.3–1 mm wide, entire and with dense stellate trichomes. Leaves alternate, discolorous, petiolate; petioles 3–30 mm long, 1–1.5 mm wide, with dense stellate trichomes; lamina elliptic to ovate, 40–180 mm long, 20–80 mm wide, penninerved with 12–14 lateral veins per side of midrib, tertiary reticulate veins obscure; upper surface dark green, venation not visible, glabrous or with scattered stellate trichomes; lower surface pale green, lateral veins weakly prominent, with dense, stellate trichomes, markedly velutinous; margins denticulate with 20–23 teeth up to 0.2 mm long, foliar glands prominent; tip acute, short to long acuminate; base rounded, weakly cordate; extrafloral nectaries 2 at base of lamina, stipitate to 1.5 mm, circular, 0.7–0.9 mm long, 0.7–0.9 mm wide, visible below only. Inflorescence up to 70 mm long, androgynous, pedunculate up to 20 mm; axis with dense stellate trichomes; bracts lanceolate, 0.8–1.3 mm long, 0.2–0.3 mm wide, with sparse to dense stellate trichomes. Male flowers c. 2.5 mm long and 3.5 mm diameter, densely clustered towards top of inflorescence; pedicels 1.8–2 mm long, 0.1–0.3 mm wide, with dense stellate trichomes; sepals valvate, 5, lanceolate to lanceolate-ovate, 1.3–1.6 mm long, c. 0.8 mm wide, with dense stellate trichomes, lanate at tip; petals 5, oblanceolate, c. 1.5 mm long and 0.4 mm wide, lanate in upper half; stamens 11 or 12, filaments filiform, 1.5–1.8 mm long, c. 0.1 mm wide, glabrous, anthers oblong, 0.4–0.5 mm long, c. 0.3 mm wide. Female flowers 2.5–3.5 mm long, 3–4.5 mm diameter, held singly and spaced up to 10 mm apart; pedicels 1.2–2 mm long, 0.5–0.6 mm diameter, with dense stellate trichomes; sepals valvate, 5, lanceolate, 1.3–1.8 mm long, 0.4–0.8 mm wide, with dense stellate trichomes; petals absent; styles 3, linear, 2.5–3 mm long, bifid for 1.5–2.2 mm, with sparse stellate trichomes in lower half; ovary 3-locular, 1–2 mm long, 1.2–2 mm diameter, with dense, ± sessile stellate trichomes. Fruits trilobate, depressed-globose, 4.5–6 mm long, 6–8 mm diameter, with scattered, ± sessile stellate trichomes. Seeds ± ovoid, 4.5–4.8 mm long, 3.8–4.5 mm wide, 2.5–3 mm thick, brown and white blotched, ventral surface ± rounded, dorsal surface rounded, micropylar ridge 3–3.5 mm long; caruncle truncate-ovate, c. 0.5 mm long and 1.2 mm wide, cream. **Fig. 10**.

***Additional specimens examined*: Queensland.** Cook District: Harvey's Creek, s.dat., *Bailey* [AQ202099] (BRI); Mt Bellenden Ker, 17°16'S, 145°54'E, Sep 1992, *Christensen* 792 (AD, BRI); Carrington road, Carrington, S of Atherton, 17°18'S, 145°27'E, Jun 1999, *Ford* 2236 (BRI, QRS); Base of Bellenden Ker, 17°15'S, 145°53'E, Jul 1993, *Forster* PIF13740 & *Lyons* (BRI, MEL, QRS); Harvey's Creek headwaters, 17°15'S, 145°53'E, Jul 1994, *Forster* PIF15499 *et al.* (BRI); Bellenden Ker Cable Car Station, 17°16'S, 145°54'E, Jan 2002, *Forster* PIF28215 *et al.* (A, BRI, K, L, MEL, WIS); Cooroo Lands, W of Innisfail, 17°31'S, 145°53'E, Jul 1971, *Hyland* 5259 (BRI, QRS); S.F.R. 607, Parish of Cairns, Shoteel L.A., 16°56'S, 145°36'E, Oct 1991, *Hyland* 14258 (QRS); N.P.R. 226, Bellenden Ker, 17°16'S, 145°53'E, Aug 1992, *Hyland* 14517 (QRS); V.C.L. Parish of Glady, 17°31'S, 145°56'E, Sep 1992, *Hyland* 14583 (QRS); Harvey Creek, c. 1.3 km upstream from Bruce Highway, 17°15'S, 145°54'E, Jan 1994, *Jago* 3061 (BRI); Warramami Hill, c. 11 km by road W of Bruce Highway

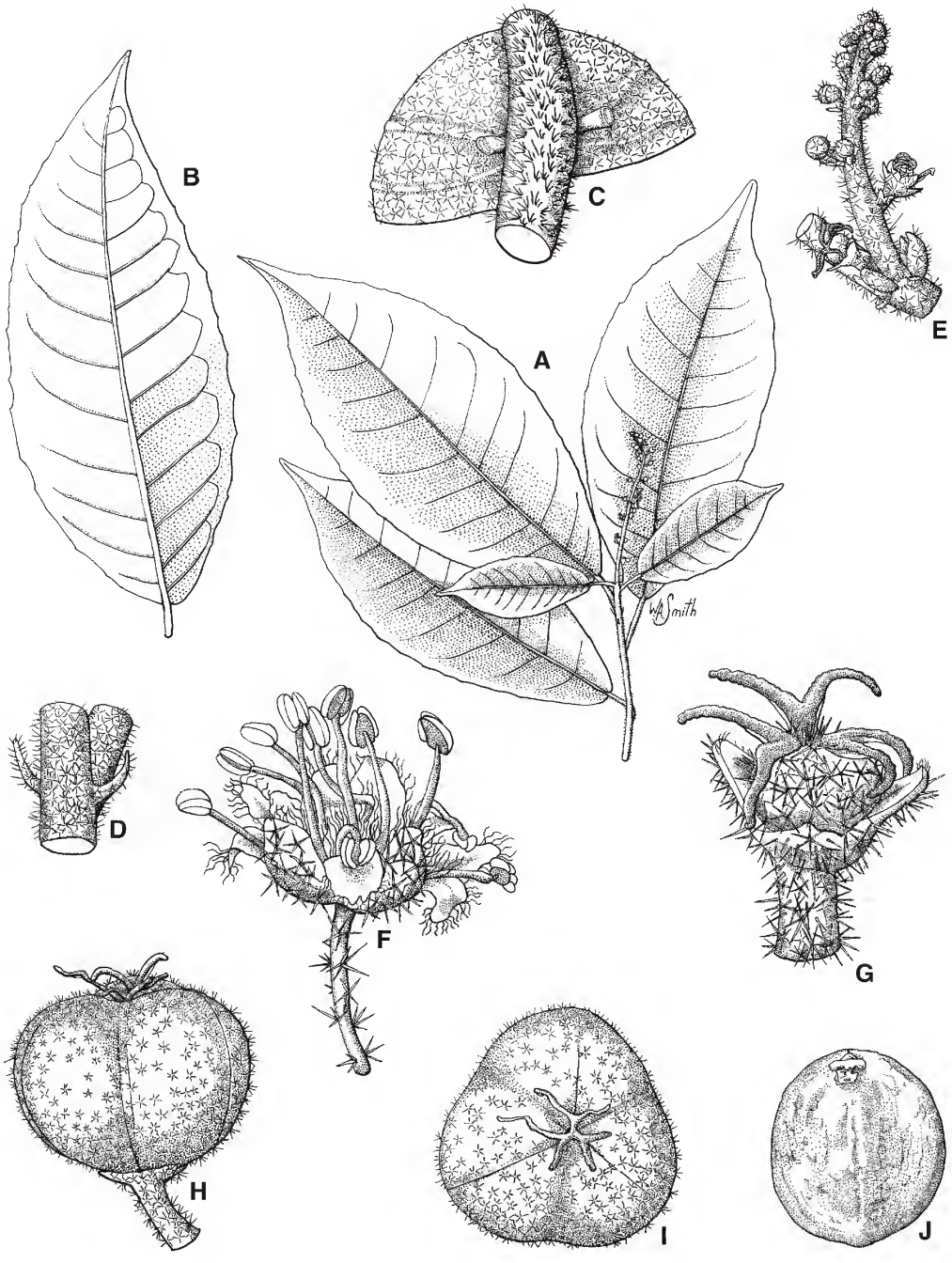


Fig. 10. ***Croton densivestitus***. A. flowering branchlet. × 0.4. B. undersurface of leaf. × 0.6. C. base of leaf lamina showing extrafloral nectaries. × 4. D. node showing stipules. × 4. E. inflorescence with female flowers towards base and male flower buds towards apex. × 2. F. male flower. × 12. G. female flower. × 8. H & I. fruit. × 4. J. seed. × 6. A & F from *Jago* 3068 (BRI); B–E, G–J from *Forster* PIF13740 (BRI). Del. W. Smith.

bridge over North Johnstone River, 17°32'S, 145°55'E, Nov 1982, *Jessup* 509 (BRI, QRS); Russell River, 1892, *Johnson* s.n. (MEL); North Johnstone River, Jun 1985, *Sankowsky* 401 & *Sankowsky* (BRI); Harvey's Creek, Russell River, 1887, *Sayer* s.n. (MEL); Bellenden Ker, Mar 1922, *White* 1291 (BRI); Russell River, 1886, *Sayer* s.n. (MEL); Warramami Hill, Jun 1992, *Tucker* [AQ625430] (BRI, DNA, L, MEL, QRS).

***Distribution and habitat*:** *Croton densivestitus* is restricted to the 'Wet Tropics' of north-eastern Queensland (**Map 5**) where it has been found in two 1° grid squares. Plants generally grow along creeks in lowland notophyll to mesophyll vineforest on alluvium, although there is one disjunct occurrence at 800 m in vineforest on a seasonal watercourse.

***Phenology*:** Flowers have been collected from June to January and fruits in March and July, but it is probable that flowering and fruiting can occur sporadically throughout the year.

***Notes*:** *Croton pubens* was included in the synonymy of *C. densivestitus* by Airy Shaw (1981). No material under this name was received in a loan to BRI from PR, but this does not preclude the existence of type material at that institution. From Domin's original description, there seems little doubt as to the placement of his name here.

Croton densivestitus is distinctive amongst Australian taxa of *Croton* in the dense yellow indumentum of the foliage.

***Conservation status*:** This is a poorly collected plant, although it may be reasonably common in the extant localities. The species is present in Wooroonooran National Park.

***Etymology*:** The specific epithet is derived from the Latin *densus* (dense) and *vestitus* (clothed) and refers to the dense indumentum on the foliage of this species.

12. Croton dockrillii Airy Shaw, Muelleria 4: 227 (1980). **Type:** Queensland. Cook District: Alligator Creek, 12°35'S, 143°24'E, 14 October 1972, *A. Dockrill* 589 (holo: QRS; iso: BRI).

***Illustration*:** Airy Shaw (1981: 619, fig. 2D).

Shrub to 3 m high, monoecious, evergreen, perennial. Indumentum uncoloured. Branchlets rounded, with dense stellate trichomes when young, glabrescent. Stipules linear-lanceolate, 1.5–5 mm long, 0.2–0.8 mm wide, entire and with dense stellate trichomes. Leaves alternate, discolorous, petiolate; petioles 3–26 mm long, c. 1.5 mm wide, with sparse stellate trichomes; lamina elliptic, 30–100 mm long, 20–50 mm wide, penninerved with 10 or 11 lateral veins per side of midrib and reticulate tertiary veins; upper surface dark glossy green, venation not visible, glabrous; lower surface pale green, venation weakly prominent, with scattered stellate trichomes, neither scabrid nor velutinous; margins sinuate to denticulate with 20–28 teeth up to 0.2 mm long, foliar glands prominent; tip acute, short to long acuminate; base cuneate; extrafloral nectaries 2 at base of lamina, stipitate to 1.5 mm, circular, 0.4–0.5 mm long, 0.4–0.5 mm wide, visible above and below. Inflorescence up to 50 mm long, androgynous, pedunculate up to 8 mm; axis with sparse stellate trichomes; bracts lanceolate, 0.7–1.5 mm long, 0.3–0.4 mm wide, with sparse to dense stellate trichomes. Male flowers 3–3.5 mm long, 3.5–4.5 mm diameter, sparsely clustered or held singly towards top of inflorescence; pedicels 2–3 mm long, 0.3–0.4 mm wide, with sparse stellate trichomes; sepals valvate, 5, lanceolate-ovate, 2–2.3 mm long, c. 1.6 mm wide, glabrous, weakly lanate at tip; petals 5, oblanceolate, 2.5–2.8 mm long, 0.7–0.8 mm wide, lanate in upper half; stamens 9–11, filaments filiform, 2.2–2.5 mm long, c. 0.2 mm wide, glabrous, anthers oblong, 0.5–0.6 mm long, 0.4–0.5 mm wide. Female flowers c. 3 mm long, 3–5 mm diameter, held singly and spaced up to 7 mm apart; pedicels 0.5–2 mm long, c. 1 mm diameter, with dense stellate trichomes; sepals valvate, 5, lanceolate to lanceolate-ovate, 2.6–3 mm long, 1–1.5 mm wide, with sparse to dense stellate trichomes; petals absent; styles 3, linear, 2.5–3 mm long, bifid for 1.8–2.6 mm, with scattered stellate trichomes in lower half; ovary 3-locular, 1.7–2 mm long, 1.7–2 mm diameter, with dense, ± sessile stellate trichomes. Fruits trilobate, globose, c. 5 mm long and 5 mm diameter, with sparse, ± sessile stellate trichomes. Seeds ovoid, c. 4 mm long, 4 mm wide, 3.5 mm thick, glossy tan-brown, ventral surface bifacial, dorsal surface rounded, micropylar ridge c. 4 mm long; caruncle truncate-ovate, c. 1–1.2 mm long, 2.3–2.5 mm wide, cream. **Fig. 11**.

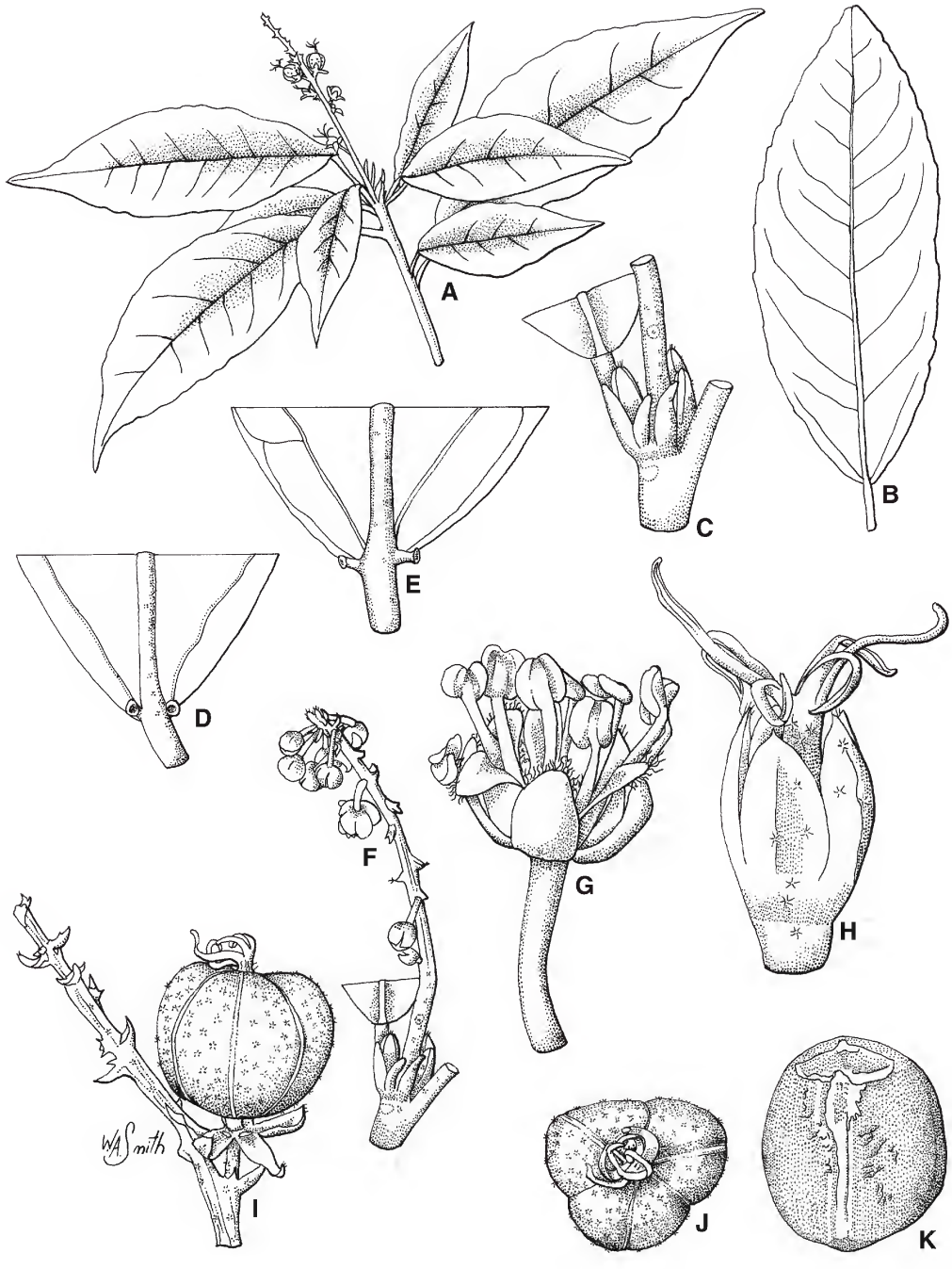


Fig. 11. ***Croton dockrillii***. A. flowering branchlet. × 0.6. B. undersurface of leaf. × 1. C. node with arrangement of stipules. × 3. D & E. base of leaf lamina showing extrafloral nectaries. × 4. F. inflorescence with male flowers. × 2. G. male flower. × 8. H. female flower. × 8. I. fruit on inflorescence. × 4. J. face view of fruit. × 4. K. seed. × 6. A, I–J from *Sankowsky* 1444 (BRI); B & D from *Sankowsky* 1050 (BRI); C, E–H from *Forster* PIF13588 (BRI); K from *Fell* DGF2138 (BRI). Del. W. Smith.

***Additional specimens*: Queensland.** Cook District: King Park, Claudie River, 12°36'S, 143°17'E, Jul 1990, *Fell* DGF2136 (QRS); ditto, *Fell* DGF2137 (QRS); ditto, *Fell* DGF2138 (BRI, QRS); 9 km SW of King Park Ranger Station, Claudie River, 12°46'S, 143°17'E, Apr 1992, *Fell* DGF2495 (BRI, MEL, QRS); Portland Roads, Apr 1944, *Flecker* N.Q.N.C. 8507 (QRS); Rocky River Scrub, eastern fall McIlwraith Range, 13°49'S, 143°27'E, Jun 1992, *Forster* PIF10627 *et al.* (BRI, DNA, K, L, MEL, NSW, QRS); Ham Hill, 12°43'S, 143°18'E, Jul 1993, *Forster* PIF13588 *et al.* (BRI, MEL, QRS); 3 km SSW of Rocky River Crossing, Silver Plains, 13°49'S, 143°27'E, Jul 1993, *Forster* PIF13665 *et al.* (BRI, CANB, MEL, QRS); Rocky River, 13°50'S, 143°25'E, Sep 1973, *Hyland* 6814 (BRI, CANB, QRS); N.P.R. 8, Parish of Weymouth, 12°40'S, 143°21'E, Jan 1982, *Hyland* 11588 (QRS); cult. Forestry & Timber Bureau, Atherton (ex Claudie River), Jan 1975, *Irvine* 1115 (BRI, QRS); cult. Tolga (ex Ham Hill, 12°43'S, 143°19'E), Dec 1989, *Sankowsky* 1050 (BRI, CANB); Iron Range, Sep 1962, *Volck* 2418 (BRI); Galloways Creek, Bamaga, May 1962, *Webb & Tracey* 6083 (BRI).

***Distribution and habitat*:** *Croton dockrillii* is endemic to Cape York Peninsula, Queensland and has been found in the rainforest areas at Cape York, Iron Range and the McIlwraith Range (Map 4) over a total of three 1° grid squares. Plants grow in evergreen notophyll to mesophyll vineforest on volcanic substrates or alluvium. *Croton dockrillii* occurs in association with *C. capitis-york* at some sites and occasional hybrids have been recorded.

***Phenology*:** Flowers have been collected sporadically throughout the year. Fruiting probably occurs two or three months later.

***Notes*:** *Croton dockrillii* is distinctive in the narrow leaves with markedly stipitate glands.

***Conservation status*:** *Croton dockrillii* is uncommon in its known range, but not endangered or threatened at this stage.

***Etymology*:** Named for Alick Dockrill of Atherton, who collected the type specimen.

13. Croton glandulosus L., Syst. Nat. ed. 10, 1275 (1759). *Decarinium glandulosum* (L.) Raf., Neogenyton 1 (1825). **Type:** [Jamaica] *P. Browne*, jam. 346. n. 1 (lecto: LINN 1140.7 *n.v.*; BRI fiche *n.v.*; *fide* Johnston (1959: 182).

***Illustrations*:** Ferguson (1901: plate 16); Small (1913: 454, fig. 2713).

Erect herb to 40 cm high, monoecious, annual. Indumentum uncoloured. Stems rounded, with sparse, sessile and stalked stellate trichomes. Stipules linear-lanceolate, 0.8–1 mm long, c. 0.3 mm wide, entire and with sparse stellate trichomes. Leaves alternate, discolorous, petiolate; petioles 3–25 mm long, 0.7–1 mm wide, with sparse, sessile and stalked stellate trichomes; lamina elliptic to oblanceolate, 5–22 mm long, 4–18 mm wide, palminerved with 5 veins at base and 2 or 3 lateral veins per side of midrib further up the lamina, tertiary reticulate veins obscure; upper surface dark green, venation ± obscure, with scattered stellate trichomes; lower surface pale green, venation weakly visible, with sparse, sessile and stalked stellate trichomes; margins crenate, with 4–7 teeth up to 3.5 mm long, foliar glands inconspicuous; tip acute to obtuse; base cordate to truncate; extrafloral nectaries 2 at top of petiole, sessile, ellipsoid, 0.5–0.8 mm long, 0.4–0.5 mm wide, visible above and below. Inflorescence up to 10 mm long, androgynous, ± sessile; axis with dense, sessile and stalked stellate trichomes; bracts linear, 0.8–1 mm long, 0.1–0.2 mm wide, with dense stellate trichomes. Male flowers c. 1.5 mm long and 1.5 mm diameter, held singly, spaced < 0.5 mm apart; pedicels c. 0.3 mm long and 0.1 mm wide, with dense, sessile and stalked stellate trichomes; sepals valvate, 5, lanceolate-ovate, 0.9–1 mm long and c. 0.5 mm wide, lanate at tip and with sparse, stalked stellate trichomes; petals 5, obovate, c. 0.8 mm long and 0.4 mm wide, lanate; stamens 9–12, filaments flattened, c. 1 mm long and 0.1 mm wide, glabrous, anthers oblong, 0.3–0.4 mm long, 0.3–0.4 mm wide. Female flowers c. 4 mm long and 3 mm diameter, held singly and densely crowded at base of inflorescence, ± sessile; sepals valvate, 5, lanceolate-ovate to obovate, 1.5–4 mm long, 1–1.5 mm wide, with sparse to dense, sessile and stalked stellate trichomes; petals absent; styles 3, linear, 1–1.5 mm long, bifid for c. 1 mm, with sparse sessile stellate trichomes; ovary 3-locular, c. 1 mm long and 1 mm diameter, with dense stellate trichomes. Fruits trilobate, globose, 4–5 mm long, 4–5 mm diameter, with sparse, sessile and stalked stellate trichomes. Seeds oblong, c. 3.5 mm long, 2.8mm wide, 2 mm thick, grey, ventral surface bifacial, dorsal surface rounded, micropylar ridge 2.5–2.8 mm long; caruncle crescent shaped, c. 0.5 mm long and 1.2 mm wide, yellowish. **Fig. 12.**

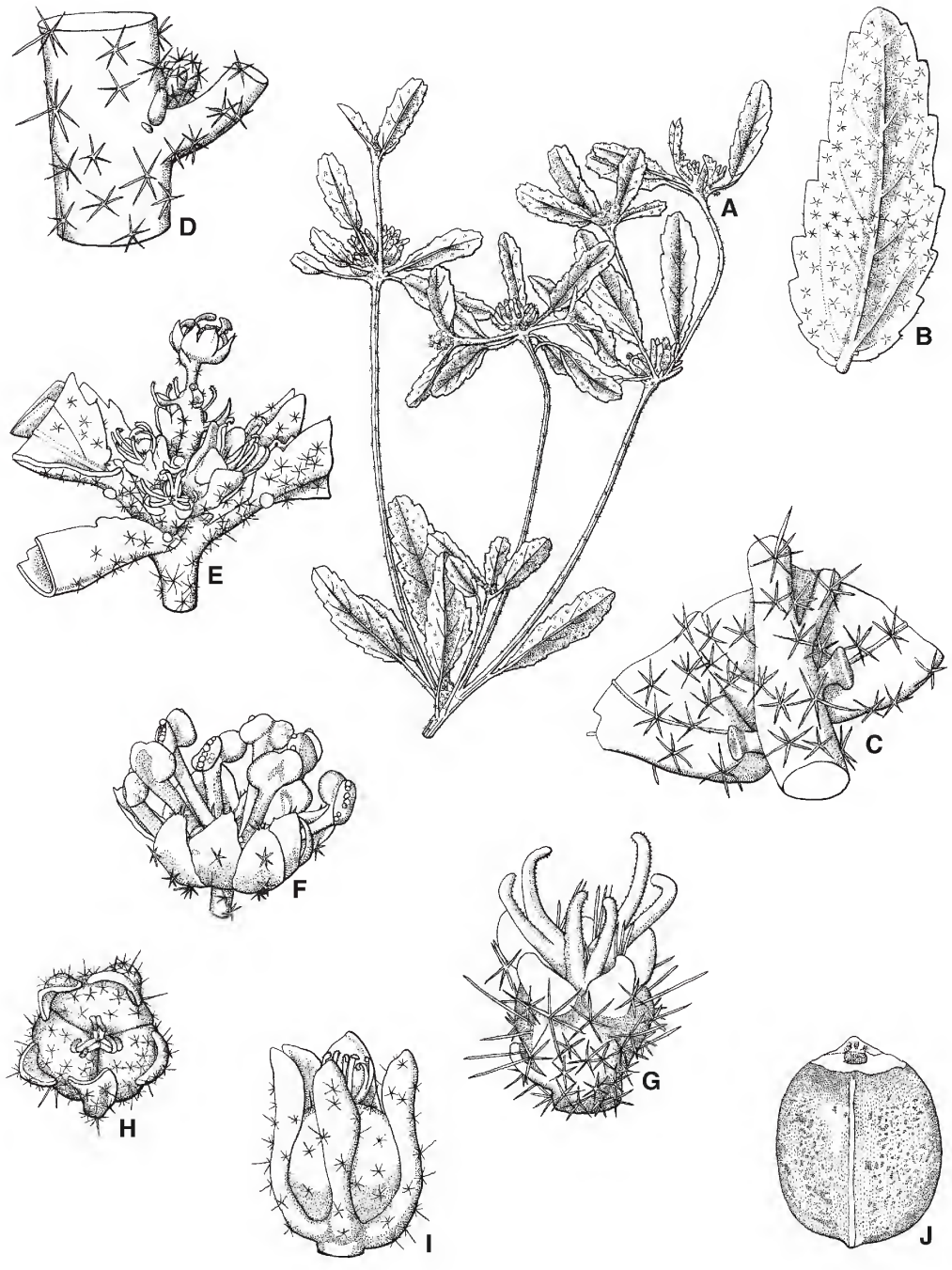


Fig. 12. ***Croton glandulosus***. A. flowering and fruiting branchlets. × 0.6. B. undersurface of leaf. × 2. C. base of leaf lamina showing extrafloral nectaries. × 12. D. node showing stipule. × 8. E. node with inflorescence. × 4. F. male flower. × 12. G. female flower. × 12. H & I. fruit enclosed by calyx. × 4. J. seed. × 8. All from *Forster* PIF28046. Del. W. Smith.

***Additional specimens examined*: U.S.A.** NEW JERSEY: Camden, Aug 1878, *Martindale* AQ206128 (BRI). GEORGIA: College Park, Fulton Co., Apr 1964, *Schallert* 842 (BRI). **Australia, Queensland.** MORETON DISTRICT: Jacobs Well road, Woongoolba, Dec 1994, *Blatch* 1813 (BRI); Jacobs Well, A.Brumm property, 27°47'S, 153°21'E, Dec 2001, *Forster* PIF28046 & *Leiper* (A, AD, BRI, DNA, K, L, MEL, MO, NSW, WIS); Jacobs Well, Apr 2000, *Leiper* [AQ667881] (BRI).

***Distribution and habitat*:** *Croton glandulosus* is native to the U.S.A. where it occurs in the south-eastern and eastern states, through Central America to Brasil (Ferguson 1901; Johnston 1959, 1962). It has been recorded several times from south-eastern Queensland near Jacobs Well (**Map 9**) as a weed in sugar-cane paddocks. Between April 2000 and December 2001, this species had experienced a population explosion at the Jacobs Well locality, with thousands of plants growing in dense swards below a sugar-cane crop.

***Phenology*:** The Australian collection had both flowers and fruits in December.

***Notes*:** Linnaeus (1759) lists "Croton glandulofum Br. jam. 1." in the protologue for *C. glandulosus*. P. Browne donated his Jamaican collections to Linnaeus (Stafleu & Cowan 1981) and the Linnean herbarium (as on the fiche at BRI) has the specimen "Brown. jam. 346. n. 1" which I am equating with being the lectotype of this name as informally designated by Johnston (1959). Several varieties have been recognised for this species based mainly on the density of foliage indumentum (Ferguson 1901; Johnston 1959, 1962).

Webster (1993a) included *C. glandulosus* in *Croton* section *Geiseleria* (Klotzsch) Baill.

***Etymology*:** The specific epithet probably refers to the conspicuous glands on the leaf lamina.

14. Croton habrophyllus Airy Shaw, Kew Bull. 31: 386 (1976). **Type:** Northern Territory. Port Darwin, June 1870, *Schultz* 680 (holo: K *n.v.*, photo at BRI!).

***Illustrations*:** Dunlop *et al.* (1995: 214, Fig. 71); Wheeler (1992: 598, Fig. 182B); Kenneally *et al.* (1996: 100–101).

Small tree or shrub to 4 m high, monoecious, deciduous, perennial. Indumentum silver. Branchlets ± rounded, with dense overlapping stellate trichomes when young, sparse with age. Stipules linear-lanceolate, 0.4–2.2 mm long, 0.1–0.2 mm wide, entire and with scattered stellate trichomes. Leaves alternate, discolorous, petiolate; petioles 3–120 mm long, 0.6–2 mm wide, with scattered to dense stellate trichomes; lamina elliptic, elliptic-ovate or obovate, 15–200 mm long, 7–135 mm wide, with ± penninerved or somewhat palminerved, 9–11 lateral veins per side of midrib and reticulate tertiary veins; upper surface glossy green, lateral venation just visible, with dense stellate trichomes becoming scattered with age; lower surface pale green, venation weakly prominent, with dense stellate trichomes becoming scattered with age, neither scabrid nor velutinous; margins sinuate to denticulate with 35–56 teeth up to 0.5 mm long, foliar glands conspicuous; tip acuminate, acute or rounded; base cordate, rounded or truncate; extrafloral nectaries 2 at lamina base, stipitate to 1 mm, ellipsoid, 0.4–1 mm long, 0.3–0.7 mm wide, visible only below. Inflorescence up to 170 mm long, androgynous or sometimes with glomerules of mixed male and female flowers, pedunculate up to 25 mm; axis with sparse to dense stellate trichomes; bracts linear-lanceolate to lanceolate, 0.7–1.2 mm long, 0.2–0.3 mm wide, with scattered stellate trichomes. Male flowers 2.5–4 mm long, 3–5 mm diameter, held singly or sparsely clustered towards top of inflorescence; pedicels 1.5–6 mm long, 0.3–0.5 mm wide, glabrous or with scattered stellate trichomes; sepals valvate, 5, lanceolate-ovate, 1.8–2.5 mm long, 0.8–1.8 mm wide, glabrous, weakly lanate at tip; petals 5, oblanceolate, 2–3 mm long, 0.5–1 mm wide, lanate at top; stamens 8–12, filaments filiform, 2–2.5 mm long, 0.1–0.2 mm wide, glabrous, anthers oblong, 0.6–0.8 mm long, 0.5–0.7 mm wide. Female flowers 2–4 mm long, 2.2–3 mm diameter, held singly and spaced up to 13 mm apart, or mixed with male flowers; pedicels 1–4 mm long, 0.5–1 mm diameter, glabrous or with sparse stellate trichomes; sepals valvate, 5, lanceolate-ovate, 1.8–2.3 mm long, 1–1.3 mm wide, with scattered stellate trichomes and lanate tip; petals absent; styles 3, obloid-flabellate to linear, 1–2.8 mm long, bifid for 0.5–1.8 mm, connate at base for c. 0.2 mm, glabrous; ovary 3-locular, 1.3–2 mm long, 1.3–2 mm diameter, with dense, sessile stellate trichomes. Fruits trilobate, depressed-globose, 5–6 mm long, 6–7 mm diameter, with sparse, sessile stellate trichomes.

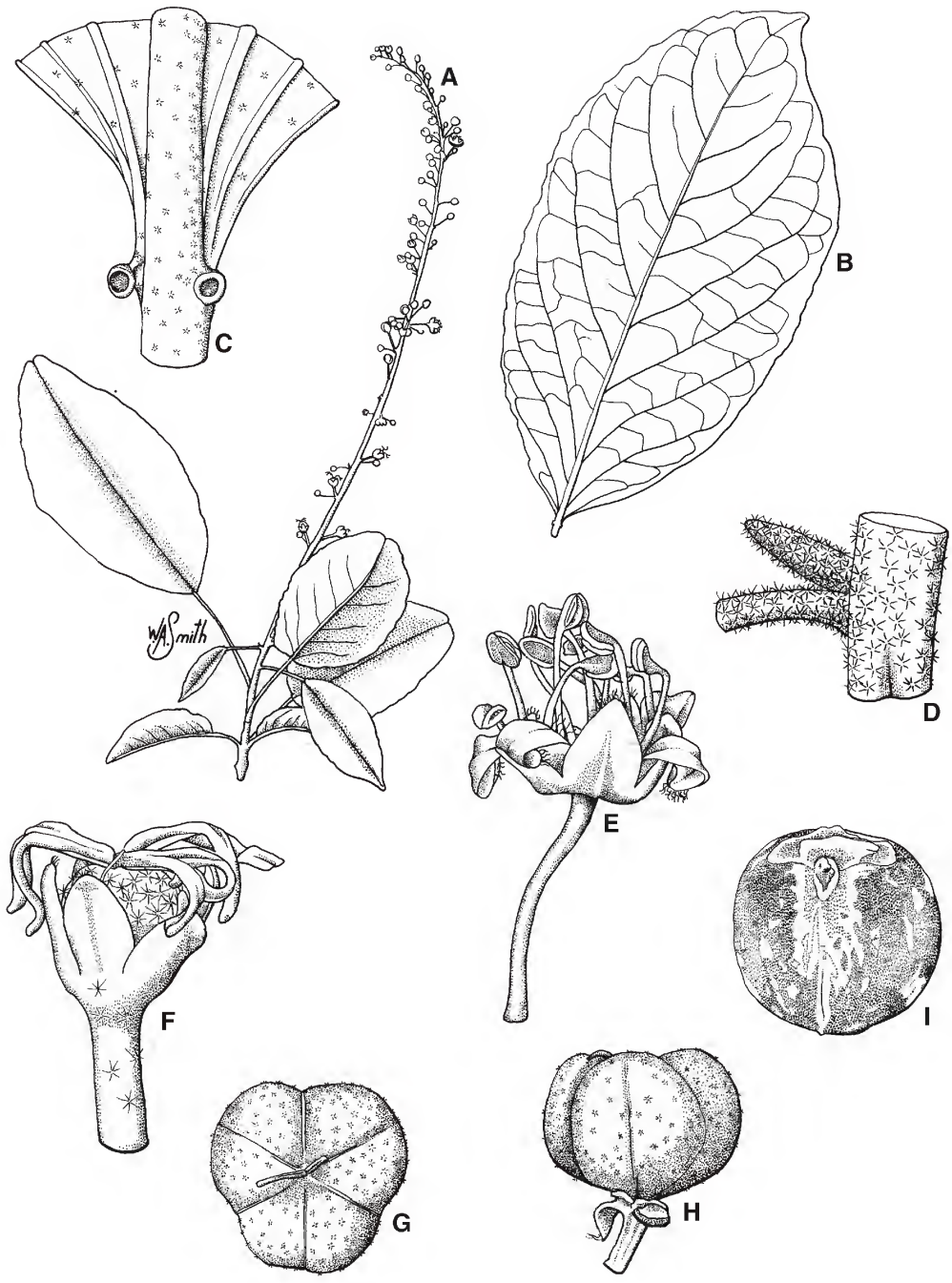


Fig. 13. ***Croton habrophyllus***. A. flowering branchlet. × 0.6. B. undersurface of leaf. × 0.8. C. base of leaf lamina showing extrafloral nectaries. × 8. D. node showing stipule. × 8. E. male flower. × 8. F. female flower. × 8. G & H fruit. × 4. I. seed. × 8. A, D, F from *O'Keefe* 5 (BRI); B, C from *Lucas* 4635 (BRI); E from *Innis* 205 (BRI); G–I from *O'Keefe* AQ454826 (BRI). Del. W. Smith.

Seeds ± obloid, 3.5–4 mm long, 2.6–3.5 mm wide, 2.2–2.5 mm thick, mottled cream and tan-brown, ventral surface bifacial, dorsal surface rounded, micropylar ridge 2–2.8 mm long; caruncle reniform, 0.5–1 mm long, 1–2 mm wide, cream-yellow. **Fig. 13**.

***Selected additional specimens*: Western Australia.** One Arm Point, N. Dampierland, 16°26'S, 123°05'E, Nov 1987, *Carter* 139 (DNA); Cape Leveque, Gnamagun Well, 16°27'S, 122°55'E, Apr 1988, *Dunlop* 7811 (BRI, DNA, MEL); Galen, Dampierland, W of Skeleton Point, 16°32'S, 122°58'E, Jan 1988, *Martin* 207 (BRI, CANB, PERTH). **Northern Territory.** 1 km past Adelaide River on Daly River road, 13°30'S, 131°05'E, Nov 1990, *Cowie* 1405 & *Dunlop* (DNA); Melville Island, Snake Bay, Sand Spear Jungle, Nov 1983, *Dunlop* 6510 & *Wightman* (BRI, DNA, MEL); East Alligator River, 12°50'S, 133°22'E, Dec 1989, *Dunlop* 7628 (BRI, CANB, DNA, MEL); Middle Arm, near Palmerston, 12°34'S, 130°34'E, Nov 1989, *Forster* PIF5942 *et al.* (BRI, DNA, MEL); 3 km W of Nhulunbuy, 12°11'S, 136°45'E, Nov 1989, *Forster* PIF6048 (BRI, DNA); Wessell Islands, 11°11'S, 136°44'E, Sep 1972, *Latz* 3289 (BRI, DNA); North Point, Kapalga, 12°23'S, 132°21'E, Nov 1983, *Russell-Smith* 885 (BRI, DNA); Bennett Bay, Eastern Arnhem Land, 13°42'S, 135°42'E, Nov 1987, *Russell-Smith* 4222 & *Lucas* (BRI, DNA); Mt Ranken, Walker River, 13°35'S, 135°32'E, Oct 1987, *Russell-Smith* 4322 & *Lucas* (BRI, DNA); Cape Wirawawo, Gove, 12°10'S, 136°47'E, Feb 1988, *Russell-Smith* 4635 & *Lucas* (BRI, DNA); Nhulunbuy, East Woody Island, 12°10'S, 136°45'E, Feb 1988, *Wightman* 4128 (BRI, DNA, MEL); Glasswater Creek, Litchfield, 13°18'S, 130°30'E, Oct 1988, *Russell-Smith* 5977 & *Lucas* (BRI, DNA); High Black Range, Moroak, 14°39'S, 133°37'E, Jan 1989, *Russell-Smith* 6614 & *Lucas* (BRI, DNA); Redbank Mine, Wollogorang Station, 17°10'S, 137°46'E, Nov 1984, *Thomson* 763 (BRI, DNA); SW corner Centre Island, Sir Edward Pellew Group, 15°06'S, 136°44'E, Jan 1989, *Thomson* 2946 (BRI, DNA). **Queensland.** Burke District: Louie Creek, 18°48'S, 138°32'E, Dec 1989, *Innis* 205 (BRI); Lawn Hill N.P., 18°45'S, 138°30'E, Dec 1989, *O'Keefe* 10 (BRI).

***Distribution and habitat*:** *Croton habrophyllus* is widespread (twenty-four 1° grid squares) in northern Australia, particularly in the "Top End" of the Northern Territory. There are disjunct populations in the Kimberley region of Western Australia and at Lawn Hill National Park in Burke district in Queensland (**Map 5**). Plants grow in deciduous vinethickets on a variety of substrates, including granite, laterite, sandstone and limestone.

***Phenology*:** Flowering occurs from August to January, especially after storm rains. The plant becomes deciduous for a short period and flowers as the new leaves are expanding. Fruiting occurs from October to April, by which time the leaves are fully expanded.

***Notes*:** This species was placed in the synonymy of *Croton armstrongii* by Airy Shaw (1980c, 1981) and later reinstated by Wilmot-Dear (1987). It is easily distinguished from related species such as *Croton byrnesii*, *C. mutabilis* and *C. rarus* in the silver indumentum and leaves with more marginal teeth (70–112).

***Conservation status*:** *Croton habrophyllus* is common and widespread.

***Etymology*:** The specific epithet is derived from the Greek *habros* (shaggy) and *phyllus* (leaf) and refers to the dense indumentum on the young foliage.

15. Croton insularis Baill., Adansonia 2: 217 (1862), ('insulare'); *Oxydectes insularis* (Baill.) Kuntze, Rev. Gen. Pl. 2: 612 (1891). **Type:** New Caledonia, *Pancher* 360 (lecto: P, *fide* McPherson & Tirel 1987).

***Illustrations*:** Williams (1979: 78); McPherson & Tirel (1987, pl. 15: 1–6); Floyd (1989: 142); James & Harden (1990: 420); Hauser (1992: 88); Logan River Branch S.G.A.P. (Qld Region) Inc. (2002: 221).

Tree or shrub to 15 m high, monoecious, evergreen, perennial; bark lenticellate, cream; blaze pale pink-red; wood straw. Indumentum silver. Branchlets rounded, with dense overlapping peltate scales. Stipules apparently obsolete. Leaves alternate, discolorous, petiolate; petioles 8–18 mm long, c. 1 mm wide, with sparse peltate scales; lamina elliptic, lanceolate-ovate to ovate, 12–100 mm long, 8–45 mm wide, venation obscure; upper surface dark matt green, with sparse peltate scales; lower surface silver, with dense, overlapping peltate scales, neither scabrid nor velutinous; margins entire or somewhat sinuate, foliar glands inconspicuous; tip acute to acuminate; base cuneate to obtuse; extrafloral nectaries 2 at top of petiole, sessile, circular, 0.2–0.5 mm long, 0.2–0.5 mm wide, visible above only. Inflorescence up to 120 mm long, unisexual or androgynous, pedunculate up to 20 mm; axis with dense, overlapping peltate scales; bracts lanceolate-triangular, 0.6–1 mm long, 0.3–1 mm

wide, with dense peltate scales. Male flowers 4–5 mm long, 3–4 mm diameter, held singly or densely clustered towards top inflorescence, spaced up to 3 mm apart; pedicels 2.3–5 mm long, 0.5–1 mm wide, with dense peltate scales; sepals valvate, 4 or 5, lanceolate-triangular, 1.5–2.5 mm long, 1.2–1.6 mm wide, with sparse peltate scales; petals 5, oblanceolate, 1.7–2.6 mm long, 0.6–1 mm wide, lanate; stamens 14–18, filaments filiform, 1.8–4 mm long, c. 0.1 mm wide, glabrous, anthers oblong, 0.8–1.1 mm long, 0.6–1 mm wide. Female flowers 2.5–3 mm long, 3.5–5 mm diameter, held singly and spaced up to 5 mm apart; pedicels 3–8 mm long, 0.6–1 mm diameter, with dense peltate scales; sepals valvate, 5, lanceolate, 1.8–2.6 mm long, 1–1.6 mm wide, with dense peltate scales; petals absent; styles 3, obloid, 0.8–2 mm long, bifid for 0.5–1.2 mm, connate at base for c. 0.2 mm, glabrous; ovary 3-locular, 1.5–2 mm long, 1.5–2.2 mm diameter, with dense, sessile peltate scales. Fruits trilobate, globose, 7–9 mm long, 5–8 mm diameter, with dense, sessile peltate scales. Seeds ovoid, 3.6–6.5 mm long, 2–3.2 mm wide, 2–2.5 mm thick, brown, ventral surface bifacial, dorsal surface rounded, micropylar ridge 2.3–5.7 mm long; caruncle crescent shaped, 0.5–0.8 mm long, 0.7–1.5 mm wide, cream-yellow. **Fig. 14**.

***Selected additional specimens*: Queensland.** Cook District: S.F. 185 Danbulla, 7 km SW of Hoop Pine Triangle, 17°09'S, 145°35'E, Jan 1993, *Forster* PIF13082 & *Bean* (BRI, L, MEL, QRS); Possum Scrub, Weipa to Stones Crossing road, 12°27'S, 142°09'E, Jul 1993, *Forster* PIF13512 *et al.* (BRI, MEL); Mt Windsor Tableland, S.F. 144, 9 km past Spencer Creek Crossing, 16°18'S, 145°05'E, Jul 1993, *Forster* PIF13703 *et al.* (BRI, MEL, QRS). North Kennedy District: Fern Creek Spring, catchment of Burdekin River, St Pauls Scrub, Mt Cooper Station, 42 km S of Ravenswood, Aug 1989, *Fell* DGF1964 (BRI). South Kennedy District: 26.5 km W of St Anns Homestead, 21°13'S, 146°39'E, Jun 1992, *Thompson* BUC582 & *Sharpe* (BRI). Leichhardt District: Coxens Peak, 22°12'S, 148°27'E, Aug 1990, *Forster* PIF7310 (BRI, MEL, QRS); 17 km from Cracow on Nathan Gorge road, 25°26'S, 150°19'E, Sep 1992, *Forster* PIF11207 & *Sharpe* (BRI, L, MEL, QRS); Palmgrove N.P., Bigge Range, 25°01'S, 149°16'E, Nov 1998, *Forster* PIF23653 & *Booth* (BRI, MEL, QRS). Maranoa District: Chesterton Range, Mt Moffat, NW of Marlong Plain & SW of Mt Sugarloaf, Nov 1990, *Henderson* 3504 & *Robins* (BRI, NSW). Port Curtis District: c. 17 km ESE of Duaringa, 23°46'S, 149°50'E, Sep 1988, *Anderson* 4520 (BRI); Barren Island, SE of Great Keppel Is, 23°10'S, 151°05'E, *Batianoff* 9691 & *Dillewaard* (BRI, NSW). Burnett District: Mt Wooroolin, 26°32'S, 151°48'E, Apr 1990, *Forster* PIF6662 (BRI, L, MEL, QRS); Coominglah Range, S.F.28 Coominglah, 24°51'S, 150°56'E, Nov 1994, *Forster* PIF15908 (BRI, MEL, QRS). Wide Bay District: 5 km SW of Mt Walsh, Coongara Rock road, 25°36'S, 152°00'E, Oct 1990, *Forster* PIF7549 (BRI, K, L, MEL, QRS); Fairlies Knob, 10 km NNE of Brooweena, 25°30'S, 152°17'E, Dec 1990, *Forster* PIF7672 (BRI, MEL, QRS). Darling Downs District: Chinchilla, May 1912, *Beasley* 4 (BRI). Moreton District: end of Steinharts road, Lark Hill, 4 km N of Marburg, 27°32'S, 152°36'E, May 1983, *Forster* PIF1586 (BRI); Splityard Creek, Wivenhoe Dam, 27°23'S, 152°38'E, Nov 1990, *Forster* PIF7612 & *Sharpe* (BRI, DNA, K, L, MEL, MO, QRS); Welk Remnant, Mt Berryman, 27°43'S, 152°18'E, Sep 1999, *Forster* PIF24931 (BRI, QRS). **New South Wales.** 36 miles [60 km] W of Wauchope on Oxley Highway, Aug 1967, *Telford* 58 (CANB).

***Distribution and habitat*:** *Croton insularis* is found in Australia in eastern Queensland from near Weipa in the north, to north-eastern New South Wales in the south (**Map 6**) over a total of forty-four 1° grid squares. As a result it is the third most widespread *Croton,* after *C. arnhemicus* and *C. phebalioides,* in mainland Australia. It also occurs in New Caledonia and Vanuatu (McPherson & Tirel 1987). Plants grow in vinethickets or vineforests on a variety of volcanic substrates.

***Phenology*:** Flowering and fruiting occurs througout the year following rain. The peak flowering period is from October to December.

***Notes*:** *Croton insularis* is easily distinguished from all other taxa of Australian *Croton* by the foliage silver below with totally obscure lateral and interlateral venation. Usually this species is encountered as a shrub up to 5 m tall but at some localities (e.g. Cathu, Windsor Tableland and Bridle Creek State Forests) it may grow up to 15 m tall as a canopy tree.

There is a variant population at Eight Mile Mountain, Emu Creek Station, 9 km NNE of Petford (*Ford* 3668 (BRI); *Forster* PIF28192 *et al.* (BRI, MEL, NSW, WIS)) that appears to be intermediate in vegetative morphology between *C. insularis* and *C. phebalioides*.

***Conservation status*:** *Croton insularis* is very common. It is present in 23 conservation reserves in south-eastern Queensland alone (Forster *et al.* 1991) and four in New South Wales (Floyd 1989).

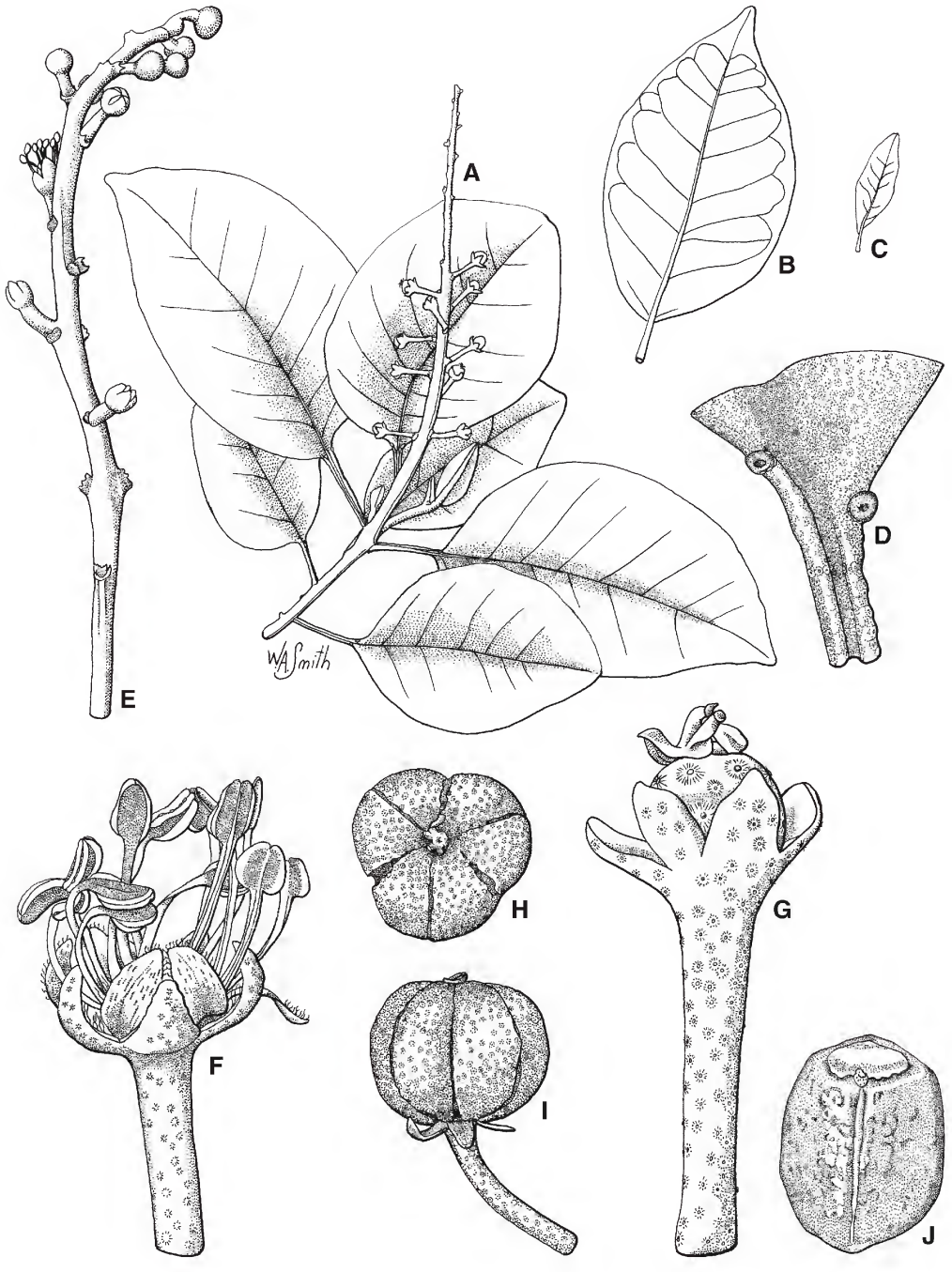


Fig. 14. ***Croton insularis***. A. flowering branchlet. × 0.8. B & C undersurface of leaf. × 0.5. D. base of leaf lamina showing extrafloral nectaries. × 8. E. inflorescence with female flowers in lower half and male flowers in upper half. × 2. F. male flower. × 8. G. female flower. × 8. H & I. fruit. × 4. J. seed. × 8. A, B & G from *Forster* PIF25193 (BRI); C from *Forster* PIF6662 (BRI); D–F from *Forster* PIF7549 (BRI); H–J from *Ryan* 1416 (BRI). Del. W. Smith.

***Etymology*:** The specific epithet refers to the island origin of the type collection.

16. Croton magneticus Airy Shaw, Muelleria 4: 227 (1980). **Type:** Queensland. North Kennedy District: Magnetic Island, 24 July 1938, *D.A. Goy* 329 (holo: BRI).

Small tree or shrub to 5 m high, monoecious, deciduous, perennial. Indumentum ginger to silver. Branchlets ± rounded, with dense stellate trichomes when young, glabrescent. Stipules subulate, 0.3–0.9 mm long, c. 0.2 mm wide, entire and with sparse to dense stellate trichomes. Leaves alternate, petiolate, discolorous; petioles 5–25 mm long, c. 1 mm wide, with dense stellate trichomes; lamina cuneate-obovate, elliptic, elliptic-ovate, 20–115 mm long, 12–60 mm wide, penninerved with 7–9 lateral veins per side of midrib, tertiary reticulate veins obscure; upper surface matt green, venation obscure, glabrous or with scattered stellate trichomes; lower surface silver, lateral veins weakly developed, with sparse to dense, stellate trichomes, scabrid to weakly velutinous; margins denticulate to weakly crenate with 8–24 short teeth up to 2 mm long, foliar glands prominent; tip obtuse to rounded; base weakly cordate, cuneate or truncate; extrafloral nectaries 2 at lamina base, sessile, ellipsoid, 0.6–0.7 mm long, 0.3–0.4 mm wide, visible only below. Inflorescence up to 80 mm long but often reduced to a single flower, often unisexual but occasionally bisexual and androgynous, pedunculate up to 10 mm; axis with dense stellate trichomes; bracts lanceolate to oblanceolate, 1.8–4 mm long, 0.4–1.5 mm wide, with dense stellate trichomes. Male flowers 3–5 mm long, 4.5–5 mm diameter, held singly on inflorescence, spaced up to 2 mm apart; pedicels 2.5–7 mm long, 0.2–1 mm wide, with sparse to dense stellate trichomes; sepals valvate, 5, lanceolate-ovate to obovate, 3–3.5 mm long, 1.8–2.2 mm wide, with dense stellate trichomes; petals 5, obovate, 3–4 mm long, c. 1.5 mm wide, lanate; stamens 15, filaments filiform, 2.2–3 mm long, 0.2–0.5 mm wide, glabrous; anthers oblong, 0.8–1.2 mm long, 1–1.3 mm wide. Female flowers 4–4.5 mm long, 3.5–5 mm diameter, held singly and spaced up to 2 mm apart; pedicels 3–8 mm long, 1–1.2 mm diameter, with dense stellate trichomes; sepals valvate, 5, lanceolate to lanceolate-ovate, 2.3–3 mm long, 1.2–1.8 mm wide, with dense stellate trichomes; petals absent; styles 3, obloid, 1.8–3 mm long, bifid for 1.6–2.8 mm long, connate at base for 0.2 mm, glabrous; ovary 3-locular, 3–4 mm long, 3–4 mm diameter, with dense, stalked stellate trichomes. Fruits trilobate, globose, c. 8 mm long and 8 mm diameter, with dense, stalked stellate trichomes. Seeds obloid-ovoid, 5–5.5 mm long, 4.2–4.5 mm wide, c. 3 mm thick, pale brown, ventral surface bifacial, dorsal surface rounded, micropylar line 4–4.5 mm long; caruncle crescent shaped, 1.5–1.7 mm long, 0.7–1 mm wide, cream. **Fig. 15**.

***Additional specimens*: Queensland.** North Kennedy District: Georges Point, 20°04'S, 148°35'E, Sep 1992, *Batianoff* 9209286 & *Carter* (BRI, MEL); Montes Resort, Cape Gloucester, 20°04'S, 148°27'E, Mar 1994, *Batianoff* 9403250 & *Dillewaard* (BRI); Gloucester Island, E. side, 19°59'S, 148°27'E, Apr 1994, *Batianoff* 94037 & *Figg* (BRI); Gloucester Island, S. end, 20°02'S, 148°26'E, Apr 1994, *Batianoff* 940415G & *Figg* (BRI); Gloucester Island, E. side, 20°01'S, 148°28'E, Apr 1994, *Batianoff* 940443 & *Figg* (BRI); Mt Abbot, 50 km W of Bowen, 20°06'S, 147°43'E, Jul 1992, *Bean* 4734 (BRI); Mt Blackjack, 'Wietalaba', 21°01'S, 147°56'E, Jan 1993, *Fensham* 490 (BRI); 'Havilah', 20°58'S, 147°52'E, Dec 1992, *Fensham* 601 (BRI); 'Fanning River', 19°44'S, 146°27'E, Jan 1993, *Fensham* 731 (BRI); Turtle Creek, SW of Greenvale, 19°18'S, 144°50'E, *Fensham* 914 (BRI); Leichhardt Range, 20°03'S, 147°03'E, Jul 1993, *Fensham* 997 (BRI); West Point, Magnetic Island, 19°07'S, 146°46'E, Jan 1993, *Forster* PIF12761 & *Bean* (BRI, MEL, QRS); 'Wietalaba', 21°01'S, 147°56'E, Jul 1993, *Forster* PIF13408 & *Tucker* (BRI, QRS); ditto, Feb 1994, *Forster* PIF14863 & *Bean* (A, BISH, BRI, CANB, DNA, K, L, MEL, NSW, QRS); Mt Blackjack, Wietalaba Station, 21°00'S, 147°55'E, Jun 1996, *Forster* PIF19197 & *Tucker* (BRI, QRS); Magnetic Island, Jun 1922, *Helms* 1125 (BRI); Balding Bay, Magnetic Island, Aug 1982, *Sandercoe* 751 (BRI); Magnetic Island, Aug 1982, *Sandercoe* 860 (BRI); Magnetic Island, Jun 1983, *Tracey* 14101 (BRI).

***Distribution and habitat*:** *Croton magneticus* is restricted to an area between Greenvale in the north to near Collinsville in the south in north-eastern Queensland (**Map 5**) over seven 1° grid squares. Plants grow in deciduous vinethicket on soils derived from sandstone, granite or acid agglomerate, often in association with *Croton arnhemicus* and *C. phebalioides*.

***Phenology*:** Flowering occurs from December to February following storm or seasonal rains, fruiting occurs from January to March. Dormant buds are held on the plants for much of the year.

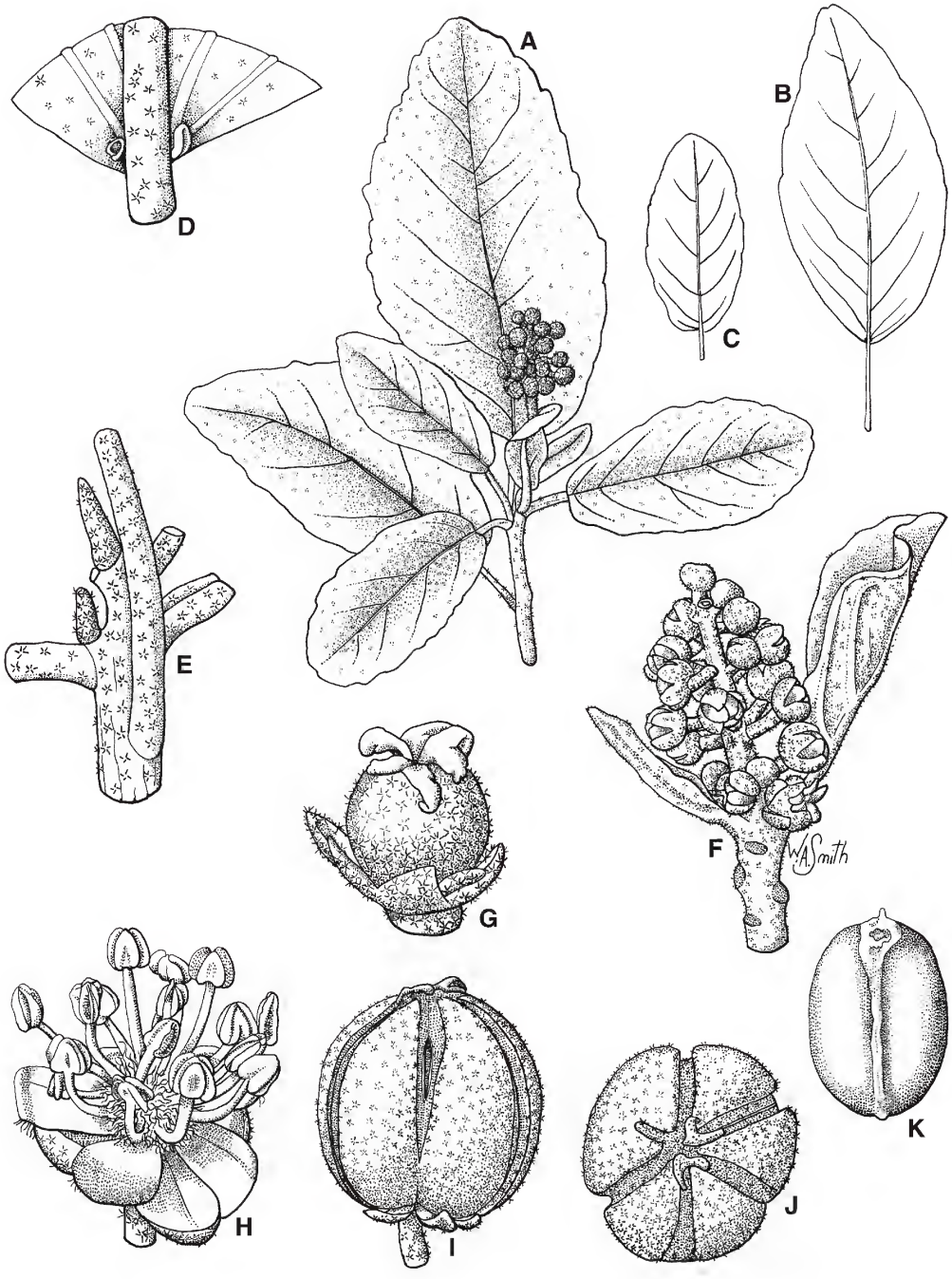


Fig. 15. ***Croton magneticus***. A. flowering branchlet. × 1. B & C. undersurface of leaves. × 0.5. D. base of leaf lamina showing extrafloral nectaries. × 6. E. node showing stipules. × 4. F. inflorescence with female flowers towards base and male flowers towards apex. × 2. G. female flower. × 6. H. male flower. × 6. I & J. dehiscing fruit. × 3. K. seed. × 4. A, C, F–H from *Forster* PIF14863 (BRI); B from *Forster* PIF12761 (BRI); I–K from *Fensham* 490 (BRI). Del. W. Smith.

***Notes*:** *Croton magneticus* is often sympatric with *C. arnhemicus* and sterile collections could possibly be confused with small-leaved forms of that species. *Croton magneticus* is easily distinguished by its penninerved leaves, as opposed to the palminerved leaves of *C. arnhemicus*.

***Conservation status*:** *Croton magneticus* is now known to be much more widespread than was previously thought (Airy Shaw 1981). It is relatively common at the listed localities, but these are disjunct and several may be subject to land clearing. The species is present in the National Park at Magnetic Island and is currently listed as Vulnerable under Queensland Government legislation.

***Etymology*:** The specific epithet refers to the plant's occurrence on Magnetic Island, where it was once thought to be endemic.

17. Croton mamillatus P.I.Forst., **sp. nov.** affinis *C. insulari* autem venatione foliorum ex 12–14 venis lateralibus constanti (vice venatione obscura), pedicellis trichomatis peltatis (vice squamis peltatis) vestitis, floribus masculinis staminibus 9 vel 10 (vice 14–18), fructibus processis mamillatis praeditis trichomatis stellatis vestitis (vice processis emamillatis squamis sessilibus peltatis vestitis) differt. **Typus:** Queensland. Moreton District: Bahr's Scrub, 5 km SSW of Beenleigh, 27°45'S, 153°10'E, 19 December 2001, *P.I.Forster* PIF28049 & *G.Leiper* (holo: BRI [2 sheets + spirit]; iso: A, L, MEL, NE, NSW).

Shrub to 4 m high, monoecious, evergreen, perennial. Indumentum uncoloured to silver. Branchlets ± rounded, with dense peltate trichomes, glabrescent. Stipules shortly lanceolate, c. 0.5 mm long and 0.3 mm wide, entire and with dense peltate trichomes. Leaves alternate, petiolate, discolorous; petioles 3–10 mm long, 1.2–1.5 mm wide, with dense peltate trichomes; lamina elliptic to oblanceolate, 30–70 mm long, 10–32 mm wide, venation penninerved with 12–14 lateral veins per side of midrib, very indistinct, tertiary reticulate veins obscure; upper surface matt dark-green, more glossy when fresh, venation weakly visible, glabrous; lower surface silver-white, lateral veins indistinct, with dense peltate trichomes and peltate scales, neither scabrid nor velutinous; margins ± entire, or very weakly denticulate with barely discernible foliar glands; tip acute to acuminate; base rounded to retuse; extrafloral nectaries absent or if present, then 2, circular, ± sessile, c. 0.3 mm long and 0.2 mm wide, visible above and below. Inflorescence up to 35 mm long, unbranched, androgynous (rarely with male and female flowers mixed in same glomerule), pedunculate up to 12 mm; axis with dense peltate trichomes; bracts shortly lanceolate, 0.5–0.7 mm long, c. 0.3 mm wide, with dense peltate trichomes. Male flowers c. 2 mm long and 3 mm diameter, held singly, spaced up to 1 mm apart, usually towards top of inflorescence; pedicels 2.5–3 mm long, 0.4–0.5 mm wide, with dense peltate trichomes; sepals valvate, 5, lanceolate-ovate to ovate, 1.8–2.2 mm long, 1.4–1.5 mm wide, with dense peltate trichomes; petals 5, obovate, 1.5–2 mm long, 0.6–0.7 mm wide, lanate in upper half; stamens 9 or 10, filaments filiform, 2–2.2 mm long, c. 0.1 mm wide, with dense simple trichomes at base, anthers oblong, 0.6–0.8 mm long, 0.3–0.4 mm wide. Female flowers 3–3.2 mm long, 2.8–3.5 mm diameter, usually held singly and spaced up to 3 mm apart; pedicels 3–4 mm long, 0.8–1 mm diameter, with dense peltate trichomes; sepals valvate, 5, ovate to obovate, 2.5–3 mm long, 1.8–2 mm wide, with dense peltate trichomes, lanate; petals absent; styles 3, linear, 1.2–1.5 mm long, multifid, twice divided for 1–1.2 mm long, connate at base for c. 0.2 mm, glabrous; ovary 3-locular, 1.8–2 mm long, 2.5–2.7 mm diameter, with dense stalked stellate trichomes. Fruits trilobate, weakly depressed-globose, 9–10 mm long, 10–10.5 mm diameter, with dense stellate trichomes on fleshy mamillate protuberances to 1 mm long and 0.5 mm diameter that are topped by a stellate trichome. Seeds oblong, 6–7 mm long, c. 3.5 mm wide, 2.5–3 mm thick, grey-brown, ventral surface bifacial, dorsal surface rounded, micropylar ridge 4.5–5 mm long; caruncle oblong-rectangular, 1.4–1.5 mm long, 0.8–1 mm wide, cream. **Fig. 16**.

***Additional specimens*: Queensland.** Moreton District: Bahr's Scrub, 5 km SW of Beenleigh, 27°45'S, 153°09'E, Feb 2001, *Bean* 17373 (BRI, MEL); slopes of Mt French, SW of Boonah, 28°00'S, 152°37'E, Jan 2002, *Bean* 18336 (BRI); Wolfdene area, 6 km SW of Beenleigh, 27°46'S, 153°10'E, Sep 2002, *Forster* PIF28882 *et al.* (A, BRI, L, MEL, NE, NSW, NY); Bahr's Scrub, Beenleigh, 27°45'S 153°10'E, Jan 2000, *Leiper* [AQ667034] (BRI, QRS); French's Creek road, near Boonah, Jun 1984, *Williams* 84050 (BRI).

***Distribution and habitat*:** This new species is known from only four localities, two near Beenleigh and two near Boonah, all southwest of Brisbane in south-eastern Queensland (**Map 5**) on two 1° grid squares. All populations occur in the understorey of dry rainforest (araucarian microphyll vineforest or notophyll vineforest) amongst rocks, on red soil derived from chert.

***Notes*:** Recognition of this taxon as a new and critically endangered species, is very much due to the keen eye of Glen Leiper who first brought the Bahr's Scrub population to my attention. *Croton mamillatus* appears to have affinities with both *C. insularis* and *C. stigmatosus*, but is immediately distinctive in its spindly habit and the highly mamillate fruit, with the fleshy processes topped by a stellate hair. This feature of mamillate fruit is also present in *Croton capitis-york* and *C. stigmatosus* but is less well developed in those species.

***Conservation status*:** *Croton mamillatus* is known from only four localities, all on private land. The populations at the four localities comprise less than 100 individuals in total. It is likely that the species was once more widespread in the region but that other populations have been destroyed in land clearing over the last 150 years. Plants of *Croton mamillatus* are also rather insignificant, and superficially similar to species such as *C. insularis* or *C. stigmatosus*, so may well have been overlooked by collectors. On present evidence the species should be regarded as critically endangered using the IUCN (2001) categories of A. 1(c), B. 2(a, b (ii, iii), C. 2a(i).

***Etymology*:** The specific epithet *mamillatus* is from the Latin word *mamillatus*, meaning mamillate or having small nipple-like projections, and refers directly to the distinctive fruit of this species.

18. Croton minimus P.I.Forst., **sp. nov.** affinis *C. arnhemico* Muell.Arg. a qua habitu suffrutice usque 30 cm alto, foliis dentibus paucioribus (22–28) et venatione secundaria obscura, et staminibus florum marium paucioribus (16–18) differt. **Typus:** Queensland. Cook District: 11 km from Petford towards Dimbulah, 2.5 km E of Eight Mile Mountain, 17°15'S, 144°58'E, 30 January 1994, *P.I. Forster* PIF14708 (holo: BRI [1 sheet + spirit]; iso: MEL, NSW).

Croton sp. (Mt Mulligan H.Flecker NQNC6457) (Forster & Henderson 1997: 72; Forster & Halford 2002: 70).

Multistemmed subshrub to 30 cm high, monoecious, evergreen, perennial. Indumentum ferruginous-silver. Branchlets rounded, with dense stellate trichomes when young, glabrescent. Stipules linear-lanceolate, 2–5 mm long, 0.4–0.5 mm wide, entire and with dense stellate trichomes. Leaves alternate, discolorous, petiolate; petioles 3–8 mm long, 1–1.2 mm wide, with dense stellate trichomes; lamina broadly ovate to lanceolate-ovate, 10– 40 mm long, 8–25 mm wide, palminerved with 3–5 veins from the base and 3 or 4 lateral veins per side of midrib further up lamina, tertiary reticulate veins obscure; upper surface green-grey, venation obscure, with sparse stellate trichomes; lower surface ferruginous-silver, lateral veins weakly prominent, with dense, stellate trichomes, velutinous; margins irregularly crenate with 11–14 teeth up to 1.5 mm long, foliar glands prominent; tip acute; base cordate to rounded; extrafloral nectaries absent at base of leaf lamina. Inflorescence up to 20 mm long, androgynous, pedunculate up to 6 mm; axis with dense stellate trichomes; bracts linear-lanceolate, 0.8–2 mm long, 0.2–0.3 mm wide, with sparse stellate trichomes. Male flowers 2.5–6 mm long, 2.5–6 mm diameter, densely clustered on inflorescences in glomerules of 1–3 flowers; pedicels 1.4–2.5 mm long, c. 0.5 mm wide, with dense stellate trichomes; sepals valvate, 5, lanceolate-ovate to ovate, 1.5–2.5 mm long, 0.9–2 mm wide, with dense stellate trichomes; petals 5, oblanceolate, 2–2.2 mm long, 0.5–1 mm wide, lanate in upper half; stamens 16–18, filaments filiform, 1–3.5 mm long, c. 0.1 mm wide, glabrous; anthers oblong, 0.7–0.8 mm long, 0.4–0.6 mm wide. Female flowers 2.5–3 mm long, 2–2.5 mm diameter, held singly and spaced up to 3 mm apart; pedicels 0.5–0.8 mm long, 0.5–0.6 mm diameter, with dense stellate trichomes; sepals valvate, 5, lanceolate-ovate, 1.8–3 mm long, 1–1.8 mm wide, with dense stellate trichomes; petals absent; styles 3, linear 1.8–2 mm long, bifid for 0.8–1 mm, with scattered stellate trichomes in lower half; ovary 3-locular, 1.8–2.6 mm long, 1.5–2.6 mm diameter, with dense,

Fig. 16. ***Croton mamillatus***. A. flowering branchlet. × 0.6. B. undersurface of leaf. × 2. C. base of leaf lamina showing extrafloral nectaries. × 12. D. node showing stipule. × 8. E. node with inflorescence with female flower near base and male flowers near apex. × 1.5. F. male flower. × 8. G. female flower. × 8. H & I fruit. × 3. J. mamillate process on fruit with stellate hairs. × 20. K. seed. × 6. All from *Forster* PIF28049 (BRI). Del. W. Smith.

sessile and stalked stellate trichomes. Fruits trilobate, globose, 6–6.5 mm long, 5–6.5 mm diameter, with dense, sessile and stalked stellate trichomes. Seeds ± ovoid to obloid, 4–4.5 mm long, c. 4 mm wide, 3–3.2 mm thick; dorsal surface rounded, ventral surface bifacial; micropylar line 3.8–4 mm long; caruncle ± reniform, 0.8–1 mm long, 1.2–1.5 mm wide, cream. **Fig. 17**.

***Additional specimens*: Queensland.** Cook District: bank of Hodgkinson River, Mineham's, *Flecker* N.Q.N.C.1165 (BRI); between Mt Mulligan & Thornborough, Dec 1937, *Flecker* N.Q.N.C.6459 (BRI); Chillagoe – Mungana road, c. 200 m SE of Red Dome turnoff, 17°07'S, 144°26'E, Nov 2000, *Ford* AF2484 & *Tucker* (BRI, CANB, K, L, MEL, NE, NSW); N.P.R. 98, near Belgravia Creek, off Burke Development road, Mungana, 17°06'S, 144°24'E, Apr 2002, *Ford* AF3330 *et al.* (BRI, DNA, MEL, NSW); between Eureka Creek & Mt Pinnacle, NNE of Summit, SW of Dimbulah, 17°13'S, 145°03'E, Apr 2002, *Ford* AF3338 & *Sankowsky* (BRI); Mt Pinnacle, SSW of Dimbulah, 17°14'S, 145°03'E, Jan 1993, *Forster* PIF12950 & *Bean* (BRI, MEL); Near Spring Creek Crossing, Mt Carbine to Lakeland Downs road, 16°27'S, 144°50'E, *Forster* PIF18128 & *Spokes* (BRI, MEL); Mungana, near Red Dome Mine turnoff, 17°06'S, 144°25'E, Jan 2002, *Forster* PIF28145 *et al.* (BRI); Eight Mile Mountain, 10.5 km NE of Petford, 17°15'S, 144°59'E, Jan 2002, *Forster* PIF28146 *et al.* (BRI, MEL, NSW, WIS); Eight Mile Mountain, Emu Creek Station, 9.5 km NNE of Petford, 17°15'S, 144°57'E, Jan 2002, *Forster* PIF28196 *et al.* (A, BRI, DNA, L, MEL, NSW, WIS); Richards Creek, Mt Mulligan, 16°52'S, 144°53'E, Nov 1999, *Holmes* 131 (BRI); 3 km from Dimbulah on the Mareeba road, 17°10'S, 145°10'E, Oct 1975, *Hyland* 8472 (BRI, QRS).

***Distribution and habitat*:** *Croton minimus* is known only from west of Dimbulah, around Chillagoe and north of Mt Carbine in north-east Queensland, over three 1° squares (**Map 4**). Plants grow in open forest with *Corymbia clarksoniana* (D.J.Carr & S.G.M.Carr) K.D.Hill & L.A.S.Johnson on skeletal soils derived from granite on steep ridges.

***Phenology*:** Flowering occurs from December to April with fruiting from December to May.

***Notes*:** *Croton minimus* appears to be a miniature derivative of *C. arnhemicus* or *C. multicaulis* that has evolved in response to the xeric environment where it has been found. A comparison of these three species is given in **Table 1**. Both *Croton minimus* and *C. multicaulis* subsp. *velutinus* come into close proximity to one another in the Spring Creek area north of Mt Carbine (vouchers: *Forster* PIF12928 & *Bean*; *Forster* PIF18128 & *Spokes*) and further field work is required to see if the two taxa intergrade.

***Conservation status*:** This species has been rarely collected, but is an inconspicuous plant and vast areas of suitable habitat exist in the known range. Hence it is probable that many more populations can be found once this area is properly explored. No conservation coding is considered necessary.

***Etymology*:** The specific epithet is derived from the Latin *minimus* and refers to the small stature of this plant.

Table 1. Comparison of morphological characters for *Croton arnhemicus*, *C. minimus* and *C. multicaulis*

Character	*C. arnhemicus*	*C. minimus*	*C. multicaulis*
Habit	shrub or tree to 5 m high	subshrub 30cm high	subshrub 1.5m high
no. of marginal teeth on leaf	60–100	22–28	32–56
leaf lamina lateral veins	prominent	weak	prominent
leaf lamina interlateral veins	prominent	obscure	prominent
no. of stamens/ flower	20–44	16–18	11–24

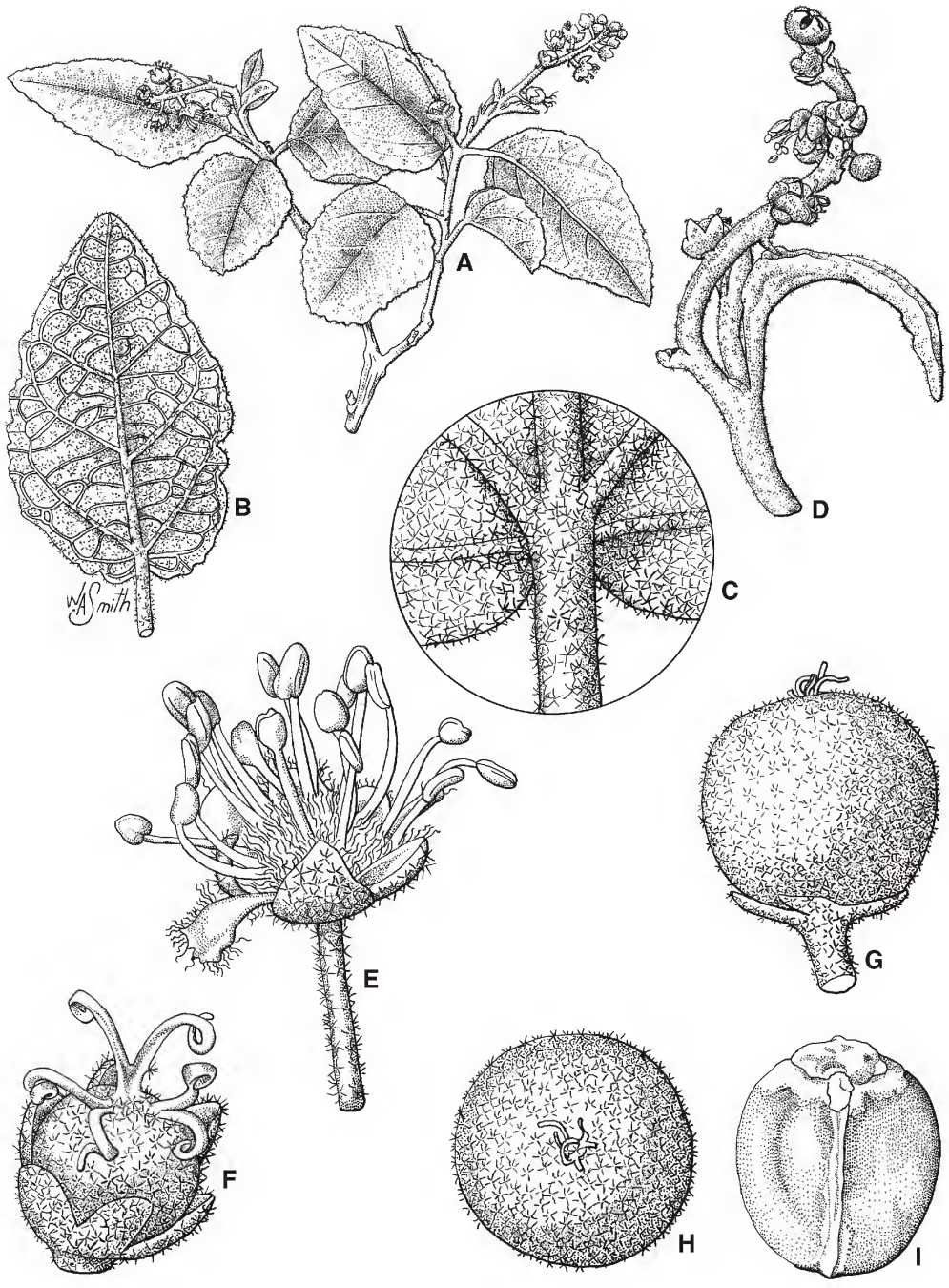


Fig. 17. ***Croton minimus***. A. flowering branchlet. × 1. B. undersurface of leaf. × 1. C. leaf lamina base demonstrating absence of extrafloral nectaries. × 6. D. inflorescence. × 2. E. male flower. × 8. F. female flower. × 8. G & H. fruit. × 4. I. seed. × 6. All from *Forster* PIF14708 (BRI). Del. W. Smith.

19. Croton multicaulis P.I.Forst., **sp. nov.** affinis *C. arnhemico* Muell.Arg. a qua habitu suffrutice multicauli semper, foliis dentibus minus quam 60, et staminibus 11–24 (plerumque minus quam 20) differt. **Typus:** Queensland. Cook District: 20.5 km along Weipa road, off Peninsula Development road, 13°03'S, 142°36'E, 7 December 1993, *P.I. Forster* PIF14367 (holo: BRI [2 sheets + spirit]; iso: DNA, L, MEL).

Croton sp. (Myall Creek P.I.Forster PIF14368) (Forster & Henderson 1997: 72; Forster & Halford 2002: 71).

Multistemmed shrub to 1.5 m high, monoecious, deciduous, perennial. Indumentum ferruginous-silver. Branchlets rounded, with dense stellate trichomes. Stipules linear to linear-lanceolate, 1.2–6 mm long, 0.2–0.6 mm wide, entire and with dense stellate trichomes. Leaves alternate, discolorous, petiolate; petioles 2–40 mm long, 1–1.7 mm wide, with dense stellate trichomes; lamina broadly ovate elliptic, lanceolate-ovate, or ovate, 15–140 mm long, 11–115 mm wide, palminerved with 3–5 veins at base, 4–6 lateral veins per side of midrib further up lamina and tertiary reticulate veins; upper surface matt green, lateral veins weakly visible, with scattered to sparse stellate trichomes; lower surface pale matt green, lateral and tertiary veins prominent, with sparse to dense stellate trichomes and sometimes with stalked yellow glandular trichomes, scabrid to velutinous; margins crenate with 16–28 teeth up to 4 mm long, foliar glands prominent; tip acute to rounded; base cordate, rounded or truncate; extrafloral nectaries absent or 2 at lamina base, sessile or stipitate to 0.8 mm long, circular to ellipsoid, 0.3–2 mm long, 0.2–1 mm wide, visible above and below. Inflorescence up to 150 mm long, usually androgynous, pedunculate up to 45 mm; axis with sparse to dense stellate trichomes; bracts linear to linear-lanceolate, 0.5–4 mm long, 0.2–0.5 mm wide, with dense stellate trichomes. Male flowers 1.8–4 mm long, 2.5–5 mm diameter, held singly on inflorescence or in dense clusters of 1–5 flowers, spaced up to 4 mm apart; pedicels 1.5–7 mm long, 0.3–1 mm wide, with dense stellate trichomes; sepals valvate, 5, lanceolate-ovate to ovate, 1.8–3 mm long, 1–2.2 mm wide, with sparse to dense stellate trichomes; petals 5, oblanceolate to obovate, 1.5–3.2 mm long, 0.5–1.5 mm wide, lanate; stamens 11–24, filaments filiform, 1–3.1 mm long, 0.1–0.2 mm wide, with dense simple trichomes at base; anthers oblong, 0.5–1 mm long, 0.4–0.6 mm wide. Female flowers 3–4.5 mm long, 2.5–5 mm diameter, held singly and spaced up to 15 mm apart; pedicels 0.8–6 mm long, 0.8–1.2 mm diameter, with dense stellate trichomes; sepals valvate, 5, lanceolate-ovate, 1.7–3 mm long, 0.9–1.8 mm wide, with dense stellate trichomes; petals absent; styles 3, linear, 1.2–3.2 mm long, bifid for 1.1–3 mm long, connate at base for c. 0.2 mm, with scattered stellate trichomes in lower parts; ovary 3-locular, 2–3.5 mm long, 2–3.5 mm diameter, with dense, stalked, stellate trichomes. Fruits trilobate, depressed-globose, 5–8 mm long, 7–8 mm diameter, with dense, stalked, stellate trichomes. Seeds obloid to ovoid, 4–5 mm long, 2.5–4.5 mm wide, 2–3.5 mm thick, black-brown to grey, ventral surface bifacial, dorsal surface ± rounded, micropylar ridge 3–4 mm long; caruncle crescent shaped, 0.6–1.5 mm long, 0.8–3.5 mm wide, cream.

***Distribution*:** *Croton multicaulis* is endemic to north Queensland from the islands of Torres Strait in the north, south to Porcupine Gorge near Hughenden, covering a total of thirteen 1° grid squares.

***Notes*:** *Croton multicaulis* is superficially very similar to *C. arnhemicus* but differs in several ways. *Croton multicaulis* is always a multistemmed subshrub with less than 60 teeth on the margins of the leaf lamina and with 11–24 (mostly less than 20) stamens per flower. *Croton arnhemicus* may persist as a multistemmed subshrub for an indefinite period, but ultimately grows into a small tree, has 60 or more teeth on the margins of the leaf lamina and has 20–44 (mostly more than 28) stamens per flower.

Key to subspecies of *Croton multicaulis*

Foliage scabrid below ..... subsp. **multicaulis**
Foliage soft velutinous below ..... subsp. **velutinus**

19a. Croton multicaulis subsp. **multicaulis**

Foliage scabrid below with sparse stellate trichomes. **Fig. 18**.

***Selected additional specimens*: Queensland.** Cook District: Thursday Island, Jun 1897, *Bailey* [AQ202076] (BRI); c. 18 km NW of Silver Plains Station, 13°52'S, 143°24'E, Nov 1980, *Clarkson* 3614 (BRI); 0.5 km S of Watson River Crossing on the Aurukun to Merluna road, c. 40 km NE of Aurukun, 13°08'S, 142°01'E, Dec 1981, *Clarkson* 4043 (BRI, QRS); Chester River Scrub, eastern fall of McIlwraith Range, 13°40'S, 143°29'E, Jun 1992, *Forster* PIF10400 *et al.* (BRI); Granny Scrub, Weipa to Stones Crossing road, 42 km from Weipa, Jul 1993, *Forster* PIF13500 *et al.* (BRI); Scrubby Creek Scrub, Silver Plains, 13°44'S, 143°28'E, Jul 1993, *Forster* PIF13626 *et al.* (BRI, MEL, NSW); Northern end of Bamboo Range, 14°36'S, 143°27'E, Dec 1993, *Forster* PIF14364 (BRI); Myall Creek Crossing, Weipa road, 12°39'S, 142°16'E, Dec 1993, *Forster* PIF14368 (BRI); Cowal Creek floodplain, Cape York, 10°55'S, 142°18'E, Jun 1994, *Forster* PIF15336 (BRI, QRS); Tragia Scrub, 3.5 km ESE of Mutee Head, Cape York, 10°55'S, 142°16'E, Jun 1994, *Forster* PIF15337 (BRI, QRS); 6.5 km from Captain Billy Landing, 11°37'S, 142°48'E, Jun 1994, *Forster* PIF15361 (BRI, MEL); 27 km SE of Heathlands, 11°52'S, 142°38'E, Feb 1992, *Johnson* 4993 (BRI, DNA, MEL, NSW); Weipa, 3 km E of Lorim Point, 12°41'S, 141°53'E, Jan 1981, *Morton* 1050 (BRI); Herring Oil Slot, Weipa, 12°39'S, 141°50'E, Dec 1989, *O'Reilly* 500 (BRI); Bamaga Mission, 11.2 km SW of Cape York, Oct 1965, *Smith* 12364 (BRI); 5 km ENE of Weipa Mission, 12°38'S, 141°56'E, Jul 1974, *Specht* 347 & *Salt* (BRI); ditto, Dec 1974, *Specht* W43 & *Salt* (BRI); 23.5 km ENE of Weipa Mission, Dec 1974, *Specht* W190 & *Salt* (BRI); Laradeenya Creek, Cape York, Jun 1963, *Stephens* [AQ202078] (BRI); New Mapoon, Northern Peninsula area, 10°52'S, 142°23'E, Jan 1998, *Waterhouse* BMW4785 (BRI).

***Distribution and habitat*:** *Croton multicaulis* subsp. *multicaulis* is endemic to Torres Strait and the northern parts of Cape York Peninsula north of Musgrave (**Map 8**). Plants often grow on the margins of vineforest, but are more common in adjacent *Eucalyptus tetrodonta* F.Muell. woodland on white sandy or red lateritic soils.

***Phenology*:** Flowering occurs from November to July with fruiting two to three months later.

***Conservation status*:** *Croton multicaulis* subsp. *multicaulis* is common throughout its known range; however, no populations appear to be present in conservation reserves at present. No conservation coding is required.

***Etymology*:** The specific epithet is derived from the Latin *multi* (many) and *caulis* (stemmed) and refers to the habit of this plant.

19b. Croton multicaulis subsp. **velutinus** P.I.Forst., **subsp. nov.** affinis *C. multicauli* P.I.Forst. a qua foliis velutinis trichomatibus stellatis densis abaxialiter differt. **Typus:** Queensland. Cook District: 19 km from Laura on road to New Laura homestead, 15°25'S, 144°25'E, 22 January 1993, *P.I. Forster* PIF12829 & *A.R. Bean* (holo: BRI [1 sheet + spirit]; iso: DNA, MEL).

Foliage velutinous below with dense stellate trichomes. **Fig. 19**.

***Selected additional specimens*: Queensland.** Cook District: Musgrave Telegraph Station, s.dat., *Barclay-Millar* [AQ202070](BRI); Little Laura River, SSW of Laura, 15°42'S, 144°17'E, Jul 1990, *Bean* 1905 (BRI); Blue Hills, 49 km from Mt Surprise township, 17°58'S, 144°02'E, Mar 1988, *Champion* 340 (BRI); 0.9 km E of the West Normanby River on the Lakeland Downs to Cooktown road, 15°46'S, 144°59'E, May 1987, *Clarkson* 6754 & *McDonald* (BRI, MBA, QRS); Cape Melville N.P., Altanmoui Range section, 14°30'S, 144°35'E, May 1993, *Fell* DGF3132 & *Stanton* (BRI); 2 km E of Mt Gibson, 16 km SSE of Lakeland Downs, West Normanby River catchment, May 1993, *Fell* DGF3281 & *Daunt* (BRI); Birthday Mt., Rokeby N.P., 23 km N of Coen aerodrome, Aug 1993, *Fell* DGF3522 & *Jensen* (BRI); 31 km from Laura on road to New Laura Homestead, 4 Mile Swamp area, Lakefield N.P., 15°18'S, 144°25'E, Jan 1993, *Forster* PIF12822 & *Bean* (BRI, MEL); New Laura Homestead area, Lakefield National Park, 15°11'S, 144°20'E, Jan 1993, *Forster* PIF12895 & *Bean* (BRI, DNA, MEL); Spring Creek, Mt Carbine to Laura road, 16°22'S, 144°43'E, Jan 1993, *Forster* PIF12928 & *Bean* (BRI, MEL); Lake Emma, Lakefield N.P., 15°17'S, 144°38'E, Jan 1993, *Forster* PIF12939 & *Bean* (BRI, DNA, MEL); Giant Horse Gallery (Laura), 15°40'S, 144°30'E, Mar 1975, *Hyland* 8111 (BRI, QRS); 19.2 km N of Laura, 15°25'S, 144°25'E, Oct 1974, *Robinson* [AQ196265]; Lakefield N.P., 20 km SW of Lakefield Homestead, Aug 1983, *Stanton* [AQ349838] (BRI). BURKE DISTRICT: Porcupine Gorge, 53 km NNE of Hughenden, 20°25'S, 144°26'E, May 1990, *Halford* Q228 (BRI); 55 km NE of Hughenden at Porcupine Gorge N.P. lookout, 20°24'S, 144°26'E, Nov 1992, *Thompson* HUG72 & *Turpin* (BRI, DNA).

***Distribution and habitat*:** *Croton multicaulis* subsp. *velutinus* has been found in the southern part of Cape York Peninsula from near Musgrave south to Lakefield National Park near Laura and has been found in six 1° grid squares (**Map 3**). There are also several apparently disjunct populations at Porcupine Gorge and Mt Surprise

Fig. 18. ***Croton multicaulis*** **subsp.** ***multicaulis***. A. habit of flowering branchlet. × 0.6. B. undersurface of leaf. × 0.8. C. base of leaf lamina showing extrafloral nectaries. × 8. D. node showing stipules. × 8. E. inflorescence with female flowers towards base and male flowers towards apex. × 2. F. male flower. × 6. G. female flower. × 8. H. seed. × 6. A, D–E from *Forster* PIF14368 (BRI); B from *Forster* PIF15361 (BRI); C & H from *Waterhouse* 4785 (BRI); F & G from *Forster* PIF13626 (BRI). Del. W. Smith.

that have been tentatively placed with this taxon. Plants grow in open eucalypt woodland with *Eucalyptus leptophleba* F.Muell. and *Melaleuca viridiflora* Sol. ex Gaertn. on reddish sandy soils or in open eucalypt forest with *Corymbia clarksoniana* and *E. tetrodonta* on red lateritic soils.

***Phenology*:** Flowering occurs from November to July with fruiting two to three months later.

***Conservation status*:** *Croton multicaulis* subsp. *velutinus* is common throughout its known range. Some populations are present in conservation reserves at Lakefield, Porcupine Gorge and Rokeby National Parks.

***Etymology*:** The subspecific epithet is derived from the Latin *velutinus* (velvety) and refers to the dense indumentum on the lower leaf surfaces of this plant.

***Conservation status*:** This subspecies is widespread, and present in at least three National Parks. No conservation coding is required.

20. Croton mutabilis P.I.Forst., **sp. nov.** affinis *C. byrnesii* Airy Shaw a qua indumento ecolorato usque argenteo, foliis sinuatis usque denticulatis dentibus 18–24, venis lateralibus paucioribus (8–10), et petiolis juvenibus trichomatibus dispersis stellate et peltatis differt. **Typus:** Queensland. Cook District: Possum Scrub, road to Stone's Crossing from Weipa, 12°27'S, 142°09'E, 8 December 1993, *P.I. Forster* PIF14376 (holo: BRI [2 sheets + spirit]; iso: DNA, L, MEL, MO, NSW).

Croton sp. (Possum Scrub P.I.Forster PIF14376) (Forster & Henderson 1997: 72; Forster & Halford 2002: 71).

Shrub to 4 m high, monoecious, deciduous, perennial. Indumentum uncoloured or silver. Branchlets ± rounded, glabrous or with scattered stellate trichomes, glabrescent. Stipules linear, 1.8–2 mm long, c. 0.2 mm wide, entire and glabrous. Leaves alternate, petiolate, discolorous; petioles 7–70 mm long, 0.5–1.5 mm wide, with scattered stellate to peltate trichomes when young, glabrescent; lamina elliptic, obovate or ± orbicular, 13–170 mm long, 7–90 mm wide, penninerved with 8–10 lateral veins per side of midrib and tertiary reticulate veins; upper surface dark green, lateral veins weakly developed, glabrous; lower surface pale green, lateral and tertiary veins weakly developed, glabrous or with stellate trichomes, neither scabrid nor velutinous; margins sinuate or denticulate with 9–17 teeth up to 1 mm long, foliar glands prominent; tip acute to rounded; base cuneate, rounded or truncate; extrafloral nectaries 2 at lamina base, sessile, ellipsoid, 0.3–1.3 mm long, 0.2–0.7 mm wide, visible below only. Inflorescence up to 70 mm long, androgynous, pedunculate up to 25 mm; axis glabrous; bracts lanceolate, 0.4–2.5 mm long, 0.2–0.7 mm wide, with scattered simple trichomes and scattered stellate trichomes. Male flowers 2.5–4 mm long, 4–6 mm diameter, held singly or in pairs on inflorescence, spaced up to 5 mm apart; pedicels 3–4 mm long, 0.4–0.7 mm wide, glabrous; sepals valvate, 5, lanceolate-ovate, 2–2.5 mm long, 1.2–1.5 mm wide, lanate on tips; petals 5, oblanceolate, 2–3 mm long, 0.5–1 mm wide, lanate on tips; stamens 10–12, filaments ± flattened, 1.5–2.8 mm long, 0.2–0.3 mm wide, with dense simple trichomes at base; anthers oblong, 0.8–1 mm long, 0.7–0.8 mm wide. Female flowers 3–3.5 mm long, 3.5–4 mm diameter, held singly and spaced up to 10 mm apart; pedicels 2.5–4 mm long, 0.5–0.7 mm diameter, glabrous; sepals valvate, 5, lanceolate-ovate, 2–2.5 mm long, 1–1.3 mm wide, lanate on tips; petals absent; styles 3, linear, 2–2.5 mm long, bifid for 1.1–2.5 mm long, connate at base for c. 0.5 mm, glabrous; ovary 3-locular, c. 2 mm long and 2 mm diameter, with dense, sessile stellate trichomes. Fruits trilobate, depressed-globose, 4–5 mm long, 6–7 mm diameter, with sparse, sessile stellate trichomes. Seeds ± obloid, 3.5–3.8 mm long, 2.8–3 mm wide, 2–2.2 mm thick, glossy brown, ventral surface bifacial, dorsal surface rounded, micropylar ridge 2.5–2.8 mm long; caruncle crescent shaped, c. 1 mm long and 1 mm wide, pale brown. **Fig. 20**.

***Additional specimens*: Queensland.** Cook District: Chester River Scrub, eastern fall of McIlwraith Range, Silver Plains Sation, 13°40'S, 143°29'E, Jun 1992, *Forster* PIF10423 & *Tucker* (BRI); Nesbit River, 13°32'S, 143°31'E, Jun 1992, *Forster* PIF10507 *et al.* (BRI); Massy Creek Scrub, Silver Plains Station, 13°55'S, 143°30'E, Jun 1992, *Forster* PIF10598 *et al.* (BRI, L, MEL, NSW); Stones Crossing, 73 km from Weipa, Jul 1993, *Forster* PIF13506 *et al.* (BRI); Possum Scrub, Weipa to Stones Crossing road, 12°27'S,

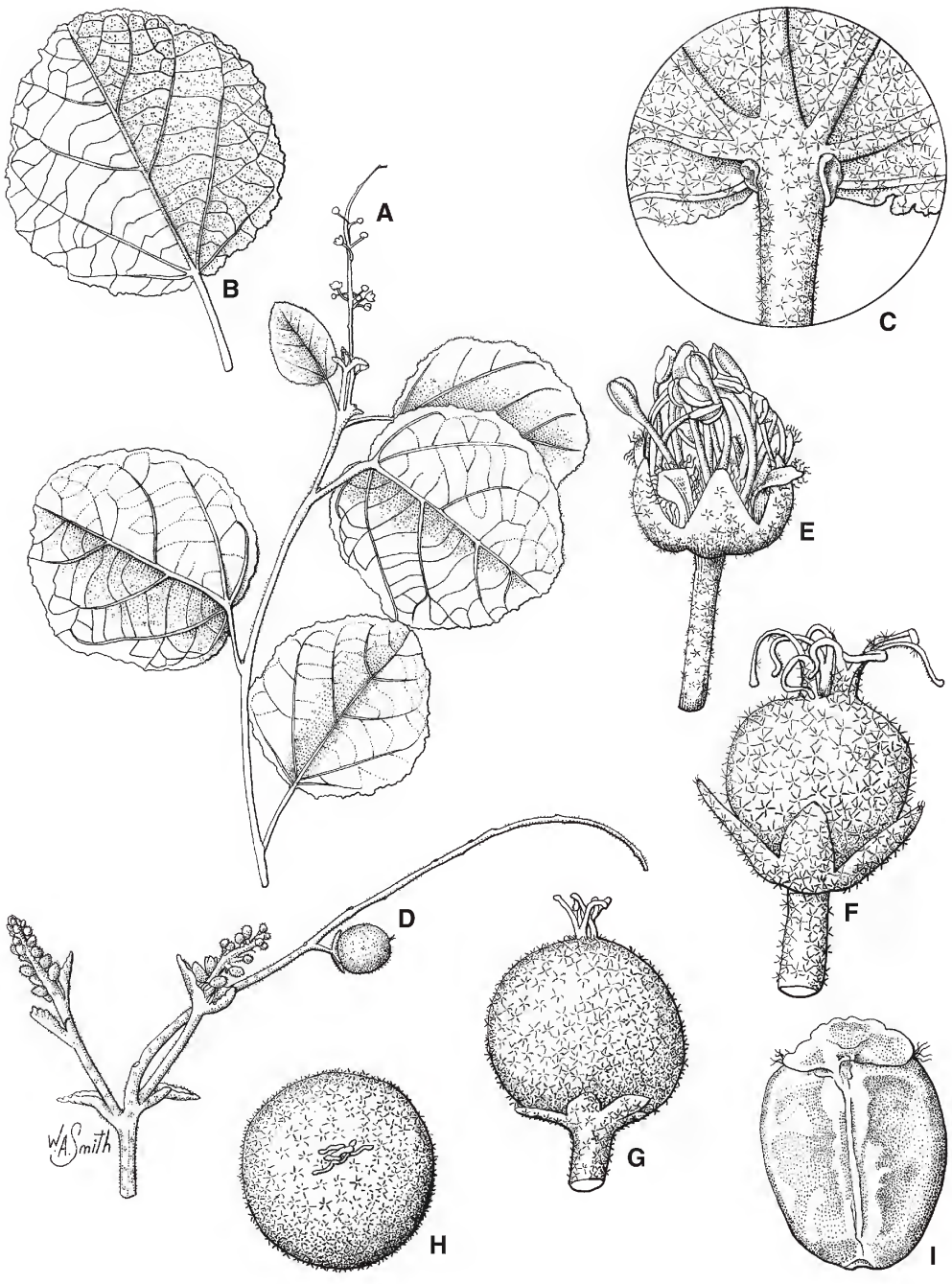


Fig. 19. ***Croton multicaulis*** subsp. ***velutinus***. A. flowering branchlet. × 0.6. B. undersurface of leaf. × 0.8. C. base of leaf lamina showing extrafloral nectaries. × 6. D. inflorescences. × 1. E. male flower. × 6. F. female flower. × 6. G & H. fruit. × 3. I. seed. × 6. A,B from *Forster* PIF12822 (BRI); C–I from *Forster* PIF12829 (BRI). Del. W. Smith.

142°09'E, Jul 1993, *Forster* PIF13515 *et al.* (BRI); Pascoe River crossing, road to Iron Range, 12°53'S, 143°00'E, Jul 1993, *Forster* PIF13532 *et al.* (BRI, QRS); Near Ham Hill (Weymouth Holding), 12°45'S, 143°20'E, Oct 1973, *Hyland* 6990 (BRI, QRS); Claudie River, Oct 1974, *Hyland* 7817 (BRI, QRS); T.R. 14 Massy, 13°52'S, 143°25'E, Nov 1980, *Hyland* 10858 (BRI, QRS); Claudie River, Jan 1982, *Hyland* 11504 (BRI, QRS); ditto, Dec 1982, *Hyland* 12401 (BRI, QRS); cult. Tolga (ex Possum Scrub, Weipa), Nov 1991, *Sankowsky* 1316 & *Sankowsky* (BRI); Nesbit River, Oct 1986, *Tucker* 61 (BRI); Claudie River, Oct 1968, *Webb & Tracey* 8542 (BRI, CANB); between Iron Range airstrip and Portland Roads - Coen road, 12°40'S, 143°23'E, Oct 1968, *Webb & Tracey* 8673 (BRI, CANB).

***Distribution and habitat*:** *Croton mutabilis* is endemic to northern Cape York Peninsula, Queensland and occurs in four 1° grid squares (**Map 9**). Plants grow on the margins of deciduous vine thickets and semi-deciduous notophyll vineforests on alluvium, red laterite or heavy black clay soils.

***Notes*:** Sterile collections of *Croton mutabilis* were misidentified by Airy Shaw (1981) as *C. storckii* Seem. ex A.C.Sm. Smith (1981) reduced *Croton storckii* to the synonymy of *C. microtiglium* Burkill, a species endemic to Fiji.

Croton mutabilis appears to be allied to *C. byrnesii* and *C. habrophyllus*, all three being deciduous and allopatric. *Croton mutabilis* differs from these two species in a number of characters (**Table 2**). While it appears similar to *C. microtiglium* this latter species differs in a number of characters (**Table 3**) and is not necessarily closely related.

Considerable variation occurs in leaf morphology of *Croton mutabilis*. Most collections of this plant have been made in winter when the plants are sterile and the leaves are well developed and turning orange prior to abscission. Flowering occurs following storm rains, when the plant produces flushes of new, and much smaller, foliage.

Conservation status: *Croton mutabilis* is relatively common throughout its known range and is present in Iron Range National Park.

Table 2. Comparison of morphological characters for *Croton byrnesii*, *C. habrophyllus* and *C. mutabilis*

Character	*C. byrnesii*	*C. habrophyllus*	*C. mutabilis*
indumentum colour	ferruginous to yellow	silver	uncoloured silver
leaf lamina margins	crenate	sinuate to denticulate	sinuate to denticulate
no.of marginal teeth per leaf lamina	40–58	70–112	18–24
no. of lateral veins each side of midrib	11–13	9–11	8–10
trichomes on petioles when young	sparse stellate	scattered to dense stellate	scattered stellate & peltate
trichomes on shoot tips or when young	scattered stellate	dense to sparse stellate	glabrous or scattered stellate
stamen filaments	flattened	filiform	flattened

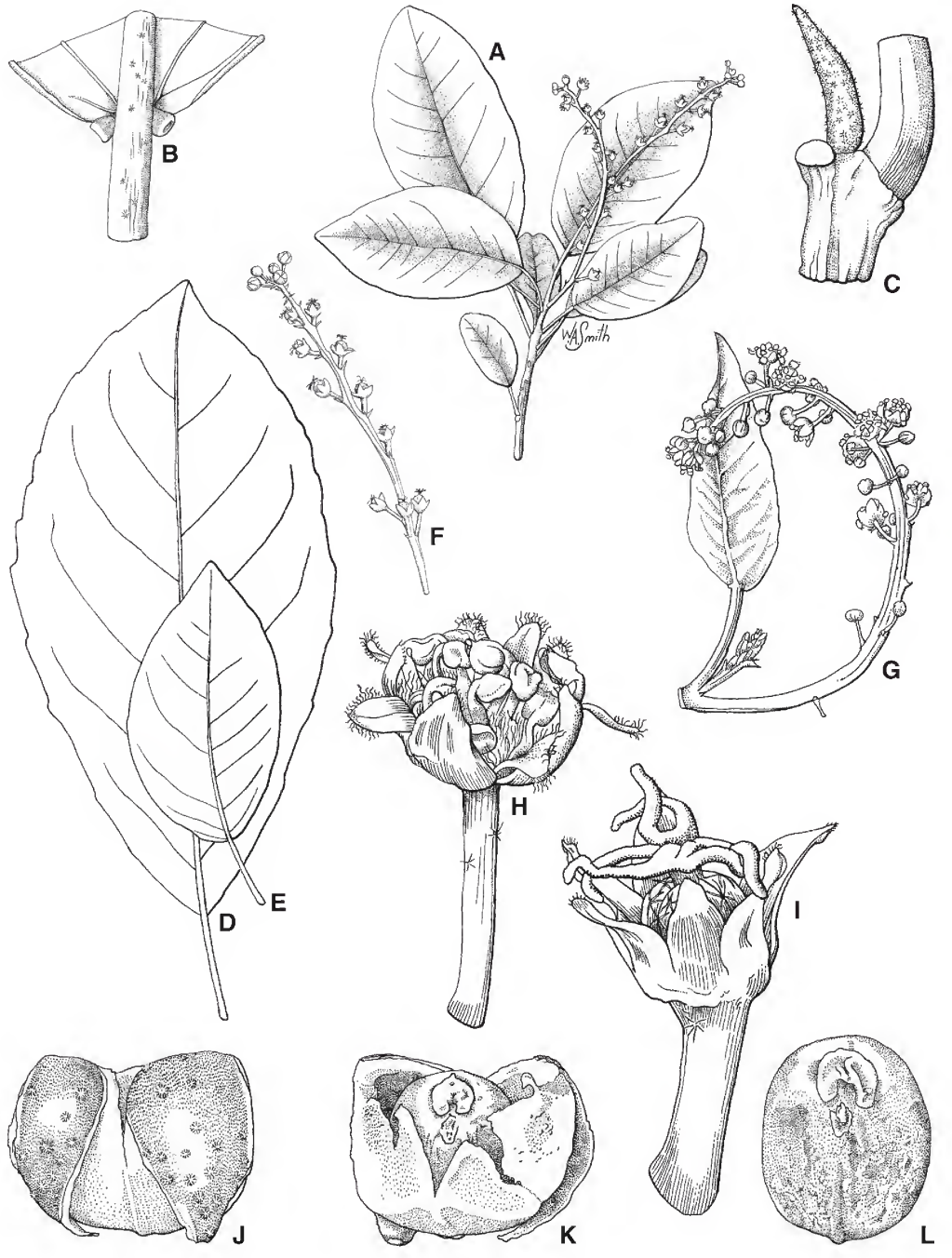


Fig. 20. ***Croton mutabilis***. A. flowering branchlet. × 0.6. B. base of leaf lamina showing extrafloral nectaries. × 6. C. node with stipule. × 6. D & E. undersurface of leaf. × 0.8. F. inflorescence of mainly female flowers. × 1. G. shoot tip with inflorescence of male flowers. × 1. H. male flower. × 8. I. female flower. × 8. J & K. parts of dehisced fruit with seed inside. × 6. L. seed. × 8. A, B, E & F from *Sankowsky* 1316 (BRI); C & D from *Tucker* 61 (BRI); G–I from *Forster* PIF14376 (BRI); J–L from *Hyland* 11504 (BRI). Del. W. Smith.

Table 3. Comparison of morphological characters for *Croton microtiglium* and *C. mutabilis*

Character	*C. microtiglium*	*C. mutabilis*
branchlet indumentum	peltate trichomes	stellate & peltate trichomes
petiole indumentum	peltate trichomes	stellate & peltate trichomes
lateral vein pairs in leaf lamina	9–11	8–10
extrafloral nectaries	poorly formed embedded	well developed, sessile
pedicel indumentum	dense peltate trichomes	glabrous

Etymology: The specific epithet is derived from the Latin *mutabilis* (changeable) and refers to the developmental change in leaf lamina morphology in this species that occurs between flowering and leaf abscission.

21. Croton phebalioides F.Muell. ex Muell.Arg., Flora 47: 485 (1864); *Oxydectes phebalioides* ('phebaliodes') (F.Muell. ex Muell.Arg.) Kuntze, Rev. Gen. Pl. 2: 612 (1891). **Type:** Queensland. NORTH KENNEDY DISTRICT: Burdekin River, *F. Mueller* (holo: K *n.v.*, photo at BRI!).

Croton maidenii R.T.Baker, J. & Proc. Roy. Soc. New South Wales 48: 444, t. 12 (1915). **Type:** New South Wales. Guthrie's Mountain (Read's Mine), 1904, *A.Paddison* (holo: NSW *n.v.*; iso: BRI).

Croton phebalioides var. *acuminatus* Domin, Biblioth. Bot. 89: 326 (1927). **Type:** Queensland. MORETON DISTRICT: Prope Brisbane River, 1863–1865, *A. Dietrich* 2326 (syn: PR528548); Queensland. NORTH KENNEDY DISTRICT: Edgecombe Bay, *Dallachy* (syn: K *n.v.*, photo at BRI!; MEL231441).

Croton phebalioides var. *typicus* Domin, Biblioth. Bot. 89: 326 (1927), nom. inval. **Type:** same as for *C. phebalioides* F.Muell. ex Muell.Arg.

***Illustrations*:** James & Harden (1990: 420); Hauser (1992: 100).

Shrub or small tree to 8 m high, monoecious, evergreen, perennial. Bark lenticellate, grey; blaze thick, flaky, cream-tan; wood cream-tan. Indumentum uncoloured to silver. Branchlets ± rounded, with dense stellate trichomes. Stipules lanceolate to lanceolate-ovate, 0.3–8 mm long, 0.2–0.5 mm wide, entire and with dense stellate trichomes. Leaves alternate, petiolate, discolorous; petioles 3–16 mm long, 0.8–1 mm wide, with dense stellate trichomes; lamina elliptic, lanceolate or ovate, 8–118 mm long, 3–38 mm wide, penninerved with 7–14 lateral veins per side of midrib, tertiary reticulate veins obscure; upper surface matt dark-green, venation obscure, glabrous or with sparse stellate trichomes; lower surface silver, lateral veins weakly visible, with dense overlapping peltate trichomes, neither scabrid nor velutinous; margins entire, sinuate or denticulate with 11–18 weakly defined teeth less than 0.2 mm long, foliar glands prominent; tip acuminate, acute, obtuse or mucronate; base cuneate; extrafloral nectaries 2 at lamina base, sessile, ellipsoid, 0.1–0.3 mm long, 0.1–0.2 mm wide, visible above only. Inflorescence up to 95 mm long, unbranched, androgynous, pedunculate up to 12 mm; axis with dense stellate to peltate trichomes; bracts lanceolate-ovate to ovate, 0.4–0.8 mm long, 0.2–0.7 mm wide, with dense peltate trichomes. Male flowers 2–3 mm long, 2.5–4.5 mm diameter, held singly or 2 to 3 per glomerule, spaced up to 5 mm apart but usually densely clustered towards top of inflorescence; pedicels 1.5–3.5 mm long, 0.3–0.5 mm wide, with dense peltate trichomes; sepals valvate, 5, lanceolate-ovate to obovate,

1.2–2.7 mm long, 1.3–1.8 mm wide, with dense peltate trichomes; petals 5, obovate, 1.3–3 mm long, 0.5–0.7 mm wide, lanate; stamens 10–12, filaments flattened, 1.6–2.5 mm long, 0.2–0.4 mm wide, glabrous, anthers oblong, 0.8–1.2 mm long, 0.6–1.2 mm wide. Female flowers 2.5–4 mm long, 3–5.5 mm diameter, held singly and spaced up to 15 mm apart; pedicels 2–6 mm long, 0.6–1 mm diameter, with dense peltate trichomes; sepals valvate, 5, lanceolate-ovate to obovate, 2.5–3.5 mm long, 1.5–2.2 mm wide, with dense peltate trichomes, lanate; petals absent; styles 3, flattened-flabellate, 1.2–2.5 mm long, multifid, twice divided for 1–2 mm long, ± free at base, glabrous or sparsely papillose near base; ovary 3-locular, 2–3 mm long, 2.6–4 mm diameter, with dense, sessile and stalked stellate trichomes. Fruits trilobate, depressed-globose, 6–8 mm long, 6.5–9 mm diameter, with dense, sessile and stalked stellate trichomes. Seeds ovoid, 4–5 mm long, 3.2–4 mm wide, 2.3–2.5 mm thick, pale to dark brown, ventral surface bifacial, dorsal surface rounded, micropylar ridge 2.8–3.8 mm long; caruncle broadly ovate, 1–1.2 mm long, 1.4–1.5 mm wide, cream to cream-yellow. **Fig. 21**.

***Selected additional specimens*: Queensland.** Cook District: Mungana, near Red Dome Mine turnoff, 17°06'S, 144°25'E, Jan 2002, *Forster* PIF28144 *et al.* (A, BRI, MEL, WIS); Mt Elephant, Curramore Holding, 16°27'S, 144°56'E, Apr 1987, *Wolfe* 2 (QRS). Burke District: Prairie Creek Gorge, 45 km NNE of Hughenden, Jun 1986, *Murray* 62 & *Morgan* (BRI). North Kennedy District: Mingela Bluff, 19°53'S, 146°45'E, Jan 1992, *Forster* PIF9436 & *Bean* (BRI, K, MEL, QRS); Mt Inkerman, 19°44'S, 147°29'E, Mar 1999, *Forster* PIF24215 (A, AD, BRI, K, L, MEL, QRS). South Kennedy District: Carlisle Is, c. 1 km W of Turtle Bay & c. 35 km N of Mackay, 20°47'S, 149°17'E, Sep 1986, *Sharpe* 4450 & *Batianoff* (BRI). Leichhardt District: Palmgrove N.P., NW of Taroom, 25°01'S, 149°15'E, Nov 1998, *Forster* PIF23808 (BRI, MEL, QRS); Expedition N.P., Amphitheatre section, Cannondale Scrub, 25°12'S, 148°59'E, Nov 1998, *Forster* PIF23869 (BRI, MEL, QRS). Port Curtis District: Mt Etna, 23°10'S, 150°27'E, Nov 1987, *Vavryn* 21 (BRI). Mitchell District: Gowan Range, c. 20 km NNW of Idalia HS, 24°43'S, 144°41'E, Apr 1984, *Purdie* 2071 (BRI). Burnett District: Kalliwa Creek, S.F. 169, St Agnes, 25°18'S, 151°51'E, Dec 1990, *Forster* PIF7717 (BRI, K, L, MEL, MO, QRS); S.F. 695 Kalpowar, Burnett Range road, 24°42'S, 151°20'E, Mar 2000, *Forster* PIF25409 & *Booth* (BRI, MEL, QRS); Coalstoun Lakes N.P., 16 km SW of Biggenden, 25°35'S, 151°54'E, Dec 2002, *Forster* PIF29182 (A, BRI, L, MEL, NE, NSW, WIS). Wide Bay District: Mt Biggenden, 25°32'S, 151°59'E, Jan 1991, *Forster* PIF7738 (BRI, MEL, QRS); Lime Mine road, between Didcot & Coalstoun Lakes, 25°33'S, 151°53'E, Dec 2001, *Forster* PIF28061 (A, BRI, K, L, MEL, WIS). Warrego District: 13 km W of Morven, 26°09'S, 146°59'E, Jun 1978, *Purdie* 766d (BRI). Maranoa District: "Stafford Park", Ulandilla, Jan 1936, *Hewitt* [AQ202176] (BRI). Darling Downs District: "Kilburnie" area, 26°47'S, 150°27'E, Oct 1985, *Hoy* 92(BRI). Moreton District: Ivorys Knob, west slopes, 10 km NE of Boonah at end of Hansens road, Nov 1986, *Bird* [AQ431621] (BRI, NSW). **New South Wales.** Duri Mt, 20 km WSW of Tamworth, 31°12'S, 150°43'E, Nov 2000, *Copeland* 2760 (BRI, NE).

***Distribution and habitat*:** *Croton phebalioides* is widespread in central and southern Queensland with an apparent northern limit at Mt Elephant. It also occurs in north-eastern New South Wales (**Map 8**). It is the most widespread *Croton* in mainland Australia by its presence in fifty-five 1° grid squares. Plants grow in semi-evergreen vinethickets throughout much of the range, although some of the northern populations are present in deciduous vinethicket.

***Phenology*:** Flowering and fruiting occurs throughout the year following storm rains, but is concentrated from September to December.

***Notes*:** *Croton phebalioides* is quite variable in terms of leaf lamina size. Much of this variation appears to be related to aridity, as the populations in drier, more inland localities tend to have smaller leaves than those from nearer the coast.

Although *Croton phebalioides* is usually a shrub, at least one locality it forms a small tree to 8 m high (*Forster* PIF29182).

This species was included in *Croton* section *Croton* by Webster (1993a), but does not conform with the characters given for that section, e.g. the penninerved foliage (versus palminerved) and the 10–12 stamens (versus 15–35).

***Conservation status*:** This is a very common plant and is present in twelve conservation reserves in south-eastern Queensland alone (Forster *et al.* 1991).

***Etymology*:** The specific epithet refers to a resemblance between the foliage of this plant and some species of *Phebalium* (Rutaceae).

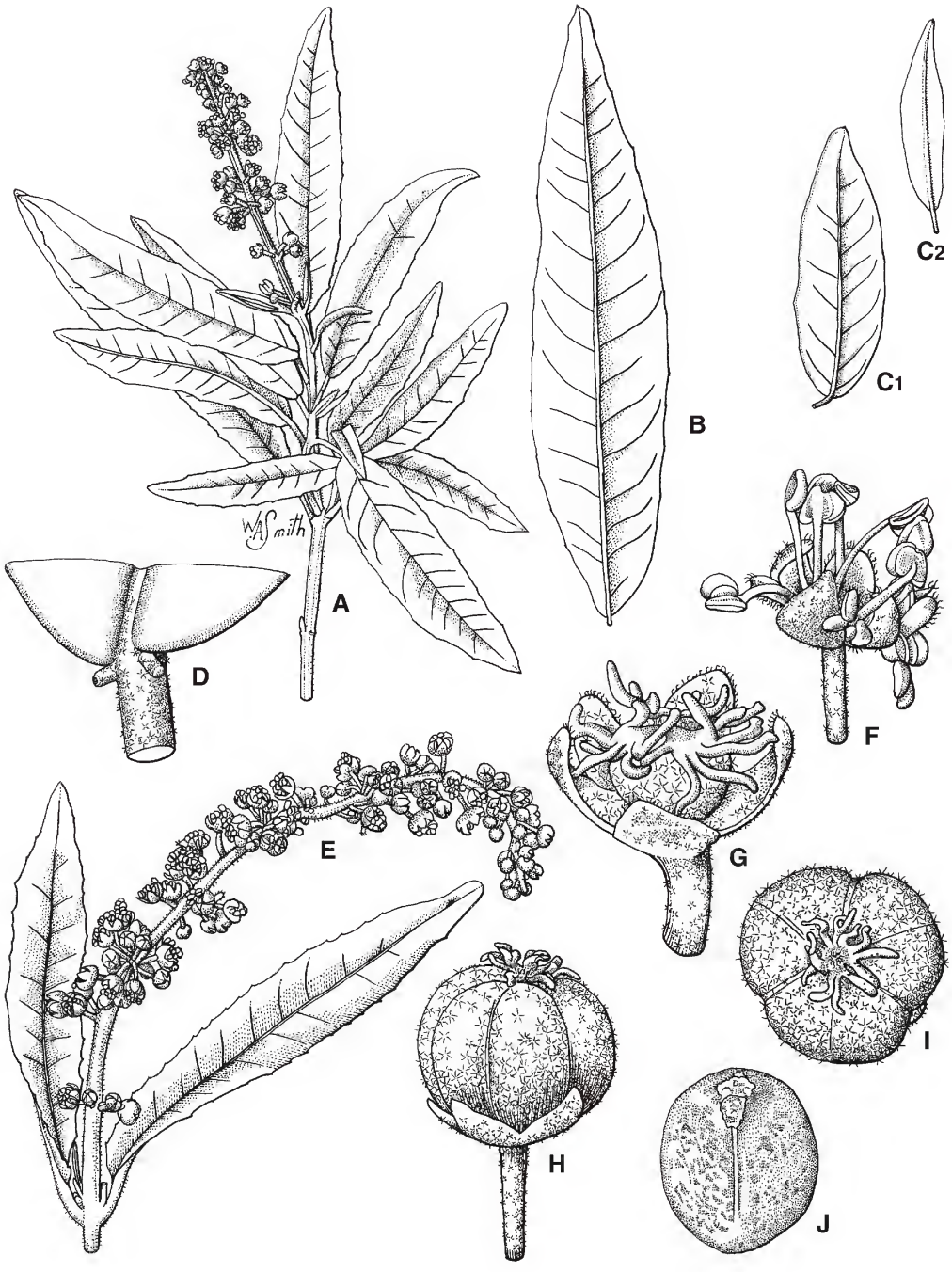


Fig. 21. ***Croton phebalioides*.** A. flowering branchlet. × 1. B & C. undersurface of leaves showing variation in size and primary venation. × 0.8. D. base of leaf lamina showing extrafloral nectaries. × 6. E. inflorescence with male flowers. × 1.5. F. male flower. × 8. G. female flower. × 6. H & I. fruits. × 4. J. seed. × 6. A & F from *Bird* AQ431621 (BRI); B & D from *Forster* PIF7717 (BRI); C1 from *Forster* PIF6571 (BRI); C2 from *Forster* PIF13410 (BRI); G from *Forster* PIF2176 (BRI); H–J from *Gordon* AQ202185 (BRI). Del. W. Smith.

22. Croton rarus P.I.Forst., **sp. nov.** affinis *C. dockrillii* Airy Shaw a qua lamina crenata et venis utroque costae 12–14, indumento ferruginei-argenteo, glandibus foliaribus sessilibus, et pedicello florum marium breviore (1–2 mm longo) differt. **Typus:** Queensland. Cook District: 4.5 km from the Watson River Crossing on the Aurukun - Merluna road, c. 40 km NE of Aurukun, 13°07'S, 141°59'E, 3 December 1981, *J.R. Clarkson* 4062A (holo: BRI [1 sheet]; iso: QRS; DNA, K, L, MO *n.v.*)

Croton sp. (Watson River J.R. Clarkson 4061B) (Forster & Henderson 1997: 72; Forster & Halford 2002: 71).

Shrub to 5 m high, monoecious, evergreen, perennial. Indumentum ferruginous-silver. Branchlets ± rounded, with dense stellate trichomes when young, glabrescent. Stipules linear, 2–3.9 mm long, c. 0.2 mm wide, entire and with sparse to dense stellate trichomes. Leaves alternate, discolorous, petiolate; petioles 6–30 mm long, 0.7–0.8 mm wide, with dense stellate trichomes; lamina narrowly elliptic to oblanceolate, 20–110 mm long, 10–35 mm wide, penninerved with 12–14 lateral veins per side of midrib and poorly developed tertiary reticulate veins; upper surface dark green, venation not visible, glabrous; lower surface pale green, venation weakly developed, with scattered to sparse, stellate trichomes, neither scabrid nor velutinous; margins crenate with 16–32 teeth up to 0.5 mm long, foliar glands prominent; tip acute to rounded; base cuneate to rounded; extrafloral nectaries 2 at base of lamina, sessile, ellipsoid, 0.7–1 mm long, 0.5–0.6 mm wide, visible mainly below. Inflorescence up to 120 mm long, unbranched, androgynous, pedunculate up to 5 mm; axis with dense stellate trichomes; bracts linear-lanceolate to lanceolate, 1–3.5 mm long, 0.2–0.3 mm wide, with scattered simple and stellate trichomes. Male flowers 3–3.5 mm long, 3–4.5 mm diameter, densely clustered in glomerules of 1–5 flowers towards the top of the inflorescence; pedicels 2.2–2.6 mm long, 0.3–0.4 mm wide, with scattered stellate trichomes; sepals valvate, 5, obovate, 2–2.3 mm long, 1–1.2 mm wide, glabrous; petals 5, oblanceolate, 2.3–2.5 mm long, 0.7–0.8 mm wide, lanate in upper half; stamens 10–12, filaments filiform-flattened, 2.2–3 mm long, c. 0.1 mm wide, glabrous, anthers oblong, 0.7–0.8 mm long, 0.6–0.7 mm wide. Female flowers 4–4.5 mm long, 3.5–4 mm diameter, held singly or in groups of 2–4 and spaced up to 11 mm apart; pedicels 1–2 mm long, 0.7–1 mm diameter, with sparse stellate trichomes; sepals valvate, 5, lanceolate-ovate, 2–3.5 mm long, 1–2 mm wide, with scattered stellate trichomes; petals absent; styles 3, linear, 2–3.2 mm long, bifid for 1.5–2.5 mm, glabrous, connate at base for c. 0.2 mm; ovary 3-locular, 1.5–2 mm long, 1.8–2.5 mm diameter, with dense, sessile stellate trichomes. Fruits trilobate, globose, 4–5 mm long, 4–4.5 mm diameter, with scattered, sessile stellate trichomes. Seeds ovoid, 3.3–4 mm long, c. 3 mm wide and 2 mm thick, dark-brown, micropylar line 2.2–2.5 mm long; caruncle not seen. **Fig. 22**.

***Additional specimens*: Queensland.** Cook District: Kowanyama, Mitchell River, Mar 1978, *Alpha & Black* 202B (BRI); 4.5 km from the Watson River Crossing on the Aurukun - Merluna road, c. 40 km NE of Aurukun, 13°07'S, 141°59'E, Dec 1981, *Clarkson* 4061B (BRI, QRS); Rokeby N.P., old Archer River crossing, Wenlock, 13°26'S, 142°42'E, Apr 1991, *Fell* DGF2291 (BRI); 12 km along road to Weipa, off Peninsula Development road, 13°04'S, 142°40'E, Jul 1993, *Forster* PIF13478 *et al.* (BRI, MEL, QRS); Stones Crossing, c. 73 km from Weipa, 12°23'S, 142°10'E, Jul 1993, *Forster* PIF13505 *et al.* (BRI); Walkers Creek, Karumba – Normanton road, 17°28'S, 141°10'E, Mar 2001, *Holmes* [AQ498382] (BRI); cult. Tolga (ex Stones Crossing, Wenlock River), Dec 1991, *Sankowsky* 1370 & *Sankowsky* (BRI).

***Distribution and habitat*:** *Croton rarus* is endemic to western Cape York Peninsula, Queensland where it has been collected from near Weipa in the north to Walkers Creek in the south (**Map 4**) over five 1° grid squares. Plants grow in semi-deciduous notophyll vineforest on alluvium along seasonally flooded watercourses, or in one instance in deciduous vinethicket on heavy black clay. *Croton rarus* is sympatric with *C. mutabilis* at some localities.

Notes: *Croton rarus* is closely allied to both *C. byrnesii* from Arnhem Land and *C. dockrillii* from the east coast of Cape York Peninsula. A macromorphological comparison of these three taxa is made in **Table 4**.

Fig. 22. ***Croton rarus***. A. flowering branchlet. × 0.8. B. undersurface of leaf. × 1. C. base of leaf lamina showing extrafloral nectaries. × 8. D. node showing stipules. × 8. E. inflorescence with female flowers towards base, male buds in upper two-thirds. × 1.5. F. male flower. × 8. G. female flower. × 8. H. coccus of dehisced fruit. × 8. I. seed. × 8. A,B,G from *Sankowsky* 1370 (BRI); C & F from *Clarkson* 4061B (BRI); D from *Sankowsky* 1446 (BRI); E from *Clarkson* 4062A (BRI); H & I from *Alpha & Black* 202B (BRI). Del. W. Smith.

Table 4. Morphological comparison of *Croton byrnesii*, *C. dockrillii* and *C. rarus*

Character	*C. byrnesii*	*C. dockrillii*	*C. rarus*
No. lateral veins in leaf lamina	11–13	10–11	12–14
leaf lamina margin	crenate	denticulate to sinuate	crenate
indumentum colour	ferruginous-yellow	clear	ferruginous-silver
foliar glands	sessile to stipitate	stipitate	sessile
male pedicel length	2.5–7 mm	2–3 mm	1–2 mm
styles divided	twice	once	once
fruit shape	depressed-globose	globose	globose

***Conservation status*:** *Croton rarus* is an uncommonly collected plant but is likely to be more widespread than the available collections would indicate. There are no immediate threats to this species and no conservation coding is thought necessary. The species has been recorded from Rokeby National Park.

***Etymology*:** The specific epithet is derived from the Latin *rarus* (scattered or rare) and alludes to the distribution and apparent paucity of this species.

23. Croton schultzii Benth., Fl. Austral. 6: 124 (1873). **Type:** Northern Territory. Port Darwin, June 1870, *Schultz* 609 (holo: K *n.v.*, photo at BRI!).

[*Croton argyratus* auct., non Blume; Brock (1988: 129); Dunlop *et al.* (1995); Wheeler (1992: 597)].

***Illustrations*:** Brock (1988: 129); Dunlop *et al.* (1995: 214, Fig. 71); Wheeler (1992: 598, Fig. 182A).

Shrub to 4 m high, monoecious, seasonally deciduous, perennial. Indumentum silver. Branchlets ± rounded, with dense overlapping peltate scales when young, glabrescent. Stipules linear-lanceolate, 3–6 mm long, 0.3–mm wide, entire and with dense peltate scales. Leaves alternate, discolorous, petiolate; petioles 20–60 mm long, 0.8–1 mm wide, with dense peltate scales; lamina elliptic to broadly ovate, 20–120 mm long, 15–100 mm wide, palminerved with 1 or 2 veins per side from base and with 6–10 lateral veins per side of midrib, tertiary reticulate veins obscure; upper surface dark green, lateral veins not visible, ± glabrous or with scattered peltate scales, glabrescent; lower surface irridescent silver, lateral veins weakly visible, with dense, overlapping, peltate scales, neither scabrid nor velutinous; margins entire or weakly sinuate, foliar glands inconspicuous; tip acute to short acuminate; base cordate; extrafloral nectaries absent, or if present then 2 at base of lamina, sessile, ellipsoid, 0.4–0.6 mm long, 0.2–0.5 mm wide, visible below only. Inflorescence up to 70 mm long, unbranched, usually androgynous, pedunculate up to 10 mm; axis with dense peltate scales; bracts lanceolate, 1–2.8 mm long, 0.2–0.8 mm wide, with dense peltate scales. Male flowers 3–4 mm long, 3–4 mm diameter, densely clustered towards the inflorescence tip; pedicels 2–4 mm long, 0.4–0.5 mm wide, with dense peltate scales; sepals valvate, 5, lanceolate to lanceolate-ovate, 2.5–2.8 mm long, 1–1.6 mm wide, with dense peltate scales; petals 5, lanceolate, 2.3–4 mm long, 0.8–1.5 mm wide, lanate in upper half and with sparse simple hairs on abaxial surface; stamens 10, filaments ± flattened, 2–3 mm long, c. 0.2 mm

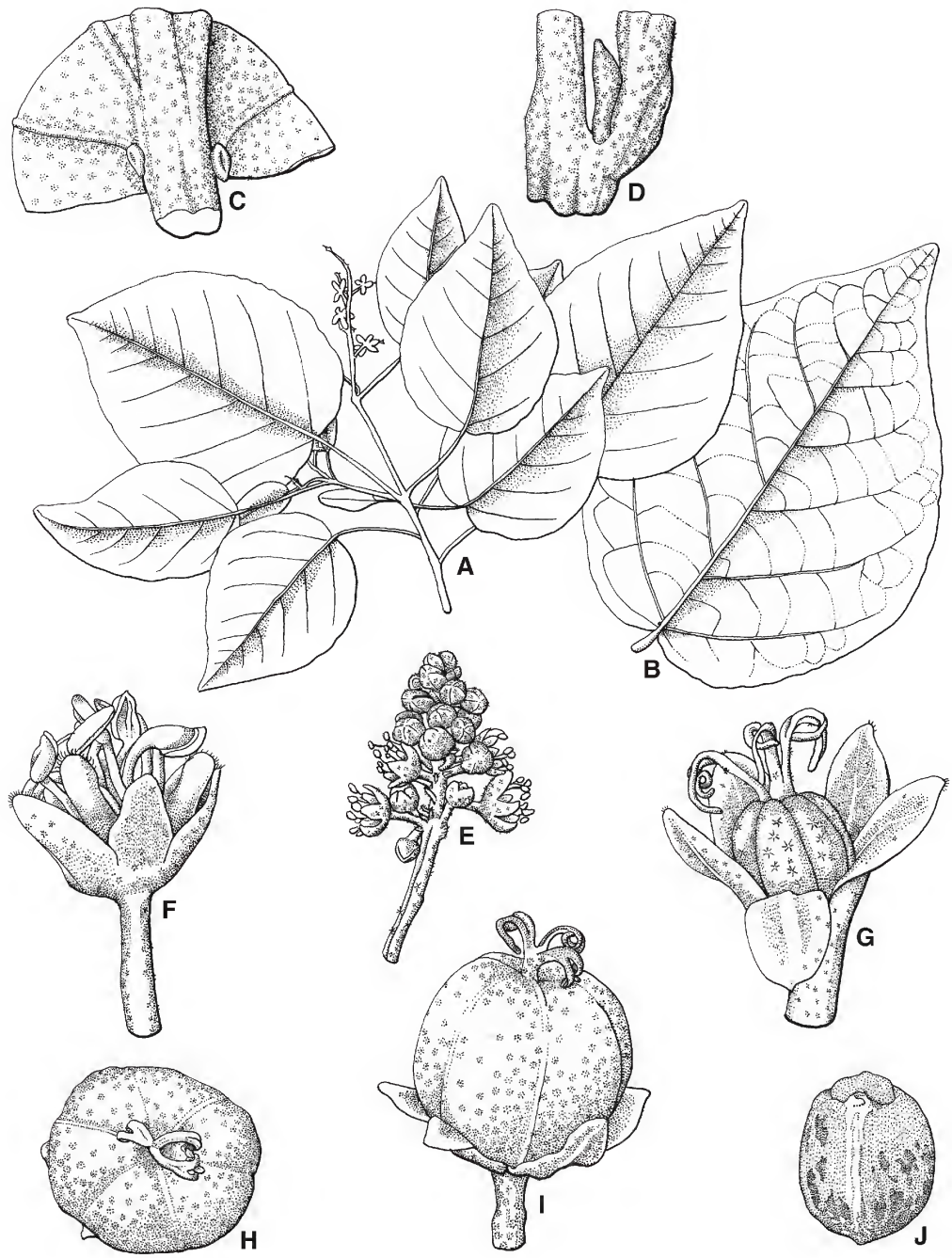


Fig. 23. ***Croton schultzii***. A. fruiting branchlet. × 0.4. B. undersurface of leaf. × 1. C. base of leaf lamina howing extrafloral nectaries. × 8. D. node showing stipule. × 6. E. inflorescence with male flowers. × 2. F. male flower. × 6. G. female flower. × 6. H & I. Fruit. × 4. J. seed. × 4. A,B,J from *Brock* 209 (BRI); C, H & I from *Cowie* 8781 (BRI); D & G from *Leach* 2695 (BRI); E & F from *Russell-Smith* 8123 (BRI). Del. W. Smith.

wide, glabrous; anthers oblong, 0.8–1 mm long, 0.5–0.7 mm wide. Female flowers 3–4.5 mm long, 3–4 mm diameter, held singly 5–15 mm apart; pedicels 2–8 mm long, 0.8–1 mm diameter, with dense peltate scales; sepals valvate, 5, lanceolate-obovate, 3–5.5 mm long, 1.5–2.5 mm wide, with dense peltate scales; petals absent; styles 3, linear to obloid, 2.6–4 mm long, bifid for 1.5–2 mm long, connate at base for c. 0.3 mm, glabrous apart from sparse peltate scales at base; ovary 3-locular, 2–3 mm long, 2–3 mm diameter, with dense peltate scales. Fruits trilobate, globose, 6–8 mm long, 7–8 mm diameter, with sparse peltate scales. Seeds ± obloid, c. 5.5 mm long, 4–4.8 mm wide, 2–2.8 mm thick, irregularly blotched brown and cream, ventral surface bifacial, dorsal surface rounded, micropylar ridge 4–4.8 mm long; caruncle crescent shaped, c. 1 mm long, 2.3–2.5 mm wide, cream. **Fig. 23**.

***Selected additional specimens*: Western Australia.** Near Cape Bernier, 14°06'S, 127°32'E, Jun 1988, *Hyland* 13538 (QRS). **Northern Territory.** East Point, Feb 1987, *Brock* 209 (BRI, DNA); East Point, 12°25'S, 130°49'E, Nov 1967, *Byrnes* 284 (DNA); Gunn Point, Nov 1990, *Cowie* 1444 & *Dunlop* (BRI, DNA, MEL); Gunn Point, 12°10'S, 131°02'E, May 1984, *Dunlop* 6706 & *Wightman* (DNA); East Point, Dec 1990, *Dunlop* 8781 & *Cowie* (BRI, DNA); Gunn Point, Nov 1989, *Forster* PIF5918 & *Russell-Smith* (BRI, DNA, MEL); Mt Briggs, Fish River Station, Mar 1989, *Leach* 2512 & *Dunlop* (BRI, DNA); Gunn Point, Feb 1990, *Leach* 2695 & *Dunlop* (BRI, CANB, DNA); Lee Point, Darwin, 12°26'S, 131°50'E, Aug 1984, *Russell-Smith* 1147 (DNA); Murganella, Wunya Beach, 11°42'S, 133°09'E, Mar 1987, *Russell-Smith* 1957 & *Lucas* (DNA); Melville Island, Condor Point, 11°44'S, 131°17'E, May 1987, *Russell-Smith* 2390 & *Lucas* (DNA); 3 km W Mt Muriel, Tipperary, 13°54'S, 131°10'E, Mar 1989, *Russell-Smith* 7981 & *Lucas* (BRI, DNA); Gunn Point, Nov 1989, *Russell-Smith* 8123 & *Lucas* (BRI, DNA).

***Distribution and habitat*:** *Croton schultzii* is endemic to Australia occuring in a few localities near Darwin in the Northern Territory and the Kimberley region in Western Australia (**Map 3**). Its distribution covers nine 1° grid squares. Plants grow in deciduous vinethicket on red laterite or limestone.

***Phenology*:** Flowering occurs from November to January, following storm rain. There is one record from June, but this is considered abnormal. Fruiting occurs from December to March.

***Notes*:** *Croton schultzii* has been referred to in recent times as *C. argyratus* (Wheeler 1992; Dunlop *et al.* 1995; Chakrabarty & Balakrishnan 1997). It is not conspecific with that species and differs in the peltate scales on the foliage (versus peltate trichomes), the male flowers with shorter pedicels (2–4 mm versus 5–6 mm), the smaller fruit (6–8 mm diameter versus 12–16 mm) and smaller seeds (c. 5.5 mm long x 4–4.8 mm wide, versus 10–11 mm long x 7–8 mm wide). *C. argyratus* is restricted to peninsular Thailand, the Malay Peninsula, Sumatra, Java, Borneo and the Lesser Sunda Islands (H.-J.Esser pers. comm. 2000), although it has also been recorded for India in the Andaman and Nicobar Islands (Chakrabarty & Balakrishnan 1997).

***Conservation status*:** The species is common at the known localities.

***Etymology*:** The name honours M. Schultz (date of birth & death unknown), who collected specimens at Port Darwin as cited by Bentham in the 'Flora Australiensis'.

24. Croton setigerus Hook., Fl. Bor.-Amer. 2: 141 (1838); *Eremocarpus setigerus* (Hook.) Benth., Bot. Voy. Sulph. 53, t. 26 (1844). **Type:** U.S.A., California, *Douglas* (holo: K *n.v.*, photo at BRI!).

***Illustrations*:** James & Harden (1990: 420); Webster (1993b: 575); Jeanes (1999: 67, Fig. 10b); Radcliffe-Smith (2001: 325, Fig. 40).

Prostrate to semi-erect herb to 20 cm high, monoecious, annual. Indumentum ferruginous-silver. Branchlets rounded, with dense stellate trichomes. Stipules linear-subulate, 5–7 mm long, 0.2–0.5 mm wide, multifid and with dense stellate trichomes. Leaves alternate, petiolate, discolorous; petioles 3–45 mm long, c. 1 mm wide, with dense stellate trichomes; lamina ovate to suborbicular, 8–65 mm long, 8–40 mm wide, palminerved with 3–5 lateral veins from base, tertiary reticulate veins obscure; upper surface silver-green, venation obscure, with dense stellate trichomes; lower surface silver, venation obscure, with dense stellate trichomes; margins entire, foliar glands absent; tip acute to rounded; base cuneate to rounded; extrafloral nectaries absent. Inflorescence up to 15 mm long, unbranched, androgynous, ± sessile; axis

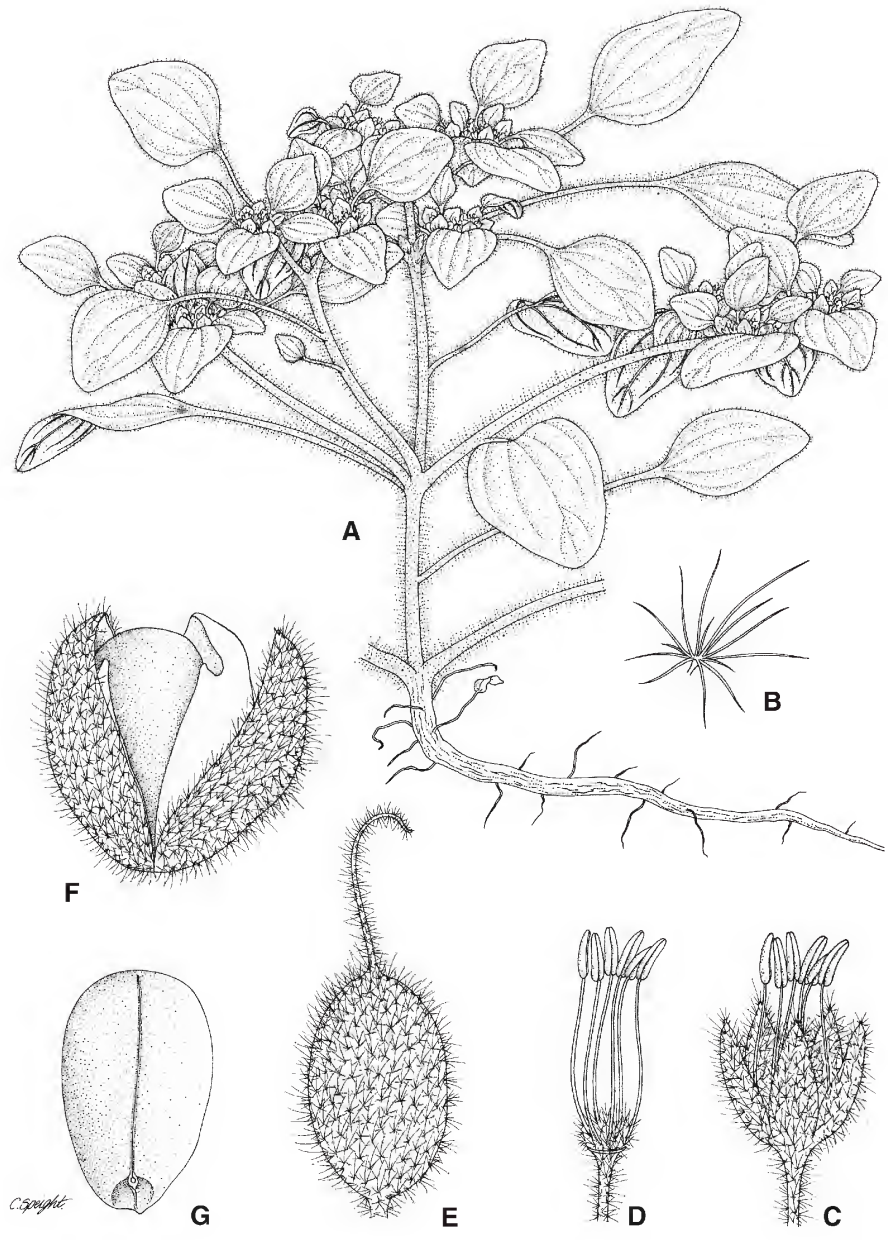


Fig. 24. ***Croton setigerus***. A. habit. × 1. B. stellate trichome. × 80. C. male flower. × 20. D. stamens. × 20. E. fruit. × 13.5. F. fruit, dehisced. × 13.5. G. seed. × 13.5. All from *Rose* 41457 (K). Del. C. Speight. Plate reproduced with permission from Radcliffe-Smith (2001: 325).

with dense stellate trichomes; bracts linear, 4–5 mm long, c. 0.1 mm wide, with dense stellate trichomes. Male flowers 3–4 mm long, 2.8–3.2 mm diameter, held singly, usually densely clustered towards top of inflorescence; pedicels 1.8–4 mm long, c. 0.1 mm wide, with sparse sessile trichomes; sepals valvate, 5, obovate, 2–2.5 mm long, 0.9–1 mm wide, with dense stellate trichomes; petals absent; stamens 5–7, filaments filiform, 2–3.8 mm long, c. 0.1 mm wide, glabrous, anthers oblong, 0.8–1 mm long, 0.3–0.4 mm wide. Female flowers 6–7 mm long, c. 2 mm diameter, held singly and spaced up to 5 mm apart, sessile; sepals absent; petals absent; styles 1, linear-subulate, 3.5–5 mm long, entire, with sparse stellate trichomes; ovary 1-locular, c. 1.5 mm long and 0.2 mm diameter, with sparse stellate trichomes. Fruits unlobed, oblong, 4–6 mm long, 3–3.5 mm diameter, with dense, sessile stellate trichomes. Seeds ellipsoid, 3–5.2 mm long, 1.7–3 mm wide, 1.4–2.2 mm thick, cream and tan-brown mottled, ventral surface bifacial, dorsal surface rounded, micropylar ridge 2.5–4 mm long; ecarunculate. **Fig. 24**.

***Additional specimens*: United States of America. California.** Near Oroville, Butte County, Jul 1937, *Copeland* 1604 (BRI); Santa Cruz Island, Pelican Bay, Jul 1930, *Clokey* 4993 (BRI); Mandeville Canyon, Santa Monica Mountains, Los Angeles County, Aug 1929, *Clokey* 4599 & *Templeton* (BRI); Tenaja Ranger Station area, Rancho California, 7 miles NW of Murietta, southwest Riverside County, Oct 1971, *Grove* 8 (BRI); Saratoga summit, Santa Clara County, Sep 1941, *Rose* 41457 (BRI). **Australia. New South Wales.** Trangie district, Feb 1939, *Glenfield Vet. Research Station* (NSW); Trangie district, Feb 1942, *s.coll.* [AQ207216] (BRI); Trangie Expt. farm, Jan 1943, *May* s.n. (NSW); near Corowa, Apr 1965, *Mulham* s.n. (NSW); Shire of Corowa, Apr 1969, *Rodway* (MEL601784). **Victoria.** Granya, 36°07'S, 147°19'E, Apr 1984, *Roberts* (MEL662901).

***Distribution and habitat*:** *Croton setigerus* is native to California, U.S.A. and is naturalised in New South Wales and Victoria in agricultural areas where it is a weed of cultivated ground (**Map 9**). Jeanes (1999) mentioned that it was also naturalised in Western Australia and South Australia, but I have not seen specimens from those states.

***Notes*:** *Croton setigerus* has been usually placed in the monotypic genus *Eremocarpus,* most recently by Radcliffe-Smith (2001). Webster (1993a, 1994) has advocated the reduction of *Eremocarpus* to a monotypic section of *Croton* and this was followed by Radcliffe-Smith & Govaerts (1997), but at subgeneric level. *Croton setigerus* is very different from the species of *Croton* familiar to me from Australia and adjacent regions, primarily in the 1-locular female flower (thought to be an adaptation to wind pollination by Webster 1993a) and fruit and the ecarunculate seed. Webster's sectional classification requires a rigorous examination utilizing both morphological and molecular data, much beyond the scope of the current work, hence his reduction of *Eremocarpus* is followed here, although with reservations.

***Phenology*:** In Australia, flowering occurs from October to January, fruiting from January to April.

***Etymology*:** The specific name is derived from the Latin *seta* (bristle) and *-ger* (carrying or bearing) and probably alludes to the dense stellate indumentum of this plant.

25. Croton simulans P.I.Forst. **sp. nov.**, affinis *C. capitis-york* autem lamina foliorum venis lateralibus leniter (vice valde) effectis et squamis densis superpositus peltatis mixtis trichomatis stellatis remotis usque sparsis (vice non nisi squamis peltatis sparsis usque densis) subtus praeditis, nectariis extrafloralibus basi laminae foliorum dispositis et tantum subter videndis (vice mode infra basin laminae dispositis et videndis et supra et subter), floribus masculinis pedicellis longioribus (5–6 mm vice 1.4–1.6 mm) petalis longioribus (1.8–2 mm vice 1.4–1.5 mm) differt. **Typus:** Queensland. Cook District: Timber Reserve 14, Parish of Kesteven, 28 November 1991, *B. Hyland* 14377 (holo: QRS; iso: BRI).

Shrub to 5 m high, monoecious, deciduous, perennial. Indumentum silver. Branchlets rounded, with dense peltate scales and scattered stellate trichomes, glabrescents. Stipules minute, triangular, < 0.3 mm long and 0.3 mm wide, with scattered peltate scales. Leaves discolorous, petiolate; petioles 3–10 mm long, c. 1 mm wide, with dense peltate scales and stellate trichomes when young, glabrescent; lamina elliptic-ovate to oblanceolate, chartaceous, 10–150 mm long,

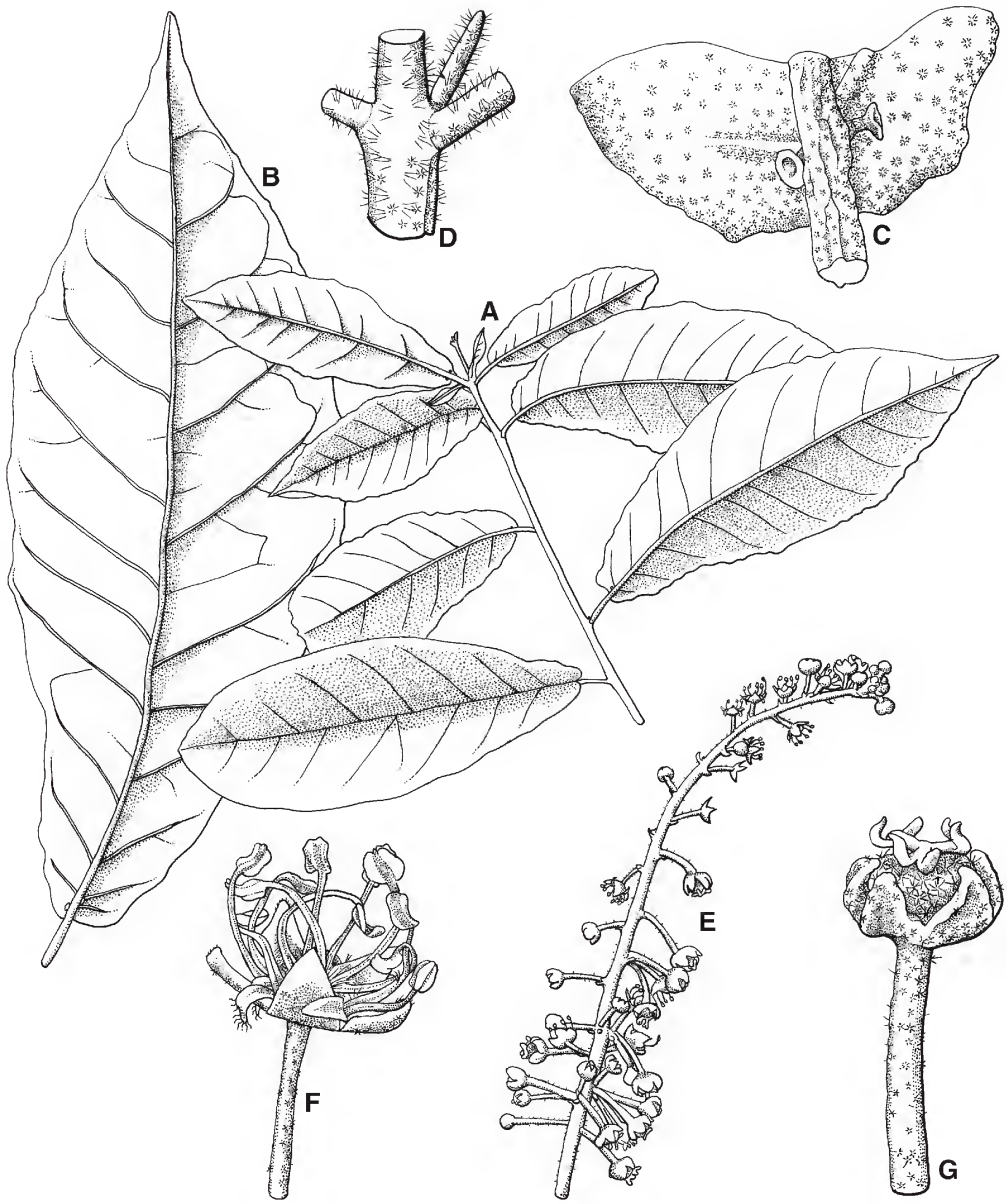


Fig. 25. ***Croton simulans.*** A. branchlet. × 0.5. B. undersurface of leaf. × 1. C. base of leaf lamina showing extrafloral nectaries. × 6. D. node showing stipule. × 6. E. inflorescence with female flowers towards base and male flowers in upper two-thirds. × 1. F. male flower. × 6. G. female flower. × 6. A–C from *Forster* PIF24072 (BRI); D–G from *Hyland* 25813 (BRI). Del. W. Smith.

4–60 mm wide, penninerved with 8–12 lateral veins per side of midrib, tertiary reticulate veins obscure; upper surface grey-green, lateral veins indistinct, with sparse to dense (overlapping) peltate scales, glabresent; lower surface silver to silver-green, lateral veins weakly developed, with sparse to dense (overlapping) peltate scales & scattered stellate trichomes, neither scabrid nor velutinous; margins entire or weakly sinuate, foliar glands prominent; tip obtuse, acute to short-acuminate; base cuneate to cordate; extrafloral nectaries 2, at leaf lamina base, sessile or stipitate to 1.2 mm long, ellipsoid, 0.3–0.4 mm long, 0.2–0.3 mm wide, visible only from below. Inflorescence up to 10 mm long, unbranched, unisexual or androgynous, pedunculate up to 10 mm; axis with dense peltate scales & stellate trichomes; bracts lanceolate, c. 1 mm long and 0.7 mm wide, with dense peltate scales. Male flowers c. 3 mm long, 4–5 mm diameter, clustered on inflorescence in glomerules of 1–3 flowers, or spaced to 5 mm apart; pedicels 5–6 mm long, c. 0.5 mm wide, with dense peltate scales & peltate trichomes; sepals valvate, 5, lanceolate-ovate, 1.8–2 mm long, 1–1.2 mm wide, lanate in upper half; petals 5, lanceolate-ovate, 1.8–2 mm long, 0.5–0.8 mm wide, lanate in upper half; stamens 10–12, filaments filiform, 2–2.2 mm long, c. 0.1 mm wide, glabrous, anthers oblong, 0.8–1 mm long, 0.4–0.5 mm wide. Female flowers 2–2.5 mm long, 2.5–3 mm diameter, held singly and spaced up to 10 mm apart; pedicels 4–6 mm long, c. 1 mm diameter, with dense peltate scales and peltate trichomes; sepals valvate, 5, lanceolate-ovate, 1.8–2 mm long, 1.5–1.7 mm wide, with dense peltate scales; petals absent; styles 3, obloid, up to 1.2 mm long and 0.2 mm wide, bifid for up to 0.7 mm long, glabrous; ovary 3-locular, 1.8–2 mm long, 1.8–2 mm diameter, with dense ferruginous, stellate trichomes. Fruits and seeds not seen. **Fig. 25**.

***Additional specimens*: Queensland.** Cook District: T.R.14, Parish of Kesteven, Nov 1991, *Hyland* 25813 RFK (BRI, QRS). Cultivated: Station road, Ipswich by M.C.Tucker (ex plant collected on Leo Creek road, eastern fall of McIlwraith Range), Mar 1999, *Forster* PIF24072 (BRI).

***Distribution & habitat*:** *Croton simulans* is thus far known from only along the Leo Creek road in the western side of the McIlwraith Range on Cape York Peninsula (**Map 3**). Plants grow as understorey shrubs in araucarian microphyll vineforest on granite.

***Phenology*:** Flowers have been recorded in November. Fruit would be expected between January and February.

***Notes*:** *Croton simulans* is superficially similar to *C. capitis-york* and may well be a sister-taxon to that species but is immediately distinguishable in the field by the more silver appearance of the seasonally deciduous foliage. *Croton simulans* differs from *C. capitis-york* in the undersurface of the leaf lamina having weakly developed lateral veins (versus strongly developed), a mixture of dense (overlapping) peltate scales and scattered to sparse stellate trichomes (versus sparse to dense peltate scales only); the extrafloral nectaries situated at the base of the lamina and visible only from below (versus situated just below the lamina base and visible both from above and below); the male flowers with longer pedicels (5–6 mm versus 1.4–1.5 mm) and longer petals (1.8–2 mm versus 1.4–1.5 mm).

***Etymology*:** The specific epithet *simulans* (imitating or resembling) is formed directly from Latin and refers to the superficial similarity of this species to *Croton capitis-york*.

26. Croton stigmatosus F.Muell., Fragm. 4: 140 (1864); *C. phebalioides* var. *stigmatosus* (F.Muell.) Domin, Biblioth. Bot. 89: 880 (1928). **Type:** Queensland. Moreton District: Moreton Bay, 1845, *Leichhardt* [sheet with female specimen] (lecto [here chosen]: P *n.v.*, photo at BRI!).

Croton stigmatosus Muell.Arg., Linnaea 34: 107 (1865), *nom. illeg.*; *Oxydectes stigmatosus* (Muell.Arg.) Kuntze, Rev. Gen. Pl. 2: 613 (1891). **Type:** Queensland. Moreton District: Moreton Bay, 1845, *Leichhardt* [2 sheets seen, one is the lectotype sheet of *C. stigmatosus* F.Muell.] (syn: P *n.v.*, photo at BRI!); New South Wales. Clarence River, [*Beckler*] *F. Mueller* (syn: G-DC *n.v.*, fiche at BRI!; isosyn: P *n.v.*, photo at BRI!).

Croton phebalioides var. *hirsuta* F.M.Bail., Queensland Fl. 5: 1436 (1902). **Type:** Queensland. Moreton District: Taylor's Range, near Brisbane, *Bailey* (holo: *n.v.* at BRI, presumed lost).

***Illustrations*:** Floyd (1989: 143); James & Harden (1990: 420); Hauser (1992: 89).

Fig. 26. ***Croton stigmatosus*** A. fruiting branchlet. × 0.6. B. undersurface of leaf. × 1. C. base of leaf lamina showing extrafloral nectaries. × 8. D. node showing stipule. × 8. E. inflorescence with female and male flowers. × 3. F. male flower. × 8. G. female flower. × 6. H & I fruit. × 3. J. mamillate process with stellate hairs. × 20. K. seed. × 6. All from *Forster* PIF28042 (BRI). Del. W. Smith.

Shrub or small tree to 18 m high, monoecious, evergreen, perennial. Bark lenticellate, blaze flesh-yellow, wood cream-yellow. Indumentum silver. Branchlets ± rounded, with dense stellate trichomes when young, glabrescent. Stipules subulate, 1.5–7 mm long, c. 0.5 mm wide, entire and with dense stellate trichomes. Leaves alternate, discolorous, petiolate; petioles 3–25 mm long, 1–1.2 mm wide, with dense peltate scales and stellate trichomes; lamina cuneate-obovate, elliptic or ovate, 13–160 mm long, 5–60 mm wide, penninerved with 12–15 lateral veins per side of midrib, tertiary reticulate veins obscure; upper surface matt dark-green, lateral veins weakly visible, with sparse stellate trichomes and sparse peltate scales; lower surface silver-white, lateral veins prominent, with dense stellate trichomes and dense peltate scales, neither scabrid nor velutinous; margins denticulate with 14–24 small teeth up to 0.5 mm long, foliar glands prominent; tip acute to acuminate; base cordate, cuneate, retuse; extrafloral nectaries 2 at base of leaf lamina, stipitate to 1.8 mm long, circular, 0.4–0.5 mm long, 0.4–0.5 mm wide, visible above and below. Inflorescence up to 180 mm long, unbranched, usually bisexual and androgynous but occasionally with male and female flowers mixed in same glomerules, pedunculate up to 32 mm; axis with dense stellate trichomes and dense peltate scales; bracts linear-lanceolate, 1.5–2 mm long, 0.3–0.5 mm wide, with dense stellate trichomes. Male flowers 2–3.5 mm long, 2.5–5 mm diameter, clustered towards top of inflorescence in glomerules of 2–7 flowers or held singly and spaced up to 8 mm apart; pedicels 2–4 mm long, 0.4–0.5 mm wide, with dense stellate trichomes; sepals valvate, 5, lanceolate-ovate, ovate or obovate, 1.5–2.2 mm long, 0.4–1.4 mm wide, with dense stellate trichomes; petals 5, obovate, 1.5–2.2 mm long, 0.3–0.8 mm wide, lanate in upper half; stamens 10–12, filaments ± filiform, 1.5–2 mm long, c. 0.1 mm wide, with dense simple trichomes at base, anthers oblong, 0.6–0.8 mm long, 0.5–0.7 mm wide. Female flowers 2.5–5 mm long, 3–8 mm diameter, usually held singly and spaced up to 7 mm apart; pedicels 5–8 mm long, c. 1 mm diameter, with dense stellate trichomes and dense peltate scales; sepals valvate, 5, obovate to ovate, 2.8–4 mm long, 1.5–3 mm wide, with dense stellate trichomes; petals absent; styles 3, linear, 1.5–3.5 mm long, multifid, twice divided for 1.3–3.2 mm long, connate at base for c. 0.2 mm, papillose and with sparse stellate trichomes on proximal two-thirds; ovary 3-locular, 2–3 mm long, 2.5–3.5 mm diameter, with dense, stalked stellate trichomes. Fruits trilobate, depressed-globose, 7–8 mm long, 7–10 mm diameter, with dense, stalked stellate trichomes on fleshy mamillate processes. Seeds ± ovoid, 5.5–6.5 mm long, 3.8–5 mm wide, 2.4–3.2 mm thick, black-brown, ventral surface bifacial, dorsal surface rounded, micropylar ridge 3.5–4 mm long; caruncle oblong-rectangular, 1–1.5 mm long, 1.3–2.5 mm wide, cream. **Fig. 26**.

***Selected additional specimens*: Queensland.** Port Curtis District: T.R. 353, W of Many Peaks, 24°32'S, 151°16'E, Nov 1995, *Bean* 9140 *& Turpin* (BRI); Shoalwater Bay, small island in archipelago in Pearl Bay, 22°25'S, 150°43'E, Jun 1999, *Brushe* JB2006 *& Plumb* (BRI); Pine Creek, S.F. 391 Bulburin, off lower reaches of Granite Creek, 24°37'S, 151°33'E, Dec 1994, *Forster* PIF16029 *et al.* (BRI); S.F. 67 Bulburin, May 1985, *Gibson* 734 (BRI, NSW). Wide Bay District: S.F. 234, SW of Cooroy, 26°29'S, 152°49'E, Apr 1993, *Bean* 5903 (BRI); Imbil, Mar 1918, *Weatherhead* [AQ202204] (BRI). Darling Downs District: Gully W of Swan Creek, 7.5 km NE of Swanfels & 11 km SW of Cunningham's Gap, 28°07'S, 152°19'E, Jan 1989, *Bird* [AQ455783] (BRI). Moreton District: Slopes of Mt Chingee, S of Rathdowney, 28°18'S, 152°26'E, Nov 2001, *Bean* 18015 (BRI, CANB, MEL, NSW); Rosen's Lookout, Beechmont, Mar 1977, *Elsol* [AQ194906] (BRI); CSR Land, Ormeau, 27°47'S, 153°13'E, Dec 2001, *Forster* PIF28042 & *Leiper* (A, BISH, BRI, DNA, L, MEL, MO, NSW, WIS, Z); Upper Brookfield, Brisbane, Feb 1978, *Jessup* 43 (BRI); Beechmont Ridge, Beechmont, Macpherson Range, Oct 1969, *Schodde* 5592 (BRI, CANB, MEL); Sunday Creek, Lamington N.P., *Smith* [AQ379568] (BRI); Blackall Range, Dec 1916, *White* [AQ202197] (BRI); Tamborine Mt, May 1940, *White* 11440 (BRI). **New South Wales.** Lismore, Mar 1898, *Baker* [MEL231575] (MEL); Wiangaree S.F., Jan 1981, *Bird* [AQ345018] (BRI); 23 km NW of Kyogle, Toonumbar forest road, Toonumbar S.F., 28°29'S, 152°48'E, Dec 1991, *Halford* Q824 (BRI, MEL, NSW); c. 2 miles [3.3 km] SW of Wiangaree, Oct 1966, *Hayes* 2558 *et al.* (BRI); Palm Gully forest road, Long Creek, between Roseberry & Queensland border, 28°23'S, 152°56'E, Apr 1981, *Jessup* 323 (BRI).

***Distribution and habitat*:** *Croton stigmatosus* is restricted to south-eastern Queensland from Shoalwater Bay in the north to the north-eastern corner of New South Wales (**Map 2**). It has been recorded from eleven 1° grid squares. Plants grow in complex notophyll vineforest that is often dominated by *Argyrodendron* spp. on volcanic soils.

Phenology: Flowering occurs from September to May; fruiting occurs from September to May.

Notes: F. Mueller (1864) cited four syntypes in the protologue for *Croton stigmatosus*, viz. "Ad flumen Richmond River, Dr Beckler; ad sinum Moreton Bay, Dr Leichhardt, F.M.; ad sinum Broad sound, Bowman; ad flumen Fitzroy River et montem Mueller Australiae orientalis tropicae, Dallachy". At P there are two sheets with specimens collected by Leichhardt from Moreton Bay, both apparently in 1845. One of these has buds, the other has female flowers. There are also sheets with collections apparently by F. Mueller (no locality) and Beckler 'Clarence River'. There is a Bowman collection from Broad Sound at MEL (MEL231578). This last collection does represent *Croton stigmatosus*, but the present day Broad Sound is well to the north of where the species is known to occur. I have been unable to locate the collections by Dallachy or Beckler (Richmond River). The name *Croton stigmatosus* F.Muell. is lectotypified with the Leichhardt collection at P that has female flowers.

To further complicate the nomenclature of this species, the name *Croton stigmatosus* was independently used by J. Mueller (1865) with the protologue stating "In Nova Hollandiae orientali ad Clarence River (F.Muell.! in hb.DC.), in Moreton-Bay (Leichhard! in hb.Mus.Paris)". The Leichhardt collection is the same one that I have used to lectotypify the name *C. stigmatosus* F.Muell. The Clarence River collection appears to have been made by Beckler and is present at both G-DC and P.

Croton stigmatosus is sometimes confused with large leaved forms of *C. phebalioides*. This latter species grows in drier closed-forest communities and differs most noticeably in the ± entire to weakly denticulate foliage with poorly developed lateral venation.

***Conservation status*:** *Croton stigmatosus* is infrequently collected but is not uncommon throughout its known range. It is present in at least three conservation reserves in south-eastern Queensland and two in New South Wales (Floyd 1989). No conservation coding is necessary.

***Etymology*:** The specific epithet is derived from the Latin *stigmatosus* and means having well developed stigmas.

27. Croton stockeri (Airy Shaw) Airy Shaw, Kew Bull. 35: 622 (1981); *Croton wassikussae* Croizat var. *stockeri* Airy Shaw, Muelleria 4: 229 (1980). **Type:** Queensland. Cook District: between Rocky River and Massy Creek, 13°40'S, 143°25'E, 13 September 1973, *G.C. Stocker* 1076 (holo: QRS; iso: BRI, CANB).

Shrub to 4m high, monoecious, evergreen or seasonally deciduous, perennial. Indumentum orange-brown. Branchlets rounded, with dense stellate trichomes. Stipules lanceolate, 3–6 mm long, 1–1.8 mm wide, entire and with dense stellate trichomes. Leaves alternate, discolorous, petiolate; petioles 5–12 mm long, c. 1 mm wide, with dense stellate trichomes; lamina ovate to elliptic, 12–80 mm long, 10–50 mm wide, penninerved with 9–11 lateral veins per side of midrib, tertiary reticulate veins obscure; upper surface matt green, venation not visible, with sparse stellate trichomes; lower surface orange-brown, lateral veins weakly prominent, with dense, stellate trichomes, velutinous; margins sinuate to denticulate with 8–30 teeth up to 0.3 mm long, foliar glands prominent; tip acute to rounded; base cordate; extrafloral nectaries 2 at lamina base, sessile, ellipsoid, 0.5–0.9 mm long, 0.3–0.5 mm wide, visible only below. Inflorescence up to 80 mm long, unbranched, androgynous, pedunculate up to 5 mm; axis with dense stellate trichomes; bracts linear-lanceolate, 1.7–2 mm long, c. 0.4 mm wide, with dense stellate trichomes. Male flowers c. 2 mm long and 3 mm diameter, densely clustered in glomerules of 4–6 flowers towards the top of the inflorescence; pedicels c. 3.5 mm long and 0.2 mm wide, with dense stellate trichomes; sepals valvate, 5, lanceolate-ovate, c. 1.8 mm long and 1 mm wide, with dense stellate trichomes; petals 5, oblanceolate, 2–2.2 mm long, 0.4–0.5 mm wide, lanate in upper half; stamens 11–12, filaments filiform, 1.8–2.1 mm long, c. 0.2 mm wide, glabrous; anthers oblong, c. 0.8 mm long and 0.5 mm wide. Female flowers 4.5–5 mm long, 4.5–5 mm diameter, often mixed in same glomerule as males or held singly and spaced up to 5 mm apart; pedicels c. 3 mm long and 1 mm diameter, with dense stellate trichomes; sepals valvate, 5, lanceolate-ovate, c. 2.8 mm long and 1.5 mm wide, with dense stellate trichomes; petals absent; styles 3, linear, 2.5–3 mm long, bifid for 1–1.5 mm, glabrous, connate

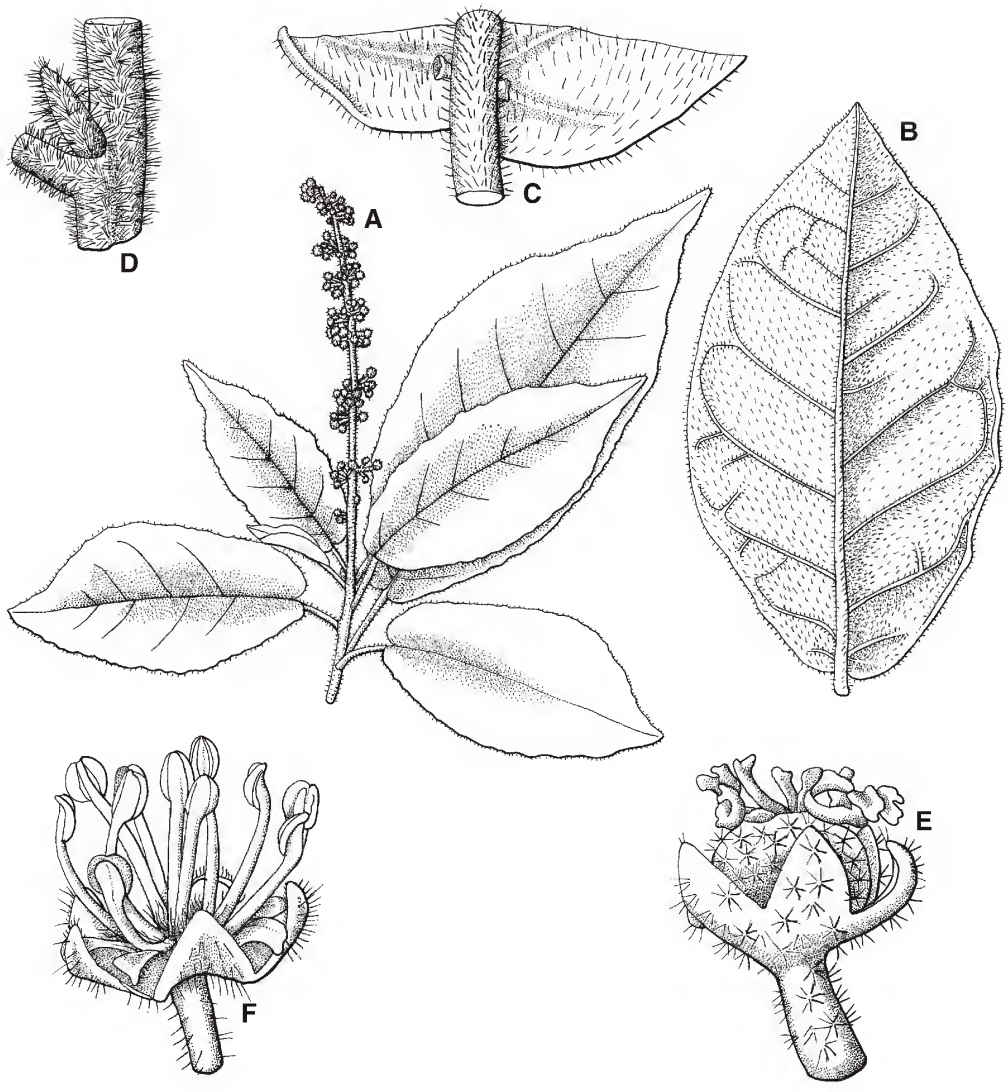


Fig. 27. ***Croton stockeri.*** A. budding branchlet. × 0.8. B. undersurface of leaf. × 1. C. base of leaf lamina showing extrafloral nectaries. × 4. D. node showing stipule. × 6. E. female flower. × 6. F. male flower. × 6. A & D from *Clarkson* 3631 (BRI); B,C,F from *Tucker* s.n. (BRI); E from *Stocker* 1076 (BRI). Del. W. Smith.

at base for c. 0.2 mm; ovary 3-locular, 3–3.8 mm long, c. 4 mm diameter, with dense stellate trichomes. Fruits and seed not seen. **Fig. 27**.

***Additional specimens*: Queensland.** Cook District: c. 10 km N of upper crossing of Massy Creek N of Silver Plains on eastern fall of McIlwraith Range, 13°51'S, 145°28'E, Aug 1978, *Clarkson* 2450 (BRI, CANB); 3 km N of Upper crossing of Massy Creek on Silver Plains Station, 13°53'S, 143°31'E, Nov 1980, *Clarkson* 3631 (BRI, QRS); Scrubby Creek, between the Rocky & the Chester River, Silver Plains Station, 13°46'S, 143°30'E, Dec 1990, *Fell* DGF2285 (QRS); 6 km W of the Rocky River mouth, Silver Plains Holding, 13°46'S, 143°29'E, Aug 1993, *Fell* DGF3484 *et al.* (BRI, DNA); 4 km NNE of Massy Creek Crossing, Silver Plains Station, 13°53'S, 143°30'E, Jun 1992, *Forster* PIF10567 *et al.* (BRI, DNA, MEL, QRS); 3 km N of Massy Creek Crossing, Silver Plains Station, 13°53'S, 143°31'E, Jun 1992, *Forster* PIF10580 *et al.* (A, BRI, DNA, K, L, MEL, QRS); Silver Plains, S of Scrubby Creek & W of Colmer Point, 13°46'S, 143°29'E, Jun 1995, *Forster* PIF17042 (BRI, MEL, QRS); Cultivated (ex Silver Plains Station, same site as *Forster* PIF17042), Jan 2002, *Tucker s.n.* (BRI).

***Distribution and habitat*:** *Croton stockeri* is endemic to Australia and is restricted to a single 1° grid square along with nine other species. All known populations occur on Silver Plains Station on the eastern fall of the McIlwraith Range on far northern Cape York Peninsula (**Map 3**). Plants grow in deciduous vinethicket on stabilised white sand dunes.

***Phenology*:** Flowers have been collected only once, in September. It may be presumed that the main flowering period is from September to January with fruiting two to three months later. Buds are retained on the plants for much of the remaining year.

***Notes*:** *Croton stockeri* is a distinctive *Croton* because of the heavily velutinous foliage covered in orange-brown stellate trichomes.

***Conservation status*:** The few known populations of *Croton stockeri* have no conservation security all being located on Aboriginal land. This species is currently listed as Rare under Queensland Government legislation.

***Etymology*:** The specific epithet honours Geoff Stocker, plant ecologist, who made the first collections of this plant while employed by the CSIRO.

28. Croton tomentellus F.Muell., Fragm. 4: 141 (1864). **Type:** Northern Territory. Upper Victoria River, on rocks, January 1856, *F. Mueller* [MEL231573] (holo: MEL).

Croton tomentellus Muell.Arg., Linnaea 34: 108 (1865), **nom. illeg.**; *Oxydectes tomentella* (Muell.Arg.) Kuntze, Rev. Gen. Pl. 2: 613 (1891). **Type:** Northern Territory. Arnhem's Land, *F. Mueller* (holo: G-DC *n.v.*, fiche at BRI).

***Illustrations*:** Wheeler (1992: 598, Fig. 182c); Dunlop *et al.* (1995: 214, Fig. 71).

Shrub to 4 high, monoecious, seasonally deciduous, perennial. Indumentum clear. Branchlets rounded, with sparse to dense stellate trichomes, glabrescent. Stipules lanceolate, 1.2–1.8 mm long, 0.3–0.5 mm wide, entire and with dense stellate trichomes. Leaves alternate, discolorous, petiolate; petioles 12–55 mm long, 1–2 mm wide, with dense stellate trichomes; lamina ovate, 20–250 mm long, 15–110 mm wide, ± palminerved with 3–5 veins from the base, 10–14 lateral veins per side of midrib, and tertiary reticulate veins; upper surface matt green, venation not visible, with scattered to dense stellate trichomes; lower surface silver, lateral and tertiary venation weakly developed, with dense, velutinous stellate trichomes, often glabrescent, neither scabrid nor velutinous; margins denticulate or weakly crenate with 40–54 teeth up to 0.5 mm long, foliar glands prominent; tip acute to short acuminate; base cordate, cuneate or rounded; extrafloral nectaries 2 at lamina base, sessile, circular to ellipsoid, 0.4–0.7 mm long, 0.4–0.7 mm wide, visible on both surfaces. Inflorescence up to 130 mm long, unbranched, androgynous, pedunculate up to 20 mm; axis with sparse to dense stellate trichomes; bracts lanceolate, 1–2 mm long, 0.3–0.5 mm wide, with sparse to dense stellate trichomes. Male flowers 2–4.5 mm long, 3.5–5 mm diameter, densely clustered in glomerules of 1–5 flowers towards the top of the inflorescence; pedicels 2–5.2 mm long and c. 0.5 mm wide, with sparse to dense stellate trichomes; sepals valvate, 5, lanceolate-ovate, 2–2.3 mm long, 0.8–1.8 mm wide, with sparse stellate trichomes; petals 5, oblanceolate, 3–3.2 mm long, 0.7–1 mm wide, lanate in upper half; stamens 11 or 12, filaments filiform, 2–2.5 mm long, c. 0.2 mm wide, glabrous, anthers oblong,

Fig. 28. ***Croton tomentellus***. A. flowering branchlet. × 0.4. B. node showing stipule. × 6. C. base of leaf lamina showing extrafloral nectaries. × 6. D. inflorescence with female flowers towards base, male flowers in upper two-thirds, some glomerules with both sexes. × 1. E. male flower. × 8. F. female flower. × 8. G & H. fruit × 4. I. seed. × 8. A,D,E,F from *Brock* 739 (BRI); B,C,I from *Byrnes* 1204 (BRI); G,H from *Brock* 656 (BRI). Del. W. Smith.

0.7–1 mm long, 0.6–0.7 mm wide. Female flowers 2.5–3 mm long, 3–4 mm diameter, often mixed in same glomerule as males or held singly and spaced up to 5 mm apart; pedicels 1.2–2.2 mm long, c. 0.8 mm diameter, with sparse stellate trichomes; sepals valvate, 5, lanceolate-ovate, 1.8–2.3 mm long, 1–1.8 mm wide, with sparse stellate trichomes; petals absent; styles 3, linear, 2–2.7 mm long, bifid for 1.2–1.4 mm, glabrous; ovary 3-locular, 1.5–2.2 mm long 1.5–2.2 mm diameter, with dense, ± sessile stellate trichomes. Fruits trilobate, globose, 4.5–6 mm long, 5–5.5 mm diameter, with sparse, ± sessile stellate trichomes. Seed ± ovoid, 3.5–4.4 mm long, 3–3.3 mm wide, 2.3–2.8 mm thick, dorsal surface rounded, ventral surface bifacial, micropylar line 2–2.8 mm long; caruncle ovate, c. 0.7 mm long and 0.7 mm wide, cream. **Fig. 28**.

***Selected additional specimens*: Western Australia.** Upper Neville Creek in Harding Range, Eastern Walcott inlet, 16°17'S, 124°59'E, May 1983, *Fell* DGF32 (BRI, PERTH); Savlon Gorge, 16°30'S, 125°16'E, Feb 1989, *Hyland* 13842 (QRS); Mitchell Plateau, 14°33'S, 125°48'E, Dec 1982, *Kenneally* 8636 (CANB, PERTH); S of Ninbing Homestead site, N of Kununurra, Jun 1969, *Lullfitz* 691102–21 & *McKenzie* (PERTH); c. 15 km W of Kalumburu on road to Truscott on Lip of Poompangala Hill, 14°17'S, 126°34'E, Dec 1992, *Mitchell* 2812 (BRI); Walsh Point - Point Warrender, 14°34'S, 125°45'E, May 1981, *Tracey* 13955 (BRI); Lone Dingo between Mitchell Plateau Mining Camp & Point Warrender, 14°35'S, 125°43'E, May 1981, *Tracey* 13956 (BRI). **Northern Territory.** Timber Creek, 15°40'S, 130°30'E, Mar 1989, *Brock* 656 (BRI, DNA); Mt Bundy, 12°52'S, 131°36'E, Nov 1990, *Brock* 739 & *Russell-Smith* (BRI, DNA, CANB, MEL, QRS); Bullita Station, Gregory N.P., 16°03'S, 130°23'E, Feb 1986, *Clark* 292 & *Wightman* (DNA); c. 67 miles [111.7 km] NE of Maranboy Police Station, Mar 1965, *Lazarides & Adams* 98 (CANB, MEL); Mt Goyder, 12°52'S, 131°41'E, May 1987, *Russell-Smith* 2358 & *Lucas* (DNA); 4 km W Umbakumba, Groote Eylandt, 13°52'S, 136°47'E, Jul 1987, *Russell-Smith* 2740 & *Lucas* (DNA); Groote Eylandt, 8 km SW Umbakumba, 13°55'S, 136°43'E, Jul 1987, *Russell-Smith* 2764 & *Lucas* (DNA); Groote Eylandt, 6 km S Umbakumba, 13°54'S, 136°49'E, Jul 1987, *Russell-Smith* 2814 & *Lucas* (DNA); Cutta Cutta, Guy Cave, 14°35'S, 132°27'E, Dec 1988, *Russell-Smith* 6506 & *Lucas* (BRI, DNA); 4 km SE Mt Harris, Kakadu, 13°18'S, 131°57'E, Jan 1989, *Russell-Smith* 6605 & *Lucas* (DNA); 20 km S Jasper Gorge, 16°13'S, 130°43'E, Mar 1989, *Russell-Smith* 7715 (DNA); Headwaters of Big Horse Creek, 15°43'S, 130°25'E, Mar 1989, *Russell-Smith* 7779 (BRI, DNA); Guy Cave area, 16 Mile Cave Reserve S of Katherine, May 1978, *Tracey* 14049 (BRI); Malgala, Groote Eylandt, 13°52'S, 132°26'E, Nov 1976, *Waddy* 617 (DNA).

***Distribution and habitat*:** *Croton tomentellus* is endemic to northern Australia where it occurs in a number of disjunct populations in the Northern Territory and Western Australia over a total of fourteen 1° grid squares (**Map 9**). Plants grow in deciduous vinethicket on granite, laterised basalt or sandstone substrates. There is also one record from open woodland on basalt.

***Phenology*:** Flowering occurs from November to March following storm rains; fruiting occurs from November to April.

***Notes*:** This species was included by Webster (1993a) in *Croton* section *Croton*, but does not have the characters given for that section, e.g. 11 or 12 stamens (versus 15–35).

***Conservation status*:** *Croton tomentellus* is widespread and present in Kakadu and Gregory National Parks. It is not considered rare or threatened.

***Etymology*:** The specific epithet is derived from the Latin *tomentellus* and means minutely tomentose, perhaps alluding to the indumentum on the lower leaf surface or the fruit.

29. Croton triacros F.Muell., Fragm. 6: 185 (1868). **Type:** Queensland. North Kennedy District: Rockingham's Bay, *Dallachy* (lecto [here chosen]: MEL231564).

Shrub to 5 m high, monoecious, evergreen, perennial. Indumentum ferruginous. Branchlets rounded, with scattered peltate trichomes when young, glabrescent. Stipules lanceolate, 4–4.5 mm long, c. 0.5 mm wide, entire and with scattered to sparse peltate trichomes. Leaves alternate, discolorous, petiolate; petioles 3–36 mm long, c. 1 mm wide, with sparse peltate trichomes; lamina elliptic, broadly elliptic or oblanceolate, 75–185 mm long, 40–70 mm wide, penninerved with 9–11 lateral veins per side of midrib and tertiary reticulate veins; upper surface dark green, venation weakly visible, with scattered peltate trichomes when young; lower surface pale green, lateral and tertiary venation weakly prominent, glabrous apart from a few scattered peltate trichomes, neither scabrid nor velutinous; margins sinuate or very weakly denticulate with 20–30 teeth up to 0.3 mm long, foliar glands prominent; tip acute to short acuminate; base cuneate; extrafloral nectaries 2 at lamina base sessile, ellipsoid, 0.7–1.3 mm

Fig. 29. ***Croton triacros***. A. fruiting branchlet. × 0.4. B. base of leaf lamina showing extrafloral nectaries. × 8. C. node showing stipules. × 8. D. inflorescence with female flowers in lower half and male flowers in upper half. × 2. E. female flower. × 12. F. male flower. × 8. G & H. fruits. × 4. I. seed. × 8. A–E from *Jago* 3060 (BRI); F from *Forster* PIF18189 (BRI); G–I from *Forster* PIF13081 (BRI). Del. W. Smith.

long, 0.4–0.7 mm wide, visible below only. Inflorescence up to 110 mm long, unbranched, androgynous, pedunculate up to 10 mm; axis glabrous or with a few scattered peltate trichomes; bracts lanceolate, 0.5–1 mm long, 0.2–0.3 mm wide, glabrous. Male flowers 2–2.5 mm long, 2–3.5 mm diameter, held singly or in 2–4-flowered glomerules up to 4 mm apart towards the top of the inflorescence; pedicels 1.8–4 mm long and c. 0.2 mm wide, glabrous; sepals valvate, 5, lanceolate-ovate, 1.6–2 mm long, 0.9–1.2 mm wide, glabrous, lanate in upper half; petals 5, oblanceolate, 1.8–2 mm long, 0.6–0.8 mm wide, lanate; stamens 10–11, filaments filiform, 1–2 mm long, c. 0.1 mm wide, glabrous, anthers oblong, 0.4–0.6 mm long, c. 0.3 mm wide. Female flowers c. 2 mm long and 2 mm diameter, often mixed in pairs in same glomerule as males or held singly and spaced up to 13 mm apart; pedicels 1.5–3 mm long, 0.5–0.6 mm diameter, with scattered peltate trichomes; sepals valvate, 5, lanceolate, 1.4–2.3 mm long, 0.8–1.3 mm wide, glabrous, or with scattered peltate trichomes; petals absent; styles 3, linear, 1.8–2.2 mm long, bifid for 0.7–1 mm, shortly connate at base, glabrous; ovary 3-locular, 1.2–2 mm long, 1.2–2 mm diameter, with sparse, ± sessile peltate trichomes. Fruits trilobate, globose, 4.5–7 mm long, 5–7 mm diameter, with scattered, ± sessile peltate trichomes. Seed ± ovoid to obloid, 3–5 mm long, 2.3–4 mm wide, 1.8–3.5 mm thick, dorsal surface rounded, ventral surface bifacial, micropylar line 2.5–3.5 mm long; caruncle ± crescent shaped, 0.5–0.8 mm long, 0.7–1.2 mm wide, cream. **Fig. 29**.

***Selected additional specimens*: Queensland.** Cook District: c. 15 miles [25 km] NNW of Daintree, 16°04'S, 145°14'E, Nov 1967, *Boyland* 466 & *Gillieatt* (BRI, CANB); T.R. 14, McIlwraith Range, head of Peach Creek, 13°44'S, 143°20'E, Dec 1990, *Fell* DGF2279 (QRS); 36.5 km along road to Leo Creek Mine, McIlwraith Range, 13°44'S, 143°20'E, Jun 1992, *Forster* PIF10299 & *Tucker* (BRI, QRS); T.R. 14, Leo Creek Mine area, McIlwraith Range, 13°44'S, 143°22'E, Jun 1992, *Forster* PIF10116 *et al.* (BRI, QRS); S.F. 185 Danbulla, 7 km SW of Hoop Pine Triangle, 17°09'S, 145°35'E, Jan 1993, *Forster* PIF13081 & *Bean* (BRI, MEL, NSW); Pinnacle Track, 2 km W of Karnak, 16°23'S, 145°18'E, Jul 1994, *Forster* PIF15529 *et al.* (BRI, QRS); Tully Falls Weir road, 17°46'S, 145°33'E, Nov 1995, *Forster* PIF18199 & *Spokes* (BRI, MEL, QRS); S.F. 185 Danbulla, Tinaroo Dam, 17°09'S, 145°33'E, Jan 2002, *Forster* PIF28160 *et al.* (A, BRI, L, MEL, NY, WIS); T.R. 9, Lankelly Creek, 13°55'S, 143°20'E, Sep 1971, *Hyland* 5382 (BRI, QRS); Mt Carter, 13°00'S, 143°15'E, Sep 1974, *Hyland* 7532 (BRI, QRS); T.R. 14 Kesteven, 13°43'S, 143°20'E, Oct 1981, *Hyland* 11138 (QRS); Harvey Creek, 10 km N of Babinda, 17°50'S, 145°54'E, Jan 1994, *Jago* 3060 (BRI); Harvey's Creek, Russell River, 1887, *Sayer* s.n. (MEL); c. 12.8 km SW of Atherton on ranges near Moomin, Sep 1950, *Smith* 4663 (BRI); Baileys Creek area, on bank of Hutchinson Creek, Oct 1962, *Smith* 11586 (BRI); McDowall Range, 16°06'S, 145°17'E, Oct 1973, *Tracey* 14540 (BRI); Lankelly Creek on western fall of McIlwraith Range, 13°55'S, 143°15'E, Oct 1969, *Webb & Tracey* 9625 (BRI); Spear Creek, Mt Danbulla, 16°43'S, 145°24'E, Oct 1973, *Webb & Tracey* 12027 (BRI). North Kennedy District: S.F. 268 Mt Spec, 3 km along Ewan road past Paluma Dam turnoff, 19°01'S, 146°08'E, Jan 1992, *Forster* PIF9493 (BRI, DNA, K, L, MEL, QRS); Mt Spec near Bambaroo, Nov 1933, *Francis* [AQ202219] (BRI).

***Distribution and habitat*:** *Croton triacros* is endemic to north-eastern Queensland where it is disjunct with most populations in the "Wet Tropics", and a northern population in the Leo Creek area of the McIlwraith Range (**Map 7**). The species occurs in six 1° grid squares. Plants grow in araucarian or complex notophyll vineforests, usually on granite substrates.

***Phenology*:** Flowering occurs from October to April following storms or seasonal rains, fruiting occurs from October to May.

***Notes*:** There are two sheets at MEL (MEL231567 and MEL231564) that are suitable as a lectotype of *Croton triacros*. Both are undated and the labels state that the material originates from Rockingham's Bay and was collected by Dallachy. The first of these is male flowering material and the latter has female flowers and fruit. It is unclear whether the two sheets were collected at the same time, hence the better sheet (MEL231564) is selected as lectotype of the name *C. triacros*.

***Conservation status*:** Common and present in conservation reserves at Crystal Creek and Daintree National Parks.

***Etymology*:** Obscure.

30. Croton verreauxii ('verreauxia') Baill., Et. Gen. Euphorb. 357 (1858); *Oxydectes verrauxii* (Baill.) Kuntze, Rev. Gen. Pl. 2: 613 (1891). **Type:** New South Wales. Camp in Heaven, *Verreaux* 59 (holo: P *n.v.*, photo at BRI).

Croton verreauxii var. *genuinus* Muell.Arg., Linnaea 34: 47 (1865), nom. inval. **Type:** as for *C. verreauxii* Baill.

Croton verreauxii var. *longifolius* Muell.Arg., Linnaea 34: 47 (1865). **Type:** New South Wales. Clarence River, *Beckler* (holo: B *n.v.*).

***Illustrations*:** Williams (1987: 83); Floyd (1989: 144); James & Harden (1990: 418); Hauser (1992: 181).

Shrub to 5 m high, monoecious, evergreen, perennial. Indumentum silver. Branchlets ± rounded, with scattered to sparse peltate scales when young, glabrescent. Stipules linear-lanceolate, 1.5–2 mm long, c. 0.6 mm wide, entire and with sparse peltate scales. Leaves alternate, discolorous, petiolate; petioles 1–36 mm long, 0.8–1 mm wide, with scattered peltate scales when young, glabrescent; lamina elliptic to lanceolate, 15–120 mm long, 5–40 mm wide, penninerved with 12–13 lateral veins per side of midrib, tertiary reticulate veins obscure to poorly developed; upper surface glossy dark green, venation obscure, glabrous; lower surface pale green, lateral veins poorly developed, with scattered peltate scales, neither scabrid nor velutinous; margins denticulate to weakly crenate with 11–24 teeth up to 0.5 mm long, foliar glands prominent; tip acute to acuminate; base cuneate; extrafloral nectaries 2 at lamina base, stipitate up to 0.3 mm long, circular to ellipsoid, 0.3–0.6 mm long, 0.2–0.4 mm wide, visible from above and below. Inflorescence up to 170 mm long, androgynous, pedunculate up to 10 mm; axis glabrous or with scattered peltate scales; bracts lanceolate to triangular, 0.6–1 mm long, 0.2–0.3 mm wide, glabrous or with a few scattered peltate scales near top. Male flowers 2–2.6 mm long, 1.5–2.2 mm diameter, in clusters of 2 or 3 flowers per glomerule, spaced up to 5 mm apart; pedicels 2–3.5 mm long, c. 0.2 mm wide, glabrous; sepals valvate, 5, lanceolate-ovate, 1–1.8 mm long, 0.5–0.9 mm wide, lanate; petals 5, oblanceolate, 1–1.8 mm long, 0.4–0.6 mm wide, lanate; stamens 10–12, filaments filiform, 0.6–1 mm long, c. 0.1 mm wide, glabrous, anthers oblong, 0.3–0.6 mm long, 0.3–0.6 mm wide. Female flowers c. 2 mm long, 2.5–3 mm diameter, held singly and spaced up to 7 mm apart; pedicels 1–2 mm long, 0.5–0.7 mm diameter, with scattered peltate scales; sepals valvate, 5, lanceolate, 1–1.8 mm long, 0.4–0.8 mm wide, glabrous or lanate at tip; petals absent; styles 3, linear, 2–2.8 mm long, bifid for 1–1.8 mm long, connate at base for c. 0.1 mm, glabrous; ovary 3-locular, 1.4–1.8 mm long, 1.5–1.8 mm diameter, with dense, sessile, yellow peltate scales. Fruits trilobate, depressed-globose, 4–6 mm long, 5–6.5 mm diameter, with sparse, sessile, yellow peltate scales. Seeds ± ovoid, 4–4.5 mm long, 2.9–3.5 mm wide, 2.2–3 mm thick, brown with slight cream mottling, ventral surface ± rounded, dorsal surface rounded, micropylar ridge 3–4 mm long; caruncle crescent shaped, 0.5–0.8 mm long, 1–1.3 mm wide, cream. **Fig. 30**.

***Selected additional specimens*: Queensland.** Wide Bay District: S.F. 234, SW of Cooroy, 26°28'S, 152°49'E, Dec 1993, *Bean* 7144 (BRI, MEL, MO); Imbil, S.F. 135, Brooloo, Western L.A., 26°30'S, 152°39'E, Oct 1982, *McDonald* 3749 & *Williams* (BRI, NSW). Darling Downs District: The Head, NE of Killarney, Dec 1984, *Bird* [AQ396387] (BRI); The Head, Main Range N.P., 28°14'S, 152°57'E, Jan 2001, *Forster* PIF28064 & *Leiper* (A, BRI, K, MEL, WIS). Moreton District: Petrie Creek, W of Woombye, 26°40'S, 152°55'E, Nov 1989, *Bean* 1188 (BRI); Upper end of Duck Creek road, near O'Reilly's, Lamington Plateau, 28°12'S, 153°07'E, May 2000, *Forster* PIF25612 & *Booth* (A, BRI, L, MEL); The Ranch, foot of Wilson's Peak, Nov 1935, *Michael* 2241 (BRI); Sarabah Range, c. 10 miles [16.7 km] S of Canungra, Oct 1969, *Schodde* 5584 (BRI, CANB); Beechmont Ridge, Beechmont, McPherson Range, Oct 1969, *Schodde* 5591 (BRI, CANB); Peecheys Scrub, Dec 1887, *Simmonds* [AQ202226](BRI); Tamborine Mt, Jan 1916, *White* [AQ202220] (BRI); Lamington N.P., Dec 1937, *White* 11401 (BRI). **New South Wales.** c. 10 miles [16.7 km] WSW of Dungog on the road to Gresford, Nov 1970, *Blaxell* 3357 & *Coveny* (BRI); Wyong, Nov 1916, *Boorman* [AQ202242](BRI); Border Fence, Moss Gardens, 28°17'S, 152°27'E, Jan 1990, *Forster* PIF6215 *et al.* (BRI, QRS); 23 km NW of Kyogle, Toonumbar Forest road, Toonumbar S.F., 28°29'S, 152°48'E, Dec 1991, *Halford* Q821 (BRI, MEL); Edinburgh Castle, 8 km SSE of Woodenbong, 28°27'S, 152°38'E, Dec 1992, *Halford* Q1561 (BRI); Minyon Falls, Whian Whian, Sep 1966, *Jones* [AQ202248] (BRI); Yaamba, Oct 1947, *King* [AQ202247] (BRI); 22 miles [36.7 km] NE of Singleton, Mar 1960, *Story* 7163 (BRI, QRS); Upper Williams River near Salisbury, Mar 1938, *White* 11608 (BRI). **Victoria**. Cult. at "Dunedin", Tyers from a cutting from... Back Creek N of Noorinbee, Apr 1979, *Galbraith* [MEL1527573] (MEL).

***Distribution and habitat*:** *Croton verreauxii* is endemic to eastern Australia where it occurs from south-eastern Queensland through eastern New South Wales south to Illawarra (Floyd 1989) over a total of fifteen 1° grid squares (**Map 7**). A doubtful locality record in north-eastern Victoria (cited above) has been discounted by Jeanes (1999) who stated that attempts to relocate the plant in the field have been unsuccessful. Plants grow in complex notophyll vineforest and microphyll moss/fern

Fig. 30. ***Croton verreauxii***. A. flowering branchlet. × 0.5. B. base of leaf lamina showing extrafloral nectaries. × 8. C. node showing stipule. × 8. D. inflorescence with female flowers in lower half and male flowers in upper half. × 1. E. male flower. × 8. F. female flower. × 8. G & H. fruit. × 4. I. seed. × 8. All from *Forster* PIF25612 (BRI). Del. W.Smith.

thickets on volcanic soils, or may be found in the ecotonal areas between closed-forest and open forest dominated by eucalypts.

***Phenology*:** Flowering occurs from August to March and fruiting occurs from October to April.

***Notes*:** The spelling of the epithet for this species was originally given as 'verreauxia', but as the species was named after Verreaux, the spelling should be 'verreauxii'.

Croton verreauxii was included in *Croton* section *Tiglium* by Webster (1993a) but does not agree with character states for this section, e.g. peltate scales (versus stellate trichomes).

Govaerts *et al.* (2000) have recently erroneously labelled an old illustration from Seeman (1867) as *C. verreauxii* based on Fijian material. As noted by Smith (1981), this is referable to the Fijian endemic *C. microtiglium.*

***Conservation status*:** Common. Present in at least three conservation reserves in Queensland (Forster *et al.* 1991) including Lamington and Main Range National Parks. Recorded from nine conservation reserves in New South Wales (Floyd 1989).

***Etymology*:** The specific epithet honours J.P.Verreaux (1807–1873), a French man resident in Tasmania and one-time botanical collector.

31. Croton waterhouseae P.I.Forst., **sp. nov.** affinis *C. multicauli* autem dentibus marginis foliorum pluribus (32–40 vice 16–28), pedicellis florium masculinorum multo longioribus (10–12 mm vice 1.5–7 mm), staminibus in floribus masculinis pluribus (32–38 vice 11–24) differt. **Typus**: Queensland. Cook District: Gabba Island, Torres Strait, 13 January 1998, *B.M.Waterhouse* BMW4775 & *J.Grimshaw* (holo: BRI).

Shrub to 4 m high, monoecious, evergreen (?), perennial. Indumentum silver to silver-ferruginous. Branchlets ± rounded, with sparse to dense sessile and shortly stalked stellate trichomes, glabrescent. Stipules linear, 4–6 mm long, c. 0.8 mm wide, with dense sessile and shortly stalked stellate trichomes. Leaves alternate, discolorous, petiolate; petioles 5–25 mm long, 1–1.2 mm wide, with dense sessile and shortly stalked stellate trichomes; lamina elliptic to obovate, 35–90 mm long, 20–50 mm wide, palminerved with 2 nerves from base per side of midrib and 4 lateral nerves per side of midrib, and distinct tertiary reticulate veins; upper surface dark green, venation weakly visible, with sparse, sessile stellate trichomes mainly on veins; lower surface grey-silver, lateral and interlateral veins prominent, with dense sessile and stalked stellate trichomes, velutinous; margins weakly crenate, with 32–38 teeth to 2 mm long, foliar glands scattered and prominent; tip acute; base cuneate to truncate; extrafloral nectaries 2(3) at base of lamina, shortly stipitate to 1 mm long, ellipsoid, 1.4–1.8 mm long, 1–1.2 mm wide, visible above and below. Inflorescence up to 110 mm long, androgynous, pedunculate up to 25 mm long, axis with sparse to dense sessile and stalked stellate trichomes; bracts linear-lanceolate, 0.8–1 mm long, 0.4–0.5 mm wide, with dense sessile stellate trichomes. Male flowers 4–5 mm long, 6–7 mm diameter, in sparse glomerules of 1 or 2 flowers in upper 4/5 of inflorescence; pedicels 10–12 mm long, c. 0.3 mm diameter, with dense sessile and stalked stellate trichomes; sepals valvate, 5, lanceolate-ovate, 2–2.3 mm long, c. 0.8 mm wide, with lanate tip and with dense sessile to stalked stellate trichomes; petals 5, obovate, 2–2.2 mm long and c. 0.5 mm wide, lanate around entire edge; stamens 32–38; filaments filiform, 2.5–3.5 mm long and c. 0.2 mm wide, with dense, simple trichomes at base; anthers oblong, 0.8–1 mm long and c. 0.5 mm wide. Female flowers 2.8–3 mm long, c. 4 mm wide, held singly and spaced up to 11 mm apart; pedicels 4.5–5 mm long, 0.8–1 mm wide, with dense sessile stellate trichomes; sepals valvate, 5, lanceolate-ovate, c. 2 mm long and 1.5 mm wide, with dense sessile stellate trichomes; petals absent; styles 3, linear-flabellate, c. 2.5 mm long, bifid for c. 2 mm, with scattered sessile stellate trichomes in lower third; ovary 3-locular, c. 3 mm long and 2 mm wide, with dense sessile stellate trichomes. Fruits and seeds not seen. **Fig. 31**.

***Distribution & habitat*:** *Croton waterhouseae* is known only from the type locality at present. Gabba Island is a continental granitic island (**Map 7**). No information about the habitat was available.

***Phenology*:** The species probably flowers from December through to February, with fruits several months later. The only known specimen is flowering and collected in January.

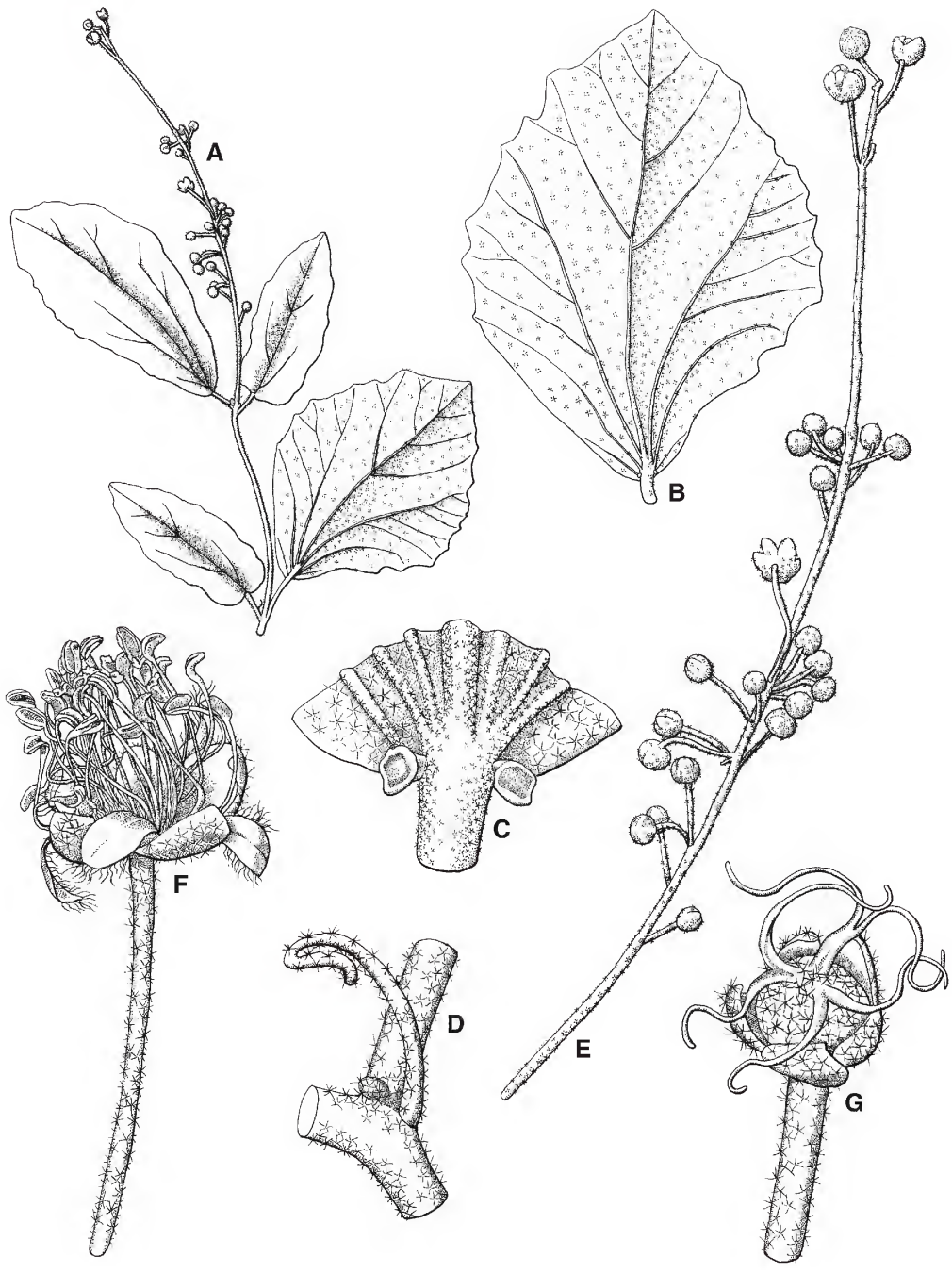


Fig. 31. ***Croton waterhouseae.*** A. habit of flowering branchlet. × 0.6. B. undersurface of leaf. × 1. C. base of leaf lamina showing extrafloral nectaries. × 6. D. node showing stipule. × 6. E. inflorescence with all male flowers. × 1.5. F. male flower. × 6. G. female flower. × 6. All from *Waterhouse* 4775 (BRI). Del. W. Smith.

***Notes*:** *Croton waterhouseae* is closely allied to the complex of species centred around *C. arnhemicus*. It is perhaps most closely related to *Croton multicaulis*, but differs from that species in the greater number of leaf margin teeth (32–40 per leaf, versus 16–28), the much longer male flower pedicels (10–12 mm versus 1.5–7 mm) and the greater number of stamens in the male flowers (32–38 versus 11–24). *Croton arnhemicus* is immediately distinguishable in the much greater number of leaf margin teeth (60–100 versus 32–40) and the generally scabrous foliage (versus softly velutinous). From both of these species it would also appear that *Croton waterhouseae* may differ (more specimens are required to be sure) in the disposition of the veins that emanate from the base of the lamina and that are immediately adjacent to the midrib. In *Croton waterhouseae* these veins steeply ascend beside the midrib at an angle of no more than 30° terminating well over half way along the leaf lamina. In both *Croton arnhemicus* and *C. multicaulis*, as well as the related *C. aridus* and *C. minimus*, these same veins strongly diverge way from the midrib at an angle of more than 45° and usually terminate no more than half way along the leaf lamina.

***Conservation status*:** Unknown at this stage. Gabba Island is uninhabitated.

***Etymology*:** Named for Barbara Waterhouse, NAQS botanist with the Australian Quarantine Inspection Service, and collector of several thousand specimens for the Queensland Herbarium from northern Australia and adjacent Malesia.

Excluded names and species

1. **Croton argyratus** Blume, Bijdr. 602 (1826).

***Notes*:** This name was misapplied to the Australian endemic *Croton schultzii* (see notes there).

2. **Croton opponens** F.Muell. ex Benth., Fl. Austral. 6: 125 (1873).

***Notes*:** Base name for *Bertya opponens* (F. Muell. ex Benth.) Guymer (Guymer 1985; Halford & Henderson 2002).

3. **Croton phebalioides** var. **hispida** J.Simmonds, *Proc. Roy. Soc. Queensland* 6: 68 (1889). ***nom. nud.*** **Type:** not designated.

***Notes*:** There is no diagnosis or type for this name.

4. **Croton prunifolius** Airy Shaw, ***nom. illeg.*** *non* Geiseler (1807), Kew Bull. 33: 56 (1978); **Croton coccymelophyllus** Radcl.-Sm. & Govaerts, Kew Bull. 52: 186 (1997).

***Notes*:** The name *Croton prunifolius* was misapplied by Airy Shaw (1981) to a sterile collection of *C. habrophyllus* from Western Australia. Because the name *Croton prunifolius* Airy Shaw was illegimate, Radcliffe-Smith & Govaerts (1997) consequently renamed this species as *Croton coccymelophyllus* Radcl.-Sm. & Govaerts. As a result this species was also recorded with a ? from N. Western Australia in Govaerts *et al.* (2000), a splendid example of misinformation and error perpetuation. *Croton coccymelophyllus* appears to be distributed in parts of Malesia, such as the Lessa Sunda Islands, Maluku and New Guinea.

5. **Croton quadripartitus** Labill. (as 'quadripartitum'), Nov. Holl. Pl. Sp. 2: 73 (1806).

***Notes*:** Base name for *Adriana quadripartita* (Labill.) Muell.Arg. (Airy Shaw 1980: 593).

6. **Croton rosmarinifolius** A.Cunn. (as 'rosmarinifolium') in Field, Geographical Mem. New South Wales 355 (1825).

***Notes*:** Base name for *Ricinocarpos rosmarinifolius* (A.Cunn.) Benth.

7. **Croton stigmatosus** var. **eurybioides** Baill., Adansonia 6: 301 (1866). ***nom. nud.*** **Type:** not designated.

Notes: There is no diagnosis and no type for this name.

8. **Croton storckii** (Muell.Arg,) A.C.Sm., Bull. Bishop Mus. 141: 83 (1936).

***Notes*:** This name was misapplied to Australian material by Airy Shaw (1980b, 1981). The populations concerned are referrable to *Croton mutabilis*.

9. **Croton urticoides** A.Cunn. in Field, Geographical Mem. New South Wales 355 (1825).

This is *Adriana urticoides*, see Appendix.

10. **Croton viscosus** Labill., Nov. Holl. Pl. Sp. 2: 72 (1806).

***Notes*:** Base name for *Beyeria viscosa* (Labill.) Miq.

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References

Airy Shaw, H.K. (1980a). The Euphorbiaceae of New Guinea. *Kew Bulletin Additional Series* 8: 1–243.

--- (1980b). New or noteworthy Australian Euphorbiaceae - II. *Muelleria* 4: 207–241.

--- (1980c). An alphabetical check-list of native Australian Euphorbiaceae (excluding *Phyllanthus*, *Euphorbia*, and the Stenolobeae). *Muelleria* 4: 243–245.

— (1981). A partial synopsis of the Euphorbiaceae - Platylobeae of Australia (excluding *Phyllanthus*, *Euphorbia* and *Calycopeplus*). *Kew Bulletin* 35: 577–700.

Anonymous (2001). IUCN Red List Categories and Criteria: Version 3.1. IUCN Species Survival Commission. IUCN, Gland, Switzerland and Cambridge, UK. ii + 30 pp.

Baillon, H. (1858). *Etude générale du groupe des Euphorbiacées.* Paris: V. Masson.

Barlow, B.A. & Hyland, B.P.M. (1988). The origins of the flora of Australia's wet tropics. *Proceedings of the Ecological Society of Australia* 15: 1–17.

Bawa, K.S., Webb, C.J. & Tuttle, A.F. (1982). The adaptive significance of monoecism in *Cnidoscolus urens* (L.) Arthur (Euphorbiaceae). *Botanical Journal of the Linnean Society* 85: 213–233.

Bentham, G. (1873). Euphorbiaceae *Flora Australiensis* 6:41–153. London: L. Reeve & Co.

Berry, P.E. (1999). *Croton*. In P.E.Berry *et al.* (eds.), *Flora of the Venezuelan Guayana* 5: 111–133. St Louis: Missouri Botanical Garden Press.

Brock, J. (1988). *Top End Native Plants*. Darwin: J. Brock.

Chakrabarty, T. & Balakrishnan, N.P. (1997). A revision of *Croton* L. (Euphorbiaceae) for Indian subcontinent. *Bulletin of the Botanical Survey of India* 34: 1–88.

Christophel, D.C. & Hyland, B.P.M. (1993). *Leaf Atlas of Australian Tropical Rain Forest Trees.* Melbourne: CSIRO Publications.

Croizat, L. (1942). New species of *Croton* L. from New Guinea. *Journal of the Arnold Arboretum* 42: 369–376.

Cronquist, A. (1988). *The Evolution and Classification of Flowering Plants*, 2nd edition. Bronx, New York: New York Botanical Garden.

Decker, K.L. & Pilson, D. (2000). Biased sex ratios in the dioecious annual *Croton texensis* (Euphorbiaceae) are not due to environmental sex determination. *American Journal of Botany* 87: 221–229.

Dominguez, C.A., Dirzo, R. & Bullock, S.H. (1989). On the function of floral nectar in *Croton suberosus* (Euphorbiaceae). *Oikos* 56: 109–114.

Dunlop, C.R., Leach, G.R. & Cowie, I.D. (1995). Flora of the Darwin Region. *Northern Territory Botanical Bulletin* No. 20. Darwin: Conservation Commission of the N.T.

Du Puy, D.J. & Telford, I.R.H. (1999). Euphorbiaceae. *Flora of Australia* 50: 260–278. Canberra: Australian Government Publishing Service.

Endress, P.K. (1994). *Diversity and Evolutionary Biology of Tropical Flowers*. Cambridge: Cambridge University Press.

Ferguson, A.M. (1901). Crotons of the United States. *Missouri Botanical Garden. Twelfth Annual Report* 33–72.

Floyd, A.G. (1989). *Rainforest Trees of Mainland South-eastern Australia.* Melbourne & Sydney: Inkata Press.

Forster, P.I. (1991). Variation in *Croton capitis-york* (Euphorbiaceae). *Kew Bulletin* 46: 569–572.

—— (1997). A taxonomic revision of *Drypetes* Vahl (Euphorbiaceae) in Australia. *Austrobaileya* 4: 477–494.

—— (1999). A taxonomic revision of *Mallotus* Lour. (Euphorbiaceae) in Australia. *Austrobaileya* 5: 457–497.

Forster, P.I., Halford, D.A. (2002). Euphorbiaceae. In R.J.F. Henderson (ed.), *Names and Distribution of Queensland Plants, Algae and Lichens*, pp. 68–74. Brisbane: Environmental Protection Agency.

Forster, P.I., Henderson, R.J.F. (1997). Euphorbiaceae. In R.J.F. Henderson (ed.), *Queensland Plants - Names and Distribution,* pp. 69–76. Brisbane: Department of Environment.

Forster, P.I., Bostock, P.D., Bird, L.H. & Bean, A.R. (1991). *Vineforest Plant Atlas for South-east Queensland.* Brisbane: Queensland Herbarium.

Freitas, L., Galetto, L., Bernardello, G. & Paoli, A.A.S. (2000). Ant exclusion and reproduction of *Croton sarcopetalus* (Euphorbiaceae). *Flora* 195: 398–402.

Freitas, L., Bernardello, G., Galetto, L. & Paoli, A.A.S(2001). Nectaries and reproductive biology of *Croton sarcopetalus* (Euphorbiaceae). *Botanical Journal of the Linnean Society* 136: 267–277.

Ganeshaiah, K.N. & Shaanker, R.U. (1988). Evolution of a unique seed maturity pattern in *Croton bonplandianum* Baill. strengthens ant-plant mutualism for seed dispersal. *Oecologia* 77: 130–134.

Geiseler, E.F. (1807). *Crotonis Monographiam.* Halae: A. Grunerti.

Govaerts, R., Frodin, D.G. & Radcliffe-smith, A. (2000). World Checklist and Bibliography of Euphorbiaceae 2 (with Pandaceae). Euphorbiaceae: Croton – Excoecariopsis. Kew: Royal Botanic Gardens.

Gross, C.L. & Whalen, M.A. (1996). A revision of *Adriana* (Euphorbiaceae). *Australian Systematic Botany* 9: 749–771.

Guymer, G.P. (1985). A name change in the genus *Bertya* (Euphorbiaceae). *Austrobaileya* 2: 147.

Halford, D.A. & Henderson, R.J.F. (2002). Studies in Euphorbiaceae A.L.Juss. *sens. lat.* 3. A revision of *Bertya* Planch. (Ricinocarpeae Müll.Arg., Bertyinae Müll.Arg.). Austrobaileya 6: 187–245.

Hauser, J. (1992). *Fragments of Green.* Bardon, Brisbane: Rainforest Conservation Society.

Hewson, H. (1988). *Plant Indumentum. A Handbook of Terminology.* Australian Flora & Fauna Series No. 9. Canberra: Australian Government Publishing Service.

Hooker, J.D. (1890). *Croton. Flora of British India* 5: 385–395. London: L.Reeve & Co.

James, T.A. & Harden, G.J. (1990). Euphorbiaceae. In G.J. Harden (ed.), *Flora of New South Wales,* 1: 389–430. Kensington (Sydney): New South Wales University Press.

Jeanes, J.A. (1999). Euphorbiaceae. In N.G. Walsh & T.J. Entwisle (eds.), *Flora of Victoria*, 4: 55–82. Melbourne: Inkata Press.

Johnston, M.C. (1959). The Texas species of *Croton* (Euphorbiaceae). *The Southwestern Naturalist* 3: 175–203.

—— (1962). The ten species of *Croton* (Euphorbiaceae) occurring in far western Texas. *The Southwestern Naturalist* 7: 1–22.

Jose, T. & Inamdar, J.A. (1989). Structure, ontogeny and biology of nectaries in *Croton bonplandianus* Baill. *Beiträge zür Biologie der Pflanzen* 64: 157–166.

Kenneally, K.F., Edinger, D.C. & Willing, T. (1996). *Broome and Beyond.* Como: Dept. of Conservation & Land Management.

Labillardiere, J.J.H. (1806). *Novae Hollandiae Plantarum Specimen.* Paris: D. Huzard.

Lanjouw, J. & Stafleu, F.A. (1954). *Index Herbariorum* Part II. Collectors A–D. *Regnum Vegetabile* Vol. 2.

Linnaeus, C. (1753). *Species Plantarum.* Stockholm: Laurentii Salvii.

Logan River Branch S.G.A.P. (Qld Region) Inc. (2002). *Mangroves to Mountains. A Field Guide to the Native Plants of the Logan – Albert Rivers Catchment.* Brisbane: Copyright Publishing Co. Pty. Ltd.

Mcpherson, G. & Tirel, C. (1991). *Croton* L. In Euphorbiacées II - Phyllanthoïdées. *Flore de la Nouvelle-Calédonie et Dépendances* 17: 78–83. Paris: Muséum National d'Histoire Naturelle.

Michaux, A. (1803). *Flora Boreali-Americana* 2: 214. Paris: Jouanaux.

Mueller, F. (1864). Euphorbiaceae. *Fragmenta Phytographie Australiae* 4: 138–144. Melbourne: Government Printer.

—— (1868). Euphorbiaceae. *Fragmenta Phytographie Australie* 6: 185. Melbourne: Government Printer.

Mueller, J. (1864). Neue Euphorbiaceen des Herbarium Hooker in Kew, auszugsweise vorläufig mitgetheilt aus dem Manuscript für De Candolle's Prodromus. *Flora* 47: 433–441.

—— (1865). Euphorbiaceae. Vorläufige Mittheilungen aus dem für De Candolle's Prodromus bestimmten Manuscript über diese familie. *Linnaea* 34: 1–224.

—— (1866). Euphorbiaceae. In A.L.L.P. de Candolle (ed.), *Prodromus Systematis Naturalis Regni Vegetabilis* 15(2): 189–1260. Paris: Masson.

—— (1873). Euphorbiaceae. In C.F.P. de Martius (ed.), *Flora Brasiliensis* 11(2): 1–715. Lipsiae: R. Oldenburg.

Philcox, D. (1997). Euphorbiaceae. In M.D. Dassanayake & W.D. Clayton (eds), *A Revised Handbook to the Flora of Ceylon.* 11: 80–283. Rotterdam: A.A. Balkema.

Radcliffe-smith, A.R. (1996). Euphorbiaceae. In G.V. Pope (ed.), *Flora Zambesiaca* 9(4): 1–337. Kew: Royal Botanic Gardens.

—— (1997). Euphorbiaceae (Part 1). In R.M. Polhill (ed.), *Flora of Tropical East Africa.* Rotterdam: A.A. Balkema.

—— (2001). *Genera Euphorbiacearum.* Kew: Royal Botanic Gardens.

Radcliffe-smith, A.R. & Govaerts, R. (1997). New names and combinations in the Euphorbiaceae – Acalyphoideae. *Kew Bulletin* 52: 477–481.

Shaanker, R.U. & Ganeshaiah, K.N. (1984). Age-specific sex ratio in a monoecious species *Croton bonplandianum*. *New Phytologist* 97: 523–532.

Secco, R. De S. & Rosa, N.A. (1992). *Croton ascendens* (Euphorbiaceae), a new liana from Eastern Amazonia. *Novon* 2: 252–254.

Seeman, B. (1867). *Flora Vitiensis,* p. 57. London: L. Reeve & Co.

Small, J.K. (1913). Euphorbiaceae. In N.L.Britton & A.Brown, *An Illustrated Flora of the Northern United States, Canada and the British Possessions*, ed. 2, 2: 452–477. New York: Charles Scribner's Sons.

Smith, A.C. (1981). Euphorbiaceae. *Flora Vitiensis Nova* 2: 439–575. Lawai, Hawaii: Pacific Tropical Botanical Garden.

Stafleu, F.A. & Cowan, R.S. (1981). *Taxonomic Literature.* Vol. III: Lh-O. Utrecht/The Hague: Bohn, Scheltema & Holkema/dr W. Junk b.v. Publishers.

Stebbins, G.L. (1950). *Variation and Evolution in Plants.* New York: Columbia University Press.

Tokuoka, T. & Tobe, H. (1998). Ovules and seeds in Crotonoideae (Euphorbiaceae): structure and systematic implications. *Botanishe Jahrbücher für Systematik Pflanzengeschichte und Pflanzengeographie* 120: 165–186.

Webb, L.J. (1978). A general classification of Australian rainforests. *Australian Plants* 9: 349–363.

Webb, L.J. & Tracey, J.G. (1981). Australian rainforests: pattern and change. In A. Keast (ed.), *Ecological Biogeography of Australia*, pp. 605–694. The Hague: W. Junk.

Webster, G.L. (1967). The genera of Euphorbiaceae in the southeastern United States. *Journal of the Arnold Arboretum* 48: 303–430.

—— (1992). Realignments in American *Croton* (Euphorbiaceae). *Novon* 2: 269–273.

—— (1993a). A provisional synopsis of the sections of the genus *Croton* (Euphorbiaceae). *Taxon* 42: 793–823.

—— (1993b). Euphorbiaceae. In J.A. Hickman (ed.), *The Jepson Manual. Higher Plants of California*, pp. 567–577. Berkeley, Los Angeles, London: University of California Press.

—— (1994). Synopsis of the genera and suprageneric taxa of Euphorbiaceae. *Annals of the Missouri Botanical Garden* 81: 33–144.

—— (2001). Synopsis of *Croton* and *Phyllanthus* (Euphorbiaceae) in western tropical Mexico. *Contributions from the University of Michigan Herbarium* 23: 353–388.

WEBSTER, G.L., DEL-ARCO-AGUILAR, M.J. & SMITH, B.A. (1996). Systematic distribution of foliar trichome types in *Croton* (Euphorbiaceae). *Botanical Journal of the Linnean Society* 121: 41–57.

WHEELER, J.R. (1992). Euphorbiaceae. In J.R. Wheeler et al. (eds.), *Flora of the Kimberley Region*. Perth: Western Australian Herbarium, Department of Conservation and Land Management.

WILLIAMS, K.A.W. (1979). *Native Plants of Queensland.* Vol. 1. K.A.W. Williams: Ipswich.

--- (1987). *Native Plants of Queensland.* Vol. 3. K.A.W. Williams: Ipswich.

WILMOT-DEAR, C.M. (1987). *Croton armstrongii* and *C. habrophyllus* (Euphorbiaceae): a confusion. *Kew Bulletin* 42: 661–662.

Appendix

Adriana urticoides (A.Cunn.) Guymer, **comb. nov.**

Croton urticoides A.Cunn., Field Geographical Memoirs on NSW 355 (April 1825). **Type:** Cox's and Macquarie Rivers, *A. Cunningham*, Oct-Dec 1822 (Chelsea Physic Library, London, U.K. (n.v.), see Mabberley (1978)).

Adriana tomentosa Gaudich., Ann. Sciences Nat. 5:223 (8 July 1825). **Type:** 'Habitat in Nova-Hollandia (Orientali.) Baie de Chiens Marins, Uranis, *C. Gaudichaud*' (lecto: P, *fide* Gross & Whalen 1996).

Two varieties were recognised by Gross and Whalen (1996) based on their research of morphological characters. As these varieties are worthy of recognition, new combinations are provided for them below.

Adriana urticoides var. **urticoides**

Adriana tomentosa Gaudich. var. *tomentosa*

See Gross and Whalen (1996) for a complete list of synonyms.

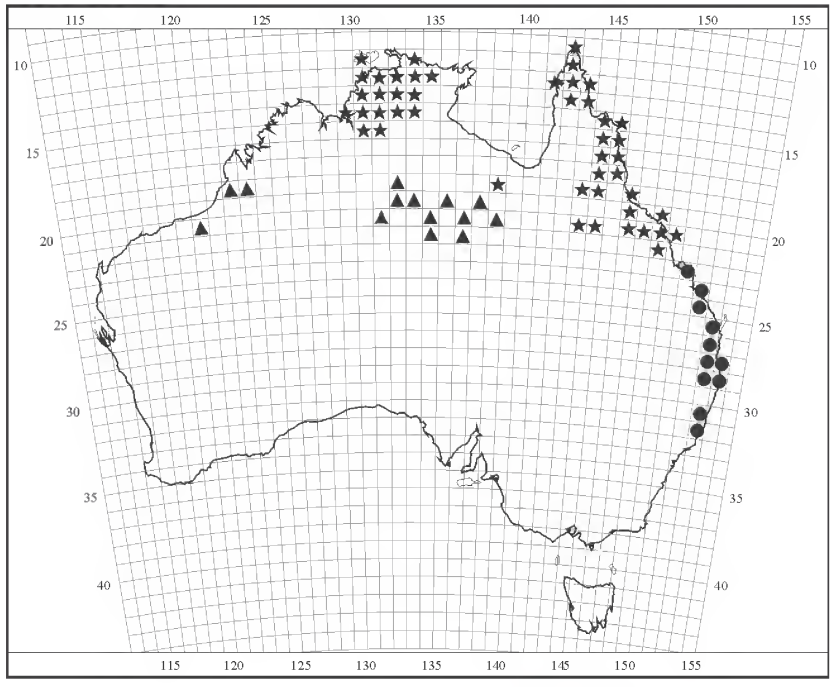
Adriana urticoides (A.Cunn.) Guymer var. **hookeri** (F.Muell.) Guymer, **comb. nov.**

Adriana tomentosa Gaudich. var. *hookeri* (F.Muell.) C.L.Gross & M.A.Whalen, Austral. System. Bot. 9:765 (1996); *Trachycarpon hookeri* F.Muell., Trans. Proc. Phil. Soc. Victoria 1:16 (1854). **Type:** "On sand ridges along the Murray, towards the junction of the Darling and Murrumbidgee", *F. Mueller* (lecto: E (n.v.), *fide* Gross & Whalen 1996).

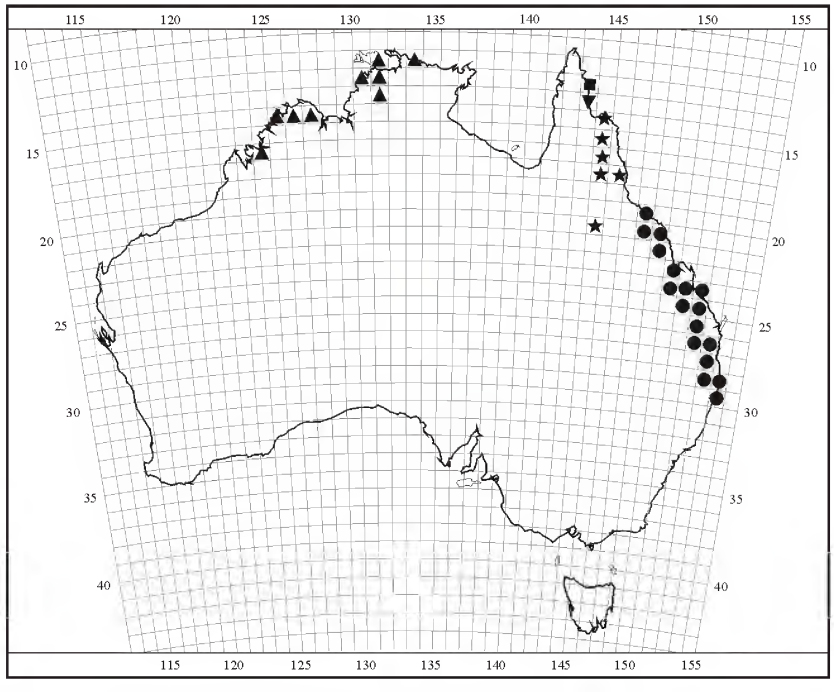
See Gross and Whalen (1996) for a complete list of synonyms.

Mueller Argoviensis in A. de Candolle's *Prodromus* (1866) was the first to recognise that *Croton urticoides* was a species of *Adriana* and referred to it as *Adriana acerifolia* Cunn. ex Hook. var. *genuina* nom. inval. in his list of excluded names at the end of his treatment of *Croton* (p. 699). However, he did not include *Croton urticoides* as a synonym of any name under *Adriana* in his treatment of that genus in the same publication (p. 889). Index Kewensis (1895) reported *Croton urticoides* as *Adriana glabrata* and more recently the University of Wisconsin on their *Croton* website has incorrectly referred *Croton urticoides* to *Adriana tomentosa* var. *tomentosa*.

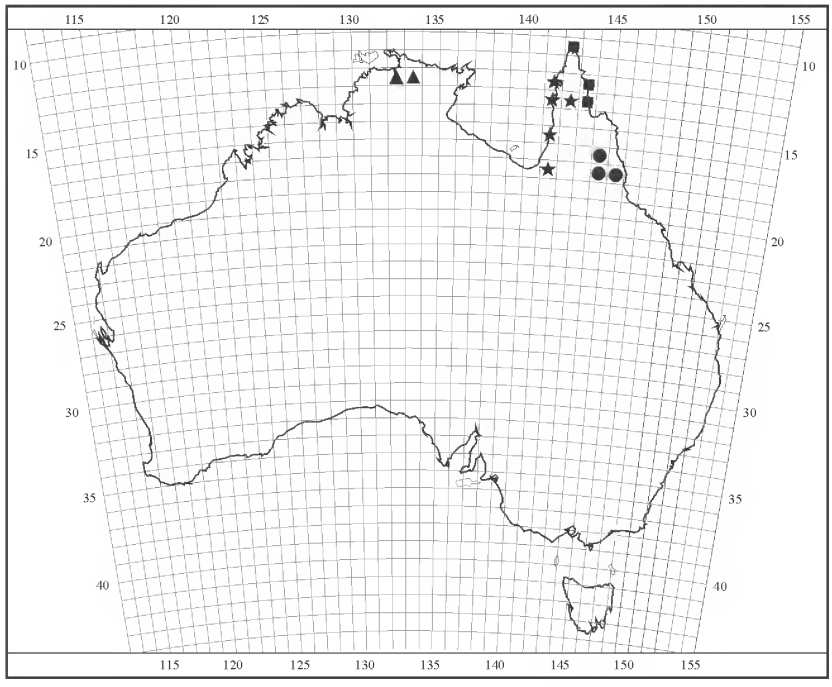
The type of *Croton urticoides* was collected by Allan Cunningham and is presumably held in the 'book' herbarium of Robert Heward's in the Chelsea Physic Garden's library in London. Mabberley, in Taxon 27: 489–491 (1978), reported the discovery of Heward's 'book' herbarium entitled "Specimens described in Field's memoirs as a specimen of the botany of the Blue Mountains" in this library.



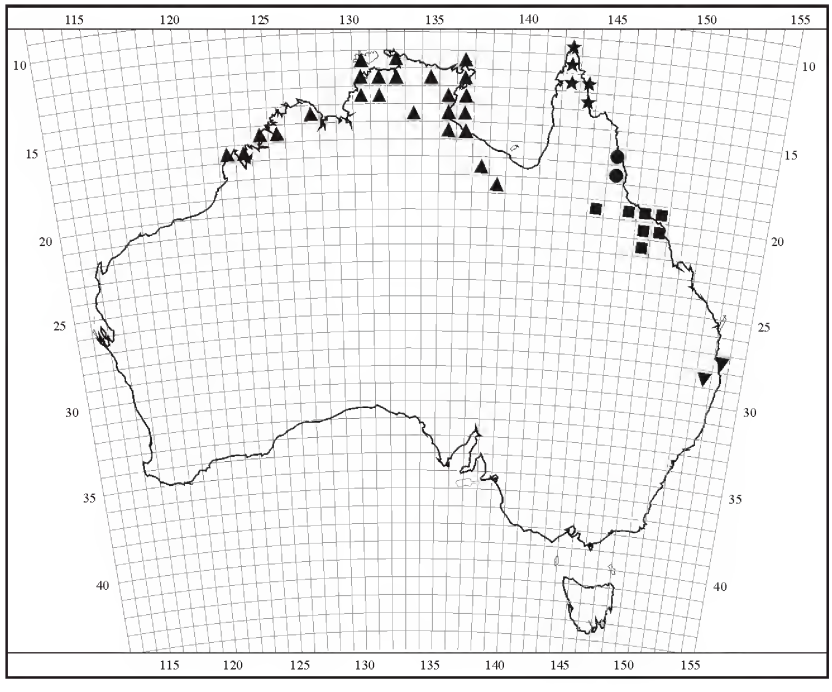
Map 2. Distribution of *Croton* in Australia. ▲ *C. aridus,* ★ *C. arnhemicus,* ● *C. stigmatosus.*



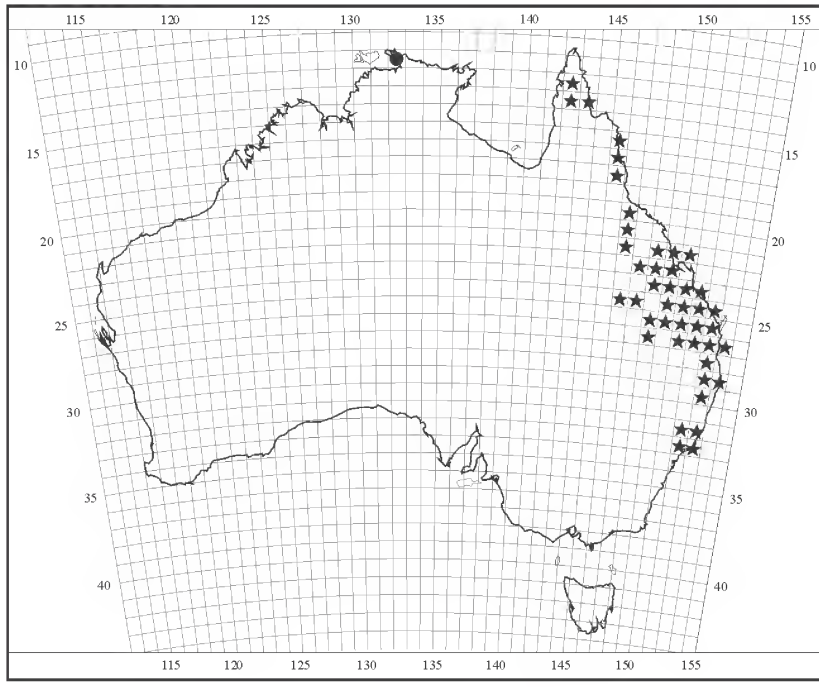
Map 3. Distribution of *Croton* in Australia. ▲ *C. schultzii,* ■ *C. brachypus,* ★ *C. multicaulis* subsp. *velutinus,* ● *C. acronychioides,* ▼ *C. choristadenius, & C. simulans, & C. stockeri.*



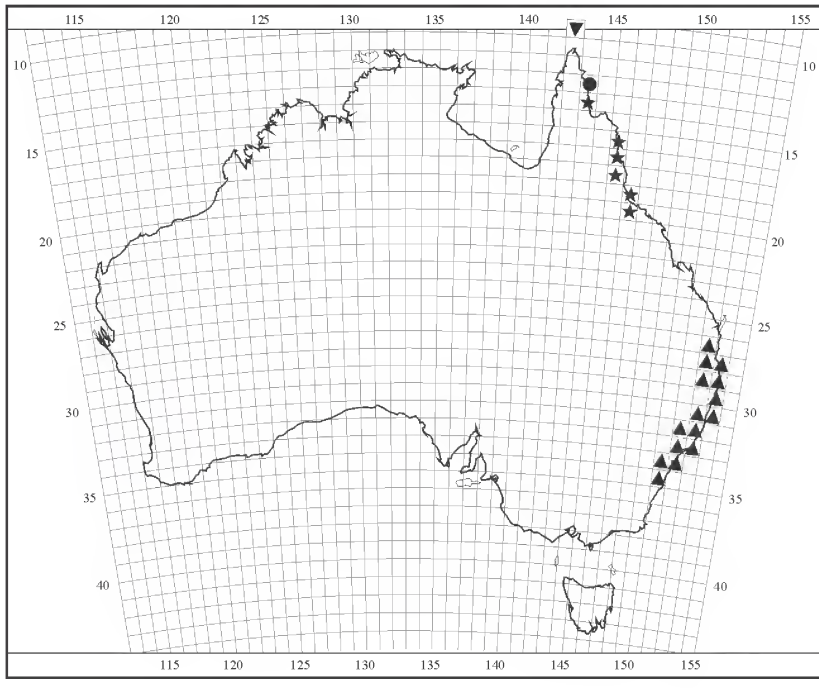
Map 4. Distribution of *Croton* in Australia. ▲ *C. byrnesii,* ■ *C. dockrillii,* ★ *C. rarus,* ● *C. minimus.*



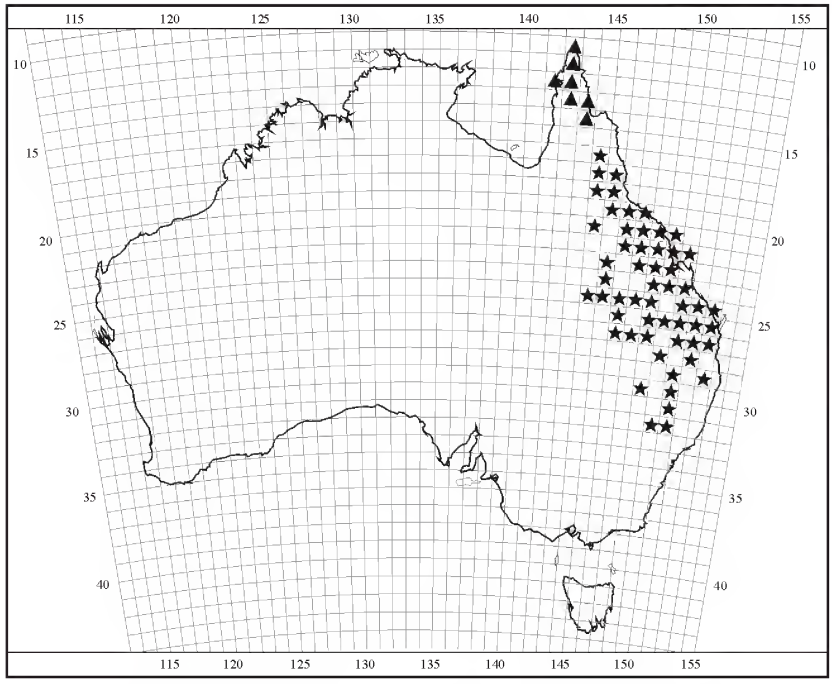
Map 5. Distribution of *Croton* in Australia. ▲ *C. habrophyllus,* ★ *C. capitis-york,* ● *C. densivestitus,* ■ *C. magneticus,* ▼ *C. mamillatus.*



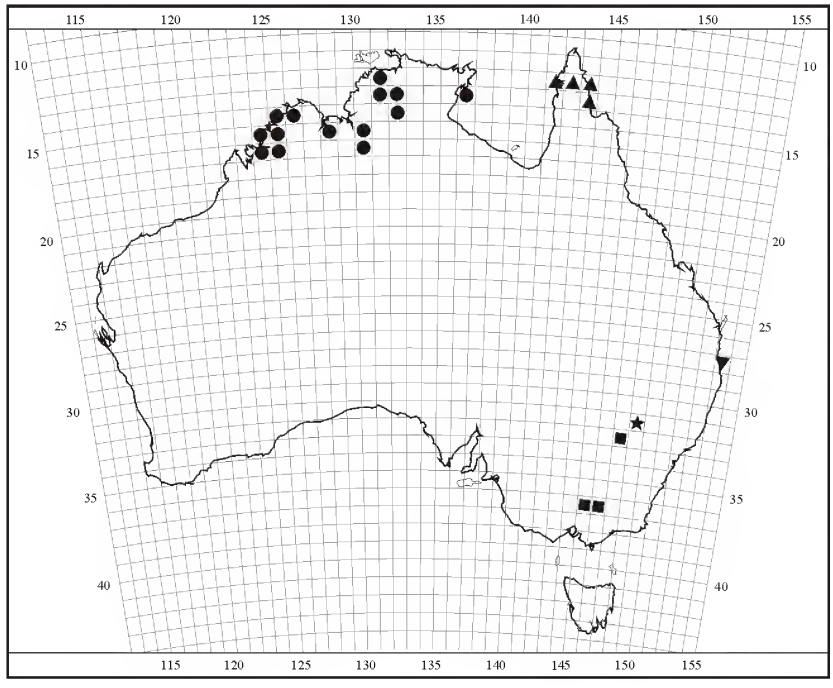
Map 6. Distribution of *Croton* in Australia. ★ *C. insularis,* ● *C. armstrongii.*



Map 7. Distribution of *Croton* in Australia. ● *C. caudatus,* ★ *C. triacros,* ▲ *C. verreauxii,* ▼ *C. waterhouseae.*



Map 8. Distribution of *Croton* in Australia. ▲ *C. multicaulis* subsp. *multicaulis*, ★ *C. phebalioides.*



Map 9. Distribution of *Croton* in Australia. ● *C. tomentellus*, ▲ *C. mutabilis*, ★ *C. capitatus*, ■ *C. setigerus*, ▼ *C. glandulosus.*

Phebalium distans P.I.Forst. (Rutaceae), a new and endangered species from south-eastern Queensland, and reinstatement of *P. longifolium* S.T.Blake

Paul I. Forster

Summary

Forster, Paul I. *Phebalium distans* P.I.Forst. (Rutaceae), a new and endangered species from south-eastern Queensland, and reinstatement of *P. longifolium* S.T.Blake. *Austrobaileya* 6(3): 437–444 (2003). *Phebalium distans* P.I.Forst. is named as a new species and distinguished from *P. longifolium* S.T.Blake (newly resurrected at specific rank) and *P. squamulosum* Vent. It is known from ten extant populations in small remnants of semi-evergreen vine thickets in south-eastern Queensland and is considered as endangered due to the low number of populations with few individuals. Both *P. distans* and *P. longifolium* are described and illustrated. A key to the species of *Phebalium* in Queensland is provided.

Key words: *Phebalium, Phebalium distans, Phebalium longifolium, Phebalium squamulosum*, Queensland – flora

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Introduction

A revision of the species of *Phebalium* Vent. occurring in Queensland was provided by Wilson (1970) as part of his overall account of the genus in Australia. More recently he (Wilson 1998) revisited this genus and transferred a number of species into the allied genera *Leionema* (F.Muell.) Paul G. Wilson, *Nematolepis* Turcz. and *Rhadinothamnus* Paul G. Wilson. This new circumscription of *Phebalium* meant that the genus consisted of c. 25 species with 5 species recognised to occur in Queensland (Forster 2002).

Wilson (1970) considered that some of the "species" of *Phebalium* comprised complexes of subspecies that were markedly disjunct, both ecologically and geographically. This was particularly the case with the taxa included under *P. squamulosum* Vent. and he recognised some ten subspecies for this species. Three of these proposed subspecies, *P. squamulosum* subsp. *squamulosum, P. squamulosum* subsp. *longifolium* (S.T.Blake) Paul G. Wilson and *P. squamulosum* subsp. *gracile* Paul G. Wilson have been recognised for Queensland (Ross 1983, 1994; Forster 1997, 2002). It is generally considered that subspecies should differ in only a few characters and that intermediate populations should exist to demonstrate continuity of character states (e.g. Stebbins (1950) states "subspecies....connected....by a series of intergrading forms" or Stace (1989) states "a population of several biotypes forming a more or less distinct regional facies of a species.....a geographical race, ecotype, topodeme or genoecodeme"). This does not seem to be the case for some of the taxa included in *P. squamulosum*, at least in Queensland, where no obvious intermediates exist, there are clear character state differences and the taxa are markedly allopatric. Bruyns (2002) has provided a succinct species concept in "species are generally taken....as groups of populations that differ in at least two persistent, "good" characters" and subspecies are "geographically complementary taxa that differ in only one "reasonably reliable" character". This has always, and continues to be, the approach that I have taken in the delimitation of taxa and these species and subspecies concepts are applied herein. This species concept equates broadly with the 'diagnostic species concept' of Judd *et al.* (2002).

In the current paper, a narrower circumscription for *Phebalium squamulosum* is advocated with *P. squamulosum* subsp.

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longifolium reinstated to species rank as *P. longifolium* S.T.Blake as listed in Forster (2002). In addition, one new species (*P. distans*) in this complex is described. These three species differ in more than three character states one from another. The morphological characters that form the discontinuities in this group of taxa are easily discernible and include habit (shrub or tree), the form and composition of indumentum (stellate trichomes, lepidote scales), whether the branchlets are glandular-tuberculate, the shape of the leaf lamina and especially the length/width ratio, the form of the leaf margin (flat or recurved), whether the calyx is glandular-tubercular, corolla size, shape and colour and seed size. All of the taxa thus delimited are markedly allopatric, with the northern *P. longifolium* having the greatest disjunction from the others.

Materials & Methods

This paper is based on collections in the Queensland Herbarium (BRI) augmented by field observations and collections by the author in Queensland and northern New South Wales. Floral descriptions are based on material preserved in spirit or by reconstitution in boiling water. A full description of *P. longifolium* is provided for comparative purposes.

Taxonomy

Phebalium distans P.I.Forst. **sp. nov.** a *P. squamuloso* subsp. *squamuloso* habitu arboris (non fruticis), lamina folii lineari (anguste oblanceolata usque anguste elliptica comparate), ratione longitudinis /latitudinis 7.7–15.5 (non 4.2–6.6), margine recurvata (plana comparate), petalis cremeis (non vivide flavis) differt. **Typus:** Queensland. Burnett District: [5*] Mt Walla, Walla Range, 5 km SW of Coalstoun Lakes, 13 September 2002, *P.I. Forster* PIF28831 (holo: BRI [2 sheets + spirit]; iso: A, AD, DNA, HO, L, MEL, MO, NE, NSW, NY, WELT, Z distribuendi)

Phebalium squamulosum subsp. *squamulosum* auct. non Vent. pro parte (Wilson 1970; Forster 1997, 2002; Forster *et al.* 1991).

Small tree (rarely a shrub) up to 8 m high, up to 15 cm dbh, bark rough-flaky, grey; blaze cream-yellow with strong aromatic scent; wood yellow. Indumentum (unless otherwise stated) on foliage and reproductive parts of overlapping lepidote trichomes that are silver to ferruginous-silver giving the covered surface this colour. Branchlets sparsely glandular-tuberculate, with a dense covering of trichomes, glabrescent. Leaves petiolate, strongly aromatic when crushed; petioles 1.7–3 mm long, 0.5–0.8 mm wide, with a sunken midrib and with dense trichomes; lamina chartaceous, linear, 14–62 mm long, 1.5–4.5 mm wide (length/width ratio 7.7–15.5); margins entire or somewhat sinuate to minutely crenate near apex, recurved; adaxial surface with sunken midrib, glossy dark-green, sparsely glandular, glabrous; abaxial surface with strongly raised midrib, densely covered in trichomes; tip apiculate to shortly acuminate; base attenuate. Inflorescences pedunculate, terminal umbels. Flowers 4–4.5 mm long, 3–4 mm wide; pedicels 4–5 mm long, c. 0.5 mm diameter, with dense trichomes; mature bud shape turbinate; calyx shortly subturbinate, 0.8–1 mm long, 1.7–1.8 mm diameter, adaxially glabrous, abaxially strongly glandular-tuberculate and with sparse trichomes, lobes broadly triangular, c. 0.3 mm long and 0.8 mm wide, irregularly dentate; petals elliptic, 3–3.2 mm long, 1–1.8 mm wide, adaxially glabrous, cream, abaxially with dense trichomes apart from c. 0.2 mm around margin that is devoid of trichomes; stamens 10, filaments 3.5–5 mm long, c. 0.1 mm diameter, filiform, glabrous, anthers oblong, 0.7–0.8 mm long, 0.4–0.5 mm wide; ovary spherical, c. 1 mm high, with dense trichomes; style 3–3.2 mm long, c. 0.3 mm diameter, with scattered multifid stellate trichomes in lower half, stigma capitate, papillate, c. 0.2 mm long and 0.3 mm wide. Cocci erect, 3.5–4 mm long, 2.5–3 mm wide, glandular, truncate at suture. Seed somewhat reniform, longitudinally compressed, 2.2–2.5 mm long, 1.3–1.5 mm wide, longitudinally corrugate, grey-black. **Fig. 1**.

***Additional specimens examined*: Queensland.** Burnett District: [1*] Spencers Road, 7 km E of Wooroolin, Sep 2002, *Forster* PIF28870 & *Smyrell* (BRI, MEL); [2*] Klass & Townes Road, 3.5 km SE of Memerambi, Sep 2002, *Forster* PIF28873 & *Smyrell* (BRI, MEL, NE, NSW); [3*] Kingaroy Heights Park & Environmental Area, 3 km SE of Kingaroy, Dec 2002, *Forster* PIF29129 & *Smyrell* (BRI); [4*] Couchmans road, 5 km N of Kingaroy, Dec 2002, *Forster* PIF29137 & *Smyrell* (BRI); Kingaroy, Mar 1933, *Lang* [AQ152703] (BRI); [5*] 3 km SW of

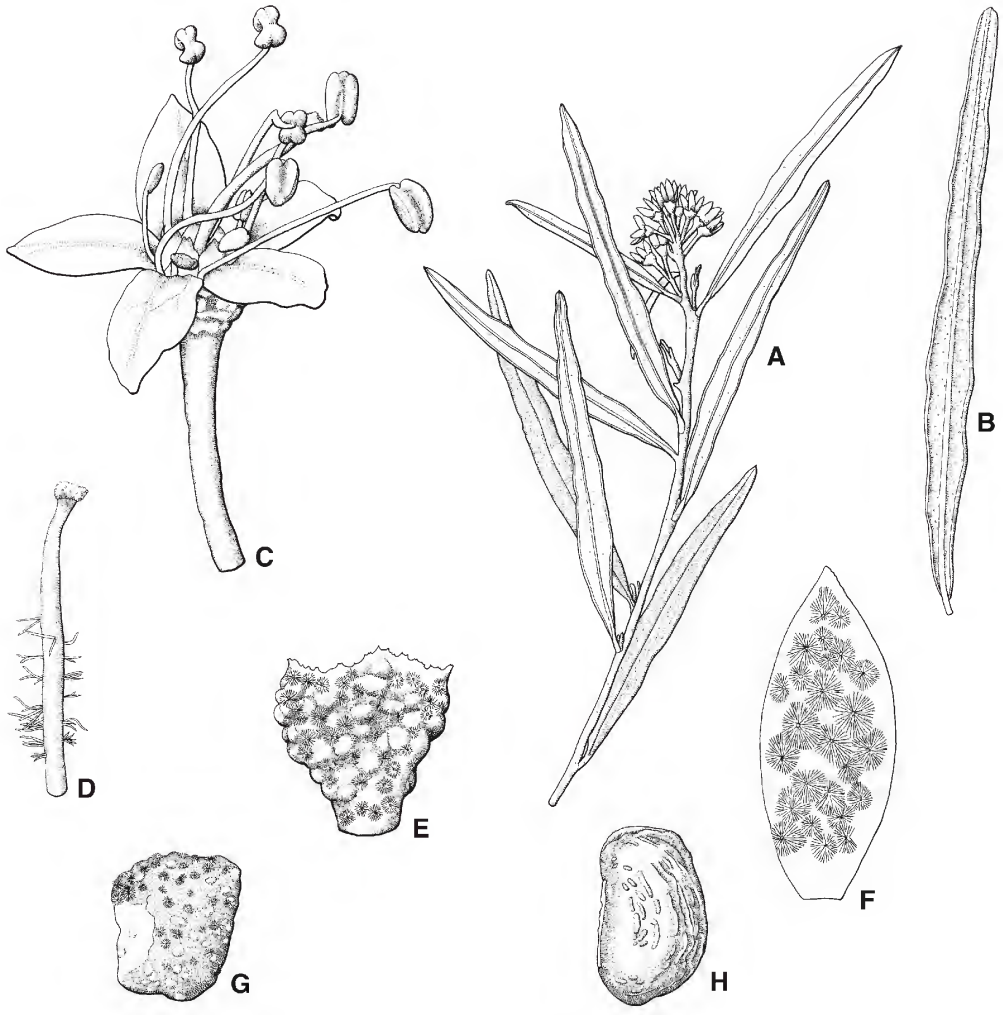

Fig. 1. *Phebalium distans*. A. flowering stem. × 1. B. undersurface of leaf showing recurved margin. × 1.5. C. flower. × 12. D. style. × 12. E. calyx showing markedly glandular-tuberculate surface and sparse covering of lepidote trichomes. × 12. F. external view of petal. × 12. G. coccus. × 6. H. lateral view of seed. × 12. A from *Leiper* (AQ678817) (BRI); B, F–H from *Forster* PIF24927 (BRI); C–E from *Forster* PIF28831 (BRI). Del. W. Smith.

Coalstoun Lakes, Walla Range, Aug 1990, *Randall* 613 (BRI); between Kingaroy & Memerambi, Mar 1986, *Schilling* [AQ399826] (BRI); Wooroolin, *s.dat.* [? Apr 1914], *Simmonds* [AQ152702] (BRI); [5*] Coalstoun Lakes, Biggenden, Jun 1994, *Thomas & Sinclair* [AQ636504] (BRI). MORETON DISTRICT: [6*] Scanlon Scrub, Mt Berryman area, Aug 1990, *Bird & Orford* [AQ473152] (AD, BISH, BRI, CANB, DNA, MEL, MO, NSW, PERTH); [6*] Mt Berryman area, 20 km S of Laidley, Dick Scanlon Scrub near Neumanns Lookout, Nov 1991, *Bird* [AQ590868] (BRI); [7*] Berlin Road, Mt Berryman area, 15 km SW of Laidley, Mar 1992, *Bird* [AQ541907] (BRI; CANB, PERTH n.v.); [8*] 1.5 km E of Mt Berryman, 10 km SSW of Laidley, Aug 1985, *Forster* PIF2109 & *Bird* (BRI); [7*] Welk Remnant, Mt Berryman, Sep 1999, *Forster* PIF24927 & *Booth* (AD, BRI, MEL, QRS); ditto loc., May 2002, *Forster* PIF28697 & *Endress* (A, BRI, L, MEL, NE, NSW, Z); ditto loc., Sep 1999, *Leiper* [AQ678817] (BRI, MEL, NSW).

* extant vouchered populations numbered 1–8, different collectors have named these sites in various ways.

Notes: *Phebalium distans* was first collected by J.H. Simmonds near Kingaroy, probably in April 1914, as all other collections by him from the Burnett were in this month. Until recently, further collections of this species have been spasmodically added to the herbarium record, mainly from the Mt Berryman area in the Lockyer Valley.

This species was included in the broad concept of *P. squamulosum* advocated by Wilson (1970). The collections by Lang and Simmonds were examined by Paul Wilson in 1965 and he noted on the determinant slips (as *P. squamulosum* var. *squamulosum*) that they were "approaching var. longifolium".

Although individuals of *P. distans* may be initially shrublike, they will eventually form small trees up to 8 m high with a stem up to 15 cm dbh. This tree habit is quite unique in the genus *Phebalium*. The flowers of *P. distans* are always cream (ageing cream-fawn). It is always found in semi-evergreen vine thicket on red volcanic soils or communities adjacent to this vegetation type. It would appear to be allied to both *P. squamulosum* and *P. longifolium* but cannot be considered as intermediate between the two.

In comparison *P. squamulosum* subsp. *squamulosum* is a small shrub (never a tree), with narrow oblanceolate to narrow elliptic leaf laminae (versus linear) with a length/width ratio of 4.2–6.6 (versus 7.7–15.5) with a flat margin (versus recurved) and the flowers are vivid yellow. Some collections identified and distributed as *P. squamulosum* subsp. *squamulosum* from the Dorrigo area in northern New South Wales (the oblanceolate-leaved form illustrated in Weston & Porteners (1991)) have cream flowers and a mixture of lepidote trichomes and stellate trichomes on the foliage, whereas the forms at Mt Ballow (Border Ranges) and Girraween N.P. in Queensland only have lepidote trichomes. This variation in *P. squamulosum* subsp. *squamulosum* requires resolution, but is beyond the scope of the current paper. *Phebalium distans* has lepidote trichomes only on the foliage. In Queensland *Phebalium squamulosum* subsp. *squamulosum* has been found in heathland, shrubland or woodland in rocky areas based on adamellite, granite, rhyolite or trachyte substrates. Both *P. squamulosum* and *P. distans* have a calyx that is markedly glandular-tuberculate.

Phebalium longifolium is also a shrub, with branchlets that are not glandular-tuberculate. It has narrow-elliptic leaves with a length/width ratio of 5–7.2, leaf laminae margins with a flat edge, a calyx that is not markedly glandular-tuberculate and seeds that are 1.8–2 mm long x 1–1.3 mm wide (versus 2.2–2.5 × 1.3–1.5 mm). Both *P. distans* and *P. longifolium* have cream flowers.

The only other taxon in this complex that occurs in Queensland is *Phebalium squamulosum* subsp. *gracile*. This taxon is a small shrub (never a tree) with linear-oblong leaf laminae (versus linear) that are markedly shorter (5–25 mm long versus 14–62 mm) with a length/width ratio of 3–7.7 (versus 7.7–15.5) and yellow flowers with shorter petals (2–3 mm versus 3–3.2 mm long). Whether or not *P. squamulosum* subsp. *gracile* is worth recognition at specific level requires further study, particularly in relation to the other proposed subspecies of *P. squamulosum* that occur in New South Wales (Wilson 1970). As an entity it is certainly quite distinct from *P. squamulosum* subsp. *squamulosum, P. distans* and *P. longifolium*.

***Distribution and habitat*:** *Phebalium distans* is currently known from ten populations, with

two of these unvouchered (*viz.* Forster *et al.* 1991). Five of these are in close proximity to one another at Mt Berryman. Four are near Kingaroy, and the tenth most northerly one at Mt Walla, is near Coalstoun Lakes. All except the Mt Walla population, are on red volcanic soils with semi-evergreen vine thicket. At Mt Walla *P. distans* occurs in semi-evergreen vine thicket, but the soil varies from red volcanic where the population is at the base of the mountain to rubble derived from rhyolitic ignimbrite at the most elevated parts of the population.

***Conservation status*:** *Phebalium distans* is considered to be *endangered in habitat* for several reasons. Firstly less than 1000 individuals are known to exist with the extant populations having the following estimated number of plants (population number cited above: number of plants estimated/area of remnant in ha) (1: 7/ <0.5; 2: 3/<0.5: 3: 14/ <0.5; 4: 20/< 0.5; 5: <200/2; 6: < 200/30; 7: < 100/2; 8: < 50/4). Several additional, but unvouchered localities in the Mt Berryman area (Sites 174 & 178 in Forster *et al.* 1991) have an unknown number of plants, however the small sizes of the remnants (5 & 3 ha respectively) means they are unlikely to harbour a large number of individuals.

Most of the suitable habitat for this species in the Coalstoun Lakes, Kingaroy and Lockyer valley areas was cleared for agriculture in the 20th century. Intensive survey of vine thicket and vineforest remnants in these three areas has been conducted since the mid 1980's (*viz.* Forster *et al.* 1991; Forster unpubl., W.J.F.McDonald unpubl.) and major populations of *P. distans* cannot be considered to have been overlooked throughout its known range. Recent intensive survey (2002) of roadside remnants in the Kingaroy Shire revealed a further three populations (populations 1, 2, 4). Population 1,2 and 4 are in small roadside remnants and the other populations are in more secure remnants (e.g. Welk Remnant – population 7), freehold land (populations 5, 6, 8) or on shire council land with no active management strategies (population 3). The large population 5 at Walla Range (which co-occurs with the Endangered *Pomaderris clivicola* E.M.Ross) has significant intrusions through the stand of naturalised pasture grasses such as *Panicum maximum* and environmental weeds such as *Lantana camara* that will act as a fire wick on the steep slope.

As with all *Phebalium* species, *P. distans* has small seed that are shed locally from the capsular fruit with little apparent long-range dispersal ability. The disjunct occurrence of this species in south-eastern Queensland suggests *P. distans* was much more widespread in the past, but is currently resticted due to the loss of suitable habitat.

Under the IUCN (2001) risk categories, *P. distans* may be categorised as Endangered under the criteria of B1a, b (i, ii, iii, iv, v), 2b (i, ii, iii, iv, v), C 2a (i).

***Etymology*:** The specific epithet is derived from the Latin *distans* (scattered) and refers to the scattered extant populations of this species.

Phebalium longifolium S.T.Blake, Proc. Roy. Soc. Queensland 70: 44 (1959). **Type:** Queensland. North Kennedy District: About W of Ingham, near Wallaman Falls, 14 August 1954, *S.T. Blake* 18809 (holo: BRI [AQ318496]).

Shrub to 3 m high. Indumentum (unless otherwise stated) on foliage and reproductive parts of overlapping lepidote trichomes that are golden-ferruginous to silver-ferruginous, giving the covered surface this colour. Branchlets not glandular-tuberculate, with a dense covering of trichomes, glabrescent. Leaves petiolate, aromatic when crushed; petioles 1.7–3 mm long, 0.7–0.8 mm wide, with a sunken midrib and with dense trichomes; lamina chartaceous, narrow-elliptic to narrow-oblanceolate, 15–80 mm long, 2.5–10 mm wide (length/width ratio 5–7.2); margins entire or somewhat sinuate to minutely dentate for entire length, thickened, flat; adaxial surface with sunken midrib, glossy dark-green, glabrous or sometimes with sparse trichomes on margin, sparsely glandular-tuberculate; abaxial surface with prominently raised midrib, densely covered in trichomes; tip acute; base attenuate. Inflorescences pedunculate, terminal umbels. Flowers 4–5.5 mm long, 4–6 mm diameter; pedicels 5–12 mm long, 0.5–0.8 mm diameter, with dense trichomes; mature bud shape turbinate; calyx shortly subturbinate, 0.7–

1.4 mm long, 2.2–3 mm diameter, adaxially glabrous, abaxially with dense trichomes, not glandular-tuberculate or only weakly so, lobes broadly triangular, 0.3–0.5 mm long, 1–1.2 mm wide, irregularly dentate; petals elliptic, 3–3.2 mm long, 1.5–1.8 mm wide, adaxially glabrous, cream, abaxially with dense trichomes apart from c. 0.2 mm margin that is devoid of trichomes; stamens 10, filaments 3–5 mm long, c. 0.1 mm diameter, filiform, glabrous; anthers oblong, 0.7–1 mm long, 0.4–0.5 mm wide; ovary spherical, c. 1 mm high, with dense trichomes; style 2.8–3.3 mm long, 0.1–0.2 mm diameter, with scattered multifid stellate trichomes in lower half, stigma capitate, papillate, c. 0.2 mm long and 0.3 mm wide. Cocci erect, 3–3.5 mm long, 2.2–2.6 mm wide, truncate at suture. Seeds somewhat reniform, longitudinally compressed, 1.8–2.2 mm long, 1–1.3 mm wide, longitudinally corrugate, grey-black. **Fig. 2.**

***Selected specimens examined*: Queensland.** Cook District: Longlands Gap, S.F. 194, Jun 1995, *Forster* PIF16776 (BRI, MEL, QRS); ditto loc., Sep 2001, *Forster* PIF27518 *et al.* (A, BRI, K, L, MEL); S.F. 194 Mt Baldy, Oct 1999, *Forster* PIF25088 & *Booth* (AD, BRI, MEL, QRS); Herberton Range S.F., Apr 1998, *Jago* 4720 (BRI). North Kennedy District: Bluewater S.F., 55 km NW of Townsville, Nov 1991, *Bean* 3790 (BRI; BISH, CANB *n.v.*); Birthday Falls, Paluma Range, Sep 1966, *Birch* [AQ152608] (BRI); W side of Paluma – Hidden Valley road, *c.* 10 km W of Paluma, Jul 1992, *Jobson* 1730 *et al.* (BRI; MEL, NSW *n.v.*); S.F, 344, *c.* 27 km W of Kennedy township, May 1976, *Thorsborne* 218 (BRI).

***Distribution and habitat*:** *Phebalium longifolium* is endemic to the "Wet Tropics" of north-eastern Queensland in several disjunct populations from the Herberton Range in the north to Paluma in the south. It inhabits the edges of wet rainforest in the ecotone to adjacent eucalypt open forest, usually on basalt or metamorphic substrates.

***Notes*:** This species is easily distinguished from *P. squamulosum* by the long narrow-elliptic leaf laminae with an attenuate base (versus cuneate), the cream flowers (versus yellow) with a non-glandular-tuberculate (or only weakly so) calyx and with narrower petals (1.5–1.8 mm wide versus 1.8–2 mm wide).

***Conservation status*:** *Phebalium longifolium* is well represented in State Forests (S.F. 194, 268, 344) and National Parks (Mt Spec) throughout its range and is not considered threatened.

Key to the species of *Phebalium* found in Queensland. N.B. *P. distans* is usually a tree, but is also keyed out as a shrub for encounters with small individuals of this species.

1. Flowers large with petals 4.5–9 mm long 2
   Flowers small with petals 2–4 mm long 4

2. Calyx with short lobes < 1 mm long; corolla yellow . . . . . **P. whitei**
   Calyx with well developed lobes 1–5 mm long; corolla white or pink 3

3. Calyx 5–6 mm diameter, cupular, 6–8 lobed; petals pink . . . . . **P. nottii**
   Calyx 2–3 mm diameter, obturbinate, 5-lobed; petals white or pink . . . . . **P. woombye**

4. Tree . . . . . **P. distans**
   Shrub 5

5. Leaf lamina linear to oblong-cuneate 6
   Leaf lamina narrow-elliptic to narrow-oblanceolate 8

6. Leaf margin undulate, markedly glandular . . . . . **P. glandulosum**
   Leaf margin entire or somewhat sinuate to minutely crenate near the apex, ... 7

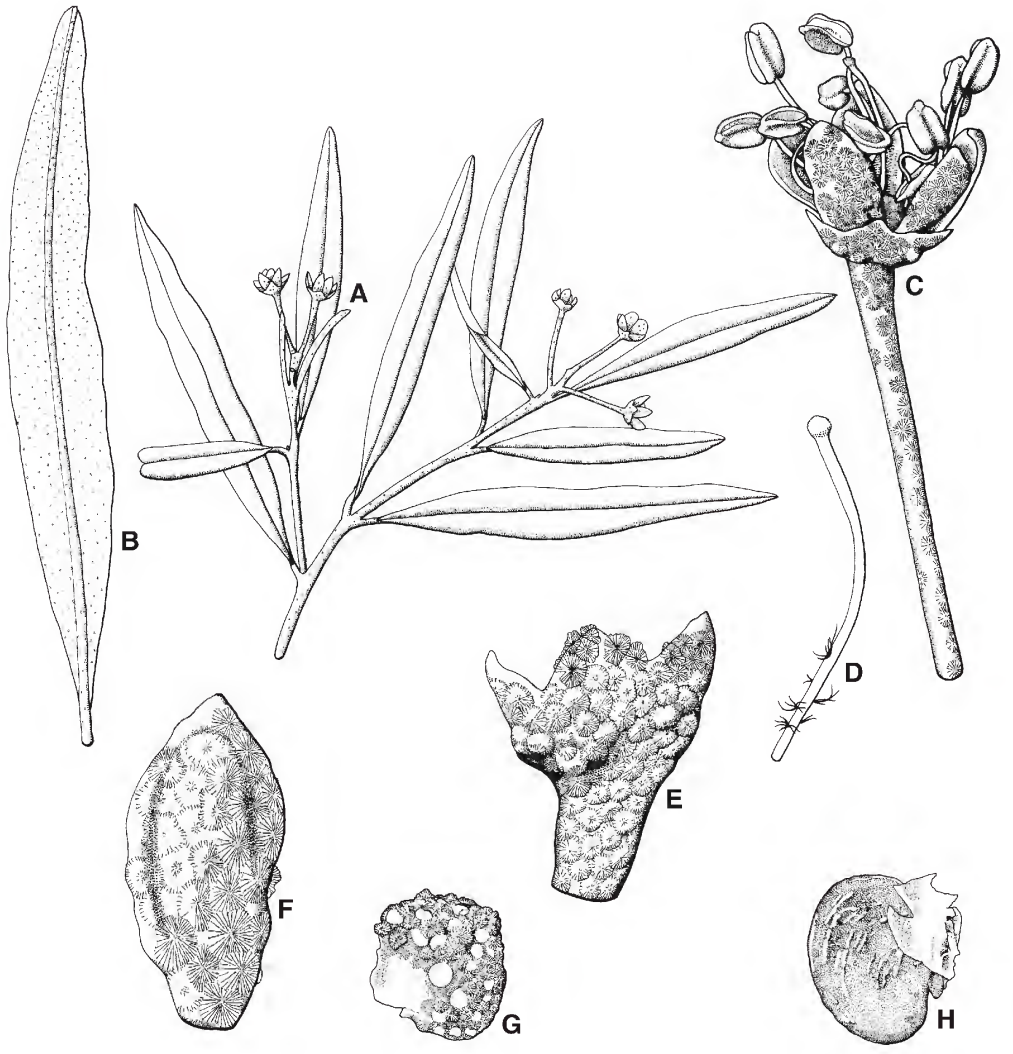

Fig. 2. ***Phebalium longifolium.*** A. flowering stem. × 1. B . undersurface of leaf showing flat margin. × 1.5. C. flower. × 6. D. style. × 12. E. calyx showing poor development of glandular-tuberculate surface and dense coverage of lepidote trichomes. × 12. F. external view of petal. × 12. G. coccus. × 6. H. seed. × 12. A, B, G, H from *Forster* PIF25088 (BRI); C–F from *Jago* 4720 (BRI). Del W. Smith.

7. Leaf lamina short, 5–25 mm long, with a length/width ratio of 3–7.7; corolla yellow, petals 2–3 mm long ..... **P. squamulosum** subsp. **gracile**
   Leaf lamina long, 14–62 mm long, with a length/width ratio 7.7–15.5; corolla cream, petals 3–3.2 mm long ..... **P. distans**

8. Leaf lamina with a cuneate base; corolla yellow, petals 1.8–2 mm wide ..... **P. squamulosum** subsp. **squamulosum**
   Leaf lamina with an attenuate base; corolla cream, petals 1.5–1.8 mm wide ..... **P. longifolium**

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References

Bruyns, P.V. (2002). Monograph of *Orbea* and *Ballyanthus* (Apocynaceae – Asclepiadoideae – Ceropegieae). *Systematic Botany Monographs* 63: 1–196.

Forster, P.I. (1997). Rutaceae. In R.J.F. Henderson (ed.), Queensland Plants Names and Distribution, pp. 184–188. Brisbane: Department of Environment.

—— (2002). Rutaceae. In R.J.F. Henderson (ed.), Names and Distribution of Queensland Plants, Algae and Lichens, pp. 177–181. Brisbane: Environmental Protection Agency.

Forster, P.I, Bostock, P.D., Bird, L.H. & Bean, A.R. (1991). Vineforest Plant Atlas for South-east Queensland. Brisbane: Queensland Herbarium.

Iucn (2001). IUCN Red List Categories and Criteria. Version 3.1 Gland: IUCN – The World Conservation Union.

Judd, W.S., Campbell, C.S., Kellogg, E.A., Stevens, P.F. & Donoghue, M.J. (2002). *Plant Systematics – a phylogenetic approach*. 2nd ed. Sunderland, Massachusetts: Sinauer Associates Inc.

Ross, E.M. (1983). Rutaceae. In T.D. Stanley & E.M. Ross, Flora of South-eastern Queensland. 1: 440–470. Brisbane: Queensland Department of Primary Industries.

--- (1994). Rutaceae. In R.J.F. Henderson (ed.), Queensland Vascular Plants Names and Distribution, pp. 301–308. Brisbane: Queensland Department of Environment & Heritage.

Stace, C.A. (1989). Plant Taxonomy and Biosystematics. 2nd edition. London, Melbourne, Auckland: Edward Arnold.

Stebbins, G.L. (1950). Variation and evolution in plants. New York: Columbia University Press.

Weston, P.H. & Porteners, M.F. (1991). *Phebalium*. In G.J. Harden (ed.), Flora of New South Wales 2: 25–263. Kensington: University of New South Wales Press.

Wilson, P.G. (1970). A taxonomic revision of the genera *Crowea*, *Eriostemon* and *Phebalium*. *Nuytsia* 1: 5–155.

—— (1998). New species and nomenclatural changes in *Phebalium* and related genera (Rutaceae). *Nuytsia* 12: 267–288.

A synopsis of *Racosperma* C. Mart. (Leguminosae: Mimosoideae)

Les Pedley

Summary

Pedley, L. (2003). A synopsis of *Racosperma* C.Mart. (Leguminosae: Mimosoideae). *Austrobaileya* 6(3): 445–496. The history of the genus *Racosperma*, which is based on *Acacia* (sect.) *Phyllodineae* DC., is briefly outlined. Names of 976 species of *Racosperma* (with 130 names of infraspecific taxa, autonyms excluded) are listed. Of these, only ten species (one represented by one of two subspecies) do not occur in Australia. Transfers of 834 taxa (711 to species, 58 to subspecies and 65 to variety) are made to *Racosperma* the vast majority from *Acacia*, 15 from *Mimosa* and one from *Adiantum*. Taxonomy closely follows the treatment of *Acacia* in the *Flora of Australia*, vols 11A & 11B (Orchard & Wilson 2001) and reference is made to the treatment of each species in the *Flora*. *Acacia cyclops*, *A. stowardii* and *A. vincentii* are treated as synonyms of *Racosperma eglandulosum*, *R. sibiricum*, and *R. deltoideum* respectively. *Acacia juncifolia* subsp. *serpentinicola* is raised to specific rank, *Racosperma serpentinicola*; as is *Acacia wickhamii* subsp. *parviphyllodinea* to *Racosperma calligerum* (nom. nov.), with *A. wickhamii* subsp. *viscidula* as a synonym of it. *Acacia clivicola,* usually considered conspecific with *A. stowardii*, is reinstated as *R. clivicola*; *A. cupularis* is referred to *R. ligulatum* var. *minus* and *A. curvinervia* to *R. juliferum* subsp. *curvinervium*. *R. sophorae* is considered to be a species distinct from *R. longifolium*. *A. desmondii* and *A. racospermoides* are the same as *R. nelsonii* and *R. paniculatum* respectively.

Key words: *Racosperma*, *Acacia*, Australia, nomenclature, new combinations.

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Introduction

The name *Racosperma* was first used by C.F.P. von Martius in a catalogue of plants growing in the Royal Botanical Garden, Munich[1] (Martius 1829). He listed species of *Acacia* in two groups, namely '*Acacia genuinae / (Omnes ♄*[2]*. pleraeque C.)*' and '*Acaciae phyllodineae De C. (Genus dist.: Racosperma Mart.)/(Pleraeq. N. Holl., omn. ♄ T.)*'. Species in each group were arranged alphabetically. Since he included *Racosperma* in *Acacia*, it must be taken that Martius did not accept it as a distinct genus at that time, and the 21 specific epithets listed under it cannot be considered as having been transferred from *Acacia* to *Racosperma*. Martius (1835) again used the name, this time quite definitely as a generic name. In an alphabetical list it was placed between *Pyrus* and *Ranunculus*. He listed three species, the names of two of which are now considered synonyms of *Racosperma paradoxum*. The other, *Racosperma sophorae*, is the only currently accepted name that can be considered as being validly published in *Racosperma* by Martius.[3]

In reviewing the classification of *Acacia sens. lat.* (Pedley 1986a) I reinstated the generic name *Racosperma*. I used the name in a number of subsequent papers (Pedley 1986b, 1987a, 1987b, 1987c, 1987d, 1988), but refrained from transferring the names of all Australian species to *Racosperma*. Over a considerable period I had more or less confined my studies to the Queensland flora and considered it fitting that the necessary new combinations be made by workers whose areas of expertise covered other

[1] Not Monaco as I stated previously (Pedley 1986a).

[2] An approximation to the Linnean symbol meaning *woody*, see Stearn (1992: 351).

[3] Previously I also carelessly, wrongly attributed the following names to Martius: *Racosperma falcatum*, *R. hispidulum*, *R. melanoxylon*, *R. strictum* (Pedley 1987c), *R. longifolium*, *R. paradoxum*, *R. verticillatum* (Pedley 1987d). In all cases I cited Martius (1835), which is incorrect. They were listed by Martius (1829), but **not** in the later publication.

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parts of Australia. Those expected combinations were not forthcoming. In fact, opposition to the adoption of the name *Racosperma* was widespread and strong. An extreme example of the views of the interested lay community was given by Anon. (1993) who proclaimed *inter alia* that "the name Racosperma is an abomination". A more measured, less emotional, but nevertheless hostile, response was that of Kanis (1986) who wrote: "Recently it was proposed by Pedley (1986) to promote Vassal's subgenera to genera in their own right. Among other things this will mean the transfer of more than 90% of the Australian species to *Racosperma* Mart., a bold step indeed. However some insiders fear that this might not be the last word at generic level". In the intervening years I have seen nothing of substance to support the fears mentioned. The validity of the name was also questioned, mainly covertly, but Chappill & Maslin (1995) spelled out the problem as they saw it: "The basic point of contention is whether Martius' (1835) publication can be indirectly connected to his earlier (Martius 1829) listing of the name where he indicated that it should be based on *Acacia* (section) *Phyllodineae* DC. (*fide* Maslin 1988). If *Racosperma* is not validly published then the name must date from Pedley (1986) and will therefore need to be conserved against earlier names". They went on to discuss the consequences and possible pitfalls of such conservation.

In view of the lack of endorsement of *Racosperma* and for convenience in managing BRI collections which include many taxa that do not occur in Queensland, I transferred names of species which I had described originally as *Racosperma* to *Acacia* (Pedley 1990) and subsequently referred species described by me as new to the latter genus. In a short introduction to the 1990 paper, I explained why those actions should not be construed as implying that I did not accept *Racosperma* as a distinct genus. Neither do I doubt the validity of the name *Racosperma.* Martius's 1835 use of it was an indirect reference to his 1829 use, and meets the requirements of Art. 32.4 of the International Code of Botanical Nomenclature (St Louis Code) (Greuter *et al.* 2000), and is covered by Ex. 4 appended to the article. Instead of *Racosperma* I could have adopted one of several names proposed by Rafinesque (1838). No one seems to have any difficulty in tracing *Racosperma* from Martius's publication of the name in 1835 back to his 1829 publication, and its conservation is not necessary.

The situation has now changed. More recent studies of Chappill & Maslin (1995), Grimes (1999), Robinson & Harrison (2000), and particularly the molecular work of Miller & Bayer (2000, 2001) provide strong grounds for the recognition of the 'Australian acacias' (that is, *Acacia* subg. *Phyllodineae* (DC.) Seringe; *Acacia* subg. *Heterophyllum* Vassal) as a genus distinct from *Acacia*. The recognition of *Racospermyces*, a rust fungus related to *Uromyces*, restricted to Australian and extra-Australian species Walker (2001), also adds weight to the mycological evidence previously presented (Pedley 1986a) for the distinctiveness of *Racosperma*. Though I have a first-hand knowledge of possibly only one-third of the Australian acacias, in the words of that well known dissident, Croizat (1958: 202), "the time is right here to call a spade a spade and to stop floating in molasses". Now is an appropriate time to complete the transfer of all taxa to *Racosperma*. Since the genus is virtually restricted to Australia publication of *Flora of Australia* vol. 11A & 11B (Orchard & Wilson 2001) has made this possible. It has brought together descriptions of all species accepted by the contributors to the *Flora* up to about the end of 2000. Importantly, in the compilation of a check-list such as this, the *Flora* provides basionyms and references to their protologues. It is now feasible to compile a list of up-to-date species of *Racosperma* without the need to check a mass of bibliographic references. I have, however, consulted protologues where possible.

On the whole I have followed the taxonomy presented in the *Flora*, but have diverged in a few cases where my views differ from those presented by the authors. Taxonomists working on acacias from Australia have used both 'variety' and, since the mid-1960s, 'subspecies' as infraspecific categories; some one, some the other, and some (myself included) both. It is sometimes difficult to distinguish their concepts of one from the other; as Benson (1962) stated, "interpretations of the two ranks vary; what a particular botanist interprets as one is exactly what another person

accepts as the other." By and large, I have retained the categories accepted by the *Flora* authors, but, in some species that I know well, I have reduced subspecies to variety.

Notes on text

The name accepted in *Racosperma* is followed on the next line, if it is a *comb. nov.*, by the basionym. Infraspecific taxa are listed under the relevant species. Autonyms are not listed, except in the case of *Racosperma spirorbis* subsp. *spirorbis*, one of the taxa which does not occur in Australia.

An asterisk (*) indicates that the taxon does not occur in Australia. Literature references in addition to the reference to the basionym are given for extra-Australian taxa.

The number in italics following a section mark (*§*) refers to the species number in the *Flora of Australia*. An obelus (†) indicates that the taxon is not included in the *Flora*, usually because it has been described since its publication. If a species is merely mentioned in the text of the *Flora*, without reference to its description, usually because of its later publication or because its name was treated as a synonym of a taxon that is included in the *Flora*, then it is referred (by the use of *sub*) to that taxon.

Brief notes have been added in the places where the taxonomy of the *Flora* has not been followed. Some changes will be discussed in subsequent papers.

Racosperma abbatianum (Pedley) Pedley, **comb. nov.** †
Acacia abbatiana Pedley, Austrobaileya 5: 313 (1999)

Racosperma abbreviatum (Maslin) Pedley, **comb. nov.** *§747*
Acacia abbreviata Maslin, J. Adelaide Bot. Gard. 2: 301 (1980).

Racosperma abruptum (Maiden & Blakely) Pedley, **comb. nov.** *§476*
Acacia abrupta Maiden & Blakely, J. Roy. Soc. W. Australia 13: 6 (1927).

Racosperma acanthaster (Maslin) Pedley, **comb. nov.** *§314*
Acacia acanthaster Maslin, Nuytsia 12: 312 (1999).

Racosperma acanthocladum (F.Muell.) Pedley, **comb. nov.** *§311*
Acacia acanthoclada F.Muell., Fragm. 3: 127 (1863).

R. acanthocladum subsp. **glaucescens** (Maslin) Pedley, **comb. nov.** *§311b*
Acacia acanthoclada subsp. *glaucescens* Maslin, Nuytsia 12: 314 (1999).

Racosperma acelleratum (Maiden & Blakely) Pedley, **comb. nov.** *§551*
Acacia acellerata Maiden & Blakely, J. Roy. Soc. W. Australia 13: 2 (1928).

Racosperma acinaceum (Lindl.) Pedley, **comb. nov.** *§446*
Acacia acinacea Lindl., in T.L.Mitchell, Three Exped. Australia 2: 265 (1838).

Racosperma aciphyllum (Benth.) Pedley, **comb. nov.** *§854*
Acacia aciphylla Benth., Linnaea 26: 627 (1855).

Racosperma acomum (Maslin) Pedley, **comb. nov.** *§436*
Acacia acoma Maslin, Nuytsia 12:315 (1999).

Racosperma acradenium (F.Muell.) Pedley, Austrobaileya 2: 344 (1987). *§688*

Racosperma acrionastes (Pedley) Pedley, **comb. nov.** *§121*
Acacia acrionastes Pedley, Austrobaileya 3: 297 (1990).

Racosperma acuarium (W.V.Fitzg.) Pedley, **comb. nov.** *§299*
Acacia acuaria W.V.Fitzg., J. W. Australian Nat. Hist . Soc. 7 (1904).

Racosperma aculeatissimum (J.F.McBr.) Pedley, **comb. nov.** *§289*
Acacia aculeatissima J.F.McBr., Contrib. Gray Herb. 59: 6 (1919).

Racosperma aculeiforme (Maslin) Pedley, **comb. nov.** *§397*
Acacia aculeiformis Maslin, Nuytsia 12: 317 (1999).

Racosperma acuminatum (Benth.) Pedley, **comb. nov.** *§866*
Acacia acuminata Benth., London J. Bot. 1: 373 (1842).
See also *Racosperma burkittii*.

Racosperma acutatum (W.V.Fitzg.) Pedley, **comb. nov.** *§337*
Acacia acutata W.V.Fitzg., J. W. Australian Nat. Hist. Soc. 6 (1904).

Racosperma adenogonium Pedley, Austrobaileya 2: 316 (1987). *§618*

Racosperma adinophyllum (Maslin) Pedley, **comb. nov.** *§405*
Acacia adinophylla Maslin, Nuytsia 12: 318 (1999).

Racosperma adnatum (F.Muell.) Pedley, **comb. nov.** *§541*
Acacia adnata F.Muell., Chem. & Druggist Australas. Suppl. 5 (51): 26 (1882).

Racosperma adoxum (Pedley) Pedley, **comb. nov.** *§913*
Acacia adoxa Pedley, Contrib. Queensland Herb. 11: 6 (1972).

R. adoxum var. **subglabrum** (Pedley) Pedley, **comb. nov.** *§913b*
Acacia adoxa var. *subglabra* Pedley, Contrib. Queensland Herb. 11: 7 (1972).

Racosperma adsurgens (Maiden & Blakely) Pedley, Austrobaileya 2: 344 (1987).*§819*

Racosperma aduncum (A.Cunn. ex G.Don) Pedley, Austrobaileya 2:344 (1987).*§120*

Racosperma aemulum (Maslin) Pedley, **comb. nov.** *§367*
Acacia aemula Maslin, Nuytsia 10:169 (1995).

R. aemulum subsp. **muricatum** (Maslin) Pedley **comb. nov.** *§367b*
Acacia aemulum subsp. *muricata* Maslin, Nuytsia 10: 171 (1995).

Racosperma aestivale (E.Pritzel) Pedley, **comb. nov.** *§104*
Acacia aestivalis E.Pritzel, Bot. Jahr. Syst. 35: 300 (1904).

Racosperma alatum (R.Br.) Pedley, **comb. nov.** *§252*
Acacia alata R. Br. in W.T. Aiton: Hortus Kew. ed. 2. 5: 464 (1813).

R. alatum var. **biglandulosum** (Benth.) Pedley, **comb. nov.** *§252b*
Acacia alata var. *biglandulosa* Benth., Fl. Austral. 2: 321 (1864).

R. alatum var. **platypterum** (Lindl.) Pedley, **comb. et stat. nov.** *252c*
Acacia platyptera Lindl., Bot. Reg. 27: misc. 3 (1841).

R. alatum var. **tetranthum** (Maslin) Pedley, **comb. nov.** *§252d*
Acacia alata var. *tetrantha* Maslin, Nuytsia 10: 157 (1995).

Racosperma alcockii (Maslin & Whibley) Pedley, **comb. nov.** *§85*
Acacia alcockii Maslin & Whibley, Nuytsia 6: 19 (1987).

Racosperma alexandri (Maslin) Pedley, **comb. nov.** *§197*
Acacia alexandri Maslin, Nuytsia 8: 288 (1992).

Racosperma allenianum (Maiden) Pedley, Austrobaileya 2: 344 (1987). *§188*

Racosperma alpinum (F.Muell.) Pedley, **comb. nov.** *§896*
Acacia alpina F.Muell., Fragm. 3: 129 (1863).

Racosperma amandae (G.J.Leach) Pedley, **comb. nov.** *§641*
Acacia amandae G.J.Leach (as 'amanda'), Fl. Australia 11B: 488 (2001).

The specific epithet *amanda* was published deliberately as a noun in apposition with the generic name. Article 23 of the International Code of Botanical Nomenclature permits such usage, and further states that the epithet may be taken from any source whatever. On the other hand, Recommendation 23A states that the names of persons used in specific epithets should take the form of nouns in the genitive or of adjectives. Since, in practice, Recommendations often have the force of Articles and since 'scientific names of taxonomic groups are treated as Latin regardless of their derivation' (Principle IV), I consider the

lack of a genitive inflection to be an error to be corrected. See also *Racosperma dorotheae* and *R. veronicae.*

A complication in the present case is that *amanda*, as well as being a common enough English-language given name, is also the gerundive of the Latin *amo*, and could be, and has been when occurring in other genera, declined like any other adjectival epithet.

Racosperma amblygonum (A.Cunn. ex Benth.) Pedley, Austrobaileya 2: 344 (1987). *§302*

Racosperma amblyophyllum (F.Muell.) Pedley, **comb. nov.** *§99*
Acacia amblyophylla F.Muell., South. Sci. Rec. 2 (7): 149 (1882).

Racosperma amentiferum (F.Muell.) Pedley, **comb. nov.** *§741*
Acacia amentifera F.Muell., J. Proc. Linn Soc., Bot. 3: 141 (1859).

Racosperma ammobium (Maconochie) Pedley, Bot. J. Linn. Soc. 92: 247 (1986). *§801*

Racosperma ammophilum (Pedley) Pedley, Austrobaileya 2: 344 (1987). *§607*

Racosperma amoenum (H.L.Wendl.) Pedley, **comb. nov.** *§72*
Acacia amoena H.L.Wendl., Comm. Acac. Aphyll. 4 t. 4 (1820).

Racosperma ampliatum (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§848*
Acacia ampliata R.S.Cowan & Maslin, Nuytsia 10:16 (1995).

Racosperma ampliceps (Maslin) Pedley, **comb. nov.** *§219*
Acacia ampliceps Maslin, Nuytsia 1: 315 (1974).

Racosperma amputatum (Maslin) Pedley, **comb. nov.** *§940*
Acacia amputata Maslin, Nuytsia 12: 493 (1999).

Racosperma amycticum (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§569*
Acacia amyctica R.S.Cowan & Maslin, Nuytsia 10: 222 (1995).

Racosperma anarthon (Maslin) Pedley, **comb. nov.** *§949*
Acacia anarthos Maslin, Nuytsia 2: 354 (1979).

Racosperma anasillum (A.S.George) Pedley, **comb. nov.** *§917*
Acacia anasilla A.S.George, J. Roy. Soc. W. Australia 82: 67 (1999).

Racosperma anastemum (Maslin) Pedley, **comb. nov.** *§846*
Acacia anastema Maslin, Nuytsia 4: 383. (1983).

Racosperma anaticeps (Tindale) Pedley, **comb. nov.** *§642*
Acacia anaticeps Tindale, Contrib. New South Wales Natl Herb. 4: 269 (1972).

Racosperma anceps (DC.) Pedley, **comb. nov.** *§86*
Acacia anceps DC., Prodr. 2: 451 (1825).

Racosperma ancistrocarpum (Maiden & Blakely) Pedley, Austrobaileya 2: 344 (1987). *§758*

Racosperma ancistrophyllum (C.R.P.Andrews) Pedley, **comb. nov.** *§568*
Acacia ancistrophylla C.R.P.Andrews, J. W. Australia Nat. Hist. Soc. 40 (1904).

R. ancistrophyllum var. **lissophyllum** (J.M. Black) Pedley, **comb. nov.** *§568b*
Acacia sclerophylla var. *lissophylla* J.M.Black, Trans. & Proc. Roy. Soc. S. Australia 47: 369 (1923).

R. ancistrophyllum var. **perarcuatum** (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§568c*
Acacia ancistrophylla var. *perarcuata* R.S.Cowan & Maslin, Nuytsia 10: 227 (1995).

Racosperma andrewsii (W.V. Fitzg.) Pedley, **comb. nov.** *§353*
Acacia andrewsii W.V.Fitzg., J. W. Australia Nat. Hist. Soc. 6 (1904).

Racosperma aneurum (F.Muell. ex Benth.) Pedley, Austrobaileya 2: 344 (1987). *§839*

R. aneurum var. **argenteum** (Pedley) Pedley, **comb. nov.** *§839j*
Acacia aneura var. *argentea* Pedley, Fl. Australia 11B: 490 (2001).

R. aneurum var. **coniferum** (Randell) Pedley, **comb. nov.** *§839a*
Acacia aneura var. *conifera* Randell, J. Adelaide Bot. Gard. 14: 122 (1992).

R. aneurum var. **fuligineum** (Pedley) Pedley, **comb. nov.** *§839i*
Acacia aneura var. *fuliginea* Pedley, Fl. Australia 11B: 489 (2001).

R. aneurum var. **intermedium** (Pedley) Pedley, **comb. nov.** *§839g*
Acacia aneura var. *intermedia* Pedley, Fl. Australia 11B: 489 (2001).

R. aneurum var. **macrocarpum** (Randell) Pedley, **comb. nov.** *§839b*
Acacia aneura var. *macrocarpa* Randell, J. Adelaide Bot. Gard. 14: 121 (1992).

R. aneurum var.**microcarpum** (Pedley) Pedley, **comb. nov.** *§839c*
Acacia aneura var. *microcarpa* Pedley, Fl. Australia 11B: 489 (2001).

R. aneurum var. **majus** (Pedley) Pedley, **comb. nov.** *§839f*
Acacia aneura var. *major* Pedley, Fl. Australia 11B: 489 (2001).

R. aneurum var. **pilbaranum** (Pedley) Pedley, **comb. nov.** *§839e*
Acacia aneura var. *pilbarana* Pedley, Fl. Australia 11B: 489 (2001).

R. aneurum var. **tenue** (Pedley) Pedley, **comb. nov.** *§839d*
Acacia aneura var. *tenuis* Pedley, Fl. Australia 11B: 489 (2001).

Racosperma anfractuosum (Maslin) Pedley, **comb. nov.** *§887*
Acacia anfractuosa Maslin, Nuytsia 2: 96 (1976).

Racosperma angustum (Maiden & Blakely) Pedley, Austrobaileya 2: 344 (1987). *§129*

Racosperma anomalum (C.A.Gardner ex Court) Pedley, **comb. nov.** *§249*
Acacia anomala C.A.Gardner ex Court, Nuytsia 2: 168 (1978).

Racosperma anthochaerum (Maslin) Pedley, **comb. nov.** *§212*
Acacia anthochaera Maslin, Nuytsia 10: 183 (1995).

Racosperma aphanocladum (Maslin) Pedley, **comb. nov.** *§198*
Acacia aphanoclada Maslin, Nuytsia 8: 290 (1992).

Racosperma aphyllum (Maslin) Pedley, **comb. nov.** *§250*
Acacia aphylla Maslin, Nuytsia 1: 320 (1974).

Racosperma applanatum (Maslin) Pedley, **comb. nov.** *§254*
Acacia applanata Maslin, Nuytsia 10: 158 (1995).

Racosperma apreptum (Pedley) Pedley, Austrobaileya 2: 344 (1987). *§815*

Racosperma apricum (Maslin & A. R.Chapm.) Pedley, **comb. nov.** *§874*
Acacia aprica Maslin & A.R.Chapm., Nuytsia 12: 471 (1999).

Racosperma arafuricum (Tindale & Kodela) Pedley, **comb. nov.** *§612*
Acacia arafurica Tindale & Kodela, Telopea 5: 53 (1992).

Racosperma araneosum (Whibley) Pedley, **comb. nov.** *§89*
Acacia araneosa Whibley, Contrib. Herb. Austral. 14: 1 (1976).

Racosperma arbianum (Pedley) Pedley, **comb. nov.** *§163*
Acacia arbiana Pedley, Austrobaileya 5: 307 (1999).

Racosperma arcuatile (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§873*
Acacia arcuatilis R.S.Cowan & Maslin, Nuytsia 12: 472 (1999).

Racosperma areolatum (M.W.McDonald) Pedley, **comb. nov.** †
Acacia areolata M.W.McDonald, Austral. Syst. Bot. 16:142, t.2 (2003).

Racosperma argutifolium (Maslin) Pedley, **comb. nov.** *§361*
Acacia argutifolia Maslin, Nuytsia 2:98 (1976).

Racosperma argyraeum (Tindale) Pedley, Austrobaileya 2: 344 (1987). *§763*

Racosperma argyrodendron (Domin) Pedley, Austrobaileya 2: 345 (1987). *§611*

Racosperma argyrophyllum (Hook.) Pedley, **comb. nov.** *§176*
Acacia argyrophylla Hook., Bot. Mag. 74: t. 4384 (1848).

Racosperma argyrotrichum (Pedley) Pedley, **comb. nov.** *§585*
Acacia argyrotricha Pedley, Austrobaileya 5: 310 (1999).

Racosperma aridum (Benth.) Pedley, **comb. nov.** *§733*
Acacia arida Benth., London J. Bot. 1: 370 (1842).

Racosperma aristulatum (Maslin) Pedley, **comb. nov.** *§318*
Acacia aristulata Maslin, Nuytsia 12: 320 (1999).

Racosperma armillatum Pedley, Austrobaileya 2: 325 (1987). *§624*

Racosperma armitii (F.Muell. ex Maiden) Pedley, Austrobaileya 2: 345 (1987). *§700*

Racosperma arrectum (Maslin) Pedley, **comb. nov.** *§750*
Acacia arrecta Maslin, Nuytsia 4: 73 (1982).

Racosperma ascendens (Maslin) Pedley, **comb. nov.** *§477*
Acacia ascendens Maslin, Nuytsia 7: 223 (1990).

Racosperma asepalum (Maslin) Pedley, **comb. nov.** *§380*
Acacia asepala Maslin, Nuytsia 12: 321 (1999).

Racosperma ashbyae (Maslin) Pedley, **comb. nov.** *§40*
Acacia ashbyae Maslin, Nuytsia 1: 321 (1974).

Racosperma asparagoides (A.Cunn.) Pedley, **comb. nov.** *§293*
Acacia asparagoides A.Cunn. in B.Field, Geogr. Mem. New South Wales. 343 (1825).

Racosperma asperulaceum (F.Muell.) Pedley, Austrobaileya 2: 345 (1987). *§925*

Racosperma asperum (Lindl.) Pedley, **comb. nov.** *§451*
Acacia aspera Lindl., in T.L.Mitchell, Three Exped. Australia 2: 138 (1838).

Racosperma assimile (S.Moore) Pedley, **comb. nov.** *§534*
Acacia assimilis S. Moore, J. Linn. Soc., Bot. 45: 172 (1920).

R. assimile subsp. **atroviride** (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§534b*
Acacia assimilis subsp. *atroviridis* R.S.Cowan & Maslin, Nuytsia 10: 240 (1995).

Racosperma ataxiphyllum (Benth.) Pedley, **comb. nov.** *§356*
Acacia ataxiphylla Benth., Linnaea 26: 605 (1855).

R. ataxiphyllum subsp. **magnum** (Maslin) Pedley, **comb. nov.** *§356b*
Acacia ataxiphylla subsp. *magna* Maslin, Nuytsia 12: 324 (1999).

Racosperma atkinsianum (Maslin) Pedley, **comb. nov.** *§814*
Acacia atkinsiana Maslin, Nuytsia 4: 75 (1982).

Racosperma atopum (Pedley) Pedley, **comb. nov.** *§845*
Acacia atopa Pedley, Fl. Australia 11B: 490 (2001).

Racosperma atrox (Kodela) Pedley, **comb. nov.**
Acacia atrox Kodela, Telopea 9: 315 (2001). †

Racosperma attenuatum (Maiden & Blakely) Pedley, Austrobaileya 2: 345 (1987). *§70*

Racosperma aulacocarpum (A.Cunn. ex Benth.) Pedley, Austrobaileya 2: 345 (1987). *§670*

R. aulacocarpum var. **fruticosum** (C.White) Pedley, Austrobailey 2:345 (1987) **syn.nov.**

Racosperma aulacophyllum (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§533*
Acacia aulacophylla R.S.Cowan & Maslin, Nuytsia 10: 241 (1995).

Racosperma auratiflorum (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§502*
Acacia auratiflora R.S.Cowan & Maslin, Nuytsia 12: 414 (1999).

Racosperma aureocrinitum (Conn & Tame) Pedley, **comb. nov.** *§172*
Acacia aureocrinita Conn & Tame, Austral. Syst. Bot. 9: 851 (1996).

Racosperma auricomum (Maslin) Pedley, **comb. nov.** *§643*
Acacia auricoma Maslin, J. Adelaide Bot. Gard. 2: 303 (1980).

Racosperma auriculiforme (A.Cunn. ex Benth.) Pedley, Bot. J. Linn. Soc. 92: 247 (1986). *§671*

Racosperma auripilum (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§593*
Acacia auripila R.S.Cowan & Maslin, Nuytsia 12: 415 (1999).

Racosperma auronitens (Lindl.) Pedley, **comb. nov.** *§373*
Acacia auronitens Lindl., Sketch Veg. Swan R. xv (1839).

Racosperma ausfeldii (Regel) Pedley, **comb. nov.** *§457*
Acacia ausfeldii Regel, Index Sem. Hort. Petrop. 106 (1867).

Racosperma awestonii (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§499*
Acacia awestonii R.S.Cowan & Maslin, Nuytsia 7: 185 (1990).

Racosperma axillare (Benth.) Pedley, Bot. J. Linn. Soc. 92: 248 (1986). *§908*

Racosperma ayersianum (Maconochie) Pedley, **comb. nov.** *§840*
Acacia ayersiana Maconochie, J. Adelaide Bot. Gard. 1: 182 (1978).

Racosperma baeuerlenii (R.T.Baker) Pedley, Austrobaileya 2: 345 (1987). *§466*

Racosperma baileyanum (F.Muell.) Pedley, Austrobaileya 2: 345 (1987). *§30*

Racosperma bakeri (Maiden) Pedley, Austrobaileya 2: 345 (1987). *§656*

Racosperma balsameum (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§578*
Acacia balsamea R.S.Cowan & Maslin, Nuytsia 12: 417 (1999).

Racosperma bancroftiorum (Maiden) Pedley (as 'bancroftii'), Austrobaileya 2: 345 (1987). *§65*

Racosperma barakulense (Pedley) Pedley, **comb. nov.** *§sub 280*
Acacia barakulensis Pedley, Austrobaileya 5: 308 (1999).

Racosperma barattense (J.M.Black) Pedley, **comb. nov.** *§469*
Acacia barattensis J.M. Black, Trans. & Proc. Roy. Soc. S. Australia 56: 42 (1932).

Racosperma barbinerve (Benth.) Pedley, **comb. nov.** *§364*
Acacia barbinervis Benth., London J. Bot. 1: 326 (1842).

R. barbinerve subsp. **boreale** (Maslin) Pedley, **comb. nov.** *§364b*
Acacia barbinervis subsp. *borealis* Maslin, Nuytsia 12: 327 (1999).

Racosperma barringtonense (Tindale) Pedley, **comb. nov.** *§134*
Acacia barringtonensis Tindale, Telopea 1: 72 (1975).

Racosperma basedowii (Maiden) Pedley, **comb. nov.** *§309*
Acacia basedowii Maiden, J. & Proc. Roy. Soc. New South Wales 53: 197 (1920).

Racosperma baueri (Benth.) Pedley, Austrobaileya 2: 345 (1987). *§158*

R. baueri subsp. **asperum** (Maiden & Betche) Pedley, **comb.** et **stat. nov.** *§158b*
Acacia baueri var. *aspera* Maiden & Betche, Census New South Wales Plants 90 (1916).

Racosperma baxteri (Benth.) Pedley, **comb. nov.** *§354*
Acacia baxteri Benth (as 'Bagsteri'), London J. Bot. 1: *347* (1842).

Racosperma beauverdianum (Ewart & Sharman) Pedley, **comb. nov.** *§851*
Acacia beauverdiana Ewart & Sharman, Proc. Roy. Soc. Victoria n. ser. 28: 230 (1916).

Racosperma beckleri (Tindale) Pedley, Bot. J. Linn. Soc. 92: 248 (1986). *§180*

Racosperma benthamii (Meisn.) Pedley, **comb. nov.** *§545*
Acacia benthamii Meisn., in J.G.C.Lehmann, Pl. Preiss. 1: 11 (1844).

Racosperma betchei (Maiden & Blakely) Pedley, Austrobaileya 2: 345 (1987). *§119*

Racosperma bidentatum (Benth.) Pedley, **comb. nov.** *§316*
Acacia bidentata Benth., London J. Bot. 1: 333 (1842).

Racosperma bifarium (Maslin) Pedley, **comb. nov.** *§442*
Acacia bifaria Maslin, Nuytsia 10: 160 (1995).

Racosperma biflorum (R.Br.) Pedley, **comb. nov.** *§337*
Acacia biflora R. Br., in W.T. Aiton, Hortus Kew. ed 2. 5: 463 (1813).

Racosperma binatum (Maslin) Pedley, **comb. nov.** *§417*
Acacia binata Maslin, Nuytsia 2: 202 (1978).

Racosperma binervatum (DC.) Pedley, Austrobaileya 2: 345 (1987). *§57*

Racosperma binervium (Wendl.) Pedley, **comb. nov.** *§775*
Mimosa binervia Wendl., Bot. Beobot. 56 (1798).

Racosperma bivenosum (DC.) Pedley, **comb. nov.** *§220*
Acacia bivenosa DC., Prodr. 2: 452 (1825).

Racosperma blakei (Pedley) Pedley, Austrobaileya 2: 345 (1987). *§778*

R. blakei subsp. **diphyllum** (Tindale) Pedley, Austrobaileya 2: 345 (1987). *§778b*

Racosperma blakelyi (Maiden) Pedley, **comb. nov.** *§236*
Acacia blakelyi Maiden, J. & Proc. Roy. Soc. New South Wales 51: 246 (1917).

Racosperma blaxellii (Maslin) Pedley, **comb. nov.** *§420*
Acacia blaxellii Maslin, Nuytsia 12: 328 (1999).

Racosperma blayanum (Tindale & Court) Pedley, **comb. nov.** *§17*
Acacia blayana Tindale & Court, Telopea 4: 109 (1990).

Racosperma boormanii (Maiden) Pedley, **comb. nov.** *§150*
Acacia boormanii Maiden, J. & Proc. Roy. Soc. New South Wales 49: 489 (1916).

Racosperma botrydion (Maslin) Pedley, **comb. nov.** *§402*
Acacia botrydion Maslin, Nuytsia 4: 30 (1982).

Racosperma brachybotryum (Benth.) Pedley, **comb. nov.** *§175*
Acacia brachybotrya Benth., London J. Bot. 1: 347 (1842).

Racosperma brachycarpum (Pedley) Pedley, Austrobaileya 2: 345 (1987). *§290*

Racosperma brachycladum (W.V.Fitzg.) Pedley, **comb. nov.** *§325*
Acacia brachyclada W.V.Fitzg., J. Bot. 50: 20 (1912).

Racosperma brachyphyllum (Benth.) Pedley, **comb. nov.** *§493*
Acacia brachyphylla Benth., Linnaea 26: 615 (1855).

R. brachyphyllum var. **recurvatum** (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§493b*
Acacia brachyphylla var. *recurvata* R.S.Cowan & Maslin, Nuytsia 9:72 (1993).

Racosperma brachypodum (Maslin) Pedley, **comb.nov.** *§478*
Acacia brachypoda Maslin, Nuytsia 7: 225 (1990).

Racosperma brachystachyum (Benth.) Pedley, Austrobaileya 2: 345 (1987). *§836*

Racosperma bracteolatum (Maslin) Pedley, **comb.nov.** *§443*
Acacia bracteolata Maslin, Nuytsia 12: 329 (1999).

Racosperma brassii (Pedley) Pedley, Austrobaileya 2: 345 (1987). *§690*

Racosperma brockii (Tindale & Kodela) Pedley, **comb.nov.** *§712*
Acacia brockii Tindale & Kodela, Telopea 5: 62 (1992).

Racosperma brownei (Poir.) Pedley, Austrobaileya 2: 346 (1987). *§291*

Racosperma brownianum (H.L.Wendl.) Pedley, **comb.nov.** *§934*
Acacia browniana H.L.Wendl., Flora 2: 139 (1819).

R. brownianum var. **endlicheri** (Meisn.) Pedley, **comb.** et **stat. nov.** *§934c*
Acacia endlicheri Meisn., in J.G.C.Lehmann, Pl. Preiss. 1: 21 (1844).

R. brownianum var. **glaucescens** (Maslin) Pedley, **comb. nov.** *§934e*
Acacia browniana var. *glaucescens* Maslin, Nuytsia 2: 356 (1979).

R. brownianum var. **intermedium** (E.Pritzel) Pedley, **comb. nov.** *§934d*
Acacia strigosa var. *intermedia* E. Pritzel, Bot. Jahr. Syst. 35: 312 (1904).

R. brownianum var. **obscurum** (A.DC.) Pedley, **comb.** et **stat. nov.** *§934b*
Acacia obscura A. DC., Mem. Soc. Phys. Genève 6: 605 (1834).

Racosperma brumale (Maslin) Pedley, **comb. nov.** *§100*
Acacia brumalis Maslin, Nuytsia 10: 185 (1995).

Racosperma brunioides (A.Cunn. ex G.Don) Pedley, Austrobaileya 2: 346 (1987). *§161*

R. brunioides subsp. **graniticum** (Pedley) Pedley, Austrobaileya 2: 346 (1987). *§161b*

Racosperma bulgaense (Tindale & S.Davies) Pedley, **comb. nov.** *§777*
Acacia bulgaensis Tindale & S.Davies, Austral. Syst. Bot. 5: 645 (1992).

Racosperma burbidgeae (Pedley) Pedley, Austrobaileya 2: 346 (1987). *§281*

Racosperma burdekense (Pedley) Pedley, **comb. nov.** *§sub 666*
Acacia burdekensis Pedley, Austrobaileya 5: 313 (1999).

Racosperma burkittii (F.Muell. ex Benth.) Pedley, **comb. nov.** *§sub 866*
Acacia burkittii F.Muell. ex Benth., Fl. Austral. 2: 400 (1864).

Kodela & Tindale (1998) and the NSW contributors to the *Flora of Australia* treated *Acacia burkittii* as a subspecies of *A. acuminata (866).* Maslin in WATTLE, citing an unpublished report on variation in the '*Acacia acuminata* (Jam) group', treated the two as distinct species.

Racosperma burrowii (Maiden) Pedley, Austrobaileya 2: 346 (1987). *§776*

Racosperma buxifolium (A.Cunn.) Pedley, Austrobaileya 2: 346 (1987). *157*

R. buxifolium subsp. **pubiflorum** (Pedley) Pedley, Austrobaileya 2: 346 (1987). *§157b*

Racosperma bynoeanum (Benth.) Pedley, **comb. nov.** *§522*
Acacia bynoeana Benth., Linnaea 26: 614 (1855).

Racosperma caerulescens (Maslin & Court) Pedley, **comb. nov.** *§61*
Acacia caerulescens Maslin & Court, Muelleria 7: 131 (1989).

Racosperma caesariatum (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§496*
Acacia caesariata R.S.Cowan & Maslin, Nuytsia 7: 210 (1990).

Racosperma caesiellum (Maiden & Blakely) Pedley, **comb. nov.** *§132*
Acacia caesiella Maiden & Blakely, J. & Proc. Roy. Soc. New South Wales 60: 180 (1927).

Racosperma calamifolium (Sweet ex Lindl.) Pedley, **comb. nov.** *§81*
Acacia calamifolia Sweet ex Lindl., Bot. Reg. 10: t. 839 (1824).

Racosperma calanthum (Pedley) Pedley, Austrobaileya 2: 346 (1987). *§277*

Racosperma calcaratum (Maiden & Blakely) Pedley, **comb. nov.** *§381*
Acacia calcarata Maiden & Blakely, J. Roy. Soc. W. Australia 13: 2 (1928).

Racosperma calcicola (Forde & Ising) Pedley, Austrobaileya 2: 346 (1987). *§606*

Racosperma caleyi (A.Cunn. ex Benth.) Pedley, **comb. nov.** *§117*
Acacia caleyi A.Cunn. ex Benth., London J. Bot. 1: 347 (1842).

Racosperma calligerum Pedley, **nom.** et **stat. nov.** *§756c*
Acacia wickhamii subsp. *parviphyllodinea* Tindale, Kodela & D.Keith, Fl. Australia 11B: 488 (2001) *A. calligera* F. Muell, J. Proc. Linn. Soc., Bot. 3: 141 (1859), *pro syn., nom. invalid.*

A. wickhamii subsp. *viscidula* (F.Muell.) Tindale, Kodela & D. Keith, Fl. Australia 11B: 488 (2001); **syn. nov.** *A. wickhamii* var. *viscidula* F. Muell., J. Proc. Linn. Soc. 3: 141 (1859), **syn. nov.**

As discussed at some length elsewhere (Pedley 2002), Bentham, in editing Mueller's (1859) paper, relegated some of his names to synonymy. Most of these have since been validated. Here I have taken up Mueller's specific epithet but based the name on *Acacia wickhamii* subsp. *parviphyllodinea*, type material of which has been widely distributed among Australian herbaria. *Acacia wickhamii* subsp. *viscidula* may warrant formal recognition but is not specifically distinct from *R. calligerum*.

Racosperma calyculatum (ACunn. ex Benth.) Pedley, Austrobaileya 2: 346 (1987). *§768*

Racosperma cambagei (R.T.Baker) Pedley, Austrobaileya 2: 346 (1987). *§609*

Racosperma camptocladum (C.R.P.Andrews) Pedley, **comb. nov.** *§215*
Acacia camptoclada C.R.P.Andrews, J. W. Australia Nat. Hist. Soc. 39 (May 1904).

Racosperma campylophyllum (Benth.) Pedley, **comb. nov.** *§554*
Acacia campylophylla Benth., Linnaea 26: 605 (1855).

Racosperma cangaiense (Tindale & Kodela) Pedley, **comb. nov.** *§21*
Acacia cangaiensis Tindale & Kodela, Austral. Syst. Bot. 4: 582 (1991).

Racosperma canum (Maiden) Pedley, Austrobaileya 2: 346 (1987). *§604*

Racosperma capillare (A.S.George) Pedley, **comb. nov.** *§918*
Acacia capillaris A.S. George, J. Roy. Soc. W. Australia 82: 69 (1999).

Racosperma cardiophyllum (A.Cunn. ex Benth.) Pedley, **comb. nov.** *§33*
Acacia cardiophylla A.Cunn. ex Benth., London J. Bot. 1: 385 (1842).

Racosperma carens (Maslin) Pedley, **comb. nov.** *§372*
Acacia carens Maslin, Nuytsia 10: 172 (1995).

Racosperma carneorum (Maiden) Pedley, **comb. nov.** *§186*
Acacia carneorum Maiden (as 'carnei'), J. & Proc. Roy. Soc. New South Wales 49: 470 (1916).

Racosperma carnulosum (Maslin) Pedley, **comb. nov.** *§423*
Acacia carnulosa Maslin, Nuytsia 12: 331 (1999).

Racosperma caroleae (Pedley) Pedley, Austrobaileya 2: 346 (1987). *§799*

Racosperma cassiculum (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§503*
Acacia cassicula R.S.Cowan & Maslin, Nuytsia 7: 187 (1990).

Racosperma castanostegium (Maslin) Pedley, **comb. nov.** *§238*
Acacia castanostegia Maslin, Nuytsia 12: 332 (1999).

Racosperma cataractae (Tindale & Kodela) Pedley, **comb. nov.** *§759*
Acacia cataractae Tindale & Kodela, Telopea 5: 56 (1992).

Racosperma catenulatum (C.T.White) Pedley, Austrobaileya 2: 346 (1987). *§843*

Racosperma caveale (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§375*
Acacia cavealis R.S.Cowan & Maslin, Nuytsia 12: 454 (1999).

Racosperma cedroides (Benth.) Pedley, **comb. nov.** *§359*
Acacia cedroides Benth., Linnaea 26: 615 (1855).

Racosperma celastrifolium (Benth.) Pedley, **comb. nov.** *§258*
Acacia celastrifolia Benth., London J. Bot. 1: 349 (1842).

Racosperma celsum (Tindale) Pedley, **comb. nov.** *§sub 670*
Acacia celsa Tindale, Austral. Syst. Bot. 13: 34 (2000).

Racosperma centrinervium (Maiden & Blakely) Pedley, Austrobaileya 2: 346. (1987). *§sub 450*

The name may be a synonym of *R. lineatum*, but the transfer to *Racosperma* is warranted pending further investigation.

Racosperma cerastes (Maslin) Pedley, **comb. nov.** *§387*
Acacia cerastes Maslin, Nuytsia 10: 173 (1995).

Racosperma chalkeri (Maiden) Pedley, **comb. nov.** *§74*
Acacia chalkeri Maiden, J. & Proc. Roy. Soc. New South Wales 49: 482 (1916).

Racosperma chamaeleon (Maslin) Pedley, **comb. nov.** *§101*
Acacia chamaeleon Maslin, Nuytsia 10: 189 (1995).

Racosperma chapmanii (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§552*
Acacia chapmanii R.S.Cowan & Maslin, Nuytsia 12: 455 (1999).

R. chapmanii subsp. **australe** (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§552b*
Acacia chapmanii subsp. *australis* R.S.Cowan & Maslin, Nuytsia 12: 457 (1999).

Racosperma chartaceum (Maslin) Pedley, **comb. nov.** *§204*
Acacia chartacea Maslin, Nuytsia 8: 293 (1992).

Racosperma cheelii (Blakely) Pedley, **comb. nov.** *§781*
Acacia cheelii Blakely, Proc. Linn. Soc. New South Wales ser. 2. 42: 441 (1917).

Racosperma chinchillense (Tindale) Pedley, Austrobaileya 2: 346 (1987). *§20*

Racosperma chippendalei (Pedley) Pedley, Austrobaileya 2: 346 (1987). *§915*

Racosperma chisholmii (F.M.Bailey) Pedley, Austrobaileya 2: 346 (1987). *§725*

Racosperma chrysellum (Maiden & Blakely) Pedley, **comb. nov.** *§103*
Acacia chrysella Maiden & Blakely, J. Roy. Soc. W. Australia 13: 16 (1928).

Racosperma chrysocephalum (Maslin) Pedley, **comb. nov.** *§336*
Acacia chrysocephala Maslin, Nuytsia 2: 304 (1978).

Racosperma chrysochaetum (Maslin) Pedley, **comb. nov.** *§718*
Acacia chrysochaeta Maslin, Nuytsia 4: 367 (1983).

Racosperma chrysopodum (Maiden & Blakely) Pedley, **comb. nov.** *§505*
Acacia chrysopoda Maiden & Blakely, J. Roy. Soc. W. Australia 13: 10 (1928).

Racosperma chrysotrichum (Tindale) Pedley, **comb. nov.** *§34*
Acacia chrysotricha Tindale, Contrib. New South Wales Natl Herb. 4: 20 (1966).

Racosperma cincinnatum (F.Muell.) Pedley, Austrobaileya 2: 347 (1987). *§673*

Racosperma citrinoviride (Tindale & Maslin) Pedley, **comb. nov.** *§830*
Acacia citrinoviridis Tindale & Maslin, Nuytsia 2: 86 (1976).

Racosperma clandullense (Conn & Tame) Pedley, **comb. nov.** *§171*
Acacia clandullensis Conn & Tame, Austral. Syst. Bot. 9: 849 (1996).

Racosperma clelandii (Pedley) Pedley, **comb. nov.** *§837*
Acacia clelandii Pedley, Fl. Australia 11B: 488 (2001).

Racosperma clivicola (Pedley) Pedley, **comb. nov.** *§sub 818*
Acacia clivicola Pedley, Contrib. Queensland Herb. 15: 7 (1974).

Racosperma clunies-rossiae (Maiden) Pedley, **comb. nov.** *§133*
Acacia clunies-rossiae Maiden, J. & Proc. Roy. Soc. New South Wales 49: 486 (1916).

Racosperma clydonophorum (Maslin) Pedley, **comb. nov.** *§256*
Acacia clydonophora Maslin, Nuytsia 10: 87 (1995).

Racosperma cochleare (Labill.) Pedley, **comb. nov.** *§544*
Mimosa cochlearis Labill., Nov. Holl. Pl. 2: 85. t. 234 (1807).

Racosperma cochlocarpum (Meisn.) Pedley, **comb. nov.** *§884*
Acacia cochlocarpa Meisn., Bot. Zeitung (Berlin) 13: 10 (1855).

R. cochlocarpum subsp. **velutinosum** (Maslin & A.R. Chapm.) Pedley, **comb. nov.** *§884b*
Acacia cochlocarpa Meisn. subsp. *velutinosa* Maslin & A.R.Chapm., Nuytsia 12: 475 (1999).

Racosperma cognatum (Domin) Pedley, **comb. nov.** *§464*
Acacia cognata Domin, Biblioth. Bot. 89: 260 (1926).

Racosperma colei (Maslin & L.A.J.Thomson) Pedley, **comb. nov.** *§682*
Acacia colei Maslin & L.A.J.Thomson, Austral. Syst. Bot. 5: 737 (1992).

Racosperma colletioides (Benth.) Pedley, **comb. nov.** *§547*
Acacia colletioides Benth., London J. Bot. 1: 336 (1842).

Racosperma comans (W.V.Fitzg.) Pedley, **comb. nov.** *§542*
Acacia comans W.V.Fitzg., J. W. Australia Nat. Hist. Soc. 5 (1904).

Racosperma complanatum (A.Cunn. ex Benth.) Pedley, Austrobaileya 2: 347 (1987). *§631*

Racosperma concolorans (Maslin) Pedley, **comb. nov.** *§383*
Acacia concolorans Maslin, Nuytsia 12: 334 (1999).

Racosperma concurrens (Pedley) Pedley, Bot. J. Linn. Soc. 92: 248 (1986). *§665*

Racosperma confertum (A.Cunn. ex Benth) Pedley, Austrobaileya 2: 347 (1987). *§164*

Racosperma confluens (Maiden & Blakely) Pedley, Bot. J. Linn. Soc. 92: 248 (1986). *§95*

***Racosperma confusum** (Merr.) Pedley, Bot. J. Linn. Soc. 92: 248 (1986). †
Acacia confusa Merr., Philip. J. Sci. 5 (Bot.): 27 (1920); Pedley, Contrib. Queensland Herb. 18: 12 (1975); I. Nielsen, Fl. Malesiana ser. I. 11: 61 (1992).

Racosperma congestum (Benth.) Pedley, **comb. nov.** *§395*
Acacia congesta Benth, London J. Bot. 1: 327 (1842).

R. congestum subsp. **cliftonianum** (W.V. Fitzg.) Pedley, **comb.** et **stat. nov.** *§395b*
Acacia cliftoniana W.V. Fitzg., J. W. Australia Nat. Hist. Soc. 10 (1904).

R. congestum subsp. **wonganense** (Maslin) Pedley, **comb. nov.** *§395c*
Acacia congesta subsp. *wonganensis* Maslin, Nuytsia 12: 338 (1999).

Racosperma conjunctifolium (F. Muell.) Pedley, Austrobaileya 2: 347 (1987). *§740*

Racosperma connianum (Maslin) Pedley, **comb. nov.** *§804*
Acacia conniana Maslin, Nuytsia 5: 323 (1985).

Racosperma consanguineum (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§538*
Acacia consanginea R.S.Cowan & Maslin, Nuytsia 10: 243 (1995).

Racosperma consobrinum (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§507*
Acacia consobrina R.S.Cowan & Maslin, Nuytsia 7: 189 (1990).

Racosperma conspersum (F.Muell.) Pedley, **comb. nov.** *§705*
Acacia conspersa F. Muell., J. Proc. Linn. Soc., Bot. 3: 140 (1859).

Racosperma constablei (Tindale) Pedley, **comb. nov.** *§48*
Acacia constablei Tindale, Telopea 1: 429 (1980).

Racosperma continuum (Benth.) Pedley, **comb. nov.** *§307*
Acacia continua Benth., Fl. Austral. 2: 322 (1864).

Racosperma convallium (Pedley) Pedley, **comb. nov.** *§650*
Acacia convallium Pedley, Austrobaileya 5: 312 (1999).

Racosperma coolgardiense (Maiden) Pedley, **comb. nov.** *§847*
Acacia coolgardiensis Maiden, J. & Proc. Roy. Soc. New South Wales 53: 211 (1920).

R. coolgardiense subsp. **effusum** (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§847b*
Acacia coolgardiensis subsp. *effusa* R.S.Cowan & Maslin, Nuytsia 10: 21 (1995).

R. coolgardiense subsp. **latius** (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§847c*
Acacia coolgardiensis subsp. *latior* R.S.Cowan & Maslin, Nuytsia 10: 22 (1995).

Racosperma coriaceum (DC.) Pedley, Bot. J. Linn. Soc. 92: 248 (1986). *§591*

R. coriaceum subsp. **pendens** (R.S. Cowan & Maslin) Pedley, **comb. nov.** *§591b*
Acacia coriacea subsp. *pendens* R.S.Cowan & Maslin, Nuytsia 9: 86 (1993).

R. coriaceum subsp. **sericophyllum** (F.Muell.) Pedley, **comb. et stat. nov.** *§591c*
Acacia sericophylla F. Muell., J. Proc. Linn. Soc., Bot. 3: 122 (1859).

Racosperma costatum (Benth.) Pedley, **comb. nov.** *§363*
Acacia costata Benth., London J. Bot. 1: 339 (1842).

Racosperma costinianum (Tindale) Pedley, **comb. nov.** *§136*
Acacia costiniana Tindale, Telopea 1: 441 (1980).

Racosperma courtii (Tindale & Herscovitch) Pedley, **comb. nov.** *§904*
Acacia courtii Tindale & Herscovitch, Telopea 4: 115 (1990).

Racosperma covenyi (Tindale) Pedley, **comb. nov.** *§138*
Acacia covenyi Tindale, Telopea 1: 432 (1980).

Racosperma cowanianum (Maslin) Pedley, **comb. nov.** *§473*
Acacia cowaniana Maslin. Nuytsia 7: 226 (1990).

Racosperma cowleanum (Tate) Pedley, Austrobaileya 2: 347 (1987). *§684*
R. oligophlebum (Pedley) Pedley, Austrobaileya 2:353 (1987), **syn. nov.**

Racosperma cracente (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§878*
Acacia cracentis R.S.Cowan & Maslin, Nuytsia 12: 476 (1999).

Racosperma craspedocarpum (F.Muell.) Pedley, **comb. nov.** *§842*
Acacia craspedocarpa F.Muell., Chemist & Druggist Australas. 2:73 (1887).

Racosperma crassicarpum (A.Cunn. ex Benth.) Pedley, Austrobaileya 2: 347 (1987). *§669*

Racosperma crassistipulum (Benth.) Pedley, **comb. nov.** *§329*
Acacia crassistipula Benth., London J. Bot. 1: 326 (1842).

Racosperma crassiusculum (H.L.Wendl.) Pedley, **comb. nov.** *§233*
Acacia crassiuscula H.L.Wendl., Comm. Acac. Aphyll. 5, 31 (1820).

Racosperma crassuloides (Maslin) Pedley, **comb. nov.** *§416*
Acacia crassuloides Maslin, Nuytsia 2: 203 (1978).

Racosperma crassum (Pedley) Pedley, Austrobaileya 2: 347 (1987). *§664*

R. crassum subsp. **longicomum** (Pedley) Pedley, Austrobaileya 2: 347 (1987). *§664b*

Racosperma cremiflorum (Conn & Tame) Pedley, **comb. nov.** *§173*
Acacia cremiflora Conn & Tame, Austral. Syst. Bot. 9: 853 (1996).

Racosperma crenulatum (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§808*
Acacia crenulata R.S.Cowan & Maslin, Nuytsia 12: 418 (1999).

Racosperma cretaceum (Maslin & Whibley) Pedley, **comb. nov.** *§90*
Acacia cretacea Maslin & Whibley, Nuytsia 6: 27 (1987).

Racosperma cretatum (Pedley) Pedley, Austrobaileya 2: 347 (1987). *§659*

Racosperma crispulum (Benth.) Pedley, **comb. nov.** *§330*
Acacia crispula Benth., Linnaea 26: 606 (1855).

Racosperma crombiei (C.T. White) Pedley, Bot. J. Linn. Soc. 92: 247 (1986). *§184*

Racosperma cultriforme (A.Cunn. ex G.Don.) Pedley, Austrobaileya 2: 347 (1987). *§153*

Racosperma cummingianum (Maslin) Pedley, **comb. nov.** *§371*
Acacia cummingiana Maslin, Nuytsia 10: 175 (1995).

Racosperma cuneifolium (Maslin) Pedley, **comb. nov.** *§398*
Acacia cuneifolia Maslin, Nuytsia 12: 339 (1999).

Racosperma curranii (Maiden) Pedley, Austrobaileya 2: 347 (1987). *§809*

Racosperma curvatum (Maslin) Pedley, **comb. nov.** *§553*
Acacia curvata Maslin, Nuytsia 2: 148 (1977).

Racosperma cuspidifolium (Maslin) Pedley, **comb. nov.** *§206*
Acacia cuspidifolia Maslin, Nuytsia 4: 79 (1982).

Racosperma cuthbertsonii (Luehm.) Pedley, **comb. nov.** *§823*
Acacia cuthbertsonii Luehm., Victorian Naturalist 13: 117 (1897).

R. cuthbertsonii subsp. **lineare** (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§823b*
Acacia cuthbertsonii subsp. *linearis* R.S.Cowan & Maslin, Nuytsia 10: 25 (1995).

Racosperma cylindricum (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§892*
Acacia cylindrica R.S.Cowan & Maslin, Nuytsia 10: 31 (1995).

Racosperma cyperophyllum (F. Muell. ex Benth.) Pedley, Austrobaileya 2: 347 (1987). *§810*

R. cyperophyllum var. **omearanum** (Maslin) Pedley, **comb. nov.** *§810b*
Acacia cyperophylla var. *omearana* Maslin. W. Austral. Naturalist 18: 186 (1991).

Racosperma dacrydioides (Tindale) Pedley, **comb. nov.** *§717*
Acacia dacrydioides Tindale, Telopea 1: 77 (1975).

Racosperma dallachianum (F.Muell,) Pedley, **comb. nov.** *§901*
Acacia dallachiana F.Muell., Fragm. 1: 7 (1858).

Racosperma dangarense (Tindale & Kodela) Pedley, **comb. nov.** *§50*
Acacia dangarensis Tindale & Kodela, Austral. Syst. Bot. 4: 586 (1991).

Racosperma daviesii (Bartolome) Pedley, **comb. nov.** *§sub 452*
Acacia daviesii Bartolome, Austral. Syst. Bot. 15: 472 (2002).

Racosperma daviesioides (C.A.Gardner) Pedley, **comb. nov.** *§386*
Acacia daviesioides C.A.Gardner, J. Roy. Soc. W. Australia 27: 173 (1942).

Racosperma daweanum (Maslin) Pedley, **comb. nov.** *§829*
Acacia daweana Maslin, Nuytsia 4: 82 (1982).

Racosperma dawsonii (R.T.Baker) Pedley, Austrobaileya 2: 347 (1987). *§480*

Racosperma dealbatum (Link) Pedley, Austrobaileya 2: 358 (1987). *§52*

R. dealbatum subsp. **subalpinum** (Tindale & Kodela) Pedley, **comb. nov.** *§52b*
Acacia subdealbata subsp. *subalpina* Tindale & Kodela, Telopea 9: 319 (2001).

Racosperma deanei (R.T.Baker) Pedley, Bot. J. Linn. Soc. 92: 248 (1986). *§40*

R. deanei subsp. **paucijugum** (F.Muell. ex N.A. Wakef.) Pedley, **comb. et stat. nov.** *§40b*
Acacia paucijuga F. Muell. ex N.A. Wakef., Victorian Naturalist 72: 93 (1955).

Racosperma debile (Tindale) Pedley, Austrobaileya 2: 347 (1987). *§16*

Racosperma declinatum (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§495*
Acacia declinata R.S.Cowan & Maslin, W. Austral. Naturalist 18: 79 (1990).

Racosperma decorum (Rchb.) Pedley, Austrobaileya 2: 347 (1987). *§116*

Racosperma decurrens (Willd.) Pedley, Austrobaileya 2: 358 (1987). *§49*

Racosperma deficiens (Maslin) Pedley, **comb. nov.** *§409*
Acacia deficiens Maslin, Nuytsia 12: 340 (1999).

Racosperma deflexum (Maiden & Blakely) Pedley, **comb. nov.** *§486*
Acacia deflexa Maiden & Blakely, J. Roy. Soc. W. Australia 13: 18 (1928).

Racosperma delibratum (A.Cunn. ex Benth.) Pedley, **comb. nov.** *§736*
Acacia delibrata A.Cunn. ex Benth., London J. Bot. 1: 374 (1842).

Racosperma delicatulum (Tindale & Kodela) Pedley, **comb. nov.** *§744*
Acacia delicatula Tindale & Kodela, Telopea 5: 58 (1992).

Racosperma delphinum (Maslin) Pedley, **comb. nov.** *§332*
Acacia delphina Maslin, Nuytsia 2: 322 (1978).

Racosperma deltoideum (A.Cunn. ex G.Don) Pedley, Austrobaileya 2: 315 (1987). *§617*
Acacia vincentii R.S.Cowan & Maslin, Nuytsia 7: 207 (1990), **syn. nov.**

Acacia vincentii R.S.Cowan & Maslin (no. *614*) is based on the aberrant specimen of *Racosperma deltoideum* noted by Pedley (1987a).

R. deltoideum subsp. **amplum** (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§617b*
Acacia deltoideum subsp. *ampla* R.S.Cowan & Maslin, Nuytsia 7: 206 (1990)

Racosperma demissum (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§833*
Acacia demissa R.S.Cowan & Maslin, Nuytsia 10: 25 (1995).

Racosperma dempsteri (F. Muell.) Pedley, **comb. nov.** *§202*
Acacia dempsteri F.Muell., Fragm. 11: 65 (1879).

Racosperma densiflorum (Morrison) Pedley, **comb. nov.** *§575*
Acacia densiflora Morrison, Scott. Bot. Rev. 1: 96 (1912).

Racosperma denticulosum (F.Muell.) Pedley, **comb. nov.** *§893*
Acacia denticulosa F.Muell., Fragm. 10: 32 (1876).

Racosperma dentiferum (Benth.) Pedley, **comb. nov.** *§392*
Acacia dentifera Benth., Botanist 4: t. 179 (1848).

Racosperma depressum (Maslin) Pedley, **comb. nov.** *§939*
Acacia depressa Maslin, Nuytsia 1: 422 (1975).

Racosperma dermatophyllum (Benth.) Pedley, **comb. nov.** *§433*
Acacia dermatophylla Benth., Fl. Australia 2: 346 (1864).

Racosperma desertorum (Maiden & Blakely) Pedley, **comb. nov.** *§891*
Acacia desertorum Maiden & Blakely, J. Roy. Soc. W. Australia 13: 24 (1927).

R. desertorum var. **nudipes** (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§891b*
Acacia desertorum var. *nudipes* R.S.Cowan & Maslin, Nuytsia 10: 34 (1995).

Racosperma deuteroneurum (Pedley) Pedley, Austrobaileya 2: 347 (1987). *§77*

Racosperma diaphanum (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§421*
Acacia diaphana R.S.Cowan & Maslin, Nuytsia 12: 420 (1999).

Racosperma diaphyllodineum (Maslin) Pedley, **comb. nov.** *§415*
Acacia diaphyllodinea Maslin, Nuytsia 2: 206 (1978).

Racosperma dictyoneurum (E. Pritzel) Pedley, **comb. nov.** *§500*
Acacia dictyoneura E.Pritzel, Bot. Jahr. Syst. 35: 303 (1904).

Racosperma dictyophlebum (F.Muell.) Pedley, Austrobaileya 2: 347 (1987). *§269*

Racosperma didymum (A.R.Chapm. & Maslin) Pedley, **comb. nov.** *§229*
Acacia didymum A.R.Chapm. & Maslin, Nuytsia 8: 268 (1992).

Racosperma dielsii (E.Pritzel) Pedley, **comb. nov.** *§561*
Acacia dielsii E.Pritzel, Bot. Jahr. Syst. 35: 294 (1904).

Racosperma dietrichianum (F.Muell.) Pedley, Austrobaileya 2: 347 (1987). *§191*

Racosperma difficile (Maiden) Pedley, Austrobaileya 2: 348 (1987). *§692*

Racosperma difforme (R.T.Baker) Pedley, **comb. nov.** *§110*
Acacia difformis R.T.Baker, Proc. Linn. Soc. New South Wales 22: 154 (1897).

Racosperma dilatatum (Benth.) Pedley, **comb. nov.** *§366*
Acacia dilatata Benth., Linnaea 26: 608 (1855).

Racosperma dimidiatum (Benth.) Pedley, Austrobaileya 2: 348 (1987). *§657*

Racosperma diminutum (Maslin) Pedley, **comb. nov.** *§408*
Acacia diminuta Maslin, Nuytsia 12: 342 (1999).

Racosperma disparrimum (M.W. McDonald & Maslin) Pedley, **comb. nov.** *§sub 670*
Acacia disparrima M.W.McDonald & Maslin, Austral. Syst. Bot. 13: 46 (2000).

R. disparrimum subsp. **calidestre** (M.W. McDonald & Maslin) Pedley, **comb. nov.** *§sub 670*
Acacia disparrima subsp. *calidestris* M.W.McDonald & Maslin, Austral. Syst. Bot. 13: 52 (2000).

Racosperma dissimile (M.W.McDonald) Pedley, **comb. nov.** *§sub 691*
Acacia dissimilis M.W.McDonald, Austral. Syst. Bot. 16:147. t.6 (2003).

Racosperma dissonum (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§572*
Acacia dissona R.S.Cowan & Maslin, Nuytsia 10: 209 (1995).

R. dissonum var. **indolorium** (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§572b*
Acacia dissona var. *indoloria* R.S.Cowan & Maslin, Nuytsia 10: 211 (1995).

Racosperma distans (Maslin) Pedley, **comb. nov.** *§794*
Acacia distans Maslin, Nuytsia 4: 386 (1983).

Racosperma distichum (Maslin) Pedley, **comb. nov.** *§261*
Acacia disticha Maslin, Nuytsia 10: 89 (1995).

Racosperma divergens (Benth.) Pedley, **comb. nov.** *§340*
Acacia divergens Benth., London J. Bot. 1: 331 (1842).

Racosperma dodonaeifolium (Pers.) Pedley, **comb. nov.** *§458*
Mimosa dodonaeifolia Pers., Syn. Pl. 2: 261 (1806).

Racosperma dolicophyllum (Maslin) Pedley, **comb. nov.** *§620*
Acacia dolichophylla Maslin, J. Adelaide Bot. Gard. 2: 307 (1980).

Racosperma donaldsonii (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§586*
Acacia donaldsonii R.S.Cowan & Maslin, Nuytsia 12: 458 (1999).

Racosperma doratoxylon (A.Cunn.) Pedley, **comb. nov.** *§798*
Acacia doratoxylon A.Cunn., in B.Field, Geogr. Mem. New South Wales 345 (1825).

Racosperma dorotheae (Maiden) Pedley, **comb. nov.** *§135*
Acacia dorotheae Maiden (as 'dorothea'), Proc. Linn Soc. New South Wales 26: 12 (1901).

Despite the contrary opinion of Hall & Johnson (1993), I consider the epithet *dorothea* to be an orthographic error to be corrected under the International Code of Botanical Nomenclature. See note under *R. amandae*.

Racosperma dorsennum (Maslin) Pedley, **comb. nov.** *§216*
Acacia dorsenna Maslin, Nuytsia 10: 192 (1995).

Racosperma drepanocarpum (F.Muell.) Pedley, Austrobaileya 2: 348 (1987). *§773*

R. drepanocarpum var. **latifolium** (Pedley) Pedley, **comb.** et **stat. nov.** *§773b*
Acacia drepanocarpa subsp. *latifolia* Pedley, Contrib. Queensland Herb. 15: 10 (1974). *R. drepanocarpum* subsp. *latifolium* (Pedley) Pedley. Austrobaileya 2: 348 (1987), **syn. nov.**

Racosperma drepanophyllum (Maslin) Pedley, **comb. nov.** *§868*
Acacia drepanophylla Maslin, Nuytsia 4: 389 (1983).

Racosperma drewianum (W.V.Fitzg.) Pedley, **comb. nov.** *§948*
Acacia drewiana W.V.Fitzg., in J.H.Maiden, J. & Proc. Roy. Soc. New South Wales, 51: 273 (1917).

R. drewianum subsp. **minus** (Maslin) Pedley, **comb. nov.** *§948b*
Acacia drewiana subsp. *minor* Maslin, Nuytsia 1: 474 (1975).

Racosperma drummondii (Lindl.) Pedley, **comb. nov.** *§952*
Acacia drummondii Lindl., Sketch Veg. Swan R. xv (1839).

R. drummondii var. **affine** (Maslin) Pedley, **comb. nov.** *§952b*
Acacia varia var. *affinis* Maslin, Nuytsia 1: 461 (1975).

R. drummondii var. **elegans** (Maslin) Pedley, **comb. nov.** *§952d*
Acacia drummondii var. *elegans* Maslin, Nuytsia 1: 468 (1975).

R. drummondii var. **majus** (Benth.) Pedley, **comb.** et **stat. nov.** *§952c*
Acacia drummondii subsp. *major* Benth., Fl. Austral. 2: 419 (1864).

Racosperma dunnii (Turrill) Pedley, **comb. nov.** *§651*
Acacia dunnii Turrill, Kew Bull. Misc. Inform. 1922 no. 9: 299 (1922).

In describing *A. dunnii,* Turrill placed *A. sericata* var. *dunnii* in synonymy. He cited two specimens (one in flower, the other in fruit) collected by E.J.Dunn, neither cited by Maiden in the protologue of *A. sericata* var. *dunnii*. In

the *Flora*, Cowan and Maslin treated these specimens, not as syntypes of a *species nova* but as material additional to that originally used by Maiden. They therefore attributed the specific epithet to Maiden.

Racosperma durabile (Maslin) Pedley, **comb. nov.** *§260*
Acacia durabilis Maslin, Nuytsia 10: 91 (1995).

Racosperma duriusculum (W.V.Fitzg.) Pedley, **comb. nov.** *§817*
Acacia duriuscula W.V.Fitzg., J. W. Australia Nat. Hist. Soc. 15 (1904).

Racosperma durum (Benth.) Pedley, **comb. nov.** *§489*
Acacia dura Benth., Linnaea 26: 622 (1855).

Racosperma echinuliflorum (G.J.Leach) Pedley, **comb. nov.** *§699*
Acacia echinuliflora G.J. Leach, Nuytsia 9: 355 (1994).

Racosperma echinulum (DC.) Pedley, **comb. nov.** *§294*
Acacia echinula DC., Prodr. 2: 449 (1825).

Racosperma effusum (Maslin) Pedley, **comb. nov.** *§728*
Acacia effusa Maslin, Nuytsia 4: 85 (1982).

Racosperma eglandulosum (DC.) Pedley, **comb. nov.** *§635*
Acacia eglandulosa DC., Prodr. 2: 450 (1825).

Acacia cyclops A.Cunn ex G.Don, Gen. Hist. 2: 404 (1832), **syn. nov.**

Racosperma elachanthum (M.W. McDonald & Maslin) Pedley, **comb. nov.** *§683*
Acacia elachantha M.W.McDonald & Maslin, Austral. Syst. Bot. 10: 31 (1997).

Racosperma elatum (A.Cunn. ex Benth.) Pedley, Austrobaileya 2: 358 (1987). *§24*

Racosperma elongatum (Sieber ex DC.) Pedley, **comb. nov.** *§526*
Acacia elongata Sieber ex DC., Prodr. 2: 451 (1825).

Racosperma empeliocladum (Maslin) Pedley, **comb. nov.** *§933*
Acacia empelioclada Maslin, Nuytsia 1: 436 (1975).

Racosperma enervium (Maiden & Blakely) Pedley, **comb. nov.** *§564*
Acacia enervia Maiden & Blakely, J. Roy. Soc. W. Australia 13: 8 (1927).

R. enervium subsp. **explicatum** (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§564b*
Acacia enervia subsp. *explicata* R.S.Cowan & Maslin, Nuytsia 10: 232 (1995).

Racosperma ensifolium (Pedley) Pedley, Bot. J. Linn. Soc. 92: 248 (1986). *§182*

Racosperma enterocarpum (R.V.Sm.) Pedley, **comb. nov.** *§548*
Acacia enterocarpa R.V.Sm., Victorian Naturalist 73: 171 (1957).

Racosperma epacanthum (Maslin) Pedley, **comb.** et **stat. nov.** *§944*
Acacia lasiocarpa var. *epacantha* Maslin, Nuytsia 1: 416 (1975).

Racosperma epedunculatum (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§889*
Acacia epedunculata R.S.Cowan & Maslin, Nuytsia 10: 34 (1995).

Racosperma ephedroides (Benth.) Pedley, **comb. nov.** *§861*
Acacia ephedroides Benth., London J. Bot. 1: 370 (1842).

Racosperma eremaeum (C.R.P.Andrews) Pedley, **comb. nov.** *§588*
Acacia eremaea C.R.P.Andrews, J. W. Australia Nat. Hist. Soc. 40 (1904).

Racosperma eremophila (W.V.Fitzg.) Pedley, **comb. nov.** *§576*
Acacia eremophila W.V.Fitzg., J. Bot. 50: 19 (1912).

R. eremophila var. **variabile** (Maiden & Blakely) Pedley, **comb. nov.** *§576b*
Acacia eremophila var. *variabilis* Maiden & Blakely, J. Roy. Soc. W. Australia 13: 6 (1927).

Racosperma eremophiloides (Pedley & P.I. Forst.) Pedley, Austrobaileya 2: 348 (1987). *§276*

Racosperma ericifolium (Benth.) Pedley, **comb. nov.** *§412*
Acacia ericifolia Benth., London J. Bot. 1: 345 (1842).

Racosperma ericksoniae (Maslin) Pedley, **comb. nov.** *§315*
Acacia ericksoniae Maslin, 12: 343 (1999).

Racosperma erinaceum (Benth.) Pedley, **comb. nov.** *§320*
Acacia erinacea Benth., London J. Bot. 1: 360 (1842).

Racosperma eriocladum (Benth.) Pedley, **comb. nov.** *§388*
Acacia erioclada Benth., Linnaea 26: 606 (1855).

Racosperma eriopodum (Maiden & Blakely) Pedley, **comb. nov.** *§696*
Acacia eriopoda Maiden & Blakely, J. Roy. Soc. W. Australia 13: 27 (1927)

Racosperma errabundum (Maslin) Pedley, **comb. nov.** *§461*
Acacia errabunda Maslin, Nuytsia 12: 345 (1999).

Racosperma estrophiolatum (F.Muell.) Pedley, Austrobaileya 2: 348 (1987). *§621*

Racosperma euthycarpum (J.M.Black) Pedley, **comb.** et **stat. nov.** *§sub 81*
Acacia calamifolia var. *euthycarpa* J.M.Black, Trans. & Proc. Roy. Soc. S. Australia 47: 369 (1923)

R. euthycarpum var. **oblanceolatum** (Stephen H. Wright) Pedley, **comb. nov.** *§sub 81*
Acacia euthycarpa subsp. *oblanceolatum* Stephen H. Wright, Muelleria 16: 64 (2002).
I have followed Wright *et al.* (2002) in their treatment of *R. euthycarpum* as a species distinct from *A. calamifolia.*

Racosperma euthyphyllum (Maslin) Pedley, **comb. nov.** *§422*
Acacia euthyphylla Maslin, Nuytsia 12: 347 (1999).

Racosperma evenulosum (Maslin) Pedley, **comb. nov.** *§419*
Acacia evenulosa Maslin, Nuytsia 12: 348 (1999).

Racosperma everistii (Pedley) Pedley, Austrobaileya 2: 348 (1987). *§141*

Racosperma excelsum (Benth.) Pedley, Austrobaileya 2: 348 (1987). *§622*

R. excelsum var. **angustum** (Pedley) Pedley, **comb.** et **stat. nov.** *§622b*
Acacia excelsa subsp. *angusta* Pedley, Austrobaileya 1: 213 (1978). *R. excelsum* subsp. *angustum* (Pedley) Pedley, Austrobaileya 2:348 (1987)

Racosperma excentricum (Maiden & Blakely) Pedley, **comb. nov.** *§427*
Acacia excentrica Maiden & Blakely, J. Roy. Soc. W. Australia 13: 4 (1928).

Racosperma exile (Maslin) Pedley, **comb. nov.** *§821*
Acacia exilis Maslin, Nuytsia 4: 87 (1982).

Racosperma exocarpoides (W.V.Fitzg.) Pedley, **comb. nov.** *§410*
Acacia exocarpoides W.V.Fitz., J. W. Australia Nat. Hist. Soc. 7 (1904).

Racosperma extensum (Lindl.) Pedley, **comb. nov.** *§251*
Acacia extensa Lindl., Sketch Veg. Swan R. xv (1839).

Racosperma fagonioides (Benth,) Pedley, **comb. nov.** *§943*
Acacia fagonioides Benth., London J. Bot. 1: 387 (1842).

Racosperma falcatum (Willd.) Pedley, Bot. J. Linn. Soc. 92: 248 (1986). *§68*

Racosperma falciforme (DC.) Pedley, Austrobaileya 2: 348 (1987). *§59*

Racosperma farinosum (Lindl.) Pedley, **comb. nov.** *§481*
Acacia farinosa Lindl., in T.L.Mitchell, Three Exped. Australia 2:145 (1838).

Racosperma fasciculiferum (F.Muell. ex Benth.) Pedley, Austrobaileya 2: 348 (1987). *§183*

Racosperma faucium (Pedley) Pedley, **comb. nov.** †
Acacia faucium Pedley, Austrobaileya 5: 314 (1999).

Racopsperma fauntleroyi (Maiden) Pedley, **comb.** et **stat. nov.** *§863*
Acacia oncinophylla var. *fauntleroyi* Maiden, J. & Proc. Roy. Soc. New South Wales 53: 214 (1920).

Racosperma ferocius (Maiden) Pedley, **comb. nov.** *§313*
Acacia ferocior Maiden, J. & Proc. Roy. Soc. New South Wales 53: 194 (1920).

Racosperma filamentosum (Maslin) Pedley, **comb. nov.** *§709*
Acacia filamentosa Maslin, Nuytsia 4: 370 (1983).

Racosperma filicifolium (Cheel & M.B.Welch) Pedley, Austrobaileya 2: 348 (1987). *§37*

Racosperma filifolium (Benth.) Pedley, **comb. nov.** *§876*
Acacia filifolia Benth., London J. Bot. 1: 369 (1842).

Racosperma filipes (Pedley) Pedley, **comb. nov.** *§710*
Acacia filipes Pedley, Austrobaileya 5: 315 (1999).

Racosperma fimbriatum (A.Cunn. ex G.Don) Pedley, Austrobaileya 2: 348 (1987). *§124*

Racosperma flabellifolium (W. V.Fitzg.) Pedley, **comb. nov.** *§304*
Acacia flabellifolia W.V.Fitzg., J. W. Australia Nat. Hist. Soc. 11 (1904).

Racosperma flagelliforme (Court) Pedley, **comb. nov.** *§246*
Acacia flagelliformis Court, Nuytsia 2: 170 (1978).

Racosperma flavescens (A.Cunn. ex Benth.) Pedley, Austrobaileya 2: 348 (1987). *§645*

Racosperma flavipilum (A.SGeorge) Pedley, **comb. nov.** *§508*
Acacia flavipila A.S.George, W. Austral. Naturalist 10: 32 (1990).

R. flavipilum var. **ovale** (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§508b*
Acacia flavipila var. *ovalis* R.S.Cowan & Maslin, Nuytsia 7: 191 (1990).

Racosperma fleckeri (Pedley) Pedley, Austrobaileya 2: 348 (1987). *§630*

Racosperma flexifolium (A.Cunn. ex Benth.) Pedley, Austrobaileya 2: 348 (1987). *§449*

Racosperma flocktoniae (Maiden) Pedley, **comb. nov.** *§76*
Acacia flocktoniae Maiden, J. & Proc. Roy. Soc. New South Wales 49: 476 (1916).

Racosperma floribundum (Vent.) Pedley, Austrobaileya 2: 348 (1987). *§899*

Racosperma floydii (Tindale) Pedley, Austrobaileya 2: 348 (1987). *§122*

Racosperma fodinale (Pedley) Pedley, **comb. nov.**
Acacia fodinalis Pedley, Austrobaileya 5: 316 (1999).†

Racosperma formidabile (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§557*
Acacia formidabilis R.S.Cowan & Maslin, Nuytsia 12: 460 (1999).

Racosperma forrestianum (E. Pritzel) Pedley, **comb. nov.** *§342*
Acacia forrestiana E.Pritzel, Bot. Jahrb. Syst. 35: 298 (1904).

Racosperma forsythii (Maiden & Blakely) Pedley, **comb. nov.** *§75*
Acacia forsythii Maiden & Blakely, J. & Proc. Roy. Soc. New South Wales 60:179 (1927).

Racosperma fragile (Maiden & Blakely) Pedley, **comb. nov.** *§535*
Acacia fragilis Maiden & Blakely, J. Roy. Soc. W. Australia 13: 5 (1927).

Racosperma frigescens (J.H.Willis) Pedley, **comb. nov.** *§637*
Acacia frigescens J.H.Willis, Victorian Naturalist 73: 158 (1957).

Racosperma froggattii (Maiden) Pedley, Austrobaileya 2: 318 (1987). *§616*

Racosperma fulvum (Tindale) Pedley, **comb. nov.** *§35*
Acacia fulva Tindale, Contrib. New South Wales Natl Herb. 4: 19 (1966).

Racosperma galeatum (Maslin) Pedley, **comb. nov.** *§589*
Acacia galeata Maslin, Nuytsia 4: 394 (1983).

Racosperma galioides (Benth.) Pedley, Austrobaileya 2: 349 (1987). *§928*

Racosperma gardneri (Maiden & Blakely) Pedley, **comb. nov.** *§661*
Acacia gardneri Maiden & Blakely, J. Roy. Soc. W. Australia 13: 32 (1927).

Racosperma gelasinum (Maslin) Pedley, **comb. nov.** *§196*
Acacia gelasina Maslin, Nuytsia 10: 194 (1995).

Racosperma geminum (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§485*
Acacia gemina R.S.Cowan & Maslin, Nuytsia 12: 421 (1999).

Racosperma genistifolium (Link) Pedley, **comb. nov.** *§288*
Acacia genistifolia Link, Enum. Hort. Berol. Alt. 2: 442 (1822).

Racosperma georgense (Tindale) Pedley, Bot. J. Linn. Soc.92: 248 (1986). *§783*

Racosperma georginae (F.M.Bailey) Pedley, Austrobaileya 2: 349 (1987). *§608*

Racosperma gibbosum (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§859*
Acacia gibbosa R.S.Cowan & Maslin, Nuytsia 10: 28 (1995).

Racosperma gilbertii (Meisn.) Pedley, **comb. nov.** *§955*
Acacia gilbertii Meisn., in J.G.C.Lehmann, Pl. Preiss. 2: 204 (1848).

Racosperma gilesianum (F.Muell.) Pedley, **comb. nov.** *§587*
Acacia gilesiana F.Muell., Chem. & Druggist Australas. Suppl. 5 (51):26 (1882).

Racosperma gillii (Maiden) Pedley, **comb. et stat. nov.** *§91*
Acacia retinodes var. *gillii* Maiden, Trans. & Proc. Roy. Soc. S. Australia 32: 275 (1908).

Racosperma gittinsii (Pedley) Pedley, Austrobaileya 2: 349 (1987). *§160*

Racosperma gladiiforme (A.Cunn. ex Benth.) Pedley, **comb. nov.** *§109*
Acacia gladiiformis A.Cunn. ex Benth., London J. Bot. 1: 354 (1842).

Racosperma glandulicarpum (Reader) Pedley, **comb. nov.** *§452*
Acacia glandulicarpa Reader, Victorian Naturalist 13: 146 (1897).

Racosperma glaucissimum (Maslin) Pedley, **comb. nov.** *§435*
Acacia glaucissima Maslin, Nuytsia 12: 350 (1999).

Racosperma glaucocaesium (Domin) Pedley, **comb. nov.** *§200*
Acacia glaucocaesia Domin, Biblioth. Bot. 89: 252 (1926).

Racosperma glaucocarpum (Maiden & Blakely) Pedley, Austrobaileya 2: 349 (1987). *§23*

Racosperma glaucopterum (Benth.) Pedley, **comb. nov.** *§441*
Acacia glaucoptera Benth., Linnaea 26: 64 (1855).

Racosperma gloeotrichum (A.R.Chapm. & Maslin) Pedley, **comb. nov.** *§708*
Acacia gloeotricha A.R.Chapm. & Maslin, 12: 487 (1999).

Racosperma glutinosissimum (Maiden & Blakely) Pedley, **comb. nov.** *§285*
Acacia glutinosissima Maiden & Blakely, J. Roy. Soc. W. Australia 13: 13 (1927).

Racosperma gnidium (Benth.) Pedley, Austrobaileya 2: 349 (1987). *§274*

Racosperma gonocarpum (F.Muell.) Pedley, **comb. nov.** *§739*
Acacia gonocarpa F.Muell., J. Proc. Linn. Soc., Bot. 3: 136 (1859).

Racosperma gonocladum (F.Muell.) Pedley, Austrobaileya 2: 349 (1987). *§686*

Racosperma gonophyllum (Benth.) Pedley, **comb. nov.** *§411*
Acacia gonophylla Benth., Linnaea 26: 613 (1855).

Racosperma gordonii (Tindale) Pedley, **comb. et stat. nov.** *§162*
Acacia baueri subsp. *gordonii* Tindale, Contrib. New South Wales Natl Herb. 4: 74 (1968).

Racosperma gracilentum (Tindale & Kodela) Pedley, **comb. nov.** *§714*
Acacia gracilenta Tindale & Kodela, Telopea 5: 61 (1992).

Racosperma gracilifolium (Maiden & Blakely) Pedley, **comb. nov.** *§470*
Acacia gracilifolia Maiden & Blakely, J. & Proc. Roy. Soc. New South Wales 60: 191 (1927).

Racosperma gracillimum (Tindale) Pedley, **comb. nov.** *§726*
Acacia gracillima Tindale, Telopea 1: 74 (1975).

Racosperma grandifolium (Pedley) Pedley, Austrobaileya 2: 349 (1987). *§676*

Racosperma graniticola (Maslin) Pedley, **comb. nov.** *§393*
Acacia graniticola Maslin, Nuytsia 12: 351 (1999).

Racosperma graniticum (Maiden) Pedley, Austrobaileya 2: 349 (1987). *§797*

Racosperma grasbyi (Maiden) Pedley, **comb. nov.** *§813*
Acacia grasbyi Maiden, J. & Proc. Roy. Soc. New South Wales 51: 25 (1917).

Racosperma x **grayanum** (J.H.Willis) Pedley, **comb. nov.** *§82*
Acacia x *grayana* J.H.Willis, Victorian Naturalist 73: 155 (1957).

Racosperma gregorii (F.Muell.) Pedley, **comb. nov.** *§327*
Acacia gregorii F.Muell., Fragm. 3:47 (1862).

Racosperma griseum (S.Moore) Pedley, **comb. nov.** *§936*
Acacia grisea S. Moore, J. Linn. Soc., Bot. 45: 174 (1920).

Racosperma guinetii (Maslin) Pedley, **comb. nov.** *§946*
Acacia guinetii Maslin, Nuytsia 2: 361 (1979).

Racosperma gunnii (Benth.) Pedley, Austrobaileya 2: 349 (1987). *§295*

Racosperma guymeri (Tindale) Pedley, Austrobaileya 2: 349 (1987). *§719*

Racosperma hadrophyllum (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§570*
Acacia hadrophylla R.S.Cowan & Maslin, Nuytsia 10: 214 (1995).

Racosperma hakeoides (A.Cunn. ex Benth.) Pedley, Austrobaileya 2: 349 (1987). *§112*

Racosperma hallianum (Maslin) Pedley, **comb. nov.** *§432*
Acacia halliana Maslin, Nuytsia 6: 36 (1987).

Racosperma hamersleyense (Maslin) Pedley, **comb. nov.** *§828*
Acacia hamersleyensis Maslin, Nuytsia 4: 90 (1982).

Racosperma hamiltonianum (Maiden) Pedley, **comb. nov.** *§114*
Acacia hamiltoniana Maiden, J. &. Proc. Roy. Soc. New South Wales 53: 199 (1920).

Racosperma hammondii (Maiden) Pedley, Austrobaileya 2: 349 (1987). *§701*

Racosperma handonis (Pedley) Pedley, Austrobaileya 2: 349 (1987). *§283*

Racosperma harpophyllum (F.Muell. ex Benth.) Pedley, Austrobaileya 2: 349 (1987). *§610*

Racosperma harveyi (Benth.) Pedley, **comb. nov.** *§102*
Acacia harveyi Benth, Fl. Austral. 2: 368 (1864).

Racosperma hastulatum (Sm.) Pedley, **comb. nov.** *§345*
Acacia hastulata Sm., in A. Rees, Cycl. 39, Suppl. (1818).

Racosperma havilandiorum (Maiden) Pedley, **comb. nov.** *§582*
Acacia havilandiorum Maiden (as 'havilandii'), J. & Proc. Roy. Soc. New South Wales 53: 182 (1920).

Racosperma helicophyllum (Pedley) Pedley, **comb. nov.** *§729*
Acacia helicophylla, Contrib. Queensland Herb. 15: 11 (1974).

Racosperma helmsianum (Maiden) Pedley, **comb. nov.** *§475*
Acacia helmsiana Maiden, J. & Proc. Roy. Soc. New South Wales 53: 174 (1920).

Racosperma hemignostum (F.Muell.) Pedley, Austrobaileya 2: 349 (1987). *§640*

Racosperma hemiteles (Benth.) Pedley, **comb. nov.** *§213*
Acacia hemiteles Benth., Linnaea 26: 619 (1855).

Racosperma hemsleyi (Maiden) Pedley, Austrobaileya 2: 349 (1987). *§697*

Racosperma hendersonii (Pedley) Pedley, **comb. nov.** *§sub 280*
Acacia hendersonii Pedley, Austrobaileya 5: 309 (1999).

Racosperma heterochroa (Maslin) Pedley, **comb. nov.** *§259*
Acacia heterochroa Maslin, Nuytsia 10: 93 (1995).

R. heterochroa subsp. **robertii comb. nov.** *§259b*
Acacia heterochroa subsp. *robertii* Maslin, Nuytsia 10: 95 (1995).

Racosperma heteroclitum (Meisn.) Pedley, **comb. nov.** *§531*
Acacia heteroclita Meisn., in L.G.C.Lehmann, Pl. Preiss. 1: 18 (1844).

R. heteroclitum subsp. **validum** (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§531b*
Acacia heteroclita subsp. *valida* R.S.Cowan & Maslin, Nuytsia 12: 424 (1999).

Racosperma heteroneurum (Benth.) Pedley, **comb. nov.** *§890*
Acacia heteroneura Benth., Linnaea 26: 624 (1855).

R. heteroneurum var. **jutsonii** (Maiden) Pedley, **comb.** et **stat. nov.** *§890b*
Acacia jutsonii Maiden, J. & Proc. Roy. Soc. New South Wales 51: 262 (1917).

R. heteroneurum var. **petilum** (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§890c*
Acacia heteroneura var. *petila* R.S.Cowan & Maslin, Nuytsia 10: 38 (1995).

R. heteroneurum var. **prolixum** (R. S.Cowan & Maslin) Pedley, **comb. nov.** *§890d*
Acacia heteroneura var. *prolixa* R.S.Cowan & Maslin, Nuytsia 10: 40 (1995).

***Racosperma heterophyllum** (Lam.) Pedley, **comb. nov.** †
Mimosa heterophylla Lam., Encyclop. 1: 14 (1783); *Acacia heterophylla* (Lam.) Willd., Sp. Pl. 4: 1054 (1806); Pedley, Contrib. Queensland Herb. 18: 6 (1975); Polhill in F. Friedmann (ed.) Fl. Mascareignes 80. Légumineuses 44–52 (1990); Du Puy & Villiers in D. Du Puy (ed.): Leguminosae of Madagascar: 237 (2002).

Racosperma hexaneurum (P.Lang & R.S.Cowan) Pedley, **comb. nov.** *§549*
Acacia hexaneura P.Lang. & R.S.Cowan, J. Adelaide Bot. Gard. 13: 115 (1990).

Racosperma hillianum (Maiden) Pedley, Austrobaileya 2: 349 (1987). *§748*

Racosperma hippuroides (Heward ex Benth.) Pedley, **comb. nov.** *§911*
Acacia hippuroides Heward ex Benth., London J. Bot. 1: 344 (1842).

Racosperma hispidulum (Sm.) Pedley, **comb. nov.** *§267*
Mimosa hispidula Sm., Spec. Bot. New Holland 53. t. 16 (1795).

Racosperma hockingsii (Pedley) Pedley, Austrobaileya 2: 349 (1987). *§273*

Racosperma holosericeum (A.Cunn. ex G.Don) Pedley, Austrobaileya 2: 349 (1987). *§677*

R. holosericeum var. **glabratum** (Maiden) Pedley, **comb. nov.** *§sub* 677
Acacia holosericea var. *glabrata* Maiden, Proc. Roy. Soc. Queensland 30: 48 (1918).

Racosperma holotrichum (Pedley) Pedley, Austrobaileya 2: 350 (1987). *§67*

Racosperma homalocladum (F.Muell.) Pedley, Austrobaileya 2: 350 (1987). *§628*

Racosperma hopperianum (Maslin) Pedley, **comb. nov.** *§sub 879*
Acacia hopperiana Maslin, Nuytsia 12: 495 (1999).

Racosperma horridulum (Meisn.) Pedley, **comb. nov.** *§346*
Acacia horridula Meisn., in J.G.C.Lehmann, Pl. Preiss. 1: 9 (1844).

Racosperma howittii (F.Muell.) Pedley, **comb. nov.** *§459*
Acacia howittii F. Muell., Victorian Naturalist 10: 16 (1893).

Racosperma hubbardianum (Pedley) Pedley, Austrobaileya 2: 350 (1987). *§166*

Racosperma huegelii (Benth.) Pedley, **comb. nov.** *§343*
Acacia huegelii Benth. (as 'Hügelii), in S.F.L.Endlicher *et al.*, Enum. Pl. 42 (1837).

Racosperma humifusum (A.Cunn. ex Benth.) Pedley, Austrobaileya 2: 350 (1987). *§658*

Racosperma hyaloneurum (Pedley) Pedley, Austrobaileya 2: 350 (1987). *§722*

Racosperma hylonomum (Pedley) Pedley, Bot. J. Linn. Soc. 92: 248 (1986). *§626*

Racosperma hypermeces (A.S.George) Pedley, **comb. nov.** *§921*
Acacia hypermeces A.S.George, J. Roy. Soc. W. Australia 82: 70 (1999).

Racosperma hystrix (Maslin) Pedley, **comb. nov.** *§379*
Acacia hystrix Maslin, Nuytsia 12: 353 (1999).

R. hystrix subsp. **continuum** (Maslin) Pedley, **comb. nov.** *§379b*
Acacia hystrix subsp. *continua* Maslin, Nuytsia 12: 356 (1999).

Racosperma idiomorphum (A.Cunn. ex Benth.) Pedley, **comb. nov.** *§328*
Acacia idiomorpha A.Cunn. ex Benth., London J. Bot. 1: 329 (1842).

Racosperma imbricatum (F.Muell.) Pedley, **comb. nov.** *§444*
Acacia imbricata F.Muell., Fragm. 1: 5 (1858).

Racosperma imitans (Maslin) Pedley, **comb. nov.** *§407*
Acacia imitans Maslin, Nuytsia 12: 356 (1999).

Racosperma imparile (Maslin) Pedley, **comb. nov.** *§344*
Acacia imparilis Maslin, Nuytsia 12: 358 (1999).

Racosperma implexum (Benth.) Pedley, Austrobaileya 2: 350 (1987). *§639*

Racosperma improcerum (Maslin) Pedley, **comb. nov.** *§319*
Acacia improcera Maslin, Nuytsia 12: 359 (1999).

Racosperma inaequilaterum (Domin) Pedley, **comb. nov.** *§209*
Acacia inaequilatera Domin, Biblioth. Bot. 89: *258* (1926).

Racosperma inaequilobum (W.V.Fitzg.) Pedley, **comb. nov.** *§242*
Acacia inaequiloba W.V.Fitzg., J. Bot. 50: 18 (1912).

Racosperma inamabile (E.Pritzel) Pedley, **comb. nov.** *§382*
Acacia inamabilis E.Pritzel, Bot. Jahr. Syst. 35: 289 (1904).

Racosperma incanicarpum (A.R.Chapm. & Maslin) Pedley, **comb. nov.** *§855*
Acacia incanicarpa A.R.Chapm. & Maslin, Nuytsia 12: 489 (1999).

Racosperma inceanum (Domin) Pedley, **comb. nov.** *§563*
Acacia inceana Domin, Vstn. Král. Ceské Spolen. Nauk, TY. Mat.-PYír. 2: 43 (1923).

R. inceanum subsp. **conforme** (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§563b*
Acacia inceana subsp. *conformis* R.S.Cowan & Maslin, Nuytsia 10: 234 (1995).

Racosperma incongestum (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§886*
Acacia incongesta R.S.Cowan & Maslin, Nuytsia 10: 48 (1995).

Racosperma incrassatum (Hook.) Pedley, **comb. nov.** *§335*
Acacia incrassata Hook., Ic. Pl. 4: t. 370 (1841).

Racosperma incurvum (Benth.) Pedley, **comb. nov.** *§357*
Acacia incurva Benth., London J. Bot. 1: 325 (1842).

Racosperma ingramii (Tindale) Pedley, **comb. nov.** *§125*
Acacia ingramii Tindale, Telopea 1: 373 (1978).

Racosperma ingratum (Benth.) Pedley, **comb. nov.** *§351*
Acacia ingrata Benth., Fl Austral. 2: 331 (1864).

Racosperma inophloia (Maiden & Blakely) Pedley, **comb. nov.** *§864*
Acacia inophloia Maiden & Blakely, J. Roy. Soc. W. Australia 13: 25 (1927).

Racosperma inops (Maiden & Blakely) Pedley, **comb. nov.** *§348*
Acacia inops Maiden & Blakely, J. Roy. Soc. W. Australia 13: 4 (1927).

Racosperma insolitum (E.Pritzel) Pedley, **comb. nov.** *§248*
Acacia insolita E.Pritzel, Bot. Jahr. Syst. 35: 310 (1904).

R. insolitum subsp. **recurvum** (Maslin) Pedley, **comb. nov.** *§248b*
Acacia insolita subsp. *recurva* Maslin, Nuytsia 12: 363 (1999).

R. insolitum subsp. **efoliolatum** (Maslin) Pedley, **comb. nov.** *§248c*
Acacia insolita subsp. *efoliolatum* Maslin, Nuytsia 12: 362 (1999).

Racosperma intortum (Maslin) Pedley, **comb. nov.** *§826*
Acacia intorta Maslin, Nuytsia 4: 398 (1983).

Racosperma intricatum (S.Moore) Pedley, **comb. nov.** *§378*
Acacia intricata S. Moore, J. Linn. Soc. Bot. 45: 172 (1920).

Racosperma irroratum (Sieber ex Spreng.) Pedley, Austrobaileya 2: 350 (1987). *§54*

R. irroratum subsp. **velutinellum** (Tindale) Pedley, **comb. nov.** *§54b*
Acacia irrorata subsp. *vellutinella* Tindale, Proc. Linn. Soc. New South Wales ser. 2. 91: 147 (1966).

Racosperma islanum (Pedley) Pedley, Austrobaileya 2: 350 (1987). *§278*

Racosperma isoneurum (Maslin & A.R.Chapm.) Pedley, **comb. nov.** *§879*
Acacia isoneura Maslin & A.R.Chapm., Nuytsia 12: 478 (1999).

R. isoneurum subsp. **nimium** (Maslin & A.R.Chapm.) Pedley, **comb. nov.** *§879b*
Acacia isoneura subsp. *nimia* Maslin & A.R.Chapm., Nuytsia 12: 479 (1999).

Racosperma iteaphyllum (F.Muell. ex Benth.) Pedley, **comb. nov.** *§179*
Acacia iteaphylla F.Muell. ex Benth., Linnaea 26: 617 (1855).

Racosperma ixiophyllum (Benth.) Pedley, Austrobaileya 2: 350 (1987). *§517*

Racosperma ixodes (Benth.) Pedley, Austrobaileya 2: 350 (1987). *§275*

Racosperma jackesianum (Pedley) Pedley, Austrobaileya 2: 350 (1987). *§720*

Racosperma jacksonioides (Maslin) Pedley, **comb. nov.** *§324*
Acacia jacksonioides Maslin, Nuytsia 2: 99 (1976).

Racosperma jamesianum (Maslin) Pedley, **comb. nov.** *§849*
Acacia jamesiana Maslin, J. Adelaide Bot. Gard. 2: 310 (1980).

Racosperma jasperense (Maconochie) Pedley, **comb. nov.** *§187*
Acacia jasperensis Maconochie, J. Adelaide Bot. Gard. 6: 201 (1983).

Racosperma jennerae (Maiden) Pedley, **comb. nov.** *§96*
Acacia jennerae Maiden, in A.J.Ewart & O.B.Davies, Fl. North. Terr. 333 (1917).

Racosperma jensenii (Maiden) Pedley, **comb. nov.** *§271*
Acacia jensenii Maiden, in A.J.Ewart & O.B.Davies, Fl. North. Territory 332 (1917).

Racosperma jibberdingense (Maiden & Blakely) Pedley, **comb. nov.** *§869*
Acacia jibberdingensis Maiden & Blakely, J. Roy. Soc. W. Australia 13: 29 (1927)

Racosperma johannis (Pedley) Pedley, **comb. nov.** *§623*
Acacia johannis Pedley, Austrobaileya 5: 311 (1999).

Racosperma johnsonii (Pedley) Pedley, Austrobaileya 2: 350 (1987). *§280*

Racosperma jonesii (F.Muell. & Maiden) Pedley, **comb. nov.** *§31*
Acacia jonesii F. Muell. & Maiden, Proc. Linn. Soc. New South Wales ser. 2. 18: 13 (1893).

Racosperma jucundum (Maiden & Blakely) Pedley, Austrobaileya 2: 350 (1987). *§139*

Racosperma juliferum (Benth.) Pedley, Bot. J. Linn. Soc. 92: 248 (1986). *§788*

R. juliferum var. **curvinervium** (Maiden) Pedley, **comb.** et **stat. nov.** *§787*
Acacia curvinervia Maiden, Proc. Roy. Soc. Queensland 30: 34 (1918); *R. juliferum* subsp. *curvinervuim* (Maiden) Pedley, Austrobaileya 2:571 (1988).

R. juliferum var. **gilbertense** (Pedley) Pedley, **comb.** et **stat. nov.** *§788b*
Acacia julifera subsp. *gilbertensis* Pedley, Austrobaileya 1: 162 (1978); *R. juliferum* subsp. *gilbertense* (Pedley) Pedley, Austrobaileya 2:350 (1987).

Racosperma juncifolium (Benth.) Pedley, Austrobaileya 2: 350 (1987). *§189*

Racosperma kalgoorliense (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§574*
Acacia kalgoorliensis R.S.Cowan & Maslin, Nuytsia 10: 215 (1995).

***Racosperma kauaiense** (Hillebr.) Pedley, Bot. J. Linn. Soc. 92: 248 (1986) †

See *Racosperma koa* for a note on treatments of Hawaiian species.

Racosperma kelleri (F.Muell.) Pedley, **comb. nov.** *§716*
Acacia kelleri F.Muell., Proc. Roy. Soc. New South Wales ser. 2. 6: 468 (1892).

Racosperma kempeanum (F.Muell.) Pedley, Austrobaileya 2: 350 (1987). *§816*

Racosperma kenneallyi (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§652*
Acacia kenneallyi R.S.Cowan & Maslin, Nuytsia 10: 64 (1995).

Racosperma kerryanum (Maslin) Pedley, **comb. nov.** *§880*
Acacia kerryana Maslin, Nuytsia 4: 105 (1982).

Racosperma kettlewelliae (Maiden) Pedley, **comb. nov.** *§143*
Acacia kettlewelliae Maiden, J. & Proc. Roy. Soc. New South Wales 49: 484 (1916).

Racosperma kimberleyense (W.V.Fitzg.) Pedley, **comb. nov.** *§738*
Acacia kimberleyensis W.V.Fitzg. in J.H. Maiden, J. & Proc. Roy. Soc. New South Wales 51: 112 (1917).

Racosperma kingianum (Maiden & Blakely) Pedley, **comb. nov.** *§506*
Acacia kingiana Maiden & Blakely, J. Roy. Soc. W. Australia 13: 19 (1928).

***Racosperma koa** (A.Gray) Pedley, Bot. J. Linn. Soc. 92: 248 (1986). †
Acacia koa A.Gray, Bot. U. S. Explor. Exped. 1: 480 (1842); Pedley, Contrib. Queensland Herb.18: 7 (1975).

St John (1980), decrying the need for further field work, distinguished three species in the Hawai'ian Is.: *Acacia kauaiensis*, *A. koaia* and *A. koa*, the latter with three varieties. Wagner *et al.*(1990), however, maintained only *A. koa*, suggesting that *A. koaia* and *A. kauaiensis* might be treated as subspecies. Their suggestion was evidently influenced by work, some of it in the field, of J.P.M. Brenan. As the results of Brenan's work have not been published I have followed the treatment of the Hawaiian species (Pedley 1975) in which only *A. koa* and *A. kauaiensis* were recognised.

Racosperma kochii (W.V.Fitzg.) Pedley, **comb. nov.** *§406*
Acacia kochii W.V.Fitzg. ex A.J.Ewart & Jean White, Proc. Roy. Soc. Victoria n. ser. 23: 285 (1911).

Racosperma kybeanense (Maiden & Blakely) Pedley, **comb. nov.** *§140*
Acacia kybeanensis Maiden & Blakely, J. & Proc. Roy. Soc. New South Wales 60: 188 (1927).

Racosperma kydrense (Tindale) Pedley, **comb. nov.** *§73*
Acacia kydrensis Tindale, Telopea 1: 435 (1980).

Racosperma laccatum (Pedley) Pedley, Austrobaileya 2: 350 (1987). *§687*

Racosperma lacertense (Pedley) Pedley, **comb. nov.** *§663*
Acacia lacertensis Pedley, Austrobaileya 5: 316 (1999).

Racosperma lachnophyllum (F.Muell.) Pedley, **comb. nov.** *§428*
Acacia lachnophylla F.Muell., South. Sci. Rec. 2(7): 150 (1882).

Racosperma lamprocarpum (O.Schwarz) Pedley, **comb. nov.** *§sub 670*
Acacia lamprocarpa O.Schwarz, Repert. Spec. Nov. Regni Veg. 24: 86 (1927).

Racosperma lanceolatum (Maslin) Pedley, **comb. nov.** *§303*
Acacia lanceolata Maslin, Nuytsia 12: 363 (1999).

Racosperma lanei (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§515*
Acacia lanei R.S.Cowan & Maslin, Nuytsia 7: 192 (1990).

Racosperma lanigerum (A.Cunn.) Pedley, Austrobaileya 2: 350 (1987). *§524*

R. lanigerum var. **gracilipes** (Benth.) Pedley, **comb. nov.** *§524b*
Acacia lanigera var. *gracilipes* Benth., Fl. Austral. 2: 325 (1864).

R. lanigerum var. **whanii** (F.Muell. ex Benth.) Pedley, **comb.** et **stat. nov.** *§524c*
Acacia whanii F. Muell. ex Benth., Fl. Austral. 2: 386 (1864).

Racosperma lanuginophyllum (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§504*
Acacia lanuginophylla R.S.Cowan & Maslin, Nuytsia 7: 194 (1990).

Racosperma laricinum (Meisn) Pedley, **comb. nov.** *§358*
Acacia laricina Meisn., in J.G.C.Lehmann, Pl. Preiss. 1: 6 (1844).

R. laricinum var. **crassifolium** (Maslin) Pedley, **comb. nov.** *§358b*
Acacia laricina var. *crassifolia* Maslin, Nuytsia 12: 367 (1999).

Racosperma lasiocalyx (C.R.P.Andrews) Pedley, **comb. nov.** *§803*
Acacia lasiocalyx C.R.P.Andrews, J. W. Australia Nat. Hist. Soc. 41 (1904).

Racosperma lasiocarpum (Benth.) Pedley, **comb. nov.** *§945*
Acacia lasiocarpa Benth., in S.L. Endlicher *et al.*, Enum. Pl. 43 (1837).

R. lasiocarpum var. **bracteolatum** (Maslin) Pedley, **comb. nov.** *§945c*
Acacia lasiocarpa var. *bracteolata* Maslin, Nuytsia 1: 415 (1975).

R. lasiocarpum var. **sedifolium** (Meisn.) Pedley, **comb. nov.** *§945b*
Acacia cycnorum var. *sedifolia* Meisn., in J.G.C. Lehmann, Pl. Preiss. 1: 22 (1844).

Racosperma lateriticola (Maslin) Pedley, **comb. nov.** *§935*
Acacia lateriticola Maslin, Nuytsia 1: 433 (1975).

Racosperma latescens (Benth.) Pedley, Austrobaileya 2: 571 (1988). *§653*

Racosperma latifolium (Benth.) Pedley, Austrobaileya 2: 350 (1987). *§660*

Racosperma latipes (Benth.) Pedley, **comb. nov.** *§543*
Acacia latipes Benth., London J. Bot. 1: 334 (1842).

R. latipes subsp. **licinum** (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§543b*
Acacia latipes subsp. *licina* R.S.Cowan & Maslin. Nuytsia 12: 464 (1999).

Racosperma latisepalum (Pedley) Pedley, Austrobaileya 2: 351 (1987). *§14*

Racosperma latzii (Maslin) Pedley, **comb. nov.** *§605*
Acacia latzii Maslin, J. Adelaide Bot. Gard. 2: 313 (1980).

Racosperma lautum (Pedley) Pedley, Austrobaileya 2: 351 (1987). *§sub 280*

Racosperma lazaridis (Pedley) Pedley, Austrobaileya 2: 351 (1987). *§760*

Racosperma legnotum (Pedley) Pedley, Austrobaileya 2: 351 (1987). *§625*

Racosperma leichhardtii (Benth.) Pedley, Austrobaileya 2: 351 (1987). *§108*

Racosperma leiocalyx (Domin) Pedley, Austrobaileya 2: 351 (1987). *§666*

R. leiocalyx var. **herveyense** (Pedley) Pedley, **comb.** et **stat. nov.** *§666b*
Acacia leiocalyx subsp. *herveyensis* Pedley, Austrobaileya 1: 180 (1978).

Racosperma leiodermum (Maslin) Pedley, **comb. nov.** *§932*
Acacia leioderma Maslin, Nuytsia 1: 442 (1975).

Racosperma leiophyllum (Benth.) Pedley, **comb. nov.** *§84*
Acacia leiophylla Benth., London J. Bot. 1: 351 (1842).

Racosperma lentigineum (Maiden & Blakely) Pedley, **comb. nov.** *§735*
Acacia lentiginea Maiden & Blakely, J. Roy. Soc. W. Australia 13: 30 (1927).

Racosperma leprosum (Sieber ex DC.) Pedley, **comb. nov.** *§456*
Acacia leprosa Sieber ex DC., Prodr. 2: 450 (1825).

Racosperma leptaleum (Maslin) Pedley, **comb. nov.** *§479*
Acacia leptalea Maslin, Nuytsia 12: 367 (1999).

Racosperma leptocarpum (A.Cunn. ex Benth.) Pedley, Austrobaileya 2: 351 (1987). *§668*

Racosperma leptoclada (A.Cunn. ex Benth.) Pedley, **comb. nov.** *§28*
Acacia leptoclada A.Cunn. ex Benth., London J. Bot. 1: 385 (1842).

Racosperma leptolobum (Pedley) Pedley, Austrobaileya 2: 351 (1987). *§646*

Racosperma leptoneurum (Benth.) Pedley, **comb. nov.** *§540*
Acacia leptoneura Benth., London J. Bot. 1:341 (1842).

Racosperma leptopetalum (Benth.) Pedley, **comb. nov.** *§105*
Acacia leptopetala Benth., Linnaea 26: 619 (1855).

Racosperma leptophlebum (F.Muell. ex Benth.) Pedley, **comb. nov.** *§762*
Acacia leptophleba F. Muell. ex Benth., Fl. Austral. 2: 395 (1864).

Racosperma leptospermoides (Benth.) Pedley, **comb. nov.** *§413*
Acacia leptospermoides Benth., Linnaea 26: 626 (1855).

R. leptospermoides subsp. **obovatum** (Maslin) Pedley, **comb. nov.** *§413c*
Acacia leptospermoides subsp. *obovata* Maslin, Nuytsia 2: 212 (1978).

R. leptospermoides subsp. **psammophilum** (E.Pritzel) Pedley, **comb.** et **stat. nov.** *§413b*
Acacia psammophila E.Pritzel, Bot. Jahr. Syst. 35: 294 (1904).

Racosperma leptostachyum (Benth.) Pedley, Austrobaileya 2: 351 (1987). *§792*

Racosperma leucocladum (Tindale) Pedley, Austrobaileya 2: 351 (1987). *§38*

R. leucocladum subsp. **argentifolium** (Tindale) Pedley, Austrobaileya 2: 351 (1987). *§38b*

Racosperma leucolobium (Sweet) Pedley, **comb. nov.** *§156*
Acacia leucolobia Sweet, Hort. Brit. ed. 2. 165 (1830).

Racosperma levatum (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§824*
Acacia levata R.S.Cowan & Maslin, Nuytsia 10: 41 (1995).

Racosperma ligulatum (A.Cunn. ex Benth.) Pedley, Austrobaileya 2: 351 (1987). *§223*

R. ligulatum var. **minus** (F.Muell.) Pedley, **comb. nov.** *§224*
Acacia salicina var. *minor* F.Muell., J. Proc. Linn. Soc., Bot. 3: 126 (1859).

A. salicina var. *wayi* Maiden (as 'Wayae'), Trans. & Proc. Roy. Soc. S. Australia 32: 277 (1908); **syn. nov.** *A. bivenosa* subsp. *wayi* (Maiden) Pedley, Austrobaileya 1: 28 (1977), **syn. nov.**

Acacia cupularis Domin, Vstr. Král. Ceské. Spolen. TY. Mat.-PYír. 2: 45 (1923), **syn. nov.**

Racosperma ligulatum and *R. bivenosum* intergrade over a wide area, particularly in the south of the Northern Territory, but, since they are distinct enough over most of their ranges, it is convenient to consider them species. However, as noted by Symon (1992) *Acacia cupularis* "is not always readily separated from" *R. ligulatum* and its recognition as *varietas* seems appropriate.

Racosperma ligustrinum (Meisn.) Pedley, **comb. nov.** *§439*
Acacia ligustrina Meisn., J.G.C.Lehmann, Pl. Preiss. 2: 203 (1848).

Racosperma limbatum (F.Muell.) Pedley, Austrobaileya 2: 351 (1987). *§761*

Racosperma linarioides (Benth.) Pedley, **comb. nov.** *§715*
Acacia linarioides Benth., London J. Bot. 1: 371 (1842).

Racosperma linearifolium (A.Cunn. ex Maiden & Blakely) Pedley, **comb. nov.** *§128*
Acacia linearifolia A. Cunn. ex Maiden & Blakely, J. & Proc. Roy. Soc. New South Wales 60: 177 (1927).

Racosperma lineatum (A.Cunn. ex G.Don) Pedley, Austrobaileya 2: 351 (1987). *§450*

Racosperma lineolatum (Benth.) Pedley, **comb. nov.** *§566*
Acacia lineolata Benth., Linnaea 26: 626 (1855).

R. lineolatum subsp. **multilineatum** (W.V.Fitzg.) Pedley, **comb.** et **stat. nov.** *§566b*
Acacia multilineata W.V.Fitzg., J. W. Australia Nat. Hist. Soc. 13 (1904).

Racosperma linifolium (Vent.) Pedley, **comb. nov.** *§151*
Mimosa linifolia Vent., Descr. Pl. Nouv. 2. t. 2 (1800).

Racosperma lirellatum (Maslin & A.R.Chapm.) Pedley, **comb. nov.** *§882*
Acacia lirellata Maslin & A.R.Chapm., Nuytsia 12: 480 (1999).

R. lirellatum subsp. **compressum** (Maslin & A.R.Chapm.) Pedley, **comb. nov.** *§882b*
Acacia lirellata subsp. *compressa* Maslin & A.R.Chapm., Nuytsia 12: 482 (1999).

Racosperma littoreum (Maslin) Pedley, **comb. nov.** *§334*
Acacia littorea Maslin, Nuytsia 2: 311 (1978).

Racosperma lobulatum (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§513*
Acacia lobulata R.S.Cowan & Maslin, Nuytsia 7: 194 (1990).

Racosperma loderi (Maiden) Pedley, **comb. nov.** *§594*
Acacia loderi Maiden, J. & Proc. Roy. Soc. New South Wales 53: 209 (1920).

Racosperma longifolium (Andrews) Pedley, **comb. nov.** *§898a*
Mimosa longifolia Andrews, Bot. Repos. 3. t. 207 (1802).

Racosperma longipedunculatum (Pedley) Pedley, Austrobaileya 2: 351 (1987). *§926*

Racosperma longiphyllodineum (Maiden) Pedley, **comb. nov.** *§805*
Acacia longiphyllodinea Maiden, J. & Proc. Roy. Soc. New South Wales 51: 254 (1917).

Racosperma longispicatum (Benth.) Pedley, Austrobaileya 2: 351 (1987). *§667*

Racosperma longispineum (Morrison) Pedley, **comb. nov.** *§527*
Acacia longispinea Morrison, Scott. Bot. Rev. 1: 96 (1912).

Racosperma longissimum (H.L.Wendl.) Pedley, Austrobaileya 2: 352 (1987). *§903*

Racosperma lorolobum (Tindale) Pedley, Austrobaileya 2: 352 (1987). *§47*

Racosperma loxophyllum (Benth.) Pedley, **comb. nov.** *§510*
Acacia loxophylla Benth., Linnaea 26: 622 (1855).

Racosperma lucasii (Blakely) Pedley, **comb. nov.** *§137*
Acacia lucasii Blakely, J. & Proc. Roy. Soc. New South Wales 62: 215 (1928).

Racosperma lullfitziorum (Maslin) Pedley, **comb. nov.** *§403*
Acacia lullfitziorum Maslin, Nuytsia 12: 369 (1999).

Racosperma lunatum (G.Lodd.) Pedley, **comb. nov.** *§155*
Acacia lunata G.Lodd., Bot. Cab. 4: t. 384 (1819).

Racosperma luteolum (Maslin) Pedley, **comb. nov.** *§954*
Acacia luteola Maslin, Nuytsia 1: 453 (1975).

Racosperma lycopodiifolium (A.Cunn. ex Hook.) Pedley, Bot. J. Linn. Soc. 92: 240 (1986). *§916*

Racosperma lysiphloia (F.Muell.) Pedley, Austrobaileya 2: 352 (1987) (as *"lysiphloium"*). *§724*

Racosperma mabellae (Maiden) Pedley, **comb. nov.** *§69*
Acacia mabellae Maiden, J. & Proc. Roy. Soc. New South Wales 49: 471 (1916).

Racosperma macdonnellense (Maconochie) Pedley, Bot. J. Linn. Soc. 92: 248 (1986). *§800*

R. macdonnellense subsp. **teretifolium** (Maslin) Pedley, **comb. nov.** *§800b*
Acacia macdonnellensis subsp. *teretifolia* Maslin, Nuytsia 6: 33 (1987).

Racosperma mackeyanum (Ewart & Jean White) Pedley, **comb. nov.** *§573*
Acacia mackeyana Ewart & Jean White, Proc. Roy. Soc. Victoria n. ser. 22: 6 (1909).

Racosperma macnuttianum (Maiden & Blakely) Pedley, **comb. nov.** *§118*
Acacia macnuttiana Maiden & Blakely, J. & Proc. Roy Soc. New South Wales 60: 176 (1927).

Racosperma maconochieanum (Pedley) Pedley, **comb. nov.** *§602*
Acacia maconochieana Pedley, Austrobaileya 2: 235 (1986).

Racosperma macradenium (Benth.) Pedley, Austrobaileya 2: 352 (1987). *§66*

Racosperma maidenii (F.Muell.) Pedley, Austrobaileya 2: 352 (1987). *§900*

Racosperma maitlandii (F.Muell.) Pedley, Bot. J. Linn. Soc. 92: 248 (1986). *§211*

Racosperma mallocladum (Maiden & Blakely) Pedley, **comb. nov.** *§702*
Acacia malloclada Maiden & Blakely, J. Roy. Soc. W. Australia 13: 23 (1927).

Racosperma mangium (Willd.) Pedley, Austrobaileya 2: 352 (1987). *§675*

Racosperma manipulare (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§743*
Acacia manipularis R.S.Cowan & Maslin, Nuytsia 10: 72 (1995).

Racosperma maranoense (Pedley) Pedley, Austrobaileya 2: 352 (1987). *§601*

Racosperma marramamba (Maslin) Pedley, **comb. nov.** *§210*
Acacia marramamba Maslin, Nuytsia 4: 94 (1982).

Racosperma maslinianum (R.S.Cowan) Pedley, **comb. nov.** *§581*
Acacia masliniana R.S.Cowan, Nuytsia 9: 79 (1993).

***Racosperma mathuataense** (A.C. Sm.) Pedley, **comb. nov.** †
Acacia mathuataensis A.C. Sm., J. Arnold Arb. 31: 165 (1950); Pedley, Contrib. Queensland Herb. 18: 11 (1975); A.C. Smith, Fl. Vitiensis Nova 3: 73. t. 17C, 18 (1985).

Racosperma matthewii (Tindale & S.Davies) Pedley, **comb. nov.** *§779*
Acacia matthewii Tindale & S.Davies, Austral. Syst. Bot. 5: 648 (1992).

Racosperma maxwellii (Maiden & Blakely) Pedley, **comb. nov.** *§232*
Acacia maxwellii Maiden & Blakely, J. Roy. Soc. W. Australia 13: 7 (1927).

Racosperma mearnsii (De Wild.) Pedley, Bot. J. Linn. Soc. 92: 249 (1986). *§46*

Racosperma megacephalum (Maslin) Pedley, **comb. nov.** *§942*
Acacia megacephala Maslin, Nuytsia 1: 254 (1972).

Racosperma megalanthum (F.Muell.) Pedley, Austrobaileya 2: 352 (1987). *§689*

Racosperma meianthum (Tindale & Hercovitch) Pedley, **comb. nov.** *§152*
Acacia meiantha Tindale & Hercovitch, Austral. Syst. Bot. 5: 571 (1992).

Racosperma meiospermum Pedley, Austrobaileya 2: 321 (1987). *§780*

Racosperma meisneri (Lehm. ex Meisn.) Pedley, **comb. nov.** *§106*
Acacia meisneri Lehm. ex Meisn. *in* J.G.C. Lehmann, Pl. Preiss. 1: 13 (1844).

Racosperma melanoxylon (R.Br.) Pedley, Bot. J. Linn. Soc. 92: 240 (1986). *§638*

Racosperma melleodorum (Pedley) Pedley, Austrobaileya 2: 352 (1987). *§270*

Racosperma melvillei (Pedley) Pedley, Austrobaileya 2: 352 (1987). *§600*

Racosperma menzelii (J.M.Black) Pedley, **comb. nov.** *§471*
Acacia menzelii J.M.Black, Trans. & Proc. Roy. S. Australia 41: 45 (1917).

Racosperma merinthophorum (E.Pritzel) Pedley, **comb. nov.** *§875*
Acacia merinthophora E.Pritzel, Bot. Jahr. Syst, 35: 307 (1904).

Racosperma merrallii (F.Muell.) Pedley, **comb. nov.** *§437*
Acacia merrallii FMuell., Proc. Linn. Soc. New South Wales ser. 2. 5: 18 (1890).

Racosperma merrickiae (Maiden & Blakely) Pedley, **comb. nov.** *§107*
Acacia merrickiae Maiden & Blakely, J. Roy. Soc. W. Australia 13: 13 (1927).

Racosperma microbotryum (Benth.) Pedley, **comb. nov.** *§97*
Acacia microbotrya Benth., London J. Bot. 1: 353 (1842).

Racosperma microcalyx (Maslin) Pedley, **comb. nov.** *§230*
Acacia microcalyx Maslin, Nuytsia 1: 323 (1974).

Racosperma microcarpum (F.Muell.) Pedley, **comb. nov.** *§447*
Acacia microcarpa F.Muell., Fragm. 1: 6 (1858).

Racosperma microcephalum (Pedley) Pedley, Austrobaileya 2: 352 (1987). *§596*

Racosperma microneurum (Meisn.) Pedley, **comb. nov.** *§881*
Acacia microneura Meisn., in J.G.C.Lehmann, Pl. Preiss. 1: 19 (1844).

Racosperma microspermum (Pedley) Pedley, Austrobaileya 2: 352 (1987). *§597*

Racosperma midgleyi (M.W.McDonald & Maslin) Pedley, **comb. nov.** *§sub 670*
Acacia midgleyi M.W.McDonald & Maslin, Austral. Syst. Bot. 13: 61 (2000).

Racosperma mimicum (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§562*
Acacia mimica R.S.Cowan & Maslin, Nuytsia 7: 212 (1990).

R. mimicum var. **angustum** (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§562b*
Acacia mimica var. *angusta* R.S.Cowan & Maslin, Nuytsia 7: 214 (1990).

Racosperma mimulum (Pedley) Pedley, Austrobaileya 2: 352 (1987). *§654*

Racosperma minutifolium (F.Muell.) Pedley, **comb. nov.** *§746*
Acacia minutifolia F.Muell., Fragm. 8: 243 (1874).

Racosperma minyura (Randell) Pedley, **comb. nov.** *§841*
Acacia minyura Randell, J. Adelaide Bot. Gard. 14: 126 (1992).

Racosperma mitchellii (Benth.) Pedley, **comb. nov.** *§56*
Acacia mitchellii Benth., London J. Bot. 1: 387 (1842).

Racosperma mitodes (A.S.George) Pedley, **comb. nov.** *§922*
Acacia mitodes A.S.George, J. Roy. Soc. W. Australia 82: 71 (1999).

Racosperma moirii (E.Pritzel) Pedley, **comb. nov.** *§937*
Acacia moirii E.Pritzel, Bot. Jahr. Syst. 35: 312 (1904).

R. moirii subsp. **dasycarpum** (Maslin) Pedley, **comb. nov.** *§937b*
Acacia moirii subsp. *dasycarpa* Maslin, Nuytsia 1: 419 (1972).

R. moirii subsp. **recurvistipulum** (Maslin) Pedley, **comb. nov.** *§937c*
Acacia moirii subsp. *recurvistipula* Maslin, Nuytsia 1: 258 (1975).

Racosperma mollifolium (Maiden & Blakely) Pedley, **comb. nov.** *§53*
Acacia mollifolia Maiden & Blakely, J. & Proc. Roy. Soc. New South Wales 60: 192 (1927).

Racosperma montanum (Benth.) Pedley, Austrobaileya 2: 352 (1987). *§460*

Racosperma monticola (F.Muell.) Pedley, Austrobaileya 2: 352 (1987). *§730*

Racosperma mooreanum (W.V.Fitzg.) Pedley, **comb. nov.** *§341*
Acacia mooreana W.V.Fitzg., J. W. Australia Nat. Hist. Soc. 10 (1904).

Racosperma mountfordiae (Specht) Pedley, **comb. nov.** *§694*
Acacia mountfordiae Specht (as 'mountfordae), Rec. Amer.-Austral. Exped. Arnhem Land 3: 233 (1958).

Racosperma mucronatum (Willd. ex H.L.Wendl.) Pedley, **comb. nov.** *§897*
Acacia mucronata Willd. ex H.L.Wendl., Comm. Acac. Aphyll. 6, 46 (1820).

R. mucronatum subsp. **dependens** (J.D.Hook.) Pedley, **comb.** et **stat. nov.** *§897b*
Acacia mucronata var. *dependens* J.D.Hook., Fl. Tasman. 1: 110 (1856).

R. mucronatum subsp. **longifolium** (Benth.) Pedley, **comb.** et **stat. nov.** *§897c*
Acacia mucronata var. *longifolia* Benth., Linnaea 26: 628 (1855)

Racosperma muellerianum (Maiden & R.T.Baker) Pedley, Austrobaileya 2: 352 (1987). *§32*

Racosperma multisiliquum (Benth.) Pedley, Austrobaileya 2: 352 (1987). *§634*

Racosperma multispicatum (Benth.) Pedley, **comb. nov.** *§871*
Acacia multispicata Benth., Fl. Austral. 2: 400 (1864).

Racosperma multistipulosum (Tindale & Bedward) Pedley, **comb. nov.** *§706*
Acacia multistipulosa Tindale & Bedward, Austral. Syst. Bot. 9: 859 (1996).

Racosperma murrayanum (F.Muell. ex Benth.) Pedley, Austrobaileya 2: 352 (1987). *§193*

Racosperma mutabile (Maslin) Pedley, **comb. nov.** *§431*
Acacia mutabilis Maslin, Nuytsia 12: 371 (1999).

R. mutabile subsp. **angustifolium** (Maslin) Pedley, **comb. nov.** *§431b*
Acacia mutabilis subsp. *angustifolia* Maslin, Nuytsia 12: 373 (1999).

R. mutabile. subsp. **incurvum** (Maslin) Pedley, **comb. nov.** *§431c*
Acacia mutabilis subsp. *incurva* Maslin, Nuytsia 12: 374 (1999).

R. mutabile subsp. **rhynchophyllum** (Maslin) Pedley, **comb. nov.** *§431d*
Acacia mutabilis subsp. *rhynchophylla* Maslin, Nuytsia 12: 375 (1999).

R. mutabile subsp. **stipuliferum** (Maslin) Pedley, **comb. nov.** *§431e*
Acacia mutabilis subsp. *stipulifera* Maslin, Nuytsia 12: 376 (1999).

Racosperma myrtifolium (Sm.) Pedley, **comb. nov.** *§257*
Mimosa myrtifolia Sm., Trans. Linn. Soc. London 1: 252 (1791).

Racosperma nanodealbatum (J.H.Willis) Pedley, **comb. nov.** *§51*
Acacia nanodealbata J.H.Willis, Victorian Naturalist 73: 154 (1957).

Racosperma nelsonii Pedley, Bot. J. Linn. Soc. 92: 249 (1986). *§811*
Acacia nelsonii Maslin, J. Adelaide Bot. Gard. 2: 314 (1980), *nom. illeg.*, *non* Saff. (1914).

Acacia desmondii Maslin, Nuytsia, 6: 33 (1987).

Since the name *Acacia nelsonii* Maslin is illegitimate, *Racosperma nelsonii* must be treated as a *nom. nov.* dating from 1986.

Racosperma nematophyllum (F.Muell. ex Benth.) Pedley, **comb. nov.** *§83*
Acacia nematophylla F.Muell. ex Benth., Linnaea 26: 612 (1855).

Racosperma neriifolium (A.Cunn. ex Benth.) Pedley, Austrobaileya 2: 353 (1987). *§126*

Racosperma nervosum (DC.) Pedley, **comb. nov.** *§264*
Acacia nervosa DC., Prodr. 2: 449 (1825).

Racosperma nesophilum (Pedley) Pedley, Austrobaileya 2: 353 (1987). *§680*

Racosperma neurocarpum (A. Cunn. ex Hook.) Pedley, **comb. nov.** *§678*
Acacia neurocarpa A.Cunn. ex Hook., Icon. Pl. 2: t. 168 (1837).

Racosperma neurophyllum (W.V.Fitzg.) Pedley, **comb. nov.** *§885*
Acacia neurophylla W.V.Fitzg., J.W. Australia Nat. Hist. Soc. 13 (1904).

R. neurophyllum subsp. **erugatum** (R.S. Cowan & Maslin) Pedley, **comb. nov.** *§885b*
Acacia neurophyllum subsp. *erugatum* R.S.Cowan & Maslin, Nuytsia 10: 51 (1995).

Racosperma newbeyi (Maslin) Pedley, **comb. nov.** *§938*
Acacia newbeyi Maslin, Nuytsia 1: 423 (1975).

Racosperma nigricans (Labill.) Pedley, **comb. nov.** *§931*
Mimosa nigricans Labill., Nov. Holl. Pl. 2: 88. t. 238 (1807).

Racosperma nigripilosum (Maiden) Pedley, **comb. nov.** *§241*
Acacia nigripilosa Maiden, J. & Proc. Roy. New South Wales 53: 172 (1920).

R. nigripilosum subsp. **latifolium** (Maslin) Pedley, **comb. nov.** *§241b*
Acacia nigripilosa subsp. *latifolia* Maslin, Nuytsia 12: 378 (1999).

Racosperma nitidulum (Benth.) Pedley, **comb. nov.** *§491*
Acacia nitidula Benth., Fl. Austral. 2: 381 (1864).

Racosperma niveum (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§560*
Acacia nivea R.S. Cowan & Maslin, Nuytsia 10: 250 (1995).

Racosperma nodiflorum (Benth.) Pedley, **comb. nov.** *§404*
Acacia nodiflora Benth., Linnaea 26: 621 (1855).

Racosperma notabile (F.Muell.) Pedley, **comb. nov.** *§87*
Acacia notabilis F.Muell., Fragm. 1: 6 (1858).

Racosperma nuperrimum (E.G.Baker) Pedley, Austrobaileya 2: 353 (1987). *§751*

Racosperma nyssophyllum (F.Muell.) Pedley, **comb. nov.** *§546*
Acacia nyssophylla F.Muell., Fragm. 4: 4 (1863).

Racosperma obesum (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§559*
Acacia obesa R.S.Cowan & Maslin, Nuytsia 10: 252 (1995).

Racosperma obliquinervium (Tindale) Pedley, **comb. nov.** *§60*
Acacia obliquinervia Tindale, Contrib. New South Wales Natl Herb. 4: 76 (1968).

Racosperma obovatum (Benth.) Pedley, **comb. nov.** *§263*
Acacia obovata Benth., London J. Bot. 1: 329 (1842).

Racosperma obtectum (Maiden & Blakely) Pedley, **comb. nov.** *§529*
Acacia obtecta Maiden & Blakely, J. Roy. Soc. W. Australia 13: 20 (1928).

Racosperma obtusatum (Sieber ex DC.) Pedley, **comb. nov.** *§115*
Acacia obtusatum Sieber ex DC., Prodr. 2: 453 (1825).

Racosperma obtusifolium (A.Cunn.) Pedley, Austrobaileya 2: 353 (1987). *§894*

Racosperma octonervium (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§490*
Acacia octonervia R.S.Cowan & Maslin, Nuytsia 9: 73 (1993).

Racosperma oldfieldii (F.Muell.) Pedley, **comb. nov.** *§867*
Acacia oldfieldii F.Muell., Fragm. 4: 7 (1863).

Racosperma olganum (Maconochie) Pedley, Bot. J. Linn. Soc. 92: 249 (1986). *§831*

Racosperma oligoneurum (F.Muell.) Pedley, **comb. nov.** *§771*
Acacia oligoneura F.Muell., J. Proc. Linn. Soc., Bot. 3: 139 (1859).

Racosperma olsenii (Tindale) Pedley, **comb. nov.** *§43*
Acacia olsenii Tindale, Telopea 2: 123 (1980).

Racosperma omalophyllum (A.Cunn. ex Benth.) Pedley, Austrobaileya 2: 353 (1987). *§599*

Racosperma ommatospermum Pedley, Austrobaileya 2: 327 (1987). *§629*

Racosperma oncinocarpum (Benth.) Pedley, **comb. nov.** *§770*
Acacia oncinocarpa Benth., London J. Bot. 1: 378 (1842).

Racosperma oncinophyllum (Lindl.) Pedley, **comb. nov.** *§862*
Acacia oncinophylla Lindl., Sketch Veg. Swan R. xv (1839).

R. oncinophyllum subsp. **patulifolium** (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§862b*
Acacia oncinophylla subsp. *patulifolia* R.S.Cowan & Maslin, Nuytsia 10: 53 (1995).

Racosperma ophiolithicum (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§537*
Acacia ophiolithica R.S.Cowan & Maslin, Nuytsia 10: 246 (1995).

Racosperma orarium (F.Muell.) Pedley, Bot. J. Linn. Soc. 92: 249 (1986). *§636*

Racosperma orbifolium (Maiden & Blakely) Pedley, **comb. nov.** *§317*
Acacia orbifolia Maiden & Blakely, J. Roy. Soc. W. Australia 13: 9 (1927).

Racosperma orites (Pedley) Pedley, Austrobaileya 2: 353 (1987). *§902*

Racosperma orthocarpum (F.Muell.) Pedley, Austrobaileya 2: 353 (1987). *§732*

Racosperma orthotrichum (Pedley) Pedley, **comb. nov.** *§914*
Acacia orthotricha Pedley, Contrib. Queensland. Herb. 11: 19 (1972).

Racosperma oshanesii (F.Muell. & Maiden) Pedley, Austrobaileya 2: 353 (1987). *§36*

Racosperma oswaldii (F.Muell.) Pedley, Austrobaileya 2: 353 (1987). *§580*

Racosperma oxycedrus (Sieber ex DC.) Pedley, **comb. nov.** *§905*
Acacia oxycedrus Sieber ex DC., Prodr. 2: 453 (1825).

Racosperma oxycladum (F.Muell. ex Benth.) Pedley, **comb. nov.** *§310*
Acacia oxyclada F.Muell. ex Benth., Fl. Austral. 2: 341 (1864).

Racosperma pachyacrum (Maiden & Blakely) Pedley, **comb. nov.** *§194*
Acacia pachyacra Maiden & Blakely, J. Roy. Soc. W. Australia 13: 21 (1927).

Racosperma pachycarpum (F.Muell. ex Benth.) Pedley, **comb. nov.** *§825*
Acacia pachycarpa F.Muell. ex Benth., Fl. Austral. 2: 408 (1864).

Racosperma pachyphyllum (Maslin) Pedley, **comb. nov.** *§434*
Acacia pachyphylla Maslin, Nuytsia 12: 379 (1999).

Racosperma pachypodum (Maslin) Pedley, **comb. nov.** *§239*
Acacia pachypoda Maslin, Nuytsia 1: 326 (1974).

Racosperma palustre (Luehm.) Pedley, **comb. nov.** *§865*
Acacia palustris Luehm., Victorian Naturalist 13: 117 (1897).

Racosperma paniculatum Pedley, Austrobaileya 2: 324 (1987). *§627*

Racosperma papulosum (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§577*
Acacia papulosa R.S.Cowan & Maslin, Nuytsia 10: 219 (1995).

Racosperma papyrocarpum (Benth.) Pedley, **comb. nov.** *§595*
Acacia papyrocarpa Benth., Fl. Austral. 2: 338 (1864).

Racosperma paradoxum (DC.) Pedley, **comb. nov.** *§453*
Mimosa paradoxa DC., Cat. Pl. Hort. Monsp. 74 (1813).

Racosperma paraneurum (Randell) Pedley, **comb. nov.** *§838*
Acacia paraneura Randell, J. Adelaide Bot. Gard. 14: 116 (1992).

Racosperma parramattense (Tindale) Pedley, Austrobaileya 2: 358 (1987). *§45*

Racosperma parvipinnulum (Tindale) Pedley, **comb. nov.** *§39*
Acacia parvipinnula Tindale, Proc. Linn. Soc. New South Wales ser. 2. 85: 249 (1960).

Racosperma pataczekii (D.I.Morris) Pedley, **comb. nov.** *§145*
Acacia pataczekii D.I.Morris, Rec. Queen Victoria Mus. 50: 1 (1974).

Racosperma patagiatum (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§497*
Acacia patagiata R.S.Cowan & Maslin, Nuytsia 7: 216 (1990).

Racosperma paulum (Tindale & S.Davies) Pedley, **comb. nov.** *§767*
Acacia paula Tindale & S.Davies. Austral. Syst. Bot. 3: 387 (1990).

Racosperma pedinum (Kodela & Tame) Pedley, **comb. nov.** *§sub 111*
Acacia pedina Kodela & Tame, Telopea 8: 305 (1999).

Racosperma pedleyi (Tindale & Kodela) Pedley, **comb. nov.** *§41*
Acacia pedleyi Tindale & Kodela, Austrobaileya 3: 745 (1992).

Racosperma pellitum (O.Schwarz) Pedley, **comb. nov.** *§679*
Acacia pellita O. Schwarz, Repert. Sp. Nov. Regni Veg. 24: 86 (1927).

Racosperma pelophilum (R.S.Cowan & Maslin) Pedley), **comb. nov.** *§514*
Acacia pelophila R.S.Cowan & Maslin, Nuytsia 12: 428 (1999).

Racosperma pendulum (A.Cunn. ex G.Don) Pedley, Austrobaileya 2: 353 (1987). *§598*

The basionym is usually cited as *Acacia pendula* A.Cunn. ex G.Don, but the name was published 12 years earlier. It might be cited as *A.pendula* A.Cunn in Oxley, Journals into the interior of New South Wales 63 (1820). The name *Eucalyptus dumosa* A.Cunn. was published by Oxley in the same way, and accepted in *Flora of Australia.* It was considered by Brummitt (2002) as an example of a nomen subnudum. Acceptance of the earlier publication does not affect the correctness of the name.

Racosperma penninerve (Sieber ex DC.) Pedley, Bot. J. Linn. Soc. 92: 239 (1986). *§58*

R. penninerve var. **longiracemosum** (Domin) Pedley, Austrobaileya 2: 353 (1987). *§58b*

Racosperma pentadenium (Lindl.) Pedley, **comb. nov.** *§929*
Acacia pentadenia Lindl., Bot. Reg. 18: t. 1521 (1832).

Racosperma perangustum (C.T.White) Pedley, Austrobaileya 2: 353 (1987). *§123*

***Racosperma peregrinale** (M.W. McDonald & Maslin) Pedley, **comb. nov.** *§sub 670*
Acacia peregrinalis M.W.McDonald & Maslin, Nuytsia 14: 455 (2002).

Racosperma perryi (Pedley) Pedley, Austrobaileya 2: 571 (1988). *§924*

Racosperma petraeum (Pedley) Pedley, Bot. J. Linn. Soc. 92: 249 (1986). *§795*

Racosperma peuce (F.Muell.) Pedley, Bot. J. Linn. Soc. 92: 249 (1986). *§185*

Racosperma phaeocalyx (Maslin) Pedley, **comb. nov.** *§365*
Acacia phaeocalyx Maslin, Nuytsia 2: 321 (1978).

Racosperma pharangites (Maslin) Pedley, **comb. nov.** *§487*
Acacia pharangites Maslin, Nuytsia 4: 33 (1982).

Racosperma phasmoides (J.H.Willis) Pedley, **comb. nov.** *§287*
Acacia phasmoides J.H.Willis, Muelleria 1: 121 (1967).

Racosperma phlebocarpum (F.Muell.) Pedley, Austrobaileya 2: 353 (1987). *§731*

Racosperma phlebopetalum (Maslin) Pedley, **comb. nov.** *§339*
Acacia phlebopetala Maslin, Nuytsia 2: 295 (1978).

R. phlebopetalum var. **pubescens** (Maslin) Pedley, **comb. nov.** *§339b*
Acacia phlebopetala var. *pubescens* Maslin, Nuytsia 2:299 (1978).

Racosperma phlebophyllum (H.B.Williamson) Pedley, **comb. nov.** *§895*
Acacia phlebophylla H.B.Williamson, in H.J.Ewart, Fl. Victoria 607 (1931).

Racosperma pickardii (Tindale) Pedley, **comb. nov.** *§205*
Acacia pickardii Tindale, Telopea 1: 372 (1992).

Racosperma piligerum (A.Cunn.) Pedley, **comb. nov.** *§168*
Acacia piligera A. Cunn., Bot. Mag. 62 sub t. 3394 (1835).

Racosperma pilligaense (Maiden) Pedley, **comb. nov.** *§282*
Acacia pilligaensis Maiden., J. & Proc. Roy. Soc. New South Wales 53: 187 (1920).

Racosperma pinguiculosum (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§484*
Acacia pinguiculosa R.S.Cowan & Maslin, Nuytsia 12: 429 (1999).

R. pinguiculosum subsp. **teretifolium** (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§484b*
Acacia pinguiculosa subsp. *teretifolia* R.S.Cowan & Maslin, Nuytsia 12: 431 (1999).

Racosperma pinguifolium (J.M.Black) Pedley, **comb. nov.** *§482*
Acacia pinguifolia J.M.Black, Trans. & Proc. Roy. Soc. S. Australia 71: 20 (1947).

Racosperma platycarpum (F.Muell.) Pedley, Austrobaileya 2: 354 (1987). *§647*

Racosperma plautellum (Maslin) Pedley, **comb. nov.** *§352*
Acacia plautella Maslin, Nuytsia 12: 381 (1999).

Racosperma plectocarpum (A.Cunn. ex Benth.) Pedley, Austrobaileya 2: 354 (1987). *§698*

R. plectocarpum subsp. **tanumbirinense** (Maiden) Pedley, Austrobaileya 2: 354 (1987). *§698b*

Racosperma plicatum (Maslin) Pedley, **comb. nov.** *§947*
Acacia plicata Maslin, Nuytsia 1: 451 (1975).

Racosperma podalyriifolium (A.Cunn. ex G.Don) Pedley, Austrobaileya 2: 354 (1987). *§147*

Racosperma polifolium (Pedley) Pedley, Austrobaileya 2: 354 (1987). *§130*

Racosperma poliochroa(E. Pritzel) Pedley, **comb. nov.** *§429*
Acacia poliochroa E.Pritzel, Bot. Jahr. Syst. 35: 293 (1904).

Racosperma polyadenium Pedley, Austrobaileya 2: 322 (1987). *§772*

Racosperma polybotryum (Benth.) Pedley, Austrobaileya 2: 354 (1987). *§19*

Racosperma polystachyum (A Cunn. ex Benth.) Pedley, Austrobaileya 2: 354 (1987). *§672*

Racosperma porcatum (P.Forster) Pedley, **comb. nov.** *§927*
Acacia porcata P.Forster, Austrobaileya 3: 261 (1990).

Racosperma praelongatum (F.Muell.) Pedley, **comb. nov.** *§192*
Acacia praelongata F.Muell., Australas. Chemist & Druggist 6: 32 (1883).

Racosperma praemorsum (P.Lang & Maslin) Pedley, **comb. nov.** *§448*
Acacia praemorsa P.Lang & Maslin, J. Adelaide Bot. Gard. 13: 118 (1990).

Racosperma praetermissum (Tindale) Pedley, **comb. nov.** *§766*
Acacia praetermissa Tindale, Telopea 2: 113 (1980).

Racosperma prainii (Maiden) Pedley, **comb. nov.** *§214*
Acacia prainii Maiden, J. & Proc. Roy. Soc. New South Wales 51: 238 (1917).

Racosperma pravifolium (F.Muell.) Pedley, Austrobaileya 2: 354 (1987). *§301*

Racosperma pravissimum (F.Muell. ex Benth.) Pedley, Austrobaileya 2: 359 (1987). *§148*

The name *Acacia pravissima* was validated in Bentham's note (Linnaea 26 (1855) 608) prior to Mueller's extended description of the species (Fragm. 1 (1858) 5).

Racosperma preissianum (Meisn.) Pedley, **comb. et stat. nov.** *§950*
Acacia obscura var. *preissiana* Meisn., in J.G.C. Lehmann, Pl. Preiss. 1: 20 (1844).

Racosperma prismifolium (E.Pritzel) Pedley, **comb. nov.** *§494*
Acacia prismifolia E.Pritzel, Bot. Jahr. Syst. 35: 293 (1904).

Racosperma pritzelianum (C.A.Gardner) Pedley, **comb. nov.** *§384*
Acacia pritzeliana C.A.Gardner, Hooker's Icon. Pl. 34: t. 3380 (1939).

Racosperma productum (Tindale) Pedley, **comb. nov.** *§765*
Acacia producta Tindale, Telopea 2: 116 (1980).

Racosperma profusum (Maslin) Pedley, **comb. nov.** *§424*
Acacia profusa Maslin, Nuytsia 12: 383 (1999).

Racosperma proianthum (Pedley) Pedley, **comb. nov.** *§711*
Acacia proiantha Pedley, Austrobaileya 5: 318 (1999).

Racosperma prominens (A.Cunn. ex G.Don) Pedley, **comb. nov.** *§142*
Acacia prominens A.Cunn. ex G.Don, Gen. Hist. 2: 406 (1832).

Racosperma proximum (Maiden) Pedley, **comb. nov.** †
Acacia proxima Maiden, J. & Proc. Roy. Soc. New South Wales 51: 105 (1917).

The name is based on *Acacia camptoclada* E.Pritzel, *nom. illeg.* non *A. camptoclada* C.R.P.Andrews. Andrews's species is treated in *Flora of Australia*. The identity of *A. camptoclada* Pritzel is discussed there as a "Doubtful Name" where it was suggested that it might be the same as *A. ancistrocarpa*. I have not seen any of the material cited by Pritzel but, from his description, it could prove to be one of the variants of *A. adsurgens*. As treated in the *Flora*, this species is rather heterogeneous. In view of its potential influence on nomenclature, I have made the transfer to *Racosperma*.

Racosperma pruinocarpum (Tindale) Pedley, **comb. nov.** *§181*
Acacia pruinicarpa Tindale, Contrib. New South Wales Natl Herb 4: 73 (1968).

Racosperma pruinosum (A.Cunn. ex Benth.) Pedley, Austrobaileya 2: 354 (1987). *§15*

Racosperma pterocaulon (Maslin) Pedley, **comb. nov.** *§255*
Acacia pterocaulon Maslin, Nuytsia 10: 165 (1995).

Racosperma ptychocladum (Maiden & Blakely) Pedley, **comb. nov.** *§525*
Acacia ptychoclada Maiden & Blakely, J. & Proc. Roy. Soc. New South Wales 60: 190 (1927).

Racosperma ptychophyllum (F.Muell.) Pedley, **comb. nov.** *§774*
Acacia ptychophylla F.Muell., J. Proc. Linn. Soc., Bot. 3: 142 (1859).

Racosperma pubescens (Vent.) Pedley, **comb. nov.** *§29*
Mimosa pubescens Vent., Jard. Malmaison 1: t. 21 (1803).

Racosperma pubicostum (C.T.White) Pedley, Austrobaileya 2: 354 (1987). *§131*

Racosperma pubifolium (Pedley) Pedley, Bot. J. Linn. Soc. 92: 249 (1986). *§784*

Racosperma pubirhachis (Pedley) Pedley, Austrobaileya 2: 354 (1987). *§703*

Racosperma pulchellum (R.Br.) Pedley, Bot. J. Linn. Soc. 92: 240 (1986). *§941*

R. pulchellum var. **glaberrimum** (Meisn.) Pedley, **comb. nov.** *§941c*
Acacia pulchella var. *glaberrima* Meisn., in J.G.C. Lehmann, Pl. Preiss. 1: 22 (1844).

R. pulchellum var. **goadbyi** (Domin) Pedley, **comb.** et **stat. nov.** *§941d*
Acacia goadbyi Domin, Vstn. Král. Ceské Spolen. Nauk. TU. Mat.-PYír. 2: 47 (1923).

R. pulchellum var. **reflexum** (Maslin) Pedley, **comb. nov.** *§941b*
Acacia pulchella var. *reflexa* Maslin, Nuytsia 1: 401 (1975).

Racosperma pulviniforme (Maiden & Blakely) Pedley, **comb. nov.** *§312*
Acacia pulviniformis Maiden & Blakely, J. Roy. Soc. W. Australia 13: 1 (1927).

Racosperma puncticulatum (Maslin) Pedley, **comb. nov.** *§396*
Acacia puncticulata Maslin, Nuytsia 12: 384 (1999).

Racosperma purpureopetalum (F.M.Bailey) Pedley (as 'purpureipetalum'), Austrobaileya 2: 354 (1987). *§268*

Racosperma pusillum (Maslin) Pedley, **comb. nov.** *§425*
Acacia pusilla Maslin, Nuytsia 12: 386 (1999).

Racosperma pustulum (Maiden & Blakely) Pedley **comb. nov.** *§127*
Acacia pustula Maiden & Blakely, Proc. Roy. Soc. Queensland 38: 177 (1927). *Racosperma neriifolium* subsp. *pustulum* (Maiden & Blakely) Pedley, Austrobaileya 2: 353 (1987).

Racosperma pycnanthum (Benth.) Pedley, **comb. nov.** *§111*
Acacia pycnantha Benth., London J. Bot. 1: 351 (1842).

Racosperma pycnocephalum (Maslin) Pedley, **comb. nov.** *§347*
Acacia pycnocephala Maslin, Nuytsia 2: 281 (1978).

Racosperma pycnostachyum (F.Muell. ex Benth.) Pedley, Bot. J. Linn. Soc. 92: 249 (1986). *§789*

Racosperma pygmaeum (Maslin) Pedley, **comb. nov.** *§262*
Acacia pygmaea Maslin, Nuytsia 10: 99 (1995).

Racosperma pyrifolium (DC.) Pedley, **comb. nov.** *§208*
Acacia pyrifolia DC., Prodr. 2: 452 (1825).

Racosperma quadrilaterale (DC.) Pedley, Austrobaileya 2: 354 (1987). *§190*

Racosperma quadrimarginum (F.Muell.) Pedley, **comb. nov.** *§834*
Acacia quadrimarginea F.Muell., Fragm. 10: 31 (1876).

Racosperma quadrisulcatum (F.Muell.) Pedley, **comb. nov.** *§374*
Acacia quadrisulcata F.Muell., Fragm. 3: 127 (1863).

Racosperma quinquenervium (Maslin) Pedley, **comb. nov.** *§430*
Acacia quinquenervia Maslin, Nuytsia 12: 387 (1999).

Racosperma quornense (J.M.Black) Pedley, **comb. nov.** *§79*
Acacia quornensis J.M. Black, Trans. & Proc. Roy. Soc. S. Australia 73: 6 (1949).

Racosperma ramiflorum (Domin) Pedley, Austrobaileya 2: 354 (1987). *§632*

Racosperma ramulosum (W.V. Fitzg.) Pedley, Austrobaileya 2: 354 (1987). *§835*

R. ramulosum var. **linophyllum** (W.V. Fitzg.) Pedley, **comb.** et **stat. nov.** *§835b*
Acacia linophylla W.V. Fitzg., J. W. Australia Nat. Hist. Soc. 16 (1904).

Racosperma recurvatum (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§501*
Acacia recurvata R.S.Cowan & Maslin, Nuytsia 12: 432 (1999).

Racosperma redolens (Maslin) Pedley, **comb. nov.** *§519*
Acacia redolens Maslin, Nuytsia 1: 327 (1974).

Racosperma rendlei (Maiden)Pedley, **comb. nov.** *§399*
Acacia rendlei Maiden, J. & Proc. Roy. Soc. New South Wales 51: 241 (1917).

Racosperma repandum (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§860*
Acacia repanda R.S.Cowan & Maslin, Nuytsia 10: 54 (1995).

Racosperma repens (A.S. George) Pedley, **comb. nov.** *§920*
Acacia repens A.S.George, J. Roy. Soc. W. Australia 82: 71 (1999).

Racosperma resinicostatum (Pedley) Pedley, Austrobaileya 2: 354 (1987). *§279*

Racosperma resinimargineum (W.V.Fitzg.) Pedley, **comb. nov.** *§850*
Acacia resinimarginea W.V.Fitzg., J. W. Australia Nat. Hist. Soc. 15 (1904).

Racosperma resinistipuleum (W.V.Fitzg.) Pedley, **comb. nov.** *§558*
Acacia resinistipulea W.V.Fitzg. (as 'resinostipulea'), J. W. Australia Nat. Hist. Soc. 12 (1904).

Racosperma resinosum (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§579*
Acacia resinosa R.S.Cowan & Maslin, Nuytsia 12: 433 (1999).

Racosperma restiaceum (Benth.) Pedley, **comb. nov.** *§245*
Acacia restiacea Benth., London J. Bot. 1: 323 (1842).

Racosperma retinerve (Benth.) Pedley, **comb. nov.** *§693*
Acacia retinervis Benth., London J. Bot. 1: 379 (1842).

Racosperma retinodes (Schltdl) Pedley, **comb. nov.** *§94*
Acacia retinodes Schltdl, Linnaea 20: 664 (1847).

R. retinodes var. **uncifolium** (J.M. Black) Pedley, **comb. nov.** *§94b*
Acacia retinodes var. *uncifolia* J.M.Black, Trans. & Proc. Roy. Soc. S. Australia 56: 42 (1932).

Racosperma retiveneum (F.Muell.) Pedley, Austrobaileya 2: 354 (1987). *§644*

R. retiveneum subsp. **clandestinum** (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§644b*
Acacia retivenea subsp. *clandestina* R.S.Cowan & Maslin, Nuytsia 10: 76 (1995).

Racosperma retrorsum (Meisn.) Pedley, **comb. nov.** *§300*
Acacia retrorsa Meisn., Bot. Zeitung (Berlin) 13: 10 (1855).

Racosperma rhamphophyllum (Maslin) Pedley, **comb. nov.** *§426*
Acacia rhamphophylla Maslin, Nuytsia 12: 389 (1999).

Racosperma rhetinocarpum (J.M. Black) Pedley, **comb. nov.** *§454*
Acacia rhetinocarpa J.M. Black, Trans. & Proc. Roy. Soc. S. Australia 44: 193 (1920).

Racosperma rhigiophyllum (F. Muell. ex Benth.) Pedley, **comb. nov.** *§909*
Acacia rhigiophylla F. Muell. ex Benth., Linnaea 26: 611 (1855).

Racosperma rhodophloia (Maslin) Pedley, **comb. nov.** *§812*
Acacia rhodophloia Maslin, J. Adelaide Bot Gard. 2: 317 (1980).

Racosperma rhodoxylon (Maiden) Pedley, Austrobaileya 2: 354 (1987). *§786*

Racosperma riceanum (Henslow) Pedley, Bot. J. Linn. Soc. 92: 249 (1986). *§907*

Racosperma richardsii (Maslin) Pedley, **comb. nov.** *§737*
Acacia richardsii Maslin, Nuytsia 4: 373 (1983).

***Racosperma richii** (A. Gray) Pedley, **comb. nov.** †
Acacia richii A. Gray, Bot. U. S. Explor. Exped. 1: 482 (1854); Pedley, Contrib. Queensland Herb. 18: 12 (1975); A.C. Smith, Fl. Vitiensis Nova 3: 73. t. 17 D & E (1985).

Racosperma ridleyanum (W.V. Fitzg.) Pedley, **comb. nov.** *§556*
Acacia ridleyana W.V. Fitzg., J. W. Australia Nat. Hist. Soc. 12 (1904).

Racosperma rigens (A.Cunn. ex G.Don) Pedley, Austrobaileya 2: 355 (1987). *§584*

Racosperma rigescens (Tindale & Bedward) Pedley, **comb. nov.** *§704*
Acacia rigescens Tindale & Bedward, Austral. Syst. Bot. 9: 864 (1996).

Racosperma rigidum (Maslin) Pedley, **comb. nov.** *§355*
Acacia rigida Maslin, Nuytsia 12: 390 (1999).

Racosperma rivale (J.M. Black) Pedley, **comb. nov.** *§88*
Acacia rivalis J.M. Black, Trans. & Proc. Roy. Soc. S. Australia 42: 173 (1918).

Racosperma robiniae (Maslin) Pedley, **comb. nov.** *§338*
Acacia robiniae Maslin (as 'robinae'), Nuytsia 2: 292 (1978).

Racosperma rossei (F. Muell.) Pedley, **comb. nov.** *§284*
Acacia rossei F. Muell., Victorian Naturalist 10: 55 (1893).

Racosperma rostellatum (Maslin) Pedley, **comb. nov.** *§323*
Acacia rostellata Maslin, Nuytsia 12: 392 (1999).

Racosperma rostelliferum (Benth.) Pedley, **comb. nov.** *§225*
Acacia rostellifera Benth,. London J. Bot. 1: 356 (1842).

Racosperma rothii (F.M. Bailey) Pedley, Austrobaileya 2: 355 (1987). *§655*

Racosperma roycei (Maslin) Pedley, **comb. nov.** *§583*
Acacia roycei Maslin, Nuytsia 2: 150 (1977).

Racosperma rubidum (A. Cunn.) Pedley, Austrobaileya 2: 355 (1987). *§71*

Racosperma rubricola (Pedley) Pedley, **comb. nov.** †
Acacia rubricola Pedley, Austrobaileya 5: 309 (1999).

Racosperma rupicola (F.Muell. ex Benth.) Pedley, **comb. nov.** *§298*
Acacia rupicola F. Muell. ex Benth., Linnaea 26: 610 (1855).

Racosperma ruppii (Maiden & Betche) Pedley, Austrobaileya 2: 355 (1987). *§159*

Racosperma ryanianum (Maslin) Pedley, **comb. nov.** *§203*
Acacia ryaniana Maslin, Nuytsia 8: 300 (1992).

Racosperma sabulosum (Maslin) Pedley, **comb. nov.** *§272*
Acacia sabulosa Maslin, Nuytsia 12: 393 (1999).

Racosperma saliciforme (Tindale) Pedley, **comb. nov.** *§63*
Acacia saliciformis Tindale, Contrib. New South Wales Natl Herb. 4: 22 (1966).

Racosperma salicinum (Lindl.) Pedley, Austrobaileya 2: 355 (1987). *§218*

Racosperma salignum (Labill.) Pedley, Austrobaileya 2: 355 (1987). *§234*

Racosperma saxatile (S. Moore) Pedley, **comb. nov.** *§418*
Acacia saxatilis S. Moore, J. Linn. Soc., Bot. 45: 173 (1920).

Racosperma saxicola (Pedley) Pedley, Austrobaileya 2: 355 (1987). *§296*

Racosperma scabrum (Benth) Pedley, **comb. nov.** *§400*
Acacia scabra Benth., Linnaea 26: 605 (1855).

Racosperma scalenum (Maslin) Pedley, **comb. nov.** *§305*
Acacia scalena Maslin, Nuytsia 12: 396 (1999).

Racosperma scalpelliforme (Meisn.) Pedley, **comb. nov.** *§265*
Acacia scalpelliformis Meisn. in J.G.C. Lehmann, Pl. Preiss. 2: 20 (1848).

Racosperma schinoides (Benth.) Pedley, **comb. nov.** *§18*
Acacia schinoides Benth., Lond. J.Bot. 1:383 (1842). Fl Austral. 2: 413 (1864).

Racosperma sciophanes (Maslin) Pedley, **comb. nov.** *§888*
Acacia sciophanes Maslin, Nuytsia 2: 153 (1977).

Racosperma scirpifolium (Meisn.) Pedley, **comb. nov.** *§235*
Acacia scirpifolia Meisn., Bot. Zeitung (Berlin) 13: 10 (1855).

Racosperma sclerocladum (Maslin) Pedley, **comb. nov.** *§244*
Acacia scleroclada Maslin, Nuytsia 10: 196 (1995).

Racosperma sclerophyllum (Lindl.) Pedley, **comb. nov.** *§483*
Acacia sclerophylla Lindl., in T. L. Mitchell, Three Exped. Australia 2: 138 (1838).

R. sclerophyllum var. **pilosum** (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§483b*
Acacia sclerophylla var. *pilosa* R.S.Cowan & Maslin, Nuytsia 12: 440. (1999).

R. sclerophyllum var. **teretiusculum** (Maiden & Blakely) Pedley, **comb. nov.** *§483c*
Acacia sclerophylla var. *teretiuscula* Maiden & Blakely, J. Roy. Soc. W. Australia 13: 22 (1928).

Racosperma sclerospermum (F.Muell.) Pedley, **comb. nov.** *§221*
Acacia sclerosperma F. Muell. Wing's S. Sci. Rec. 2 (7): 150 (1882).

R. sclerospermum subsp. **glaucescens** (A.R.Chapm. & Maslin) Pedley, **comb. nov.** *§21b*
Acacia sclerosperma subsp. *glaucescens* A.R. Chapm. & Maslin, Nuytsia 8: 274 (1992).

Racosperma scopulorum (Pedley) Pedley, **comb. nov.** *§713*
Acacia scopulorum Pedley (as 'scopularum'), Austrobaileya 5: 319 (1999).

Racosperma seclusum (M.W.McDonald) Pedley, **comb. nov.** *§691b*
Acacia secluse M.W.McDonald, Austral, syst. Bot. 16:152. t.9 (2003)

A.tumida var pubescens Maiden A.J.Ewart & O.B.Davies, Fl.N.Terr. 344 (1917) **syn. nov.**

Racosperma sedifolium (Maiden & Blakely) Pedley, **comb. nov.** *§286*
Acacia sedifolia Maiden & Blakely, J. Roy. Soc. W. Australia 13: 3 (1927).

R. sedifolium subsp. **pulvinatum** (Maslin) Pedley, **comb. nov.** *§286b*
Acacia sedifolia subsp. *pulvinata* Maslin, Nuytsia 12: 398 (1999).

Racosperma semicircinale (Maiden & Blakely) Pedley, **comb. nov.** *§401*
Acacia semicircinalis Maiden & Blakely, J. Roy. Soc. W. Australia 13: 11 (1927).

Racosperma semilunatum (Maiden & Blakely) Pedley, Austrobaileya 2: 355 (1987). *§154*

Racosperma semirigidum (Maiden & Blakely) Pedley, Austrobaileya 2: 355 (1987). *§144*

Racosperma semitrullatum (Maslin) Pedley, **comb. nov.** *§350*
Acacia semitrullata Maslin, Nuytsia 2: 282 (1978).

Racosperma sericatum (A.Cunn. ex Benth.) Pedley, **comb. nov.** *§648*
Acacia sericata A.Cunn. ex Benth., London J. Bot. 1: 380 (1842).

Racosperma sericocarpum (W.V. Fitzg.) Pedley, **comb. nov.** *§438*
Acacia sericocarpa W.V. Fitzg., J. W. Australia Nat. Hist. Soc. 9 (1904).

Racosperma sericoflorum (Pedley) Pedley, **comb. nov.** *§681*
Acacia sericoflora Pedley (as 'sericiflora'), Contrib. Queensland Herb. 15: 16 (1974).

Racosperma serpentinicola (Maslin) Pedley, **comb.** et **stat. nov.** *§189b*
Acacia juncifolia subsp. *serpentinicola* Maslin, Telopea 6: 47 (1994).

Examination of specimens from the type locality and consideration of the protologue description indicate that the taxon should be recognised as a distinct species.

Racosperma sertiforme (A.Cunn.) Pedley, **comb. nov.** *§167*
Acacia sertiformis A.Cunn., Bot. Mag. 62 sub t. 3394 (1835).

Racosperma sessile (Benth.) Pedley, **comb. nov.** *§389*
Acacia sessilis Benth., London J. Bot. 1: 336 (1842).

Racosperma sessilispicum (Maiden & Blakely) Pedley, **comb. nov.** *§870*
Acacia sessilispica Maiden & Blakely, J. Roy. Soc. W. Australia 13: 23 (1927).

Racosperma setuliferum (Benth.) Pedley, **comb. nov.** *§752*
Acacia setulifera Benth., Linnaea 26: 625 (1855).

Racosperma shirleyi (Maiden) Pedley, Austrobaileya 2: 355 (1987). *§793*

Racosperma shuttleworthii (Meisn.) Pedley, **comb. nov.** *§331*
Acacia shuttleworthii Meisn., in J.G.C.Lehmann, Pl. Preiss. 1: 7 (1844).

Racosperma sibilans (Maslin) Pedley, **comb. nov.** *§592*
Acacia sibilans Maslin, Nuytsia 4: 402 (1983).

Racosperma sibinum (Maslin) Pedley, **comb. nov.** *§853*
Acacia sibina Maslin. Nuytsia 2: 155 (1977).

Racosperma sibiricum (S. Moore) Pedley, **comb. nov.** *§818*
Acacia sibirica S. Moore, J. Linn. Soc., Bot. 34: 189 (1899).

Acacia stowardii Maiden, J. Roy. Soc. New South Wales 51: 269 (1917); *Racosperma stowardii* (Maiden) Pedley, Austrobaileya 2: 356 (1987), **syn. nov.**

Pedley (1974) referred *Acacia sibirica* to *A. kempeana*, a course followed by Kodela (*Flora of Australia* 11B: 293). Re-examination of the type (BM), however, indicates that it is conspecific with *A. stowardii*.

Racosperma siculiforme (A.Cunn. ex Benth.) Pedley, **comb. nov.** *§297*
Acacia siculiformis A.Cunn. ex Benth., London J. Bot. 1: 337 (1842).

Racosperma signatum (F. Muell.) Pedley, **comb. nov.** *§806*
Acacia signata F. Muell., Fragm. 4: 7 (1863).

Racosperma silvestre (Tindale) Pedley, **comb. nov.** *§44*
Acacia silvestris Tindale, Victorian Naturalist 73: 162 (1957).

Racosperma simmonsianum (O'Leary & Maslin), Pedley, **comb. nov.** *§sub 432*
Acacia simmondsiana (O'Leary & Maslin), J. Adelaide Bot. Gard. 20: 5 (2002).

***Racosperma simplex** (Sparrman) Pedley, Bot. J. Linn. Soc. 92: 249 (1986). †
Acacia simplex Sparrman, Nov. Act. Soc. Ups. 3: 195 (1781); Pedley, Contrib. Queensland Herb. 18: 10 (1975); A.C. Smith, Fl. Vitiensis Nova 3: 71. t. 17 A & B (1985).

Racosperma simsii (Benth.) Pedley, Austrobaileya 2: 355 (1987). *§633*

Racosperma simulans (Maslin) Pedley, **comb. nov.** *§360*
Acacia simulans Maslin, Nuytsia 2: 100 (1976).

Racosperma singulum (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§872*
Acacia singula R.S. Cowan & Maslin, Nuytsia 10: 45 (1995).

Racosperma smeringum (A.S. George) Pedley, **comb. nov.** *§919*
Acacia smeringa A.S. George, J. Roy. Soc. W. Australia 82: 73 (1999).

Racosperma solenotum (Pedley) Pedley, **comb. nov.** *§769*
Acacia solenota Pedley, Austrobaileya 5: 319 (1999).

Racosperma sophorae (Labill.) C. Martius (as 'sophora'), Hort. Reg. Monacensis Seminifer (1835) and Hort. Reg. Monacensis. 188 (1829), the latter **nom. inval.**

Racosperma sorophyllum (E. Pritzel) Pedley, **comb. nov.** *§326*
Acacia sorophylla E. Pritzel, Bot. Jahr. Syst. 35: 296 (1904).

Racosperma spanium (Pedley) Pedley, Austrobaileya 2: 355 (1987). *§785*

Racosperma sparsiflorum (Maiden) Pedley, Austrobaileya 2: 355 (1987). *§796*

Racosperma spathulifolium (Maslin) Pedley, **comb. nov.** *§237*
Acacia spathulifolia Maslin, Nuytsia 2: 213 (1978).

Racosperma speckii (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§528*
Acacia speckii R.S Cowan & Maslin, Nuytsia 12: 465 (1999).

Racosperma spectabile (A. Cunn. ex Benth.) Pedley, Austrobaileya 2: 355 (1987). *§22*

Racosperma sphacelatum (Benth.) Pedley, **comb. nov.** *§390*
Acacia sphacelata Benth., London J. Bot. 1: 338 (1842).

R. sphacelatum subsp. **recurvum** (Maslin) Pedley, **comb. nov.** *§390b*
Acacia sphacelata subsp. ***recurva*** Maslin, Nuytsia 12: 401 (1999).

R. sphacelatum subsp. **verticillatum** (Maslin) Pedley, **comb. nov.** *§390c*
Acacia sphacelata subsp. *verticillata* Maslin, Nuytsia 12: 402 (1999).

Racosperma sphaerostachyum (E. Pritzel) Pedley, **comb. nov.** *§757*
Acacia sphaerostachya E. Pritzel, Bot. Jahr. Syst. 35: 305 (1904).

Racosperma sphenophyllum (Maslin) Pedley, **comb. nov.** *§306*
Acacia spenophylla Maslin, Nuytsia 12: 403 (1999).

Racosperma spillerianum (J.E.Br.) Pedley, **comb. nov.** *§174*
Acacia spilleriana J.E. Br., Forest Fl. S. Australia part 7: t. 31 (1886).

Racosperma spinescens (Benth.) Pedley, **comb. nov.** *§308*
Acacia spinescens Benth., London J. Bot. 1: 323 (1842).

Racosperma spinosissimum (Benth.) Pedley, **comb. nov.** *§322*
Acacia spinosissima Benth., Linnaea 26: 621 (1855).

Racosperma spirorbis (Labill.) Pedley (as *'spirorbe'*), Austrobaileya 2: 355 (1987)

R. spirorbis subsp. **solandri** (Benth.) Pedley, Austrobaileya 2:355 (1987). *§674*

*__R. spirorbis__ subsp. **spirorbis**; Labill., Sert. Austro-Caled. 69. t. 69. (1825); Pedley, Contrib. Queensland Herb. 18: 20 (1975); I. Nielsen, Fl. Nouv. Calédonie 12: 34. t. 6 (1983). †

Racosperma spondyllophyllum (F. Muell.) Pedley, Austrobaileya 2: 355 (1987). *§912*

Racosperma spongoliticum (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§516*
Acacia spongolitica R.S.Cowan & Maslin, Nuytsia 7: 195 (1990).

Racosperma spooneri (O'Leary) Pedley, **comb. nov.** †
Acacia spooneri O'Leary, J. Adelaide Bot. Gard. 20: 11 (2002).

Racosperma squamatum (Lindl.) Pedley, **comb. nov.** *§247*
Acacia squamata Lindl., Sketch Veg. Swan R. xv (1839).

Racosperma startii (A.R.Chapm. & Maslin) Pedley, **comb. nov.** *§228*
Acacia startii A.R. Chapm. & Maslin, Nuytsia 8: 275 (1992).

Racosperma steedmanii (Maiden & Blakely) Pedley, **comb. nov.** *§93*
Acacia steedmanii Maiden & Blakely, J. Roy. Soc. W. Australia 13: 16 (1928).

Racosperma stellaticeps (Kodela, Tindale & D.Keith) Pedley, **comb. nov.** *§754*
Acacia stellaticeps Kodela, Tindale & D.Keith, Nuytsia 13: 483 (2001).

Racosperma stenophyllum (A. Cunn. ex Benth.) Pedley, Austrobaileya 2: 355 (1987). *§590*

Racosperma stenopterum (Benth.) Pedley, **comb. nov.** *§369*
Acacia stenoptera Benth., London J. Bot. 1: 325 (1842).

Racosperma stereophyllum(Meisn.) Pedley, **comb. nov.** *§852*
Acacia stereophyllum Meisn., in J.G.C.Lehm., Pl. Preiss. 2: 203 (1848).

R. stereophyllum var. **cylindratum** (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§852b*
Acacia stereophylla var. *cylindrata* R.S.Cowan & Maslin, Nuytsia 10: 57 (1995).

Racosperma stigmatophyllum (A.Cunn. ex Benth.) Pedley, **comb. nov.** *§764*
Acacia stigmatophylla A.Cunn. ex Benth., London J. Bot. 1: 377 (1842).

Racosperma stipuligerum (F.Muell.) Pedley, Austrobaileya 2: 356 (1987). *§707*
R. stipuligerum subsp. *galorifolium* (Maiden & Blakely) Pedley, Austrobaileya 2:356 (1987), **syn. nov.**

Racosperma stipulosum (F.Muell.) Pedley, Austrobaileya 2: 317 (1987). *§615*

Racosperma storyi (Tindale) Pedley, Austrobaileya 2: 356 (1987). *§42*

Racosperma striatifolium (Pedley) Pedley, Austrobaileya 2: 356 (1987). *§782*

Racosperma strictum (Andrews) Pedley, **comb. nov.** *§462*
Mimosa stricta Andrews, Bot. Repos. 1. t. 53 (1799).

Racosperma strongylophyllum (F. Muell.) Pedley, Austrobaileya 2: 356 (1987). *§207*

Racosperma suaveolens (Sm.) Pedley, **comb. nov.** *§177*
Mimosa suaveolens Sm., Trans. Linn. Soc. London 1: 253 (1791).

Racosperma subcaeruleum (Lindl.) Pedley, **comb. nov.** *§178*
Acacia subcaerulea Lindl., Bot. Reg. 13: t. 1075 (1827).

Racosperma subflexuosum (Maiden) Pedley, **comb. nov.** *§539*
Acacia subflexuosa Maiden, J. & Proc. Roy. Soc. New South Wales 53: 178 (1920).

R. subflexuosum subsp. **capillatum** (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§539b*
Acacia subflexuosa subsp. *capillata* R.S.Cowan & Maslin, Nuytsia 12: 443 (1999).

Racosperma sublanatum (Benth.) Pedley, Austrobaileya 2: 318 (1987). *§613*

Racosperma subporosum (F.Muell.) Pedley, **comb. nov.** *§465*
Acacia subporosa F.Muell., Fragm. 4: 5 (1863).

Racosperma subracemosum (Maslin) Pedley, **comb. nov.** *§930*
Acacia subracemosa Maslin, Nuytsia 1: 446 (1975).

Racosperma subrigidum (Maslin) Pedley, **comb. nov.** *§195*
Acacia subrigida Maslin, Nuytsia 10: 198 (1995).

Racosperma subsessile (A.R.Chapm. & Maslin) Pedley, **comb. nov.** *§550*
Acacia subsessilis A.R.Chapm. & Maslin, Nuytsia 12: 490 (1999).

Racosperma subternatum (F.Muell.) Pedley, **comb. nov.** *§742*
Acacia subternata F.Muell., J. Proc. Linn. Soc., Bot. 3: 124 (1859).

Racosperma subtessarogonum (Tindale & Maslin) Pedley, **comb. nov.** *§844*
Acacia subtessoragona Tindale & Maslin, Nuytsia 2: 88 (1976).

Racosperma subtilinerve (F.Muell.) Pedley, **comb. nov.** *§723*
Acacia subtilinervis F.Muell., Fragm. 4: 8 (1863).

Racosperma subulatum (Bonpl.) Pedley, **comb. nov.** *§80*
Acacia subulata Bonpl., Descr. Pl. Malmaison 110. t. 45 (1816).

Racosperma sulcatum (R. Br.) Pedley, **comb. nov.** *§492*
Acacia sulcata R.Br., in W.T. Aiton, Hortus Kew. ed. 2. 5: 460 (1813).

R. sulcatum var. **planoconvexum** (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§492c*
Acacia sulcata var. *planoconvexa* R.S.Cowan & Maslin, Nuytsia 9: 77 (1993).

R. sulcatum var. **platyphyllum** (Maiden & Blakely) Pedley, **comb. nov.** *§492b*
Acacia sulcata var. *platyphylla* Maiden & Blakely, J. Roy. Soc. W. Australia 13: 3 (1927).

Racosperma symonii (Whibley) Pedley, **comb. nov.** *§857*
Acacia symonii Whibley, J. Adelaide Bot. Gard. 2: 167 (1980).

Racosperma synchronicium (Maslin) Pedley, **comb. nov.** *§201*
Acacia synchronicia Maslin, Nuytsia 8: 302 (1992).

Racosperma tarculense (J.M.Black) Pedley, **comb. nov.** *§856*
Acacia tarculensis J.M. Black, Trans. & Proc. Roy. Soc. S. Australia 36: 171 (1912).

Racosperma taylorianum (F.Muell.) Pedley, **comb. nov.** *§951*
Acacia tayloriana F. Muell., South. Sci. Rec. 2(7): 151 (1882).

Racosperma telmicum (A.R.Chapm. & Maslin) Pedley, **comb. nov.** *§227*
Acacia telmica, A.R. Chapm. & Maslin, Nuytsia 8: 277 (1992).

Racosperma tenuinerve (Pedley) Pedley, Austrobaileya 2: 356 (1987). *§790*

Racosperma tenuispicum (Maslin) Pedley, **comb. nov.** *§734*
Acacia tenuispica Maslin, Nuytsia 4: 376 (1983).

Racosperma tenuissimum (F.Muell.) Pedley, Austrobaileya 2: 356 (1987). *§820*

Racosperma tenuius (Maiden) Pedley, **comb. nov.** *§619*
Acacia tenuior Maiden, J. & Proc. Roy. Soc. New South Wales 53: 186 (1920).

Racosperma tephrinum (Pedley) Pedley, Austrobaileya 2: 356 (1987). *§603*

Racosperma teretifolium (Benth.) Pedley, **comb. nov.** *§376*
Acacia teretifolia Benth., London J. Bot. 1: 326 (1842).

Racosperma terminale (Salisb.) Pedley, **comb. nov.** *§25*
Mimosa terminalis Salisb., Prodr. Stirp. Chap. Allerton 325 (1796).

Racosperma tessellatum (Tindale & Kodela) Pedley, **comb. nov.** *§467*
Acacia tessellata Tindale & Kodela, Austral. Syst. Bot. 4: 579 (1991).

Racosperma tetanophyllum (Maslin) Pedley, **comb. nov.** *§488*
Acacia tetanophylla Maslin, Nuytsia 2: 157 (1977).

Racosperma tetragonocarpum (Meisn.) Pedley, **comb. nov.** *§370*
Acacia tetragonocarpa Meisn., in J.G.C.Lehmann, Pl. Preiss. 1: 4 (1844).

Racosperma tetragonophyllum (F. Muell.) Pedley, Austrobaileya 2: 356 (1987). *§217*

Racosperma tetraneurum (Maslin & A.R.Chapm.) Pedley, **comb. nov.** *§883*
Acacia tetraneura Maslin & A.R.Chapm., Nuytsia 12: 483 (1999).

Racosperma tetrapterum (Maslin) Pedley, **comb. nov.** *§440*
Acacia tetraptera Maslin, Nuytsia 12: 405 (1999).

Racosperma thomsonii (Maslin & M.W.McDonald) Pedley, **comb. nov.** *§685*
Acacia thomsonii Maslin & M.W. McDonald, Nuytsia 10: 444 (1996).

Racosperma tindaleae (Pedley) Pedley, Austrobaileya 2:356 (1987). *§165*

Racosperma tingoorense (Pedley) Pedley, **comb. nov.** *§667b*
Acacia tingoorensis Pedley, Austrobaileya 5: 320 (1999).
Racosperma longispicatum subsp. *velutinum* (Pedley) Pedley, Austrobaileya 2: 351 (1987) **syn. nov.**

Racosperma tolmerense (G.J. Leach) Pedley, **comb. nov.** *§649*
Acacia tolmerensis G.J. Leach, Nuytsia 9: 351 (1994).

Racosperma toondulya (O'Leary) Pedley, **comb. nov.** †
Acacia toodulya O'Leary, J. Adelaide Bot. Gard. 20: 17 (2002).

Racosperma torticarpum (C.A.Gardner ex R.S.Cowan & Maslin) Pedley, **comb. nov.** *§498*
Acacia torticarpa C.A.Gardner ex R.S.Cowan & Maslin, Nuytsia 7: 217 (1990).

Racosperma torulosum (Benth.) Pedley, Austrobaileya 2: 356 (1987). *§695*

Racosperma trachycarpum (E.Pritzel) Pedley, **comb. nov.** *§727*
Acacia trachycarpa E. Pritzel., Bot. Jahr. Syst. 35: 308 (1904).

Racosperma trachyphloia (Tindale) Pedley, **comb. nov.** *§55*
Acacia trachyphloia Tindale, Proc. Linn. Soc. New South Wales 85: 248 (1960).

Racosperma translucens (A.Cunn. ex Hook.) Pedley, Austrobaileya 2: 356 (1987). *§755*

Racosperma tratmanianum (W.V.Fitzg.) Pedley, **comb. nov.** *§877*
Acacia tratmaniana W.V.Fitzg., J. W. Australia Nat. Hist. Soc. 8 (1904).

Racosperma trigonophyllum (Meisn.) Pedley, **comb. nov.** *§391*
Acacia trigonophylla Meisn., in J.G.C.Lehmann, Pl. Preiss. 2: 199 (1848).

Racosperma trinale (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§530*
Acacia trinalis R.S.Cowan & Maslin, Nuytsia 12: 444 (1999).

Racosperma trinervatum (Sieber ex DC.) Pedley, **comb. nov.** *§521*
Acacia trinervata Sieber ex DC., Prodr. 2: 451 (1825).

Racosperma trineurum (F. Muell.) Pedley, **comb. nov.** *§518*
Acacia trineura F.Muell., Fragm. 4: 5 (1863).

Racosperma tripterum (Benth.) Pedley, Austrobaileya 2: 356 (1987). *§910*

Racosperma triptychum (F.Muell. ex Benth.) Pedley, **comb. nov.** *§532*
Acacia triptycha F.Muell. ex Benth., Fl. Austral. 2: 337 (1864).

Racosperma triquetrum (Benth.) Pedley, **comb. nov.** *§445*
Acacia triquetra Benth., London J. Bot. 1: 358 (1842).

Racosperma tropicum (Maiden & Blakely) Pedley, Austrobaileya 2: 356 (1987). *§662*

Racosperma truculentum (Maslin) Pedley, **comb. nov.** *§400*
Acacia truculenta Maslin, Nuytsia 12: 407 (1999).

Racosperma trulliforme (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§509*
Acacia trulliformis R.S.Cowan & Maslin, Nuytsia 12: 446 (1999).

Racosperma truncatum (Burm. f.) Pedley, **comb. nov.** *§333*
Adiantum truncatum Burm. f., Fl. Indica 235. t. 66 fig. 4 (1768).

Racosperma tuberculatum (Maslin) Pedley, **comb. nov.** *§394*

Acacia tuberculata Maslin, Nuytsia 12: 408 (1999).

Racosperma tumidum (F.Muell. ex Benth.) Pedley, **comb. nov.** *§691*
Acacia tumida F. Muell. ex Benth., Fl. Austral. 2: 409 (1864).

R. tumidum var. **extentum** (M.W.McDonald) Pedley, **comb. nov.** *§sub 691*
Acacia tumida var. *extenta* M.W.McDonald, Austral. Syst. Bot. 16:158. t. 12 (2003).

R. tumidum var. **kalparn** (M.W.McDonald) Pedley, **comb. nov.** *§sub 691*
Acacia tumida var. *kalparn.* Austral. Syst. Bot. 16: 160. t. 13 (2003).

R. tumidum var **pilbarense** (M.W.McDonald) Pedley, **comb. nov.** *§sub 691*
Acacia tumida var. *pilbarensis* M.W.McDonald, Austral. Syst. Bot. 16: 162 (2003).

Racosperma tysonii (Luehm.) Pedley, **comb. nov.** *§222*
Acacia tysonii Luehm., Victorian Naturalist 13:12 (1896).

Racosperma ulicifolium (Salisb.) Pedley, Austrobaileya 2: 356 (1987). *§292*

Racosperma ulicinum (Meisn.) Pedley, **comb. nov.** *§321*
Acacia ulicina Meisn., in J.G.C.Lehmann. 2: 202 (1848).

Racosperma uliginosum (Maslin) Pedley, **comb. nov.** *§349*
Acacia uliginosa Maslin, Nuytsia 2: 285 (1978).

Racosperma umbellatum (A.Cunn. ex Benth.) Pedley, Austrobaileya 2: 356 (1987). *§791*

Racosperma unciferum (Benth.) Pedley, Austrobaileya 2: 356 (1987). *§146*

Racosperma uncinatum (Lindl.) Pedley, Austrobaileya 2: 357 (1987). *§169*

Racosperma uncinellum (Benth.) Pedley, **comb. nov.** *§536*
Acacia uncinella Benth., Linnaea 26: 613 (1855).

Racosperma undoolyanum (G.J. Leach) Pedley, **comb. nov.** *§802*
Acacia undoolyana G.J.Leach, J. Adelaide Bot. Gard. 11: 55 (1988).

Racosperma undosum (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§571*
Acacia undosa R.S.Cowan & Maslin, Nuytsia 10: 220 (1995).

Racosperma undulifolium (A.Cunn. ex G.Don) Pedley, **comb. nov.** *§170*
Acacia undulifolia A.Cunn. ex G.Don, Gen. Hist. 2: 404 (1832).

Loddiges's brief description and plate (Bot. Cab. 16 (1830) t. 1544) is not considered sufficient for valid publication of the name *A. undulifolia*, as the plate lacks any scale.

Racosperma unguiculatum (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§565*
Acacia unguiculata R.S.Cowan & Maslin, Nuytsia 7: 218 (1990).

Racosperma unifissile (Court) Pedley, **comb. nov.** *§362*
Acacia unifissilis Court, Nuytsia 2: 173 (1978).

Racosperma urophyllum (Benth.) Pedley, **comb. nov.** *§266*
Acacia urophylla Benth., Bot. Reg. 27: Misc. 24 (1841).

Racosperma validinervium (Maiden & Blakely) Pedley, Bot. J. Linn. Soc. 92: 249 (1986).*§92*

Racosperma varium (Maslin) Pedley, **comb. nov.** *§953*
Acacia varia Maslin, Nuytsia 1: 456 (1975).

R. varium var. **crassinerve** (Maslin) Pedley, **comb. nov.** *§953b*
Acacia varia var. *crassinervis* Maslin, Nuytsia 1: 459 (1975).

R. varium var. **parviflorum** (Benth.) Pedley, **comb. nov.** *§953c*
Acacia drummondii var. *parviflora* Benth., Fl. Austral. 2: 419 (1864).

Racosperma vassalii (Maslin) Pedley, **comb. nov.** *§414*
Acacia vassalii Maslin, Nuytsia 2: 215 (1978).

Racosperma venulosum (Benth.) Pedley, Austrobaileya 2: 357 (1987). *§523*

Racosperma vernicifluum (A.Cunn.) Pedley, Austrobaileya 2: 357 (1987). *§455*

Racosperma veronicae (Maslin) Pedley, **comb. nov.** *§463*
Acacia veronicae Maslin (as 'veronica'), Nuytsia 7: 43 (1989).

Though the author deliberately used 'veronica' as a noun in apposition with *Acacia*, I consider it to be an error to be corrected under the International Code of Botanical Nomenclature. See note under *R. amandae*, and also *R. dorotheae*.

Racosperma verriculum (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§512*
Acacia verricula R.S.Cowan & Maslin, Nuytsia 7: 197 (1990).

Racosperma verticillatum (L'Hér.) Pedley, **comb. nov.** *§906*
Mimosa verticillata L'Hér., Sert. Angl. 30 (1789).

R. verticillatum subsp. **cephalanthum** (F.Muell.) Pedley, **comb.** et **stat. nov.***§906c*
Acacia verticillata var. *cephalantha* F. Muell., J. Proc. Linn. Soc., Bot. 3: 121 (1859).

R. verticillatum subsp. **ovoideum** (Benth.) Pedley, **comb.** et **stat. nov.** *§906d*
Acacia ovoidea Benth., London J. Bot. 1: 339 (1842).

R. verticillatum subsp. **ruscifolium** (A.Cunn. ex G. Don) Pedley, **comb.** et **stat. nov.***§906b*
Acacia ruscifolia A.Cunn. ex G.Don, Gen. Hist. 2: 407 (1832).

Racosperma vestitum (Ker Gawler) Pedley, **comb. nov.** *§149*
Acacia vestita Ker Gawler, Bot. Reg. 9: t. 698 (1823).

Racosperma victoriae (Benth.) Pedley, Bot. J. Linn. Soc. 92: 249 (1986). *§199*
Acacia victoriae subsp. *arida* Pedley does not warrant formal taxonomic status.

Racosperma viscidulum (Benth.) Pedley, Austrobaileya 2: 357 (1987). *§468*

Racosperma viscifolium (Maiden & Blakely) Pedley, **comb. nov.** *§474*
Acacia viscifolia Maiden & Blakely, J. Roy. Soc. W. Australia 13: 7 (1928).

Racosperma vittatum (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§511*
Acacia vittata R.S.Cowan & Maslin, Nuytsia 12: 448 (1999).

Racosperma volubile (F.Muell.) Pedley, **comb. nov.** *§368*
Acacia volubilis F.Muell., Fragm. 10: 98 (1877).

Racosperma wanyu (Tindale) Pedley, **comb. nov.** *§822*
Acacia wanyu Tindale, Contrib. New South Wales Natl Herb. 4: 270 (1972).

Racosperma wardellii (Tindale) Pedley, Austrobaileya 2: 357 (1987). *§64*

Racosperma warramaba (Maslin) Pedley, **comb. nov.** *§520*
Acacia warramaba Maslin, Nuytsia 4: 108 (1982).

Racosperma wattsianum (F.Muell. ex Benth.) Pedley, **comb. nov.** *§78*
Acacia wattsiana F.Muell. ex Benth., Fl. Austral. 2: 374 (1864).

Racosperma websteri (Maiden & Blakely) Pedley, **comb. nov.** *§858*
Acacia websteri Maiden & Blakely, J. Roy. Soc. W. Australia 13: 25 (1928).

***Racosperma wetarense** (Pedley) Pedley, Bot. J. Linn. Soc. 92: 249 (1986). †
Acacia wetarensis Pedley, Contrib. Queensland Herb. 18: 18 (1975); I. Nielsen, Fl. Malesiana ser. I. 11: 61 (1992); M.W. McDonald & B.R. Maslin, Austral. Syst. Bot. 13: 67 (2000).

Racosperma whibleyanum (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§567*
Acacia whibleyana R.S.Cowan & Maslin, Nuytsia 10: 228 (1995).

Racosperma whitei (Maiden) Pedley, Austrobaileya 2: 357 (1987). *§721*

Racosperma wickhamii (Benth.) Pedley, Austrobaileya 2: 357 (1987). *§756*

R. wickhamii var. **cassiterum** (Pedley) Pedley, **comb.** et **stat. nov.** *§756d*
Acacia nuperrima subsp. *cassitera* Pedley, Austrobaileya 1: 188 (1978).

The *Flora of Australia* treatment of *Racosperma wickhamii* has not been followed. Though further investigation is indicated, *Acacia wickhamii* subsp. *viscidulum* (*§756b*) and *A. wickhamii* subsp. *parviphyllodineum* (*§756c*) have been combined and recognised as a distinct species, *Racosperma calligerum*, based on the latter taxon.

Racosperma wilcoxii (Maslin) Pedley, **comb. nov.** *§231*
Acacia wilcoxii Maslin, Nuytsia 10: 200 (1995).

Racosperma wilhelmianum (F.Muell.) Pedley, **comb. nov.** *§472*
Acacia wilhelmiana F.Muell., Defin. Austral. Pl. 4 (1855).

Racosperma willdenowianum (H.L.Wendl.) Pedley, **comb. nov.** *§253*
Acacia willdenowiana H.L.Wendl., Verz. Beggart. Hannover 5 (1845).

Racosperma williamsianum (J.T.Hunter) Pedley, **comb. nov.** *§sub 781*
Acacia williamsiana J.T.Hunter, J. Roy. Soc. W. Australia 80: 235 (1998).

Racosperma williamsonii (Court) Pedley, **comb. nov.** *§113*
Acacia williamsonii Court, Muelleria 2: 163 (1972).

Racosperma wilsonii (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§555*
Acacia wilsonii R.S.Cowan & Maslin, Nuytsia 12: 449 (1999).

Racosperma wiseanum (C.A.Gardner) Pedley, **comb. nov.** *§243*
Acacia wiseana C.A.Gardner, J. Roy. Soc. W. Australia 27: 173 (1942).

Racosperma xanthinum (Benth.) Pedley, **comb. nov.** *§226*
Acacia xanthina Benth., London J. Bot. 1: 355 (1842).

Racosperma xanthocarpum (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§832*
Acacia xanthocarpa R.S.Cowan & Maslin, Nuytsia 10: 58 (1995).

Racosperma xerophilum (W.V.Fitzg.) Pedley, **comb. nov.** *§385*
Acacia xerophila W.V.Fitzg., J. W. Australia Nat. Hist. Soc. 8 (1904).

R. xerophilum var. **brevius** (E.Pritzel) Pedley, **comb. nov.** *§385b*
Acacia fitzgeraldii var. *brevior* E.Pritzel, Bot. Jahr. Syst. 35: 291 (1904).

***Racosperma xiphocladum** (Baker) Pedley, Bot. J. Linn. Soc. 92: 249 (1986). †

There is some doubt about the status of *R. xiphocladum*. Du Puy & Villiers (in Du Puy *et al.* 2002) considered it conspecific with

Acacia heterophylla which they reported as 'cultivated and perhaps naturalised in a few restricted localities in C. Madagascar'. They may be correct in their assessment of the species, but further investigation by a taxonomist more familiar with the genus *Racosperma* is warranted. It is noteworthy that the name *Racosperma xiphocladum* was not mentioned by Du Puy & Villiers.

Racosperma xiphophyllum (E.Pritzel) Pedley, **comb. nov.** *§827*
Acacia xiphophylla E. Pritzel, Bot. Jahr. Syst. 35: 305 (1904).

Racosperma yirrkallense (Specht) Pedley, **comb. nov.** *§745*
Acacia yirrkallensis Specht, Rec. Amer.-Austral. Exped. Arnhem Land 3: 232 (1958).

Racosperma yorkrakinense (C.A.Gardner) Pedley, **comb. nov.** *§807*
Acacia yorkrakinensis C.A.Gardner, J. Roy. Soc. W. Australia 27: 174 (1942).

R. yorkrakinense subsp. **acritum** (R.S.Cowan & Maslin) Pedley, **comb. nov.** *§807b*
Acacia yorkrakinensis subsp. *acrita* R.S.Cowan & Maslin, Nuytsia 10: 60 (1995).

Racosperma zatrichotum (A.S.George) Pedley, **comb. nov.** *§923*
Acacia zatrichota A.S.George, J. Roy. Soc. W. Australia 82: 73 (1999).

POSTSCRIPT. In view of the attitudes, from disdain to near hostility, to the use of the name *Racosperma* from 1987 up to and including publication of the *Flora*, it is not surprising that there is still opposition to the nomenclature adopted here. Most taxonomists would agree that *Acacia* in its Benthamian or pre-1986 circumscription is no longer tenable. Some believe that the name *Acacia* should be conserved with an Australian species as type, with the result that *Acacia* would be the correct name for *Racosperma*, and that *Acacia* in the strict sense (type species: *A. nilotica*), would have to be renamed. Such a proposal has now been put forward by Orchard & Maslin (2003). A brief survey of literature suggests that the earliest available name would be *Vachellia* Wight & Arn. The name seems to have been applied to only six species, though it was recognised, comparatively recently, as a genus distinct from *Acacia sensu stricto* by Kostermans (1980). I delayed publishing this paper for a year to allow a proposal to conserve *Acacia* to be presented to the Nomenclature Committee of the ICBN. Proponents of the conservation evidently consider it preferable to have a name redeemed from virtual oblivion and have it applied to 120–130 species of the Old and New world tropics rather than to have the correct name, known to taxonomists and knowledgeable lay workers since 1986–1987, applied to some 1 000 species virtually confined to Australia.

This paper has been difficult to prepare, not only because of the attention to detail that has been required but also because I am aware of its possible long-term effects. I have 'thought long and hard about the social and economic effects of the name changes'(Pedley 1986b). I am also conscious and uncomfortable that I have become the author of so many names while those, whose names appear within the brackets and who were responsible for describing the taxa, tend to be overlooked. Since almost 40 per cent. of the taxa listed were described in the last 35 years it is obvious that without the considerable efforts of Mr B.R. Maslin, the late Dr. R.S. Cowan and Dr. M.D. Tindale and their associates, the principal workers in this period, there could be no list at all.

I am grateful for the support I have had from colleagues, mainly at the Queensland Herbarium (BRI), who encouraged me to proceed with the work. Much more research on the genus is needed. Its relationship with other mimosoid genera needs to be investigated further, as does its infrageneric classification. The only published classification of the genus (Pedley 1986a) is coarse and of little practical value. The groupings of species of *Acacia* of Maslin & Stirton (1997) could well be useful, but, as I have already suggested (Pedley 1986b), a suggestion supported by Maslin (1995), an agglomerative system such as the one used by Pryor & Johnson (1971) for *Eucalyptus sens. lat.* seems a more attractive approach to classification. The 'groups' mentioned but often only loosely defined by some authors in the *Flora* would be a good starting point for such a classification.

References

ANON. (1993). *Acacia* — Are not any botanical names sanctified by popular demand and usage? *Australian Plants* 17 (135): 128.

BENSON, L. (1962). *Plant taxonomy. Methods and principles.* New York: Ronald Press.

BRUMMITT, R.K. (2002). A consideration of 'nomina subnuda'. *Taxon* 51:71–74

CHAPPILL, J.A. & MASLIN, B.R. (1995). A phylogenetic assessment of the tribe Acacieae. In: Crisp, M. & Doyle, J.J. (eds). *Advances in Legume Systematics* 7: Phylogeny: 77–99. Kew: Royal Botanic Gardens.

CROIZAT, L. (1958). *Panbiogeography.* vol. 1. Caracas: published by the author.

DU PUY, D.J., LABAT, J.-N., RABEVOHITRA, VILLIERS, J.-F., BOSSER, & MOAT, J. (2002). *The Leguminosae of Madagascar.* Kew: Royal Botanic Gardens.

GREUTER, W., MCNEILL, J., BARRIE, F.R., BURDET, H.M., DEMOULIN, V., FILGEIRAS, T.S., NICHOLSON, D.H., SILVA, P.C., SKOG, J.E., TREHANE, P., TURLAND, N.J. & HAWKESWORTH, D.L. (2000). *International Code of Botanical Nomenclature.* Konigstein: Köeltz Scientific Books.

GRIMES, J.W. (1999). Inflorescence morphology, heterochrony, and phylogeny in the mimosoid tribes Ingeae and Acacieae (Leguminosae: Mimosoideae). *The Botanical Review* 65: 317–347.

HALL, N. & JOHNSON, L.A.S. (1993). *The names of acacias of New South Wales.* Sydney: Royal Botanic Gardens.

KANIS, A. (1986). Taxonomic changes in Australian Mimosaceae. *Bulletin for the International Group for the Study of Mimosoideae.* No. 14: 40–48.

KODELA, P.G. & TINDALE, M.D. (1998). The reduction of *Acacia burkittii* to *Acacia acuminata* subsp. *burkittii* (*Acacia* section Juliflorae: Fabaceae, Mimosoideae). *Telopea* 7: 415–417.

KOSTERMANS, A.J.G.H. (1980). In M.D. Dassanayake, *A revised handbook to the Flora of Ceylon* 1: 478.

MARTIUS, C.F.P. VON (1829). *Acacia* in Martius, C.F.P. von & Shrank, F., *Hortus Regius Monacensis* 188.

—— (1835). *Hortus Regius Monacensis Seminifer.*

MASLIN, B.R. (1988). Should *Acacia* be divided? *Bulletin of the International Group for the Study of Mimosoideae* 16: 54–76.

—— (1995). Systematics and phytogeography of *Acacia*: an overview. *Institute of Foresters Australia Newsletter* 36 (2): 2–5.

MASLIN, B. R. (CO-ORDINATOR) (2001). *WATTLE: acacias of Australia.* Canberra: ABRS & Perth: CALM.

MASLIN, B.R. & STIRTON, C.H. (1997). Generic and infrageneric classification in *Acacia* (Leguminosae: Mimosoideae): a list of critical species on which to build a comparative data set. *Bulletin of the International Group for the Study of Mimosoideae.* 20: 22–24.

MILLER, J.T. & BAYER, R.J. (2000). Molecular phylogenetics of *Acacia* (Fabaceae: Mimosoideae) based on the chloroplast *trn*K/*mat*K and nuclear Histone H3-D DNA sequences. In Herendeen, P.S. & Bruneau, A. (eds): *Advances in legume systematics* 9: 181–200. Kew.

—— (2001). Molecular phylogenetics of *Acacia* (Fabaceae: Mimosoideae) based on the chloroplast *matK* coding sequence and flanking *trnK* intron spacer regions. *American Journal of Botany* 88: 697–705.

MUELLER, F. (1859). Contributiones ad Acaciarum Australiae cognitem. *Journal & Proceedings of the Linnean Society, Botany* 3: 114– 148.

ORCHARD, A.E. & WILSON, A.J.G. (eds) (2001). Flora of Australia Volumes 11A & 11B, *Acacia.* Canberra: ABRS & Melbourne: CSIRO.

ORCHARD, A.E. & MASLIN, B.R. (2003). Proposal to conserve the name *Acacia* (Leguminosae: Mimosiodeae) with a conserved type. *Taxon* 52:362–363

PEDLEY, L. (1974). Notes on *Acacia*, chiefly from Queensland. *Contributions from the Queensland Herbarium* 15: 1–27.

—— (1975). Revision of the extra-Australian species of *Acacia* subg. *Heterophyllum. Contributions from the Queensland Herbarium* 18: 1–23.

—— (1986a). Derivation and dispersal of *Acacia* (Leguminosae), with particular reference to Australia, and the recognition of *Senegalia* and *Racosperma. Botanical Journal of the Linnean Society* 92: 219–254.

—— (1986b). Australian acacias: taxonomy and phytogeography. In Turnbull, J.W. (ed.): *Australian acacias in developing countries.* ACIAR Proceedings no. 16: 11–16. Canberra: Australian Centre for International Agricultural Research.

—— (1987a). *Racosperma deltoideum* (Cunn. ex G. Don) Pedley (Leguminosae: Mimosoideae) and related species in northern Australia. *Austrobaileya* 2: 314–320.

--- (1987b). Notes on *Racosperma* Martius (Leguminosae: Mimosoideae), 1. *Austrobaileya* 2: 321–327.

--- (1987c). *Racosperma* Martius (Leguminosae: Mimosoideae) in Queensland: a checklist. *Austrobaileya* 2: 344–357.

--- (1987d). *Racosperma* Martius (Leguminosae: Mimosoideae) in New Zealand: a checklist. *Austrobaileya* 2: 358– 359.

--- (1988). *Racosperma* Martius (Leguminosae: Mimosoideae) in Queensland and New Zealand: supplement to the checklist of species. *Austrobaileya* 2: 571–572.

--- (1990). New combinations in *Acacia* (Leguminosae: Mimosoideae). *Austrobaileya* 3: 571–572.

--- (2002). A conspectus of *Acacia* subg. *Acacia* in Australia. *Austrobaileya* 6: 177–186.

Pryor, L.D. & Johnson, L.A.S. (1971). *A classification of the eucalypts.* Canberra: Australian National University.

Rafinesque, C.S. (1838). *Sylva Telluriana.* Mantissa synoptica. Philadelphia: published by the author.

Robinson, J. & Harris, S.A. (2000). A plastid DNA phylogeny of the genus *Acacia* Miller (Acacieae, Leguminosae). *Botanical Journal of the Linnean Society* 132: 195–222.

St John, H. (1980). Classification of *Acacia koa* and its relatives (Leguminosae). Hawaiian plant studies 93. *Pacific Science* 33: 357–367 ('1979').

Stearn, W.T. (1992). *Botanical Latin.* 4th ed. Newton Abbot: David & Charles.

Symon, D.E. (1992). Whibley, D.J.E. : *Acacias of South Australia* 2nd ed. (p. 140). Adelaide : Government Printer.

Wagner, W.L., Herbst, D.R., & Sohmer, S.H. (1990). Manual of the Flowering Plants of Hawai'i. *Bishop Museum Special Publication* 83. University of Hawaii Press.

Walker, J. (2001). A revision of the genus *Atelocauda* (Uredinales) and description of *Racospermyces* Gen. Nov. for some rusts of *Acacia*. *Australasian Mycologist* 20: 3–28.

Wright, S.H., J.W. Grimes & P.Y. Ladiges (2002). A systematic study of *Acacia calamifolia s.l.* with special emphasis on *A. euthycarpa* in Victoria. *Muelleria* 16: 55–64.

Studies in Euphorbiaceae A.L.Juss. *sens. lat.* 5.

A revision of *Pseudanthus* Sieber ex Spreng. and *Stachystemon* Planch. (Oldfieldioideae Köhler & Webster, Caletieae Müll.Arg.)

David A. Halford and Rodney J.F. Henderson

Summary

Halford, D.A. and Henderson, R.J.F. (2003). Studies in Euphorbiaceae A.L.Juss. *sens. lat.* 5. A revision of *Pseudanthus* Sieber ex Spreng. and *Stachystemon* Planch. (Oldfieldioideae Köhler & Webster, Caletieae Müll.Arg.). *Austrobaileya*, 6(3): 497–532. A systematic study of *Pseudanthus* Sieber ex Spreng. and *Stachystemon* Planch. is presented. Nine species are recognised in *Pseudanthus*, of which three are newly described here, while nine species are recognised in *Stachystemon*, three of which are also described here as new. These six new species are *Pseudanthus ballingalliae* Halford & R.J.F.Hend., *P. ligulatus* Halford & R.J.F.Hend., *P. pauciflorus* Halford & R.J.F.Hend., *Stachystemon intricatus* Halford & R.J.F.Hend., *S. mucronatus* Halford & R.J.F.Hend. and *S. vinosus* Halford & R.J.F.Hend. The new combinations *Pseudanthus orbicularis* (Müll.Arg.) Halford & R.J.F.Hend., based on *Caletia divaricatissima* var. *orbicularis* Müll.Arg., *Stachystemon nematophorus* (F.Muell.) Halford & R.J.F.Hend., based on *Pseudanthus nematophorus* F.Muell. and *S. virgatus* (Klotzsch) Halford & R.J.F.Hend., based on *Chrysostemon virgatus* Klotzsch, are made. New species are illustrated while all species are described and their distributional range mapped, and notes on their distribution, habitat and phenology are given. Lectotypes are chosen for *Pseudanthus orientalis* F.Muell., *P. ovalifolius* F.Muell. and *P. polyandrus* F.Muell., as well as *Stachystemon vermicularis* Planch. *Pseudanthus pimeleoides* Sieber ex Spreng. is neotypified. All known synonyms are listed here including phrase names that have been used to identify the taxa prior to formal publication of their names. A key to identify the species is also provided.

Key words: *Euphorbiaceae, Pseudanthus, Stachystemon, Australian flora, taxonomy, nomenclature*

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Introduction

This paper presents a taxonomic revision of the genera *Pseudanthus* Sieber ex Spreng. and *Stachystemon* Planch. Nine species are recognised in each genus. These two genera are very similar anatomically (Levin & Simpson 1994) and are evidently very closely related. They have consistently been linked in previous classifications recognising subdivisions within the Euphorbiaceae (Müller 1866, Bentham 1880, Grüning 1913, Pax & Hoffmann 1931).

The most recent classification of Euphorbiaceae places *Pseudanthus* and *Stachystemon* in subtribe Pseudanthinae Müll.Arg., in tribe Caletieae Müll.Arg. in subfamily Oldfieldioideae Köhler & Webster (Webster 1994, Levin & Simpson 1994). The other genera included in this subtribe are *Kairothamnus* Airy Shaw, *Scagea* McPherson, *Micrantheum* Desf. and *Neoroepera* Müll.Arg. *Kairothamnus* (monotypic) and *Scagea* (with two species) are endemic genera of New Guinea and New Caledonia respectively, while *Micrantheum* (with four species) and *Neoroepera* (with two species) are small endemic Australian genera. *Pseudanthus* and *Stachystemon* differ from all other genera of the Pseudanthinae in having conspicuous, decurrent stipules and fruits that are 1-seeded. The four Australian genera of the Pseudanthinae are similar in characters of leaf architecture, leaf anatomy and wood structure (Hayden 1994). However, *Micrantheum* differs from *Pseudanthus* and *Stachystemon* in having what is interpreted as large foliose stipules (Grüning 1913, Levin & Simpson 1994) and pollen grains with long, more or less exinous spines (Webster 1994), while *Neoroepera* differs from them in having cotyledons several times broader than the radicle, male flowers with many

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discrete glands present between the tepals and stamens, styles with the distal portion expanded and flattened into a large stigmatic zone, and fruit that dehisce leaving a persistent, stout columella.

Traditionally the main distinction between *Pseudanthus* and *Stachystemon* has been the nature of the androecium and the structure variously interpreted as a central disc or a pistillode in male flowers. *Pseudanthus* was described by Sprengel (1827) who included in it a single species, *P. pimeleoides,* based on material collected by Sieber from the Sydney region of eastern Australia. *Pseudanthus pimeleoides* has male flowers with 6 stamens in 2 whorls that are closely clustered around a small central disc. In 1845, Planchon described the genus *Stachystemon* to contain a single species, *S. vermicularis* (as *S. vermiculare*), based on material collected by James Drummond in south-western Western Australia. Planchon considered *Stachystemon* to be similar to *Pseudanthus* in habit, stipules, calyx morphology and ovule arrangement, but differing strikingly from that in androecium morphology. *Stachystemon vermicularis* has male flowers with numerous ± sessile anthers borne on an elongated cylindrical column and lacking any central disc.

In the most recent account of *Pseudanthus* and *Stachystemon* as a whole, Grüning (1913) recognised seven species in *Pseudanthus* and three species in *Stachystemon*. He distinguished the two genera on androecium morphology. He then proceeded to divide *Pseudanthus* into three sections based on stamen number and length of the tepals in male flowers. Thus, *P. pimeleoides* with 6 stamens and linear tepals about 1 cm long was placed by itself in one group he called *P.* sect. *Eupseudanthus* (= *P.* sect. *Pseudanthus*). *Pseudanthus orientalis, P. ovalifolius, P. divaricatissimus* and *P. micranthus*, with 3 to 6 stamens and ovate tepals 1–2 mm long, formed the second group he called *P.* sect. *Microcaletia*, while *P. virgatus* and *P. nematophorus*, with 9–18 stamens, formed the third group, *P.* sect. *Chrysostemon*. Grüning commented in his discussion of *Stachystemon* that the genus could well be united with the sect. *Chrysostemon* of the genus *Pseudanthus*.

Recently, Radcliffe-Smith (1993) argued that there was a continuum of variation with regard to the androecium and that the differences between *Pseudanthus* and *Stachystemon* were insufficient to warrant recognition of two genera. He tabulated the eleven species then known in the two genera and listed the androecium and disc character states for each species. He recorded *P. virgatus* and *P. nematophorus* as having a central disc in the male flowers and *S. polyandrus* as having a vestigial central disc. He also listed *P. pimeleoides* as having its staminal filaments partly fused to the central disc.

In undertaking the present revision, we have reassessed the morphological characters of the species previously consigned to *Pseudanthus* and *Stachystemon*. We have found that *P. virgatus, P. nematophorus* and *S. polyandrus* do not have a central disc in the male flower, and that although the inner staminal filiaments of *P. pimeleoides* are appressed to the central disc they are not fused to that central disc. We have thus concluded that the androecium structure and the presence or absence of a central disc in male flowers are still useful diagnostic characters to distinguish between two groups of species. Following transfer of *P. virgatus* and *P. nematophorus* (i.e. members of *P.* sect. *Chrysostemon*) from *Pseudanthus* to *Stachystemon*, these groups become distinctive morphological and biogeographic entities that are, we believe, worthy of recognition at the generic rank. Consequently, it is our contention that these taxa should be maintained as distinct genera named *Pseudanthus* and *Stachystemon* and distinguished as follows.

Key to *Pseudanthus* and *Stachystemon*

Male flowers with a central disc present and stamens 3–6, ± free, on a ± flat receptacle ..... **Pseudanthus**

Male flowers without a central disc, with stamens > 7, variously fused or on a raised receptacle ..... **Stachystemon**

Materials and methods

This revision is based on an assessment of morphological characters of about 550 dried herbarium collections, and collections and field studies undertaken by the second author from 1988 to 1992. Herbarium collections from herbaria AD, BRI, CANB, HO, MEL, NE, NSW and PERTH were studied and annotated, and selected material from B, K and LD was also seen. Acronyms used here and elsewhere to indicate herbaria holding particular specimens are those listed by Holmgren *et al.* (1990). All specimens cited have been examined by one or both of the authors, unless indicated otherwise by (*n.v.*).

The species treated in the present paper are listed alphabetically. Descriptions of colour of vegetative and floral parts are either from the herbarium labels or from photographs taken by the second author during field studies. Measurements listed are based upon the total variation observed in the herbarium specimens examined. Information on plant size, flowering and fruiting times, and habitat of occurrence was obtained from herbarium labels. All measurements were made either on fresh material, dried material, material preserved in 70% ethanol, or dried material reconstituted by placing in boiling water for a few minutes. The term 'obloid' is defined as a 3-dimensional shape; a parallelipiped with rounded corners and edges. The morphological data for this revision were recorded using the DELTA system (Dallwitz *et al.* 1993). The distribution maps were produced with MapInfo Version 3 and are based on herbarium specimen locality data.

Taxonomy of *Pseudanthus*

Pseudanthus Sieber ex Spreng., Syst. veg. 16th edn, 4(2), curae posteriores: 22 (1827); *Pseudanthus* Sieber ex Spreng. sect. *Pseudanthus*, Müll.Arg., Linnaea 34: 55 (1865). **Type:** *Pseudanthus pimeleoides* Sieber ex Spreng.

Caletia sect. *Microcaletia* Müll.Arg., Linnaea 34: 55 (1865); *Pseudanthus* sect. *Microcaletia* (Müll.Arg.) Kuntze in Post & Kuntze, Lex. Gen. Phan. 463 (1903). **Type:** not designated.

Pseudanthus sect. *Eupseudanthus* Müll.Arg., Linnaea 34: 55 (1865), *nom. inval.*

***Derivation of name*:** Named from Greek *pseudos* (false) and *anthos* (flower), in reference to the small flower-clusters at the apex of branchlets in *P. pimeleoides* appearing to be a single conspicuous flower (Baines 1981).

Monoecious shrubs. Stems erect, ascending or decumbent, rarely prostrate, much branched; branchlets ± terete, reddish brown coloured, glabrous or rarely pubescent, longitudinally ridged by decurrence of margins of stipules along internodes. Leaves stipulate, petiolate, alternate, opposite or decussate, simple; stipules persistent, with margins entire or toothed, glabrous or fimbriate; laminae flat or concavo-convex, entire, usually conspicuously thickened along margins. Flowers solitary (or rarely 2 or 3) in upper leaf axils, bracteate; distal branchlet internodes often contracted to produce terminal flower clusters with subtending leaves reduced and bract-like. Male flowers pedicellate; tepals 6(or rarely 5), subequal, in 2 whorls, with each whorl imbricate in bud but spreading or erect at anthesis; receptacle ± flat; stamens 6(or rarely 3–5), in 2 whorls with those of the outer whorl opposite outer tepals, and those of the inner whorl opposite inner tepals; filaments free, erect, stout, those of outer whorl stamens shorter than those of inner whorl stamens; anthers 2-celled, free, dorsifixed; cells obloid, dehiscing by longitudinal slits; disc present, generally 3-lobed, fleshy. Female flowers sessile or rarely shortly pedicellate; tepals 6(or rarely 4 or 5), persistent, subequal, in 2 whorls with each whorl imbricate in bud, later appressed to ovary (and fruit); disc absent; ovary 3(rarely 2)-celled with 2(rarely 1) ovules in each locule; styles 3(rarely 2), stout, shortly connate or ± free, simple, persistent, erect and spreading or recurving distally, canaliculate on adaxial surface. Fruits capsular, ovoid to cylindrical-ellipsoid, 1-seeded by abortion, splitting at maturity into 3 bivalved segments. Seeds globose to ovoid or obloid to cylindrical, smooth, with exostomal pit obscure to well developed, carunculate; endosperm copious; cotyledons a little broader than the radicle.

A genus of 9 species endemic in eastern Australia.

Key to species of *Pseudanthus*

1. Tepals of male flowers ≥5 mm long 2
   Tepals of male flowers < 5 mm long 3

2. Tepals of male flowers acute to obtuse with red-brown apiculum (visible in dried state) . . . . . **3. P. ligulatus**
   Tepals of male flowers acute to obtuse without red-brown apiculum . . . . . **9. P. pimeleoides**

3. Branchlets hairy; male flowers with (2 or) 3 stamens . . . . . **4. P. micranthus**
   Branchlets glabrous; male flowers with 6 stamens 4

4. Locules uniovulate . . . . . **7. P. ovalifolius**
   Locules biovulate 5

5. Tepals of male flowers > 2 mm long . . . . . **8. P. pauciflorus**
   Tepals of male flowers ≤ 2 mm long 6

6. Leaves < twice as long as broad . . . . . **5. P. orbicularis**
   Leaves ≥ twice as long as broad 7

7. Stipules entire; margins of leaf laminae thin . . . . . **1. P. ballingalliae**
   Stipules irregularly toothed or fimbriate; margins of leaf laminae conspicuously thickened 8

8. Stipules fimbriate; leaf laminae narrowly elliptic to elliptic or ovate, 2 to 3 times as long as broad, 3–5.5 mm long, 1.3–2.1 mm wide . . . . . **2. P. divaricatissimus**
   Stipules irregularly toothed; leaf laminae linear, narrowly oblong to oblong or oblanceolate, 3 to 9 times as long as broad, 3.5–13 mm long 0.7–1.7 mm wide . . . . . **6. P. orientalis**

The species are here arranged alphabetically.

1. Pseudanthus ballingalliae Halford & R.J.F.Hend. **sp. nov.** affinis *P. divaricatissimo* (Müll.Arg.) Benth. sed plantis statura diffusa et altiore (frutex diffusus usque ad 1.5 m altus non compactus ad 15 cm altus), foliorum lamina oblonga vel oblongo-elliptica non ovata vel elliptica, marginibus non conspicue incrassatis, floribus masculinis pedicellis brevioribus (ad 0.5 mm non 0.7–1.2 mm longis) et staminibus 3 ad 5 non 6, floribus femineis tepalis omnino glabris non pubescentibus distaliter in pagina adaxiali differt. **Typus:** Queensland. Leichhardt District: Robinson Gorge, Expedition NP, 29 October 1999, *D.A. Halford* Q3835 (holo: BRI, iso: CANB, K, L, MEL, MO, NSW, distribuendi).

Pseudanthus sp. (Salvator Rosa NP M.E.Ballingall MEB450); Forster & Halford (2002, p. 73).

Diffuse shrub to 1.5 m high; stems ascending to erect, freely branching; branchlets glabrous. Leaves decussate rarely subopposite; stipules triangular, 0.2–0.5 mm long, red-brown, acute with a dark brown glandular tip, and with margins entire; decurrent margins glabrous or minutely papillose; petioles 0.4–0.6 mm long, smooth; laminae flat or slightly concavo-convex, oblong to narrowly oblong or narrowly oblong-elliptic, 2.8–7(–9) mm long, 1–1.8 mm wide, length/width ratio 2–5:1, glabrous or rarely with minute scabrid hairs on margins; midrib obscure adaxially, slightly raised abaxially; tip straight or slightly recurved, rounded to obtuse, with a minute red-brown apiculum; margins flat, not obviously thickened. Flowers solitary in

axils of upper leaves though appearing to be in terminal clusters; bracts narrowly triangular or ovate, 0.2–0.7 mm long, glabrous except for fimbriate margins. Male flowers on pedicels c. 0.5 mm long; tepals 5 or 6, convex-concave, narrowly obovate or suborbicular, 0.9–1 mm long, 0.6–0.9 mm wide, yellow coloured, spreading; apex rounded; margins entire; receptacle glabrous; stamens 3–5, with filaments entire, free, 0.2–0.3 mm long, and anthers 0.3–0.4 mm long; disc irregularly lobed. Female flowers sessile; tepals 6, ovate, 1.2–1.8 mm long, 0.7–1 mm wide, green coloured, slightly keeled, glabrous; apex rounded; margins erose; receptacle glabrous. Ovaries trigonal-globose, 0.6–1 mm across, glabrous; locules 3, biovulate; styles 0.7–1 mm long, erect and spreading distally. Fruits sessile or shortly pedicellate with pedicel up to 0.2 mm long; persistent tepals ≤half the length of the capsule; capsule narrowly ovoid or narrowly cylindric-ellipsoid, 4–5.3 mm long, 2–2.7 mm across, smooth or tuberculate along ridges, glabrous, green coloured turning brown with age. Seeds ± obloid, c. 3.5 mm long, c. 1.6 mm wide, c. 1.8 mm across; testa smooth, dull brown; exostome pit well developed; caruncle squat-conical, c. 0.7 mm long, c. 1 mm wide. **Fig. 1.**

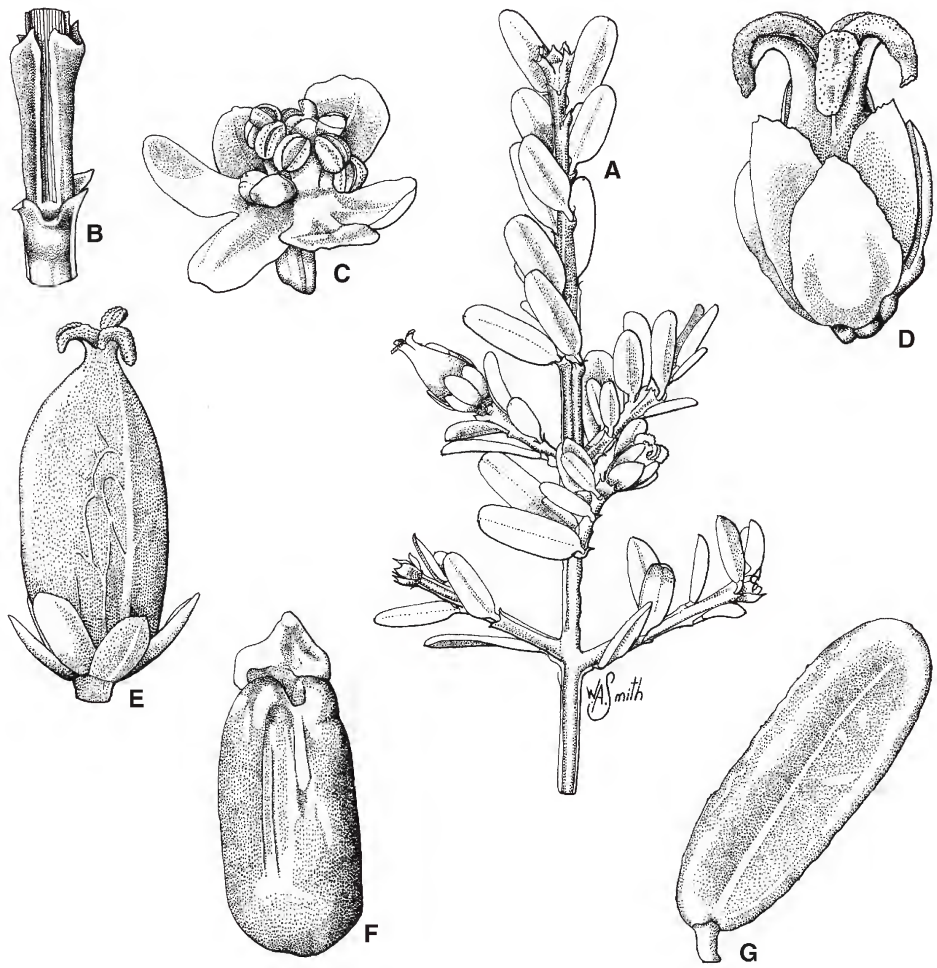


Fig. 1. ***Pseudanthus ballingalliae.*** A. branchlet with fruit × 4. B. section of branchlet with leaves removed showing stipules with decurrent margin × 12. C. male flower from side × 18. D. female flower × 18. E. fruit with persistent tepals × 8. F. seed × 12. G. leaf ×12. A-G from *Halford* Q3835 (BRI). Del. W. Smith.

***Additional specimens*: Queensland.** LEICHHARDT DISTRICT: Sentinel Mt, Salvator Rosa Section, Carnarvon NP, Oct 1981, *Ballingall* MEB450 & *Cockburn* (BRI); Robinson Gorge, Expedition NP, Sep 1995, *Forster* PIF17699 & *Figg* (BRI); *ditto*, Sep 1995, *Forster* PIF17751 & *Figg* (BRI); Spring Creek, Expedition NP, Sep 2000, *Forster* PIF26138 & *Booth* (BRI).

***Distribution and habitat*:** *Pseudanthus ballingalliae* is endemic in central Queensland, occurring in the Carnarvon and Expedition National Parks. It is recorded as growing in open eucalypt forest or woodland communities on shallow sandy soils on steep slopes and in sandstone gorges. **Map 1.**

***Phenology*:** Flowers and fruits have been collected in September and October.

***Affinities*:** *Pseudanthus ballingalliae* is similar to *P. divaricatissimus* but differs from that in its taller, diffuse habit (shrubs up to 1.5 m high as compared with compact shrubs to 15 cm high), oblong or oblong elliptic as compared with ovate or elliptic leaf laminae, with margins not prominently thickened, male flowers on pedicels up to 0.5 as compared with 0.7–1.2 mm long and with 3 to 5 rather than 6 stamens, and female flowers with wholly glabrous tepals.

***Etymology*:** The species is named in honour of Ms M.E. (Betty) Ballingall (1920-1998) who made many useful botanical collections in southern Queensland and Central Australia now incorporated into various herbaria, and apparently the first person to have collected this species.

2. Pseudanthus divaricatissimus (Müll.Arg.) Benth., Fl. Austral. 6: 60 (1873); *Pseudanthus divaricatissimus* (Müll.Arg.) Benth. var. *divaricatissimus*, Benth., Fl. Austral. 6: 60 (1873); *Caletia divaricatissima* Müll.Arg., Linnaea 32: 79 (1863); *Caletia divaricatissima* Müll.Arg. var. *divaricatissima*, Müll.Arg., Flora 47(31): 486 (1864). **Type:** New South Wales. Blue Mountains, in 1818, *A. Cunningham* (holo: G-DC *n.v.*, microfiche IDC 800–73. 2453: III, 5).

Caletia divaricatissima var. *genuina* Müll.Arg., Flora 47(31): 486 (1864), *nom. inval.*

Pseudanthus divaricatissimus var. *genuinus* Grüning in A.Engler, Pflanzenr. H.58: 30 (1913), *nom. inval.*

***Illustration*:** G. Grüning (1913: p. 29, fig. 6A–B).

Compact shrub to 15 cm high; stems ascending to decumbent or prostrate, freely branching; branchlets glabrous. Leaves alternate or decussate; stipules triangular to broadly triangular, 0.5–0.6 mm long, red-brown, acuminate, with margins fimbriate; decurrent margins glabrous or minutely papillose; petioles 0.3–0.5 mm long, smooth; laminae slightly concavo-convex, narrowly elliptic to elliptic or ovate, 3–5.5 mm long, 1.3–2.1 mm wide, length/width ratio 2–3:1, smooth, glabrous except for minute scabrid hairs on margins; midrib obscure adaxially, slightly raised abaxially; tip recurved, rounded to obtuse or acute with a minute white-coloured apiculum; margins flat or slightly recurved, conspicuously thickened and white coloured. Flowers solitary in axils of upper leaves, sometimes with subtending leaf much reduced; bracts ovate, 0.4–0.5 mm long, pubescent on margin and on the adaxial surface. Male flowers on pedicels 0.7–1.2 mm long; tepals 6, ± flat, ovate, ovate-elliptic or obovate, 0.8–1.5 mm long, 0.5–0.8 mm wide, pale red, spreading; apex rounded or obtuse; margins entire; receptacle glabrous; stamens 6, with filaments entire, free, 0.2–0.8 mm long, and anthers 0.3–0.4 mm long, smooth; disc 3-lobed with each lobe notched at tip. Female flowers sessile or pedicellate with pedicels up to 1 mm long; tepals 6, ovate or broadly oblong, 1.2–1.6 mm long, 0.6–1 mm wide, pale red coloured, keeled, pubescent on adaxial surface distally, glabrous on abaxial surface; apex acute to obtuse or rounded; margins minutely fimbriate; receptacle glabrous. Ovaries trigonal-globose, 0.4–0.6 mm across, glabrous; locules 3, biovulate; styles 0.5–0.9 mm long, erect and recurved distally. Fruits sessile or shortly pedicellate with pedicel 0.4–0.5 mm long; persistent tepals ≤half the length of the capsule; capsule ovoid, 4–4.5 mm long, 2.4–2.8 mm across, smooth, glabrous, mottled green and red. Seeds broadly ovoid or subglobose, 2.4–2.8 mm long, 2.1–2.4 mm across; testa smooth or slightly rugose, subglossy dark brown; exostome pit well developed; caruncle squat-conical, c. 0.6 mm long, c. 1.2 mm wide.

***Selected specimens (from c. 45 examined)*: New South Wales.** North Obelisk, 2 km W of Urbenville, Oct 1990, *Bean* 2506 (BRI); near northern end of Narrow Neck Peninsula, Nov 1983, *Benson* 1325 & *Keith* (NSW); Goonoo State Forest, 2 km N of Frost

Road, Sep 1988, *Briggs* 2386 (MEL, NSW); Wentworth Falls, Blue Mountains, Oct 1965, *Burgess* s.n. (CANB [CBG015349], NSW); Sublime Point, Leura, Dec 1962, *Constable* 4123 (NSW); Mount Blackheath, c. 3 miles [c. 5 km] W of Blackheath, Oct 1959, *Constable* s.n. (AD, NSW [NSW48924]); Kings Tableland, 3 miles [c. 4.8 km] S of Wentworth Falls, Oct 1960, *Constable* s.n. (NSW [NSW55742]); near Newnes junction, 5 miles [c. 8 km] E of Lithgow, Feb 1967, *Coveny* s.n. [NSW130514] (NSW); 3.3 km E of Mt Coricudgy, Oct 1976, *Crisp* 2237 *et al.* (AD, CANB); Blue Mountains, 2.5 km NNE of Clarence sawmill, Oct 1994, *Davies* 1766 & *Corsini* (CANB, MEL); Morton NP, Northern Budawang Range, NW of Crooked Falls, Oct 1985, *Gilmour* 5271 (CANB); Newnes Junction, Sep 1914, *Hamilton* s.n. (NSW); Wentworth Falls, Apr 1914, *Hamilton* s.n. (NSW); Evans Lookout, Blue Mountains NP, Oct 1990, *Henderson* & *Turpin* H3421 (BRI); Goonoo State Forest, c. 15 km SW of Mendooran on road to Dubbo, Sep 1989, *Henderson* & *Turpin* H3243 (BRI, NSW); Bald Trig, off Clarence-Glowworm Tunnels road, Feb 1986, *Hind* 4477 (NSW); Kings Tableland, S of Wentworth Falls, Aug 1952, *Melville* 649 & *Johnson* (MEL); Kydra Reefs, Mar 1974, *Rodd* 2653 (NSW); Katoomba area, Narrow Neck Plateau Drive, near start of Golden Stairs track, Oct 1984, *Taylor* 303 & *Coveny* (NSW); Kydra Peak, c. 40 km ESE of Cooma, Oct 1945, *Willis* s.n. [MEL2061293] (MEL). **Tasmania**. Coles Bay, Jun 1996, *Cave* 033 (AD, CANB, MEL).

***Distribution and habitat*:** *Pseudanthus divaricatissimus* occurs in a more or less continuous distribution from near Muswellbrook southwards to Bega with disjunct populations near Urbenville and Dubbo in New South Wales and in the Coles Bay area in eastern Tasmania. It is recorded as growing in heathland, shrubland or mallee woodland communities on sandy soils often on rocky sites mostly overlying sandstone. **Map 2.**

***Phenology*:** Flowers and fruits have been collected throughout the year.

***Notes*:** The disjunct northern populations of *P. divaricatissimus* (as represented by *Briggs* 2386 (MEL, NSW), *Henderson* & *Turpin* H3243 (BRI, NSW) and *Bean* 2506 (BRI)) are atypical of this species in having tepals in male flowers oblong in outline and thus having a superficial resemblance to those in male flowers of *P. ovalifolius*. However, these populations differ from *P. ovalifolius* in having generally shorter staminal filaments, shorter tepals in male flowers and biovulate rather than uniovulate locules in female flowers. Also, some difficulty may be experienced in separating the northern populations of *P. divaricatissimus* from those of *P. pauciflorus* subsp. *pauciflorus*. For discussion of their differences, see 'Affinities' under *P. pauciflorus*. Further collections and field studies of these northern populations to determine their standing are warranted.

Apart from the collections from Tasmania having numerous galls, there appears to be no significant morphological differences between the New South Wales and Tasmanian material of this species.

3. Pseudanthus ligulatus Halford & R.J.F.Hend. **sp. nov.** arte affinis *P. pimeleoides* Sieber ex Spreng. ut videtur sed foliis lamina lineari ad anguste oblonga vel raro lanceolata non lanceolata ad anguste ovata, ad apicem acuta apiculo rufo-brunneo ad 0.2 mm longo non attenuata apiculo albo ad 0.5 mm longo instructa, et floribus masculinis pedicellis brevioribus (< 2 mm non > 2 mm longis) et tepalis apiculatis rubro-brunneis non acutis ad obtusis ad apicem differt. **Typus:** Queensland. Cook District: Davies Creek NP, c. 16 km E of Mareeba, 15 April 1989, *R.J.F. Henderson & J.R. Clarkson* H3217 (holo: BRI; iso: K, MEL, NSW, distribuendi).

Diffuse to compact shrub 40–150 cm high; stems freely branching; branchlets glabrous. Leaves alternate or decussate; stipules triangular or ovate, 0.5–1.3 mm long, red-brown, acute to acuminate with a dark brown glandular tip, and with margins erose or irregularly lobed; decurrent margins glabrous; petiole 0.5–1.1 mm long, smooth or papillose; laminae flat or slightly concavo-convex, lanceolate, linear to narrowly oblong, 7–12 mm long, 1.1–1.8 mm wide, length/width ratio 5–15:1, smooth except for papillae on margin, glabrous; midrib obscure adaxially, slightly raised abaxially; tip straight, acute with a minute, recurved, red-brown apiculum up to 0.2 mm long; margins thickened and white-coloured. Flowers solitary in axils of upper leaves though appearing to be in terminal clusters; bracts narrowly triangular or narrowly ovate, 0.5–1 mm long, with crisped hairs on adaxial surface and on margins towards tip. Male flowers on pedicels 0.5–1.8 mm long; tepals 6, ± flat, linear, 7–15 mm long, 0.5–0.9 mm wide,

creamy white coloured, erect; apex acute or obtuse with minute red apiculum; receptacle ± glabrous; stamens 6, with filaments entire or bifid distally, free, 0.2–1.5 mm long, and anthers 0.5–0.8 mm long, papillose; disc irregularly lobed. Female flowers sessile; tepals 6, lanceolate or ovate, 1.2–3.7 mm long, 0.6–1 mm wide, pale green coloured with reddish tips, keeled, glabrous on both surfaces; apex obtuse, acute or acuminate; margins entire, serrate, irregularly toothed or fimbriate distally; receptacle ± glabrous. Ovary subglobose, 0.6–1 mm across; locules 3, biovulate; styles 1–1.3 mm long, erect and recurved distally. Fruits sessile; persistent tepals > half the length of the capsule; capsule ovoid, 5.8–7 mm long, 2.7–3.2 mm across, smooth, glabrous, green coloured. Seeds obloid, c. 3.8 mm long, c. 2.1 mm wide, c. 2.4 mm across; testa smooth, glossy brown; caruncle somewhat conical, c. 0.8 mm long, c. 1.2 mm wide.

***Distribution and habitat*:** *Pseudanthus ligulatus* is confined to Queensland where it occurs from the Mareeba district south to Charters Towers and east to Cumberland Islands in the north, with disjunct populations on the Glasshouse Mountains, near Brisbane in the south east.

***Affinities*:** *P. ligulatus* seems most closely related to *P. pimeleoides* but can be distinguished from that by having linear to narrowly oblong, rarely lanceolate leaf laminae with an acute tip that is ultimately terminated by a minute red-brown apiculum up to 0.2 mm long (as compared with lanceolate or narrowly ovate leaf laminae with an acute to attenuate tip that is ultimately terminated by a white apiculum up to 0.5 mm long), and male flowers with shorter pedicels (< 2 mm long as compared with mostly greater than 2 mm long) and a reddish brown apiculate tip on the tepals.

***Etymology*:** The specific epithet is from Latin *ligulatus*, ligulate or with a ligule, which refers to tongue-like tepals.

***Variability*:** The southern populations differ from those in the north in habit, length of filaments of stamens and the shape of tepals in female flowers, and appear worthy of formal recognition. The southern entity is therefore here treated as a distinct subspecies which can be distinguished using the following key.

Shrub up to 150 cm high; leaves evenly distributed along the branchlets; tepals of female flowers lanceolate to ovate, > 2 mm long . . . **3a. P. ligulatus** subsp. **ligulatus**

Shrub up to 50 cm high; leaves ± crowded towards the ends of the branchlets; tepals of female flowers ovate, < 2 mm long . . . . . **3b. P. ligulatus** subsp. **volcanicus**

3a. **Pseudanthus ligulatus** Halford & R.J.F.Hend. subsp. **ligulatus**

Shrub, 50–150 cm high. Stipules narrowly triangular to triangular. Leaves evenly distributed along the branchlets. Staminal filaments 0.2–0.7 mm long. Tepals of female flowers lanceolate to ovate; 2.1–3.7 mm long, 0.6–1 mm wide. **Fig. 2.**

***Selected specimens (from c. 50 examined)*: Queensland.** Cook District: Davies Creek, Lamb Range, Jun 1967, *Brass* 33549 (BRI, QRS); Ravenshoe, Jan 1932, *Brass* 1887 (BRI); Mt Mulligan, Apr 1985, *Clarkson* 5764 (BRI, MEL); Davies Creek NP, 2 km past carpark, Jun 1991, *Forster* PIF8524 (BRI, CANB, MEL); Herberton Weir, Wild River, Feb 1990, *Forster* PIF6246 (BRI, MEL); S.F.R.607, Davies Creek, May 1971, *Hyland* 5012 (BRI, CANB, NSW); S.F.R.607, Mulgrave L.A., Nov 1973, *Irvine* 704 (BRI, MEL, NSW); S.F.R.607, Mulgrave L.A., Nov 1973, *Irvine* 705 (BRI, CANB); Daives Creek, Apr 1962, *McKee* 9328 (BRI, CANB, NSW); Wild River gorge, 5 miles [c. 8 km] from Herberton, Jun 1972, *Wrigley & Telford* NQ756 (CANB). Burke District: "Warang" Holding, White Mountains, c. 38 km NNW of Torrens Creek township, Jul 1988, *Fell* DF1297 & *Swain* (BRI). North Kennedy District: Mount Bertha, Gloucester Island, Mar 1994, *Batianoff* 9403314 *et al.* (BRI); Mt Abbot, 50km W of Bowen, Mar 1992, *Bean* 4217 (BRI); Upper Torrens Creek, White Mountains NP, Apr 1992, *Bean* 4281 (BRI); E of Baal Gammon Mine, c. 7 km W of Herberton, Jun 1983, *Conn* 1373 & *DeCampo* (BRI, MEL). Cape Upstart NP, Aug 1971, *Wyatt* 15 (BRI). South Kennedy District: Shaw Island, Nov 1985,

Batianoff 3094 & *Dalliston* (BRI, CANB); Thomas Island, Whitsunday Group, Dec 1984, *Warrian* CW81 (BRI).

***Distribution and habitat*:** *Pseudanthus ligulatus* subsp. *ligulatus* occurs in north-eastern Queensland from near Mareeba, near Hughenden and from Cape Upstart near Ayr south to the Cumberland Islands east of Proserpine. It is recorded as growing in heathland, open eucalypt woodland or forest communities or rarely in rainforest communities, on exposed mountain tops or on hillsides of exposed rock pavement of granite or sandstone; also along creek banks and in sheltered gorges. The soils are noted to be generally shallow and sandy in texture. **Map 3.**

***Phenology*:** Flowers have been collected throughout the year, fruits in April, May, July and October.

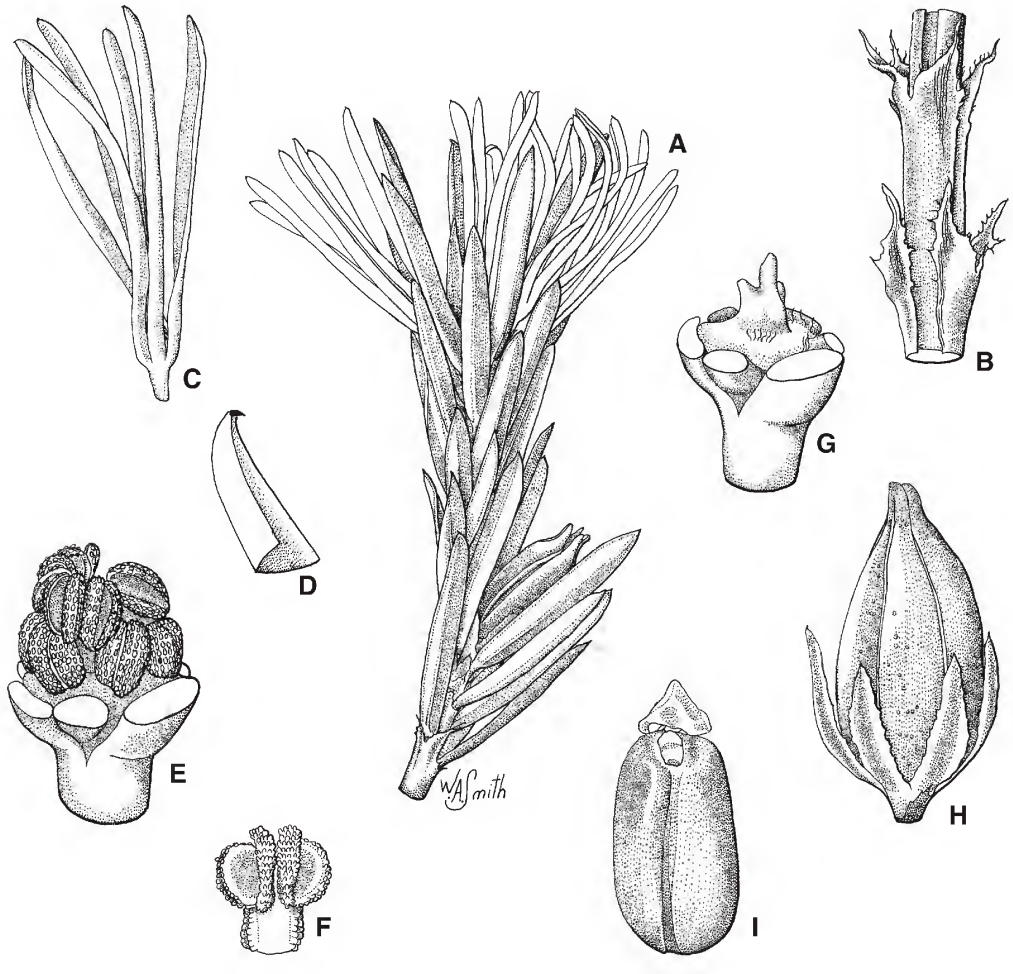


Fig. 2. ***Pseudanthus ligulatus*** subsp. ***ligulatus***. A. branchlet with flowers and fruit × 3. B. section of branchlet with leaves removed showing stipules with decurrent margin × 12. C. male flower from side × 4. D. apex of tepal from male flower × 24. E. male flower with tepals removed × 18. F. stamen × 24. G. male flower with tepals and stamens removed showing cental disc × 18. H. fruit with persistent tepals × 6. I. seed × 8. A-I from *Henderson & Clarkson* H3217 (BRI). Del. W. Smith.

3b. Pseudanthus ligulatus subsp. **volcanicus** Halford & R.J.F.Hend. **subsp. nov.** ab *P. ligulatus* Halford & R.J.F.Hend. subsp. *ligulatus* plantis statura diffusa et breviora (frutex diffusus usque ad 50 cm non 40–150 cm altus), foliis in ramulis distaliter confertis non aequaliter distributis et floribus femineis tepalis ovatis et < 2 mm longis non lanceolatis ad ovatis et > 2 mm longis differt. **Typus:** Queensland. MORETON DISTRICT: Mount Tibrogargan, Glasshouse Mountains, 8 March 1991, *A.R.Bean* 2871 (holo: BRI).

Diffuse shrub up to 40 cm high. Stipules triangular to ovate. Leaves ± crowded towards the ends of the branchlets. Staminal filaments 0.5–1.5 mm long. Tepals of female flowers ovate, 1.2–1.8 mm long, 0.6–0.8 mm wide.

***Selected specimens (from 14 examined)*: Queensland.** MORETON DISTRICT: Mt Tibrogargan, Aug 1975, *Coveny* 6723 & *Hind* (BRI, NSW); Crookneck, Glasshouse Mountains, Jul 1939, *Goy* & *Smith* 697 (BRI); Mt Crookneck, Glasshouse Mountains, May 1935, *Goy* s.n. [AQ205142] (BRI); Mt Coonowrin, Glasshouse Mountains, Oct 1973, *Hassall* 73128 (BRI); Mount Tibrogargan, Mar 1974, *Hassall* 7411 (BRI); Mt Coonowrin, Glasshouse Mountains, Sep 1930, *Hubbard* 4117 (BRI); Mt Crookneck, Glasshouse Mountains, Dec 1967, *Smith* s.n. [AQ205143] (BRI, CANB); Mt Coonowrin, Aug 1968, *Smith* 14005 (BRI); Mt Tibrogargan, Glasshouse Mountains, Apr 1984, *Telford* 9690 (CANB, MEL); Mt Coonowrin, Glasshouse Mountains, Jan 1966, *Whaite* & *Whaite* 3073 (BRI, NSW).

***Distribution and habitat*:** *Pseudanthus ligulatus* subsp. *volcanicus* is restricted to the slopes of the Glasshouse Mountains in south-east Queensland. It is recorded as growing in crevices and along ledges on trachyte cliff faces. **Map 4.**

***Phenology*:** Flowers have been collected throughout the year, fruits in August.

***Etymology*:** The epithet is derived from Latin *volcanicus*, volcanic, in reference to where this subspecies occurs, i.e. on mountains of volcanic origin.

4. Pseudanthus micranthus Benth., Fl. Austral. 6: 59/60 (1873). **Type:** South Australia. [without locality, without date,] [*J.*] *Whittaker* s.n. (holo: K (cibachrome at BRI)).

Phyllanthus tatei F.Muell., S. Sci. Rec. 2: 55 (1882); *Micrantheum tatei* (F.Muell.) J.M.Black, Fl. S. Austral. 1st edn: 356 (1924). Type: South Australia. Bundaleer Range, [without date,] [*R. Tate* s.n.] (holo: MEL [MEL 107258]).

***Illustrations*:** J.Z. Weber & D.J. Morley (1985: p 212); J.Z Weber (1986: p 765, fig.409).

Compact shrub up to 30 cm high; stems ascending to erect, intricately branched; branchlets pubescent with minute spreading hairs up to 0.2 mm long. Leaves alternate; stipules triangular to filiform, 0.4–1 mm long, red-brown, with margins entire; decurrent margins obscure or absent; petiole 0.3–0.4 mm long, smooth; laminae ovate or orbicular, 1.7–5 mm long, 1.2–2.7 mm wide, length/width ratio 1–3:1, smooth except for papillae on margins, glabrous; midrib obscure adaxially, slightly raised abaxially; tip straight or recurved, acute to obtuse, sometimes with a minute recurved apiculum; margins flat, not noticeably thickened. Flowers in axils of upper leaves; bracts triangular to filiform, c. 0.5 mm long, pubescent on adaxial surface. Male flowers 1–3 per axil, on pedicels 0.4–1.3 mm long; tepals 6, ± flat or concave, subequal, ovate, suborbicular or obovate, 0.6–1.6 mm long, 0.5–1 mm wide, yellow coloured with reddish tinge, spreading; apex obtuse; margins entire; receptacle glabrous; stamens (2 or)3, with filaments entire, free at base, adhering near apex by interlocking papillae, 0.8–1 mm long, and anthers 0.4–0.5 mm long, smooth; disc 3-lobed. Female flowers solitary, sessile; tepals 4–6, ovate, 1.1–1.5 mm long, 0.8–1 mm wide, yellow coloured with reddish brown margin, slightly keeled, glabrous on both surfaces; apex obtuse; margins erose; receptacle glabrous. Ovary mostly 3-locular and trigonal-globose or if 2-locular then laterally compressed, 0.9–1.1 mm across; locules biovulate; styles 1–2 mm long, spreading and recurved distally. Fruits sessile; persistent tepals ≤half of the length of capsule; capsule ± ovoid, 3.5–5.5 mm long, 3–4.8 mm across, smooth or slightly rugose, glabrous, creamy green coloured becoming pinkish red with age. Seeds subglobose to ovoid, 2.5–3.5 mm long, c. 2.3 mm across, smooth, somewhat glossy brown; exostome pit well developed; caruncle subconical, c. 0.9 mm long, c. 1.2 mm wide.

***Additional specimens*: South Australia.** Inman Valley turnoff on Waitpinga Road, Sep 1981, *Bates* 1015 (AD); top of cliffs near Waitpinga, Sep 1981, *Bates* 1014 (AD); c. 2 km NE of Newland Head, Nov 1981, *Bushman* 42 (AD); Kangaroo Island, Flinders Chase NP, May 1995, *Davies* 764 (AD); Victor Harbour, Jul 1983, *Davies* 553 & *Bushman* (AD); Waitpinga Beach, Jul 1983, *Davies* 515 & *Bushman* (AD); Willow Creek, Oct 1955, *Fraser* (AD); Victor Harbour, Jul 1970, *Hunt* 3215 (AD); Port Elliot, Apr 1895, *Hussey* (AD); Port Elliot, Aug 1967, *Kraehenbuehl* 3451 (AD); Inman Valley, Oct 1987, *Murfet* 612 (AD); Kangaroo Island, Sep 1995, *Overton* 2570 (AD)

***Distribution and habitat*:** *Pseudanthus micranthus* occurs in South Australia where it is restricted to the southern Lofty Ranges from Mount Compass to Cape Jervis, and Kangaroo Island. It is recorded as growing in shrubland, heathland and open mallee communities on sandy soils. **Map 5.**

***Phenology*:** Flowers have been collected in January and from April to November, fruits in January and from July to October.

***Notes*:** *Pseudanthus micranthus* is easily distinguished from all other species of *Pseudanthus* by having stems with obscure decurrent stipule margins or decurrent stipule margins absent from stems, stamens 3 and free at base but joined at apex by interlocking hairs, and branchlets with erect translucent minute hairs.

In his protologue, Bentham (1873) stated of this species that it was a "much-branched glabrous shrub". However, examination of the type clearly shows minute hairs on the branches.

5. Pseudanthus orbicularis (Müll.Arg.) Halford & R.J.F.Hend. **comb. nov.**; *Caletia divaricatissima* var. *orbicularis* Müll.Arg., Flora 47(31): 486 (1864); *Caletia orientalis* var. *orbicularis* (Müll.Arg.) Baill., Adansonia 6: 327 (1866); *Pseudanthus divaricatissimus* var. *orbicularis* (Müll.Arg.) Benth., Fl. Austral. 6: 60 (1873), as '*orbiculare*'. **Type:** Victoria. summit of rocky mountains on the M'Allister [Macalister] River, Gippsland, [without date,] *Dr* [*F.*] *Mueller* s.n. (holo: K (ex herb. Hook.); iso: MEL [MEL2062900, MEL2062899 & MEL2062916]; possible iso: MEL [MEL224491]).

Pseudanthus divaricatissimus var. *orbicularis* Ewart, Fl. Victoria 725 (1930), as 'orbiculare', *nom. illeg.* **Type:** not designated.

***Illustration*:** J.A. Jeanes (1999: p.73, fig.11e), as *P. divaricatissimus*.

Compact shrub to up to 1.5 m high and wide; stems ascending to decumbent, freely divaricately branching; branchlets glabrous. Leaves decussate; stipules triangular, 0.4–0.7 mm long, red-brown, acute, and with margins entire or fimbriate; decurrent margins glabrous or hispidulous; petiole 0.2–0.6 mm long, smooth; laminae ± flat or slightly concavo-convex, broadly elliptic to orbicular or rarely broadly ovate, 1.4–3.6 mm long, 1.2–2.3 mm wide, length/width ratio 1–1.7:1, smooth, glabrous or with minute hairs on margin; midrib obscure adaxially, slightly raised abaxially; tip ± straight, rounded or emarginate, usually with a minute red-brown apiculum; margins flat or slightly recurved, not obviously thickened. Flowers solitary in axils of upper leaves; bracts narrowly triangular or ovate, 0.3–0.5 mm long, pubescent on margin and abaxial surface. Male flowers on pedicels 0.4–0.6 mm long; tepals 6, convex-concave, ovate or obovate, 0.9–1.3 mm long, 0.5–0.8 mm wide, creamy white or red coloured, spreading; apex rounded to obtuse, margins entire; receptacle glabrous; stamens 6, with filaments entire, free, 0.4–1.2 mm long, and anthers 0.3–0.4 mm long, smooth; disc irregularly lobed. Female flowers sessile; tepals 5 or 6, ovate or elliptic, 1.4–1.7 mm long, 0.6–0.9 mm wide, pale red coloured, slightly keeled, glabrous; apex acute to obtuse; margins irregularly toothed; receptacle glabrous. Ovary trigonal-globose, 0.6–0.7 mm across, glabrous, tuberculate along ridges; locules 3, biovulate; styles 0.6–0.7 mm long, erect and recurved distally. Fruits sessile; persistent tepals ≤the length of the capsule; capsule narrowly ovoid, 3.8–4.5 mm long, 1.2–2.2 mm across, smooth or tuberculate along ridges, glabrous, mottled green and red. Seeds ± cylindrical, laterally compressed, 3.1–3.3 mm long, 1.1–1.5 mm wide, 1.3–1.8 mm across; testa smooth or slightly rugose, dull reddish brown; exostome pit well developed; caruncle squat-conical, c. 0.6 mm long, c. 0.7 mm wide.

***Selected specimens (from 45 examined)*: New South Wales.** Nadgee Nature Reserve, Merrica River crossing of main road from entrance of reserve to Newtons Beach, Jan 1985, *Albrecht* 1539 (MEL, NSW); Nullica State Forest, Jan 1986, *Albrecht* 2409 (MEL); rhyolite knoll SSE of Nethercote Falls on the Yowaka River, Oct 1985, *Albrecht* 2036 (CANB, MEL, NSW); 3 km WSW of the Old Hut Creek crossing of the Nethercote Road, Nullica State Forest, Oct 1985, *Albrecht* 2067 (CANB, MEL, NSW); Deua NP, c. 20 km WNW of Moruya, Mar 1985, *Beesley* 383 & *Binns* (CANB, MEL, NSW); mountain peak 2.5 km NE of Mount Poole, Yambulla State Forest, Jul 1986, *Briggs* 1997 & *Albrecht* (CANB, NSW); Bunbury State Forest, 14 miles (c. 22.5 km) E of Parkes, Oct 1973, *Coveny* 5253 (NSW); Hervey Range, E of Peak Hill, May 1978, *Harden* s.n. [NE038787A] (NE); c. 15 km SE of Peak Hill on road to Molong via Baldry, Harvey Range, Sep 1989, *Henderson* & *Turpin* H3246 (AD, BRI, NSW); Yumbulla State Forest, c. 24 km S of Eden, Newtons crossing Picnic area, Feb 1984 *Taylor* 204 & *James* (MEL, NSW). **Victoria**. c. 5 miles [c. 8 km] NW of Mt Margaret, Jan 1973, *Beauglehole* ACB41287& *Chesterfield* (MEL, NSW); S side of Barrytennie Road, 12.8 km NW of Mid Western Highway turnoff (which is 7 km W of Cowra), Sep 1997, *Jobson* 4820 & *Mills* (BRI, NSW); c. 16 miles [c. 26 km] NE of Buchan, Jan 1953, *Melville* 3069 *et al.* (K, MEL, NSW); Brisbane Ranges NP, c. 250 m SW of Aeroplane Road turnoff on Reids Road, Oct 1992, *Stajsic* 619 *et al.* (MEL); Werribee Gorge State Park, Jan 1991, *Stajsic* 136 (MEL); Maramingo Hill, Sep 1946, *Wakefield* 4227 (MEL); Mt Ray summit area, c. 19 km NE of Briagolong, Dec 1998, *Walsh* 4902 & *Anderson* (MEL); Mt Margaret track, c. 0.8 km NE from Tamboritha Road, Apr 1992, *Walsh* 3438 & *Albrecht* (BRI, MEL); 3.5 km NW from Genoa township, Oct 1991, *Walsh* 3221 (BRI, MEL); Wellington River, 7.5 km N of Licola, Jan 1984, *Yugovic* 019 (CANB, MEL).

***Distribution and habitat*:** *Pseudanthus orbicularis* occurs in a number disjunct localities in south-eastern Australia, from Ulan, Wellington and Cowra areas in the Central Western Slopes Subdivision, and Mourya and Eden districts in South Coast Subdivision, New South Wales, extending into far eastern Gippsland, and westwards to Werribee Gorge, Victoria. It is recorded as growing in rocky sites on hillsides and ridges in shrubland, low woodland with heath understorey or open eucalypt forest with shrubby understorey. The soils are shallow, mostly sandy or occasionally sandy loam or sandy clay, often overlying rhyolite or granite, or less frequently sandstone. **Map 6.**

***Phenology*:** Flowers and fruits have been collected throughout the year.

***Notes*:** *Pseudanthus orbicularis* seems most closely related to *P. divaricatissimus* but differs from that in having orbicular rather than narrowly elliptic to elliptic or ovate leaf laminae, leaf margins not prominently thickened, narrower capsules (1.2–2.2 mm rather than 2.4–2.8 mm across) and seed ± cylindrical and 3.1–3.3 mm long rather than broadly ovoid and 2.4–2.8 mm long. *Pseduanthus obricularis* is sometimes confused with *P. ovalifolius* but can be distinguished from that by the shape of the tepals in its male flowers, leaf margins not prominently thickened and its biovulate locules.

6. Pseudanthus orientalis F.Muell., Fragm. 2: 14 (1860); *Caletia orientalis* (F.Muell.) Baill., Adansonia 6: 327 (1866); *Caletia orientalis* (F.Muell.) Baill. var. *orientalis*, Baill., Adansonia 6: 327 (1866). **Type:** New South Wales. Botany Bay, Jan 1857 (or Apr 1855), *F. Mueller* s.n. (lecto, here chosen: MEL [MEL2064467]).

Caletia linearis Müll.Arg., Linnaea 32: 79 (1863). **Type:** [New South Wales.] Port Jackson, in 1816, *A. Cunningham* (syn: G-DC *n.v.*, microfiche IDC 800–73. 2453: III. 3, [top right]); Port Jackson, in 1826, [*J.S.C.*] *Dumont d'Urville* (syn: G-DC *n.v.*, microfiche IDC 800–73. 2453: III. 3 [bottom left]).

Compact shrub to 0.5 (rarely1) m high; stems ascending to decumbent or rarely prostrate, freely branching; branchlets glabrous. Leaves alternate or decussate; stipules broadly triangular, 0.5–0.7 mm long, pale red-brown becoming grey-white with age, acuminate, with margins irregularly toothed; decurrent margins glabrous; petiole 0.4–0.6 mm long, smooth; laminae concavo-convex, linear, narrowly oblong to oblong or oblanceolate, 3.5–13 mm long, 0.7–1.7 mm wide, length/width ratio 3–9:1, smooth, glabrous or minutely papillose on margins; midrib obscure adaxially, slightly raised abaxially; tip straight or recurved, obtuse to rounded, sometimes with a minute red-brown apiculum; margins flat, thickened and white-coloured. Flowers solitary in axils of upper leaves, often appearing to be in terminal clusters; bracts narrowly triangular, 0.6–1 mm long, pubescent on adaxial surface. Male flowers on pedicels 1–2 mm long; tepals 6,

slightly convex-concave, narrowly oblong or sometimes narrowly obovate, 0.9–1.6 mm long, 0.4–0.8 mm wide, pale yellow to creamy-white coloured, spreading; apex obtuse sometimes with minute reddish brown apiculum; margins entire or toothed; receptacle glabrous; stamens 6, with filaments entire, free, 0.2–0.6 mm long, and anthers 0.3–0.4 mm long, smooth; disc irregularly lobed. Female flowers sessile; tepals 6, ovate to elliptic, 1–1.4 mm long, 0.6–0.7 mm wide, pale green coloured with reddish tips, slightly keeled, pubescent on adaxial surface distally, glabrous on abaxial surface; apex obtuse; margins erose; receptacle glabrous. Ovary trigonal-globose, 0.5–0.7 mm across, glabrous; locules 3, biovulate; styles 0.3–0.6 mm long, erect and spreading distally. Fruits sessile; persistent tepals ≤half the length of the capsule; capsule narrowly ovoid, 3.5–4 mm long, 1.5–1.7 mm across, smooth or slightly rugose, glabrous, mottled green and red or reddish brown. Seeds narrowly ovoid to cylindrical, 2.2–3.5 mm long, 1.1–1.5 mm across; testa smooth, somewhat glossy brown; exostome pit not well developed; caruncle conical, 0.5–0.9 mm long, 0.6–0.9 mm wide.

***Selected specimens (from c. 80 examined)*: Queensland.** Port Curtis District: Littabella NP, c. 40 km NW of Bundaberg, Nov 1993, *Bean* 7012 (BRI); 4 km WSW of Stockyard Point, May 1996, *Fell* 4615 (BRI); 4 km from Byfield turnoff to Five Rocks, Sep 1977, *Powell* 885 & *Armstrong* (BRI, NSW). Wide Bay District: Wide Bay Military Training area, c. 10 km NNW of Camp Kerr, Sep 1980, *Adams* 3576 (BRI, CANB); Marcus Beach, S of Noosa, Mar 1993, *Bean* 5832 (BRI); Sandy Cape, Fraser Island, Apr 1966, *Blake* 22718 (BRI); Burrum Coast NP, Kinkuna section, Oct 1996, *Forster* PIF19978 & *Leiper* (BRI, MEL); Noosa NP, Noosa, Dec 1984, *Sharpe* 3645 & *Batianoff* (BRI, NSW); Upper Noosa River, 22 km N of Tewantin, Aug 1976, *Telford* 4356 (CANB). Moreton District: Beerwah State Forest, Mar 1953, *Melville* 3545 *et al.* (BRI, CANB, K); Caloundra, Aug 1933, *Blake* 4879 (BRI); Moreton Island, c. 0.9 km WSW of Cape Moreton, Dec 1974, *Durrington* 1414 & *Batianoff* (BRI); Mt Coolum, Nov 1987, *Henderson* H3110 (BRI); Peel Island, Oct 1994, *Thompson* & *Bean* MOR444 (BRI). **New South Wales**. Captain Cook's historical landing site, Kurnell, Aug 1976, *Coveny* 7761 & *Hind* (NSW); La Perouse, May 1976, *Coveny* 7670 & *Davies* (NSW); Crowdy Head, N of Harrington, Feb 1969, *Blaxell* 190 (NSW); Petrol Depot at SW Rocks, 22 miles (c. 35.2 km) by road NE of Kempsey, Sep 1967, *Coveny* s.n. (NSW); Crowdy Bay National Bay, 5.3 km S of Laurieton Bridge on Diamond Head road, Mar 1981, *Haegi* 2043 (NSW); 5 miles (c. 8 km) NE of Woodburn, Feb 1971, *O'Hara* & *Coveny* 3504 (BRI, NSW); c. 10 km NW of Iluka, Dec 1967, *Williams* s.n. [NE024351A] (NE).

***Distribution and habitat*:** *Pseudanthus orientalis* occurs in coastal areas from Shoalwater Bay, central Queensland, southwards to Botany Bay, New South Wales. It is recorded as growing on sandy soils in moist coastal heath, shrubland or open *Banksia* woodland with heath understorey, on coastal flats, headlands and stabilised beach dunes. It also occurs in low open forest with heath or shrub understorey. **Map 7.**

***Phenology*:** Flowers and fruits have been collected throughout the year, particularly from August to November.

***Typification*:** Mueller (1860) did not cite any particular specimen in his protologue of this species which he said occurred "in ericetis litoralibus Australiae orientalis extratropicae". The specimen selected here as lectotype predates Mueller's publication, has the name *P. orientalis* on the label in Mueller's hand and matches the description of the species given in the protologue.

7. Pseudanthus ovalifolius F.Muell., Trans. Philos. Inst. Victoria 2: 66 (1858); *Caletia ovalifolia* (F.Muell.) Müll.Arg., Linnaea 34: 55 (1865). **Type:** [Victoria.] Grampians, [in 1857], [*C.*] *Wilhelmi* s.n. (lecto, here chosen: MEL [MEL694290]; possible isolecto: MEL [MEL2062910 (ex herb. Sonder), MEL2062903 (ex herb. Sonder)], K (element on the right).

***Illustration*:** J.A. Jeanes (1999: p.73, fig.11d); M.G. Corrick & B.A. Fuhrer (2000: p.82).

Straggling to compact shrub to 30 cm high; stems ascending to erect, divaricate; branchlets glabrous. Leaves subopposite, decussate or rarely alternate; stipules broadly triangular to broadly ovate, 0.5–0.9 mm long, red-brown becoming grey with age, acute, obtuse or acuminate with a dark brown glandular tip, and with margins erose, fimbriate or irregularly lobed; decurrent margins hispidulous; petiole 0.1–0.4 mm long, smooth; laminae concavo-convex, narrowly oblong-elliptic, elliptic or sometimes orbicular, (1.8–)2.2–5(–7.5) mm long, 1–2.1 mm wide, length/width ratio 1–4:1, smooth except for minute papillae on margins and sometimes on the midrib abaxially, glabrous except for

occasional minute hispid hairs on midrib abaxially; midrib obscure adaxially, slightly prominent abaxially; tip straight or slightly recurved, obtuse to rounded and sometimes terminated by a minute, dark red-brown mucro; margins flat, thickened and white-coloured. Flowers solitary in axils of upper leaves but sometimes appearing to be in terminal clusters; bracts ovate, 1–1.5 mm long, entire or 3-toothed distally, pubescent on margins and on the adaxial surface. Male flowers on pedicels 0.5–1.3 mm long; tepals 6, flat, narrowly oblong to oblong or narrowly obovate, 1.3–2.4 mm long, 0.5–0.8 mm wide, creamy white coloured, spreading; apex rounded to obtuse; margins entire; receptacle glabrous; stamens 6, with filaments entire, free, 0.5–1.8 mm long, and anthers 0.3–0.5 mm long, smooth; disc 3-lobed with each lobe notched at tip. Female flowers sessile; tepals 5 or 6, lanceolate to narrowly ovate, 1.1–2.2 mm long, 0.2–0.6 mm wide, reddish brown coloured at base and creamy-white distally, slightly keeled, glabrous on both surfaces; apex acute to acuminate; margins erose or irregularly toothed; receptacle glabrous. Ovary trigonal-globose, 0.7–1.2 mm across, glabrous; locules 3, uniovulate; styles 1.3–2.3 mm long, erect and spreading distally. Fruits sessile; persistent tepals ≤half the length of the capsule; capsule ovoid, 3.5–4 mm long, 1.9–2.2 mm across, ± smooth, glabrous, green coloured. Seeds ovoid, 2.5–2.7 mm long, 1.5–1.7 mm across; testa smooth, dull brown; exostome pit well developed; caruncle ± pyramidal, c. 0.6 mm long, c. 0.6 mm wide.

***Selected specimens (from 52 examined)*: New South Wales.** North Ben Boyd NP, 6 km N of Eden, Oct 1978, *Newman* s.n. [MEL204781] (MEL). **Victoria.** 15 miles [c. 24 km] NNE of Bendigo, near the Huntly-Kamarooka road, Oct 1959, *Aston* 418 (MEL); Mt Victory, Reids Lookout, Grampians, Oct 1950, *Beauglehole* 8355 (MEL); Little Desert, east-west access track W of Nhill-Gymbowen road, Sep 1975, *Corrick* 5334 (MEL); ridge near Kappa Cave, Victoria Range, The Grampians, Sep 1963, *Filson* 5291 (MEL); Grampians, Oct 1952, *Gauba* s.n. (CANB [CBG001513], NSW [NSW130415]); Campbell Road, 1.7 km W of Tennyson road, 26.2 km N of Bendigo, Aug 1995, *Jobson* 3685 (BRI, MEL, NSW); along the Goad Track at the summit of Victoria Range about 3 km S of the Fertility Shelter, Sep 1989, *LeBreton* s.n. [MEL234094] (MEL); Flagstaff Hill, 5.5 miles [c. 8.8 km] N of Eaglehawk, Sep 1952, *Melville* 1255 *et al.* (K, MEL, NSW); Grampian mountains, northern end of Mt Stapylton, Jul 1961, *Muir* 2141 (MEL); Central Whipstick, Aug 1960, *Perry* s.n. [MEL530704] (MEL); Whipstick Scrub, N of Bendigo, Oct 1966, *Phillips* s.n. [CBG039579] (CANB); Mt Rosea, Grampians, Nov 1971, *Phillips* 508 (CANB); Kamarooka Forest, Campbell Road, c. 2 km W from Kamarooka East-Huntley road, Oct 1991, *Walsh* 3097 (BRI, MEL); Grampians, 600 m from Wallaby Rocks summit, Oct 1986, *Westaway* 266 (MEL). **Tasmania.** Tanners Bay Mines, Flinders Island, Furneaux Group, Jul 1973, *Whinray* 2211 (CANB); Cape Barren Island, Furneaux Group, May 1969, *Whinray* 434 (MEL); Cape Barren Island, Furneaux Group, Oct 1973, *Whinray* 633 (MEL); Cape Barren Island, Sep 1985, *Ziegeler* s.n. [HO95818] (HO).

***Distribution and habitat*:** *Pseudanthus ovalifolius* occurs in a number of scattered localities in south-eastern Australia from near Eden, New South Wales, Little Desert, The Grampians, and Bendigo and Bairnsdale districts, Victoria; and on Cape Barren and Flinders Islands, Tasmania. It is recorded as growing on shallow sandy or clay soils on rocky hillsides in heathland, shrubland including shrubland dominated by *Melaleuca uncinata*. It also occurs occasionally in mallee communities. **Map 8.**

***Phenology*:** Flowers have been collected from February to November, fruits in December.

***Typification*:** Mueller (1858) based his description of *P. ovalifolius* on material collected by J.F. [Carl] Wilhemi from The Grampians, and from the Serra and Victoria Ranges in Victoria. Seven sheets of collections made by Wilhemi from the Grampians have been located at MEL. A further sheet has been located amongst material on loan to BRI from K and it carries 2 specimens and 2 labels, both in Mueller's hand. In his protologue, Mueller's described the male flowers but not the female flowers of the species. Sheet MEL694290 at MEL is here chosen as lectotype because it is the best-preserved specimen, has male flowers attached and the label is annotated by Mueller with the name *P. ovalifolius*.

***Notes*:** The uniovulate condition of *P. ovalifolius* appears to be stable and constant in this species. This condition is presumed derived by reduction from the biovulate state seen in the other species of *Pseudanthus* and it clearly distinguishes *P. ovalifolius* from all other species of that genus. However, there is no doubt that *P. ovalifolius* belongs to it.

8. Pseudanthus pauciflorus Halford & R.J.F.Hend. **sp. nov.** arte affinis *P. pimeleoidi* Sieber ex Spreng. ut videtur sed foliis lamina anguste obovata, anguste elliptica vel anguste oblongo-elliptica non anguste lanceolata ad lanceolata vel ovata, floribus masculinis minoribus et minus conspicuis tepalis 2.7–4.8 non 5–11 mm longis in pedicellis brevioribus (0.7–2.2 mm non 2–5 mm longis), et floribus in pseudo-fasciculis distalibus paucioribus differt. In additamentis haec species affinis formae boreali *P. divaricatissimi* (Müll.Arg.) Benth. aliquantum sed floribus masculinis tepalis 2.7–4.8 non 0.8–1.5 mm longis et floribus femineis tepalis lanceolatis vel raro oblanceolatis non ovatis ad late oblongis differt. **Typus:** Queensland. MORETON DISTRICT: Mt Ernest, Mt Barney NP, 17.7 km SW of Rathdowney, 17 March 2001, *D.A. Halford* Q7000 (holo: BRI; iso: MEL, distribuendi)

Compact shrub to 60 cm high; stems ascending to erect, freely branching; branchlets glabrous. Leaves alternate or decussate; stipules triangular or ovate to broadly ovate, 0.8–1.3 mm long, red-brown, acute to acuminate with dark brown glandular tip, and with margins erose to fimbriate; decurrent margins glabrous; petiole 0.5–0.8 mm long, smooth; laminae concavo-convex, narrowly elliptic, narrowly obovate or narrowly oblong-elliptic, 3.5–14 mm long, 1–2.2 mm wide, length/width ratio 2–6:1, smooth except for minute papillae on midrib abaxially, glabrous except for minute scabrid hairs on margins and sometimes on midrib abaxially; midrib obscure adaxially, slightly prominent abaxially; tip recurved, obtuse or subacute, with a translucent mucro up to 0.2 mm long; margins flat, thickened and white-coloured. Flowers solitary in axils of upper leaves though appearing to be in terminal clusters; bracts narrowly triangular to ovate, 1–3 mm long, glabrous or with pale brown crisped hairs on adaxial surface distally. Male flowers on pedicels 0.7–2.2 mm long; tepals 6, ± flat, narrowly oblong or narrowly obovate, 2.7–4.8 mm long, 0.6–1.2 mm wide, creamy white coloured, erect but slightly recurved distally; apex acute, obtuse or rounded; margins entire; receptacle glabrous; stamens 6, with filaments ± entire, free, 0.1–0.6 mm long, and anthers 0.3–0.5 mm long, papillose; disc small, not lobed, hemispherically domed. Female flowers sessile; tepals 4–6, lanceolate (when reddish brown) or rarely oblanceolate (when green), 0.5–4 mm long, 0.2–0.8 mm wide, keeled, glabrous on both surfaces; apex acute to acuminate; margins erose or fimbriate; receptacle glabrous. Ovary trigonal-globose, 0.4–0.8 mm across, glabrous or tuberculate distally; locules 3, biovulate; styles 0.6–1.1 mm long, erect and recurved distally. Fruits sessile; persistent tepals > half the length of the capsule; capsule ovoid, 2.7–4 mm long, 1.5–2.5 mm across, tuberculate distally, glabrous, green coloured though sometimes with dark reddish blushes. Seeds obloid to ovoid, 2.5–3 mm long, 1.5–1.9 mm wide, 1.7–2.2 mm across; testa smooth, dull or glossy brown; caruncle pyramdial, 0.5–0.6 mm long, 0.6–1.3 mm wide.

***Distribution and habitat*:** *Pseudanthus pauciflorus* is disjunct in its distribution with populations occurring from Blackdown Tableland to near Taroom in central Queensland and from Rathdowney in south-east Queensland southward to Port Macquarie on the north coast of New South Wales.

***Affinities*:** *Pseudanthus pauciflorus* seems most closely related to *P. pimeleoides* but differs from that by having narrowly obovate, narrowly elliptic or narrowly oblong-elliptic rather than narrowly lanceolate to lanceolate or ovate leaf laminae, smaller and less conspicuous male flowers with tepals 2.7–4.8 mm long rather than 5–11 mm long, on shorter pedicels (0.7–2.2 mm long as compared with 2–5 mm long), and the distal pseudo-clusters of flowers being less floriferous. *Pseudanthus pauciflorus* is somewhat similar in appearance to the northern form of *P. divaricatissimus* but can be distinguished from that by its longer tepals in male flowers (2.7–4.8 mm long as compared with 0.8–1.5 mm long), and lanceolate or rarely oblanceolate rather than ovate or broadly oblong tepals in female flowers.

***Variability*:** The northern and southern populations of *P. pauciflorus* differ somewhat in habit, leaf lamina shape, the length of the pedicel in male flowers and the length of tepals in female flowers. Although some characters

overlap somewhat, the populations appear worthy of formal recognition. These entities are here treated as subspecies which can be distinguished using the following key.

Pedicels of male flowers 1.2-2.2 mm long; tepals of female flowers 0.5-2.9 mm long ..... **8a. P. pauciflorus** subsp. **pauciflorus**

Pedicels of male flowers 0.7-1.1 mm long; tepals of female flowers 3-4 mm long ..... **8b. P. pauciflorus** subsp. **arenicola**

8a. **Pseudanthus pauciflorus** Halford & R.J.F.Hend. subsp. **pauciflorus**

Pseudanthus sp. (Tylerville P.I.Forster+ PIF11510); Forster & Halford (2002, p. 73).

Leaf laminae narrowly elliptic, narrowly obovate, or rarely narrowly oblong-elliptic, 3.5–7.3(–9.3) mm long, 1.3–2.2 mm wide. Male flowers on pedicels 1.2–2.2 mm long. Female flowers with 4–6 tepals; tepals lanceolate, 0.5–2.9 mm long, up to 0.2 mm wide. **Fig. 3.**

***Selected specimens (from 11 examined)*: Queensland.** Moreton District: Mt Ernest, Oct 1932, *Blake* 4363A (BRI); Mt Barney, Oct 1935, *Everist* 1374 (BRI); Campbell's Folly, 4 km SW of Tylerville, Sep 1992, *Forster* PIF11510 & *Leiper* (BRI); Mt Gillies, eastern part of summit, Oct 1992, *Forster* PIF12108 & *Reilly* (BRI); Mt Ernest, Sep 1989, *Leiper* s.n. [AQ458072] (BRI); Mt Ernest, Oct 1932, *White* 8567 (BRI). **New South Wales.** Moses Rock Flora Reserve, 30 km (direct) N of Dorrigo, Apr 1994, *Bean* 7654 (BRI); Gibraltar Range NP, c. 67 km E of Glen Innes, on the Gywdir Highway, Oct 1969, *Coveny* 2214 (NSW); on North Snowy Road, Bellangry State Forest, Mar 1983, *Whaite* 4465 (NSW); Blatheram Creek area, 10 km NE of Torrington, Nov 1969, *Wissmann* s.n. [NE022850A] (NE).

***Distribution and habitat*:** *Pseudanthus pauciflorus* subsp. *pauciflorus* occurs in eastern Australia from near Rathdowney, south-east Queensland, south to Port Macquarie, New South Wales and west to Torrington. It is recorded as growing in heath, shrub-land or open eucalypt forest communities on exposed mountain tops, cliff-lines or hillsides of exposed rock pavement. The soils are generally noted as shallow sandy loams derived from granite or rhyolite substrates. **Map 9.**

***Phenology*:** Flowers have been collected in March, April and from September to November, fruits in April and November.

***Notes*:** The collections *Wissmann* [NE22850A] (NE), from Torrington, and *Bean* 7654 (BRI), from Dorrigo, differ from other collections of *P. pauciflorus* subsp. *pauciflorus* in the shape of the tepals in female flowers. These two collections have tepals that are somewhat foliose in nature with a much-reduced lamina.

***Etymology*:** The epithet is derived from the Latin, *pauci-*, few, and *-florus*, -flowered, and refers to the comparatively few flowers the species produces.

8b. **Pseudanthus pauciflorus** subsp. **arenicola** Halford & R.J.F.Hend. **subsp. nov.** ab *P. paucifloro* Halford & R.J.F.Hend. subsp. *paucifloro* floribus masculinis in pedicellis brevioribus (0.7–1.1 mm non 1.2–2.2 mm longis) et floribus femineis tepalis longioribus (3–4 mm non 0.5–2.9 mm longis) et latioribus (0.6–0.8 mm non usque ad 0.2 mm latis) differt. **Typus:** Queensland. Leichhardt District: Blackdown Tableland, 20 Apr 1971, *R.J. Henderson* 722 *et al.* (holo: BRI; iso: BRI, CANB, K, MEL, NSW, distribuendi)

Pseudanthus sp. (Tylerville P.I.Forster+ PIF11510) subsp. (Blackdown Tableland R.J.Henderson H722); Forster & Halford (2002, p. 73).

Leaf laminae narrowly obovate or narrowly oblong-elliptic, 4–14 mm long, 1–1.9 mm wide. Male flowers on pedicels 0.7–1.1 mm long.

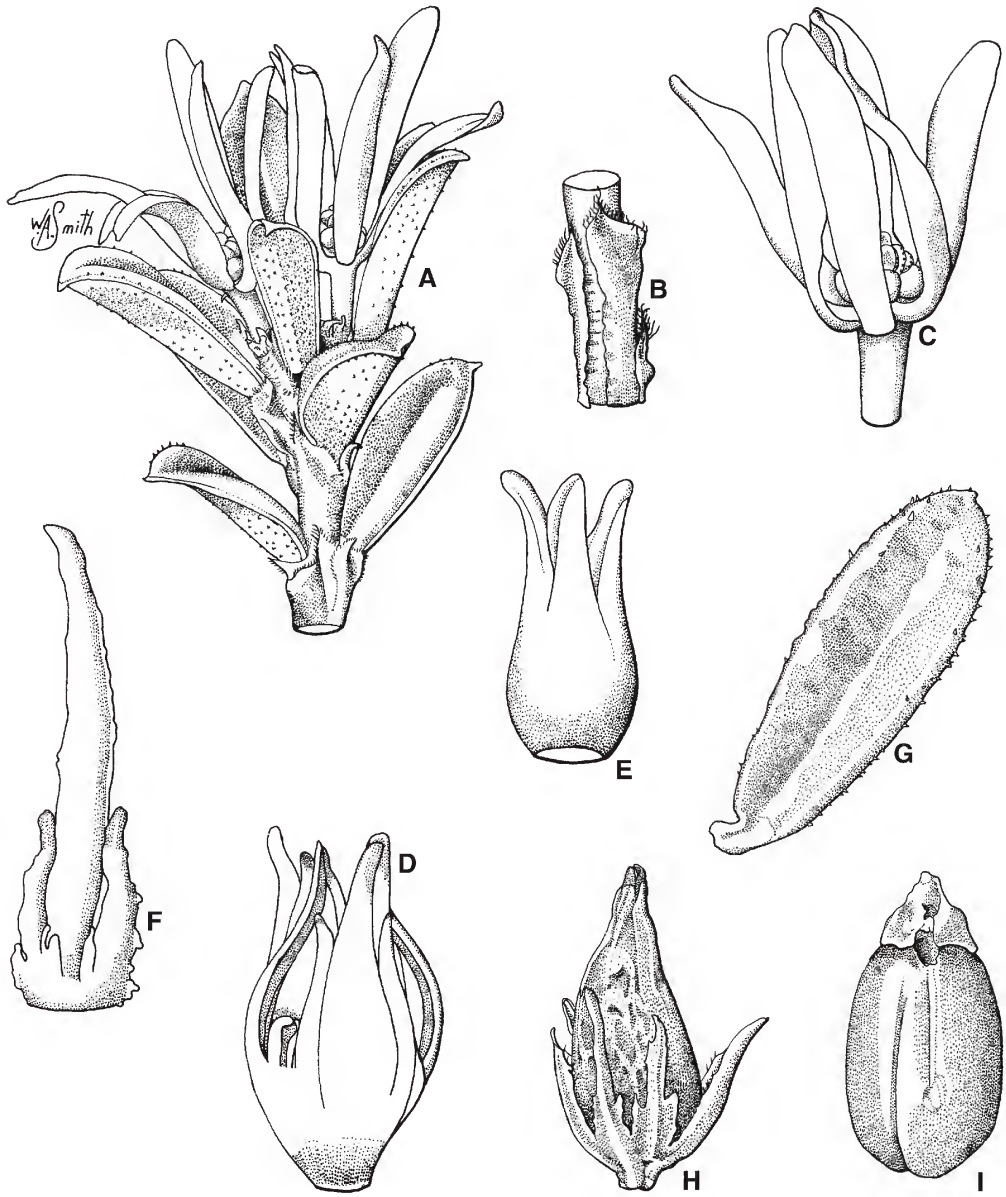


Fig. 3. ***Pseudanthus pauciflorus*** subsp. ***pauciflorus*****.** A. branchlet with flowers × 8. B. section of branchlet with leaves removed showing stipules with decurrent margin × 8. C. male flower from side × 12. D. female flower × 24. E. ovary × 24. F. tepal of female flower ×40. G. leaf × 12. ***Pseudanthus pauciflorus*** subsp. ***arenicola***. H. fruit with persistent tepals × 8. I. seed × 12. A-F from *Forster* & *Leiper* PIF11510 (BRI); G from *Halford* Q3800 (BRI); H, I from *Bean* 6936 (BRI). Del. W. Smith.

Female flowers with 6 tepals; tepals lanceolate, 3–4 mm long, 0.6–0.8 mm wide. **Fig. 3.**

***Additional specimens*: Queensland.** LEICHHARDT DISTRICT: Peregrine Lookout walking track, Blackdown Tableland, Nov 1993, *Bean* 6936 (BRI); Planet Downs pastoral holding, Apr 1998, *Brushe* JB1560 (BRI); Robinson Gorge NP, upstream section of main gorge in Get Down area, Sep 1992, *Forster* PIF11404 & *Sharpe* (BRI); Robinson Gorge, side branch upstream of Get Down, Expedition NP, Sep 1995, *Forster* PIF17780 & *Figg* (BRI); Blackdown, Aug 1961, *Gittins* 385A (BRI); Blackdown Tableland, May 1962, *Gittins* 385B (BRI, NSW); Blackdown Tableland, c. 1 km N of Horseshoe Lookout, Jan 1983, *Telford* 9179 & *Butler* (CANB).

***Distribution and habitat*:** *Pseudanthus pauciflorus* subsp. *arenicola* is restricted to central Queensland to the Blackdown Tableland near Blackwater and the Robinson Gorge (Expedition Range) near Taroom. It is recorded as growing in heath or open eucalypt forest communities on sandy soils associated with sandstone plateaux, cliff-lines or scree slopes. **Map 10.**

***Phenology*:** Flowers and fruits have been collected sporadically throughout the year.

***Etymology*:** The epithet, from Latin *arena*, sand, and *cola*, dweller, relates to the soils where plants of this subspecies are found.

Notes: The subspecies of *P. pauciflorus* are sometimes difficult to distinguish morphologically. Apart from the characters in the key above *P. pauciflorus* subsp. *arenicola* differs from *P. pauciflorus* subsp. *pauciflorus* generally in having slightly narrower and longer leaves with the leaf lamina somewhat twisted, at least when dried. They also occur in different habitats with *P. pauciflorus* subsp. *arenicola* being found on sandy soils derived from sandstone, whereas *P. pauciflorus* subsp. *pauciflorus* occurs on sandy loams derived from igneous rocks.

9. Pseudanthus pimeleoides Sieber ex Spreng., Syst. veg. 16th edn, 4(2) curae posteriores: 25 (1827). **Type:** [Australia.] in Nova Hollandia, [in 1823,] [*F.W.*] *Sieber s.n.* (holo: B (destroyed)); [Australia.] in Nova Hollandia, [in 1823], [*F.W.*] *Sieber* 292, (neo, here chosen: MEL [MEL2065874] (ex herb. Sonder); isoneo: K (ex herb. Hook.).

***Illustration*:** G. Grüning (1913: p.29, fig.6C-F).

Compact shrub to 60 cm high; stems erect, freely branching; branchlets glabrous. Leaves alternate or sometimes opposite; stipules narrowly triangular or broadly ovate, 1–1.3 mm long, red-brown becoming grey-white with age, acuminate with dark brown glandular tip, and with margin erose and irregularly toothed; decurrent margins glabrous or minutely hispidulous; petiole 0.4–1 mm long, smooth; laminae slightly to prominently concavo-convex, lanceolate or narrowly ovate, 6–13 mm long, 1–1.7 mm wide, length/width ratio 5–7:1, smooth except sometimes for minute papillae on midrib abaxially, glabrous except for minute scabrid hairs on margins; midrib obscure adaxially, prominent abaxially; tip straight or recurved, acute to attenuate with a white-coloured mucro up to 0.5 mm long; margins flat, conspicuously thickened and white-coloured. Flowers solitary in axils of upper leaves, though appearing to be in terminal clusters; bracts obovate or ovate, 1–1.3 mm long, fimbriate on margins and with short crisped hairs near tip on abaxial surface. Male flowers on pedicels (1.5–)2–5 mm long; tepals 6, slightly concavo-convex, linear or narrowly obovate, 5–12 mm long, 0.7–1.6 mm wide, creamy white coloured, erect; apex acute to obtuse; margins entire; receptacle glabrous; stamens 6, with filaments entire or slightly bifid, free, 0.3–1.4 mm long, and anthers 0.4–0.8 mm long, papillose; disc irregularly lobed. Female flowers sessile; tepals 6, lanceolate to ovate, 1.4–3 mm long, 0.5–0.8 mm wide, of unknown colour in fresh state, slightly keeled, glabrous on both surfaces; apex acuminate to obtuse sometimes with a minute reddish brown coloured glandular tip; margins irregularly toothed or fimbriate; receptacle sparsely covered with reddish brown curled hairs. Ovary trigonal-globose, c. 1 mm across, glabrous; locules 3, biovulate; styles c. 1.3 mm long, erect and recurved distally. Fruits sessile; persistent tepals > or ≤ half the length of the capsule; capsule ovoid, c. 4 mm long, c. 2.1 mm across, slightly tuberculate, glabrous, green coloured. Seeds not seen.

***Selected specimens (from c. 55 examined)*: New South Wales.** Rocky Crossing, Tahmoor, Aug 1962, *Burgess* s.n. [CBG001702] (CANB); Woronora River, 2 miles [c. 3.2 km] W of Heathcote, Aug 1956,

Constable s.n. [NSW39034] (NSW); The Pheasants Nest, Nepean River, 10 miles [c. 16 km] S of Camden, Oct 1965, *Constable* 6192 (NSW); Patonga Creek, Patonga, Mar 1960, *Constable* s.n. [MEL2065452] (MEL); above Colo River gorge, Feb 1977, *Coveny* 9119 & *Hind* (CANB, NSW); Scouter's Mt track crossing at Heathcote Creek, Heathcote NP, Sep 1983, *Coveny* 11616 & *Bishop* (NSW); The Woolwash, Campbelltown, Sep 1983, *Coveny* 11630 & *Bishop* (NSW); Nepean River at Maldon, c. 20 km SW of Campbelltown, Nov 1984, *Dunn* 584 & *James* (NSW); W tributary, Emu Creek, Wollemi NP, Mar 1984, *Floyd* 2048 (NSW); Engadine, Sep 1926, *Fuller* 291 (CANB); Woronora River, Sep 1927, *Fuller* s.n. [CANB5754] (CANB); Flat Top, Mt Hay Road, near The Pinnacles, Blue Mountains NP, Oct 1987, *Hind* 5413 & *D'Aubert* (BRI, NSW); Bargo River at end of Stratford road, Tahmoor, Nov 1987, *Hind* 5425 *et al.* (NSW); Cataract Dam, Sep 1908, *Maiden* s.n. (NSW); Picton, Sep 1891, *Maiden* s.n. (NSW); Georges River, Kentlyn, Oct 1966, *McBarron* 13349 (NSW); Woolwash, Campbelltown, Sep 1962, *McBarron* 7182 (NSW); The Elbow, George's River, Kentlyn, Aug 1966, *McBarron* 12746 (MEL, NSW); Colo Gorge at Boorai Creek-Dooli Creek junction, 24 km NW of Colo Heights, Aug 1981, *Telford* 8657 (CANB).

***Distribution and habitat*:** *Pseudanthus pimeleoides* is restricted to the Sydney region of New South Wales, from Colo Heights southwards to Bargo. It is recorded as growing on sandy soils overlying sandstone in open eucalypt forest with open heath understorey. **Map 11.**

***Phenology*:** Flowers have been collected from February to November, fruits in February, September and November.

***Typification*:** No type material of *P. pimeleoides* has been located by us. Sprengel (1827) did not cite any particular Seiber collection number in the protologue of *P. pimeleoides*. According to Stafleu and Cowan (1985), Sprengel's herbarium was passed on to his son then later dismembered and sold. The Euphorbiaceae portion was acquired by K. Mueller in Halle in 1853 then brought to Berlin in 1890. Due to action in Berlin in World War II, it is no longer extant. Selection of a neotype for *P. pimeleoides* is therefore in order. The Sieber collection 292 in MEL [MEL2065874] is here chosen as a neotype. It agrees with the protologue description.

***Notes*:** The collections *Johnson* [NSW23443] from near Musselbrook, and *Jobson* 2877 and *Webster* 18825 from Lee's Pinch (all in NSW) approach *P. pauciflorus* in leaf lamina shape but are more typical of *P. pimeleoides* in male flower size and pedicel length, and are more profusely flowering.

Excluded Name(s)

Pseudanthus tasmanicus Rodway, Pap. & Proc. Roy. Soc. Tasmania 1901: 107 (1902). **Type:** 'Among and about basalt rocks on the shores of Lake Lucy Long on the Ironstone Range and on the banks of the South Esk, near Avoca.' (holo: ?).

According to Radcliffe-Smith (1993) this name is applicable to a species of *Pseudanthus* Wight (= *Nothosaerva* Wight) in the Amaranthaceae. Type material appears non existent rendering correct placement of the name impossible at this stage. From the description, however, with respect to the nature of the ovules, it is clear that the name is not applicable to any species of *Pseudanthus* Spreng. Walsh (1996) treated it as a synonym of *Muehlenbeckea axillaris* (Hook.f.) Endl., applicable to plants in family Polygonaceae.

Taxonomy of *Stachystemon*

Stachystemon Planch., Hooker's London Journal of Botany 4: 471, t.15 (1845). **Type:** *Stachystemon vermicularis* Planch.

Pseudanthus sect. *Caletiopsis* Müll.Arg. in A. DC, Prodr. 15(2): 197 (1866). **Type:** *Pseudanthus nitidus* Müll.Arg. (= *Stachystemon virgatus* (Klotzsch) Halford & R.J.F.Hend.).

Chrysostemon Klotzsch in Lehm., Pl. Preiss. 2: 232 (1848); *Pseudanthus* sect. *Chrysostemon* (Klotzsch) Müll.Arg., Linnaea 34: 56 (1865). **Type:** *Chrysostemon virgatus* Klotzsch (= *Stachystemon virgatus* (Klotzsch) Halford & R.J.F.Hend.).

Chorizotheca Müll.Arg., Linnaea 32: 76 (1863). **Type:** *Chorizotheca micrantheodies* Müll.Arg. (= *Stachystemon virgatus* (Klotzsch) Halford & R.J.F.Hend.).

***Derivation of name*:** Named from the Greek *stachys* (ear of corn, a spike) and *stemon* (thread, stamen), in reference to the stamens being united in a long cylindrical central column (Baines 1981). This character is particularly well

developed in *Stachystemon vermicularis*, whose type is the type of the generic name.

Monoecious shrubs. Stems erect, ascending or decumbent, sparingly to much-branched; branchlets ± terete, reddish brown coloured becoming greyish white with age, mostly glabrous, rarely hispidulous, smooth or rarely papillose, ridged by decurrence of stipular margins along internodes. Leaves stipulate, petiolate, alternate, opposite or decussate, simple; stipules persistent, with margins entire or toothed, glabrous or fimbriate; laminae flat, concavo-convex or cymbiform, entire, usually conspicuously thickened along margins. Flowers solitary or few in upper leaf axils, bracteate; distal branchlet internodes often contracted to produce flower clusters at ends of branchlets with subtending leaves often reduced and bract-like. Male flowers pedicellate or rarely sessile; tepals (3 or) 4–6(–10), equal or unequal, in 2 whorls, with each whorl imbricate in bud but spreading or erect at anthesis; receptacle a hemispherical to elongated cylindrical column; stamens 7 to numerous; filaments variously fused or free, stout, mostly bifid distally; anthers of two separate (rarely adnate) contiguous cells, each transverse on the apex of the filament, dehiscing by longitudinal slits; disc absent. Female flowers sessile or rarely shortly pedicellate; tepals 4 or 6 (rarely 5), persistent, subequal, appressed to ovary (and fruit); disc absent; ovary 2(rarely 3)-celled with 2 ovules in each locule, smooth, glabrous; styles 2 (rarely 3), shortly connate or ± free, simple, persistent, spreading to erect with tip recurved. Fruit capsular, ovoid, ellipsoid or obloid and laterally compressed, 1-seeded by abortion, splitting at maturity into 2 (rarely 3) bivalved segments. Seeds subglobose, obloid or rarely ovoid, smooth, with exostomal pit obscure or well developed, carunculate; endosperm copious; cotyledons several times broader than the radicle.

A genus of 9 species endemic in south-western Western Australia.

Key to species of *Stachystemon*

1. Young branchlets with spreading unicellular hairs up to 0.8 mm long ..... **9. S. virgatus**
   Young branchlets glabrous 2

2. Tepals of male flowers all ± similar 3
   Tepals of male flowers dissimilar, either 1 or 3 inner tepals much longer than outer 3 tepals 6

3. Leaf laminae recurved distally, densely minutely papillose on upper surface; leaf margins slightly recurved; decurrent margin of stipules papillose; leaf apex acute to obtuse with mucro up to 0.6 mm long; male flowers with 4, rarely 3 tepals ..... **4. S. mucronatus**
   Leaf laminae ± plain, smooth on upper surface; leaf margins flat; decurrent margin of stipules smooth; leaf apex rounded or obtuse without mucro; male flowers with mostly 6, rarely 4 or up to 10 tepals 4

4. Capsules 6.5–7 mm long; stems sparingly branched; leaf laminae linear of linear-ovate, 4–30 mm long; midrib faintly prominent above ..... **7. S. vermicularis**
   Capsules 3.5–5.2 mm long; stems freely branching; leaf laminae obovate, narrowly elliptic to elliptic or narrowly oblong-elliptic to oblong-eliptic, 2–7 mm long; midrib obscure above; 5

5. Tepals of male flowers red; stamens ≥ 25; filaments 0.3–0.4 mm long; anthers purplish red or brown ..... **2. S. brachyphyllus**
   Tepals of male flowers yellow; stamens 10–14; filaments > 1mm long; anthers yellow ..... **6. S. polyandrus**

6. Leaves crowded towards the ends of branchlets; leaf laminae < 3 mm long; midrib obscure below ..... **3. S. intricatus**
   Leaves evenly spaced along branchlets; leaf laminae ≥ 3 mm long; midrib prominent below 7

7. Male flowers with one inner tepals at least 3 times longer than other two inner tepals; stamens 12–16 ..... **5. S. nematophorus**
   Male flowers with all three inner tepals ± the same length; stamens > 25 8

8. Inner tepals of male flowers ≥ 6 mm long, maroon to purplish red; outer tepals of male flowers irregularly toothed; leaf laminae acute with mucro up to 0.4 mm long ..... **8. S. vinosus**
   Inner tepals of male flowers < 6 mm long, yellow; outer tepals of male flowers entire; leaf laminae obtuse to rounded or acute ..... **1. S. axillaris**

The species are here arranged alphabetically.

1. Stachystemon axillaris A.S.George, J. Roy. Soc. Western Australia 50(4): 97 (1968, '1967'); *Pseudanthus axillaris* (A.S.George) Radcl.-Sm., Kew Bull. 48(1): 167 (1993). **Type:** Western Australia. 5 miles [c. 8 km] W of Mogumber Siding, 17 September 1965, *A.S. George* 6828 (holo: PERTH; iso: K; MEL [MEL2064482]).

***Illustration*:** A.S. George (1968, '1967': p.98, fig.1B, p.100, fig.2R–V).

Diffuse shrub to 1.2 m high; stems erect, sparingly branched; branchlets smooth, glabrous. Leaves evenly spaced along stems and branchlets, alternate; stipules narrowly triangular, 1–1.7 mm long, 0.4–0.6 mm wide, glabrous, pale brown coloured, acute to attenuate, and with margins mostly entire; decurrent margins glabrous; petioles 0.7–1.7 mm long, smooth; laminae ± flat or concavo-convex, linear to linear-oblong, (5–)10–30 mm long, 1.2–2.6 mm wide, densely minutely papillose adaxially, smooth or with scattered minute papillae abaxially, glabrous adaxially and abaxially; midrib slightly impressed or obscure adaxially, prominent abaxially; tip obtuse to rounded or acute; margins flat or sometimes slightly recurved, not prominently thickened. Flowers solitary or several in axils of upper leaves; bracts 1–3, ovate to broadly ovate, 1–1.4 mm long, glabrous, reddish brown coloured; bracteoles 1–4, similar to but smaller than bracts. Male flowers on slender pedicels 1.5–2.5 mm long; tepals 6, dissimilar with inner whorl longer than outer whorl, spreading, somewhat tumid, with margins entire; outer tepals 3, ovate or ovate-elliptic, 1–1.8 mm long, 0.8–1.3 mm wide, greenish yellow coloured, with tip rounded to obtuse or acute; inner tepals 3, linear-oblong or narrowly ovate, 1.7–3 mm long, 0.5–1 mm wide, yellow coloured, with a few simple crisped hairs proximally, with tip rounded to obtuse; receptacle hemispherical, c. 1 mm long, 1.5–2 mm diameter, glabrous; stamens 50–70, with filaments dorsi-ventrally flattened, 0.3–0.5 mm long, and anthers ellipsoid, 0.2–0.3 mm long, ± smooth, red turning brown coloured after anthesis. Female flowers on stout pedicels 0.2–0.7 mm long; tepals 6, similar; ovate, 1.5–2 mm long, 0.8–1.1 mm wide, greenish yellow coloured sometimes with a reddish flush distally, keeled, somewhat scarious, glabrous on both surfaces; apex obtuse, acute or acuminate and sometimes with a hard apiculum up to 0.5 mm long; margins erose or irregularly toothed. Ovary 0.6–0.7 mm diameter; locules 2 or rarely 3; styles 2.5–2.7 mm long, glabrous. Fruits on pedicel 0.5–0.8 mm long, ± ovoid but laterally compressed, 5–6.2 mm long, 3.7–4.5 mm wide, 2.7–3.2 mm across, smooth or somewhat rugose in dried state, glabrous. Seeds subglobose or ovoid, 4.2–4.8 mm long, 2.3–3.5 mm across; exostome pit well developed; caruncle subconical, 1.1–1.5 mm long, 1.2–1.5 mm wide.

***Selected specimens (from 14 examined)*: Western Australia.** near Arrowsmith River, Jun 1970, *Ashby* 3245 (PERTH); Reserve 31030, 18 km S of Eneabba, Mar 1981, *Blackwell* 3132 & *Griffin* (PERTH); 10 km NW of Eneabba, Mar 1981, *Blackwell* 3096 & *Griffin* (PERTH); 2 miles [c. 3 km] NNE of Yeal Swamp in Wanneroo, Jan 1965, *Chadwick* 2564 (PERTH); Three Springs-Coorow Road, Sep 1970, *Chapman* s.n. (PERTH); S.E.C. access road, 25 km S of Eneabba on

Brand Highway, Jul 1981, *Cranfield* 1686 (PERTH); c. 4 km S of Eneabba Railway Station, Oct 1982, *Demarz* 9373 (PERTH); 4 miles [c. 6 km] S of Cockleshell Gully, Sep 1966, *George* 7814 (PERTH); 8 km S of Eneabbba, Sep 1977, *Hnatiuk* 771186 (PERTH); c. 4 km SE of Kalbarri, May 1968, *Wilson* s.n. (PERTH).

***Distribution and habitat*:** *Stachystemon axillaris* occurs in scattered localities in an area of Western Australia bounded by Kalbarri National Park, Three Springs, Moora and Wanneroo. It is recorded as growing on sandplains in low open heath or low open woodland dominated by *Eucalyptus todtiana* on grey or white sand, often with lateritic gravel overlying laterite. **Map 12.**

***Phenology*:** Flowers have been collected from February to October, fruits in September and October.

***Notes*:** The conservation status of *Stachystemon axillaris* is given as Priority 4 (Western Australian Herbarium 1998-2003) under the Western Australian Flora Conservation Codes.

2. **Stachystemon brachyphyllus** Müll.Arg., Linnaea 32: 76 (1863), as 'brachyphyllum'. *Pseudanthus brachyphyllus* (Müll.Arg.) F.Muell., Syst. Census Austral. pl.1: 18 (1882). **Type:** [Western Australia.] Swan River, [without date,] [*J.*] *Drummond* 95 (holo: G-DC *n.v.*, microfiche IDC 800–73. 2454: I. 7); iso: BRI [AQ403982], K, PERTH).

Diffuse to compact shrub to 70 cm high; stems erect, much-branched distally; branchlets smooth, glabrous. Leaves evenly spaced along stems and branchlets, alternate; stipules narrowly triangular to triangular, 0.5–1.7 mm long, 0.3–0.4 mm wide, glabrous except for a few hairs adaxially, red-brown becoming grey-white coloured with age, attenuate, and with margins entire, glabrous or sparsely fimbriate; decurrent margins glabrous; petioles 0.3–0.5 mm long, smooth or rugulose; laminae concavo-convex or rarely cymbiform, narrowly elliptic to elliptic or narrowly oblong-elliptic to oblong-elliptic, 3.2–6.7 mm long, 1.1–1.9 mm wide, glabrous and smooth on adaxial surface, smooth except for minute papillae on margin and along midline of abaxial surface, glabrous or rarely with scattered minute hairs on abaxial surface; midrib obscure adaxially, prominent abaxially; tip obtuse; margins flat, thickened but not obviously so. Flowers solitary in axils of upper leaves, grouped into terminal clusters, often with subtending leaves reduced and bract-like; bracts triangular, 0.5–0.8 mm long, with a few hairs on adaxial surface and along margin, reddish brown coloured; bracteoles 2, similar to but smaller than bracts. Male flowers on stout, tapered pedicels 1.5–3.5 mm long; tepals 6(10), ± similar, slightly concavo-convex, narrowly oblong to narrowly ovate, 1.7–3.3 mm long, 0.5–1 mm wide, scarious or somewhat tumid, red coloured, spreading, with tip acute, and margins entire or irregularly toothed; receptacle cylindrical, 1.5–8.5 mm long, 0.5–1.5 mm diameter, glabrous; stamens 25 to numerous, with filaments dorsi-ventrally flattened or irregularly shaped, tumid and 0.3–0.4 mm long, and anthers obloid, 0.4–0.5 mm long, smooth or papillose, purplish red or brown coloured. Female flowers subsessile; tepals 6, ± similar or those of the inner whorl slightly smaller, ovate or broadly obovate to suborbicular, 2–4.1 mm long, 1.5–1.9 mm wide, yellow with reddish tips, keeled, scarious, glabrous on both surfaces except for a few hairs on midline of adaxial surface; apex acuminate or obtuse to rounded with a hard apiculum up to 0.5 mm; margins irregularly toothed, erose or minutely fimbriate. Ovary 0.5–1.2 mm diameter; locules 2; styles 3.5–5.5 mm long, glabrous. Fruits ± sessile, ± ovoid but laterally compressed, 4.7–5 mm long, 3.5–3.8 mm diameter, 3–3.5 mm across, smooth or somewhat rugose in dried state, glabrous. Seeds subglobose, 3–3.7 mm long, 2.3–3 mm across; exostome pit poorly or well developed; caruncle subconical, 0.8–1.1 mm long, 0.8–1 mm wide.

***Additional specimens*:** **Western Australia.** near Narembeen, 72 km S of Merredin, Sep 1929, *Blackall* s.n. (PERTH); 33 km E of Forrestonia crossroads or 118 km E of Hyden on northern side of road to Norseman, Oct 1984, *Brown* 211 (PERTH); Wyalkatchem, Jun 1922, *Gardner* s.n. (PERTH); Wyalkatchem, Jun 1922, *Gardner* 1705 (PERTH); on small reserve W of Manmanning, Dec 1974, *George* 12928 (BRI, PERTH); without locality, Aug 1980, *George* 15906 (PERTH); Moora, Jan 1978, *Haberley* s.n. (PERTH); 23 km NE of Mt Heywood, Nov 1980, *Newbey* 7966 (PERTH); 84.4 miles [c. 136 km] N of Perth, between Bolgart and Calengiri, Sep 1971, *Paust* 1007 (PERTH); 5 miles [c. 8 km] W of Manmanning, Sep 1984, *Smith* 444 (MEL, PERTH); 3 km NW of

Wongan Hills between road to Piawaning and railway line, Sep 1983, *Taylor* 2163 & *Ollerenshaw* (CANB).

***Distribution and habitat*:** *Stachystemon brachyphyllus* occurs from near Wongan Hills south-eastward to Mt Heywood and Mt Ragged near Esperance in Western Australia. It is recorded as growing in heath, open shrub mallee or low woodland communities with dense shrub understorey, on deep sandy soils sometimes overlying lateritic rocks. **Map 13.**

***Phenology*:** Flowers have been collected from June to January, fruits from August to January.

***Notes*:** A number of intermediates between *S. brachyphyllus* and *S. polyandrus* have been observed, e.g. as represented by *Beard* 5266 (PERTH), *Wittwer* W1874 (PERTH), *Hnatuik* 761262 (PERTH), *Brown* 103 (PERTH) and *Pignatti* 1165 (PERTH). In these specimens, the leaves are shorter and more elliptic than is typical for *S. brachyphyllus*. As well, the leaf axils are generally more hairy and the stipules broader than is typical in *S. brachyphyllus*. They differ from typical *S. polyandrus* in having shorter staminal filaments, and calyx lobes and staminal filaments that are dark reddish maroon coloured as compared with yellow to white colouration typical of *S. polyandrus*.

3. Stachystemon intricatus Halford & R.J.F.Hend., **sp. nov.** ab speciebus *Stachystemonis* Planch. ceteris omnibus caulibus dense et intricate ramosis, et foliis parvis (laminis 1.4–2.5 mm longis) ad extremum ramulorum confertis facile distinguibilis. **Typus:** Western Australia. 5 km S of Paynes Find, 7 August 1969, *P.G. Wilson* 8627 (holo: PERTH; iso: PERTH).

Pseudanthus intricatus C.A.Gardner ms, Paczkowska & Chapman (2000).

Compact shrub to 30 cm high; stems ascending to erect, densely and intricately branched; branchlets smooth, glabrous. Leaves crowded towards the ends of branchlets, decussate or subopposite on elongating shoots; stipules narrowly triangular, 0.6–0.8 mm long, 0.1–0.2 mm wide, glabrous abaxially, sparsely to densely pubescent adaxially, red-brown becoming grey coloured with age, attenuate and with margins erose or fimbriate; decurrent margins glabrous; petioles 0.3–0.5 mm long, smooth; laminae concavo-convex or somewhat cymbiform, obovate or elliptic, 1.4–2.5 mm long, 0.6–1.5 mm wide, smooth or with scattered papillae on margins adaxially, smooth abaxially, glabrous adaxially and abaxially; midrib obscure adaxially and abaxially; tip rounded, sometimes with a minute white-coloured apiculum; margins flat, conspicuously thickened. Flowers solitary in axils of upper leaves, grouped into terminal clusters, sometimes with subtending leaves reduced and bract-like; bracts ovate, 0.6–0.8 mm long, with crisped hairs on adaxial surface and on margins, reddish brown coloured; bracteoles 1 or 2, similar to but smaller than bracts. Male flowers sessile or shortly pedicellate with pedicels 0.5–0.6 mm long, stout and tapered; tepals 6, dissimilar with inner whorl longer than outer whorl, spreading, somewhat tumid, with margins entire; outer tepals 3, broadly obovate to suborbicular, 1.3–1.4 mm long, 1.1–1.4 mm wide, cupular, white coloured, with tip rounded to obtuse; inner tepals 3, narrowly obovate to obovate, 2.1–4 mm long, 0.9–1.5 mm wide, ± flat, white coloured though sometimes with pinkish blush, with tip rounded; receptacle cylindrical, 0.5–0.6 mm long, 0.4–0.5 mm diameter, glabrous; stamens 23–27, with filaments dorsi-ventrally flattened, 0.2–0.6 mm long, and anthers ellipsoid, 0.2–0.4 mm long, smooth, of unknown colour. Female flowers sessile; tepals (5 or) 6, ± dissimilar, scarious, concave, not keeled, glabrous on both surfaces, white coloured; outer tepals 3, narrowly ovate to ovate, 1.3–1.7 mm long, 0.8–1 mm wide, with acute to obtuse tip and erose or irregularly toothed margins; inner tepals (2 or) 3, broadly ovate to suborbicular, 0.9–1.3 mm long, 0.6–0.9 mm wide, with obtuse to rounded tip and ± entire margins; receptacle glabrous. Ovary 0.6–0.7 mm diameter; locules 2; styles 1.6–2.3 mm long, glabrous. Fruits sessile, obloid, 6–7 mm long, 2.5–2.7 mm diameter, 3.2–3.7 mm across, smooth or rugose in dried state, glabrous. Seeds not seen. **Fig. 4**

***Additional specimens*:** **Western Australia.** Lake Monger, Jul 1959, *Aplin* 550 (PERTH); Kirkalocka Station, 7 miles [c. 11 km] E of homestead, Sep 1973, *Beard* 6660 (NSW, PERTH); Butcher's Track, E of Meadow Station, Oct 1973, *Beard* 6827 (NSW, PERTH); 3 miles [c. 5 km] N of Paynes Find, Jul 1931, *Blackall* 35 (PERTH); proposed Toolonga Nature Reserve, Sep 1978, *Burbidge* 38 (PERTH); 2.3 km WNW of Wealbarguntha Hill, Koonmarra Station, Aug 1986, *Cranfield* 6013 (PERTH); 2.3 km WNW of

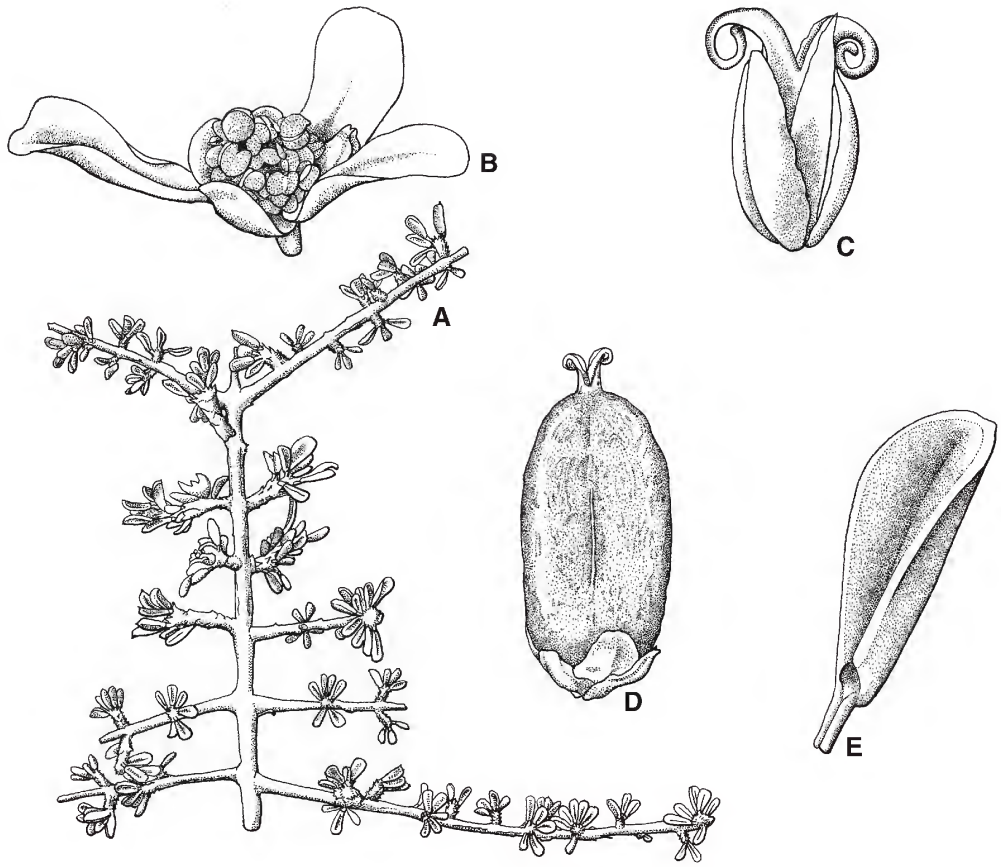


Fig. 4. ***Stachystemon intricatus***. A. branchlet with flowers ×2. B. male flower from side ×10. C. female flower ×14. D. fruit ×6. E. leaf ×20. A-E from *Beard* 6827 (PERTH). Del. W. Smith.

Wealbarguntha Hill, Koonmarra Station, Aug 1986, *Cranfield* 6002 (PERTH); 287 mile peg on Paynes Find – Mt Magnet road, Jul 1966, *Fairall* 1803 (PERTH); Paynes Find, Jul 1931, *Gardner* 2225 (PERTH); between Meeberrie and Hamlin Pool, Aug [1931], *Gardner* 2538 (PERTH); 5 km S of Paynes Find, Aug 1969, *Wilson* 8627 (PERTH).

Distribution and habitat: *Stachystemon intricatus* occurs in an area of Western Australia more or less bounded by Hamelin Pool, Meekatharra and Paynes Find. It is recorded as growing on breakaways in shrubland on white-red sandy clay over laterite, and on sand plains in mulga on red sandy soils. **Map 14.**

Phenology: Flowers have been collected from July to October, fruits in October.

Affinities: *S. intricatus* is easily distinguished from other species of *Stachystemon* by its dense and intricately branched stems, and its small leaves crowded at the ends of the branchlets.

Etymology: The specific epithet is from Latin *intricatus*, entangled, a reference to the branching pattern of plants of this species.

4. Stachystemon mucronatus Halford & R.J.F.Hend., **sp. nov.** arte affinis *S. virgato* (Klotzsch) Halford & R.J.F.Hend. sed caulis ramulis glabris et papillosis, stipulis longioribus (1.2–3 mm non 0.9–1.6 mm longis), pagina adaxiali laminae foliorum minute papillosa non laevi et mucrone laminae foliorum longiore (ad 0.6 mm longo non minuto, si praesenti) et plus prominenti differt. **Typus:** Western

Australia. c. 48 km ESE of Ravensthorpe, on road to Esperance, 20 Sep 1988, *R.J.F. Henderson* H3186 (holo: BRI; iso: MEL, PERTH, distribuendi).

Compact shrub to 80 cm high; stems ascending to erect, much-branched; branchlets papillose, glabrous. Leaves evenly spaced along stems and branchlets, alternate or sometimes decussate; stipules narrowly triangular, 1.2–3 mm long, 0.3–0.7 mm wide, red-brown becoming grey coloured with age, glabrous, attenuate with a dark brown gland at tip, and with margins entire or irregularly toothed; decurrent margins papillose; petioles 0.6–0.8 mm long, smooth; laminae concavo-convex, narrowly oblong to narrowly oblong-elliptic or narrowly elliptic, 2.7–10.2 mm long, 1.2–2.5 mm wide, densely minutely papillose adaxially, sparsely minutely papillose abaxially, glabrous adaxially and abaxially; midrib

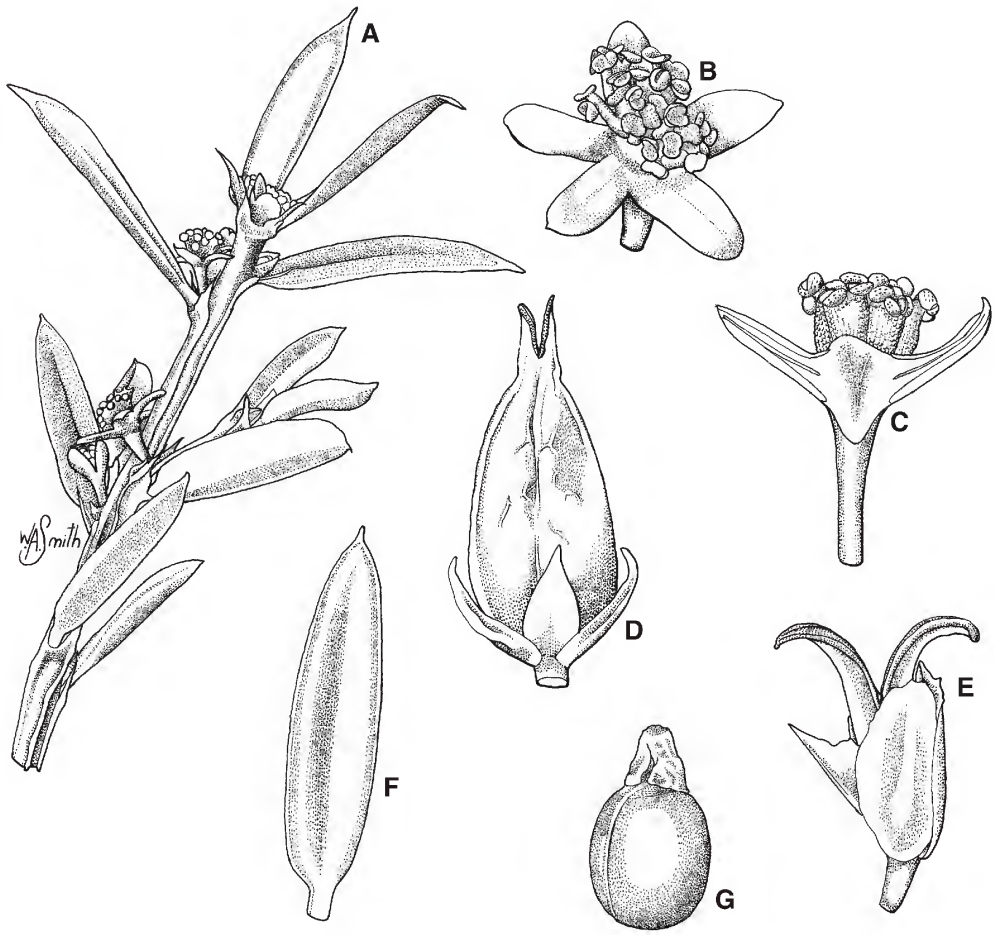


Fig. 5. ***Stachystemon mucronatus.*** A. branchlet with flowers × 4. B. male flower from side × 12. C. longitudinal section of male flower × 12. D. fruit ×6. E. female flower × 12. F. leaf × 6. G. seed × 8. A-F from *Henderson* 3186 (BRI); G from *Jobson* 2635 (BRI). Del. W. Smith.

obscure adaxially, prominent abaxially; tip recurved, acute to obtuse with a white-coloured mucro up to 0.6 mm long; margins slightly recurved, prominently thickened. Flowers solitary in axils of upper leaves, grouped into terminal clusters with subtending leaves sometimes reduced and bract-like; bracts ovate, 1.3–1.6 mm long, glabrous, reddish brown coloured, toothed distally; bracteoles absent or up to 2, similar to but smaller than bracts. Male flowers on slender pedicels 0.5–0.8 mm long; tepals (3)4(or 5), similar, convex, broadly ovate, 1–1.7 mm long, 0.8–1.5 mm wide, somewhat tumid, greenish yellow coloured, spreading, with apex acute to obtuse, and margins entire or slightly erose; receptacle hemispherical, c. 0.4 mm long and c. 1 mm diameter, with a few minute hairs; stamens 7–15, with filaments dorsi-ventrally flattened, 0.5–0.9 mm long, and anthers ellipsoid, 0.2–0.4 mm long, smooth, yellow coloured. Female flowers sessile or shortly pedicellate with pedicels stout, up to 0.5 mm long; tepals 4(5 or 6), ± similar, narrowly ovate to ovate, 1.9–3 mm long; 0.7–1 mm wide, yellowish coloured, prominently keeled, scarious, glabrous on both surfaces; apex acuminate or acute; margins irregularly toothed or lobed. Ovary 0.5–0.6 mm diameter; locules 2; styles 1.8–2.5 mm long, glabrous or sparsely papillose proximally. Fruits sessile, ± ovoid but laterally compressed, 5–7 mm long, 2.2–3 mm wide, 2.2–2.7 mm across, ± smooth, glabrous. Seeds subglobose, 2.4–2.5 mm long, 2.1–2.5 mm wide; exostome pit absent or if present then not well developed; caruncle subconical, 1–1.5 mm long, 0.6–1.1 mm wide. **Fig. 5.**

***Selected specimens (from 16 examined)*: Western Australia.** Thumb Peak range, SW of Ravensthorpe, Oct 1965, *George* 7148 (PERTH); Mt Maxwell, 40 km (by road) N of Bremer Bay, Oct 1993, *Jobson* 2635 (BRI); on southern face of East Mt Barren, Oct 1970, *Maslin* 948 (PERTH); upper southern slopes of East Mt Barren, Oct 1966, *Muir* 4167 (MEL); East Mt Barren, Oct 1985, *Pignattii* 1433 (PERTH); slopes of Mt Maxwell, Nov 1985, *Powell* 3328 (NSW, PERTH); Mt Maxwell, west end of Fitzgerald River NP, Sep 1992, *Robinson* 936 (BRI); Fitzgerald River Reserve, Jul 1970, *Royce* 8915 (PERTH); Thumb Peak, Fitzgerald River NP, Oct 1970, *Royce* 9272 (PERTH); near Middle Mt Barren, Fitzgerald River NP, May 1970, *Wilson* 10155 (PERTH); East Mt Barren, c. 8 km W of Hopetoun, Oct 1966, *Wilson* 5456 (PERTH); East Mt Barren, Apr 1974, *Wittwer* W1193 (PERTH); East Mt Barren, Aug 1965, *Wittwer* 363 (PERTH).

***Distribution and habitat*:** *Stachystemon mucronatus* has been recorded from a number of peaks in the Fitzgerald River National Park and from one locality near the Oldfield River between Ravensthorpe and Esperance in Western Australia. It is recorded as growing on mountain and hill tops in *Banksia* heathland on white sandy soils with quartz stones, and on plains in shrubland communities on grey sandy loam soils. **Map 15.**

***Phenology*:** Flowers have been collected in April and from August to November, fruits in September and October.

***Affinities*:** *Stachystemon mucronatus* is most closely related to *S. virgatus* but can be distinguished from that by its glabrous papillose branchlets, generally longer stipules (1.2–3 mm long as compared with 0.9–1.6 mm long), minutely papillose adaxial surface of the leaf lamina, and longer and more prominent mucro on the leaf lamina apex.

***Etymology*:** The specific epithet is from Latin *mucronatus*, possessing a hard sharp point, a reference to conspicuous mucro at the apex of leaves of this species.

5. Stachystemon nematophorus (F.Muell.) Halford & R.J.F.Hend., **comb. nov.**

Pseudanthus nematophorus F.Muell., Fragm. 2: 4 (1860). **Type:** [Western Australia.] Murchison River, [without date,] [*A.F.*] *Oldfield* s.n. (holo: MEL [MEL98606]; iso: MEL [MEL2062906] (ex herb. Sonder)).

***Illustration*:** S.D. Hopper *et al.* (1990: p. 88).

Compact shrub to 10 cm high; stems ascending to erect, much-branched; branchlets, smooth, glabrous. Leaves evenly spaced along stems and branchlets, decussate; stipules narrowly triangular, 0.7–1.2 mm long, 0.2–0.3 mm wide, glabrous, pale brown coloured, acute with a red gland at tip, and with margins entire or minutely toothed; decurrent margins glabrous; petioles 0.6–0.8 mm long, smooth; laminae concavo-convex, linear to linear-oblong, 4–15 mm long, 0.9–1.5 mm wide, minutely papillose adaxially, smooth except for minute papillae on midrib abaxially, glabrous adaxially and abaxially; midrib obscure adaxially, prominent abaxially; tip acute with white-coloured mucro c. 0.2 mm long;

margins flat, conspicuously thickened. Flowers solitary in axils of upper leaves, grouped into terminal clusters with subtending leaves sometimes reduced and bract-like; bracts triangular, up to 0.2 mm long, glabrous, reddish brown coloured; bracteoles 2, similar to but smaller than bracts. Male flowers ± sessile; tepals 6, dissimilar, spreading, tumid, ± flat or slightly convex, with margins entire; outer tepals 3, broadly ovate or oblong to oblong-ovate, 0.5–0.9 mm long, 0.6–0.8 mm wide, of unknown colour when fresh; with rounded to obtuse tip; inner tepals 3 with two slightly shorter and one much longer than outer tepals, of unknown colour when fresh; shorter tepals broadly ovate, 0.6–0.7 mm long, 0.5–0.6 mm wide, with rounded to obtuse tip; longer tepal filiform, 2.5–2.7 mm long, 0.1–0.2 mm wide, with glandular tip; receptacle slightly convex, c. 0.2 mm long, 0.5–0.6 mm diameter, glabrous; stamens 12–16, with filaments dorsi-ventrally flattened, 0.4–0.6 mm long, and anthers obloid, 0.2–0.3 mm long, ± smooth, of unknown colour. Female flowers sessile; tepals 6, ± similar, ovate; 0.6–1.2 mm long, 0.2–0.5 mm wide, of unknown colour, keeled, somewhat tumid, glabrous on both surfaces; apex acute to obtuse sometimes with a brown glandular tip; margins irregularly toothed. Ovary 0.4–0.5 mm diameter; locules 2; styles 0.5–0.9 mm long, glabrous. Fruits sessile, ovoid, 5–7 mm long, 2–3 mm across, smooth or somewhat rugose in dried state, glabrous. Seeds obloid, 3–3.5 mm long, 1.8–1.9 mm wide, 1.7–2.2 mm across; exostome pit well develop; caruncle subconical, c. 0.8 mm long, c. 1 mm wide.

***Additional specimens*:** Western Australia. [without specific locality], in 1854, *Drummond* 89 (PERTH); Red Bluff, c. 5 km S of Kalbarri township, Sep 1988, *Henderson* H3147 (BRI); Kalbarri NP, c. 0.5 km S of Z bend, May 1968, *Wilson* 6751 (PERTH).

***Distribution and habitat*:** *Stachystemon nematophorus* is known only from the Kalbarri National Park north of Geraldton in Western Australia. It is recorded as growing on rocky pavement in low shrubland on sandy soils in rock crevices. **Map 16.**

***Phenology*:** Flowers have been collected in May, fruits in September.

***Notes*:** When in flower, *Stachystemon nematophorus* is not easily confused with any other species of *Stachystemon* because of the single elongated inner tepal in the male flowers.

The conservation status of *Stachystemon nematophorus* is given as Declared Rare Flora (Western Australian Herbarium 1998-2003) under the Western Australian Flora Conservation Codes.

6. Stachystemon polyandrus (F.Muell.) Benth., Fl. Austral. 6: 62 (1873); *Pseudanthus polyandrus* F.Muell., Fragm. 2: 153 (1861). **Type:** Western Australia. Oldfield River, [without date,] [*G.*] *Maxwell* s.n. (lecto: MEL [MEL2065950]; iso: K).

Pseudanthus chryseus Müll.Arg., Flora 47(31): 486 (1864). **Type:** [Western Australia.] Swan River, [without date,] [*J.*] *Drummond* 221 (holo: K; iso: BRI [AQ403983], MEL [MEL2062938], PERTH).

***Illustration*:** M.G. Corrick & B.A. Fuhrer (1996: p.55).

Diffuse to straggling shrub to 50 cm high; stems ascending to erect, much-branched; branchlets smooth, glabrous. Leaves ± crowded towards the ends of branchlets, alternate or sometimes decussate; stipules narrowly triangular, 0.5–0.9 mm long, 0.2–0.3 mm wide, glabrous abaxially, pubescent adaxially, red-brown becoming grey coloured with age, attenuate, and with margins fimbriate; decurrent margins glabrous; petioles 0.4–0.7 mm long, papillose or wrinkled; laminae concave or somewhat cymbiform, obovate, oblong-elliptic or elliptic, 2–4 mm long, 1.1–1.4 mm wide, smooth except for minute papillae on margins and glabrous except for scattered minute hairs on margins adaxially, minutely papillose and glabrous or sparsely hispidulous abaxially; midrib obscure adaxially, prominent abaxially; tip rounded; margins flat, thickened but not obviously so. Flowers solitary in axils of upper leaves, grouped into terminal clusters often with subtending leaves reduced and bract-like; bracts triangular, 1–1.9 mm long, with curled hairs on adaxial surface and fimbriate margins, reddish brown coloured; bracteoles 1 or 2, similar to but smaller than bracts. Male flowers on stout, tapered pedicels 1–2 mm long; tepals 4–6, similar, concavo-convex, narrowly ovate, 1.5–2.5 mm long, 0.5–0.8 mm wide, somewhat tumid, erect, yellow coloured, with apex acute and margins entire; receptacle cylindrical, 0.5–

2 mm long, 0.6–0.7 mm diameter, glabrous or with simple hairs up to 0.3 mm long; stamens 10–14, with filaments of uneven length, subterete or dorsi-ventrally flattened sometimes tumid distally, 1.3–3 mm long, and anthers ellipsoid, 0.4–0.7 mm long, smooth, yellow coloured. Female flowers sessile; tepals 6, ± similar or inner whorl slightly smaller, narrowly ovate to ovate, 2–3.2 mm long, 1–1.5 mm wide, yellow to white coloured, prominently keeled, scarious, glabrous on abaxial surface, villose or pubescent on adaxial surface; apex acute or acuminate with a hard apiculum up to 0.3 mm long; margins fimbriate. Ovary 0.6–0.7 mm diameter; locules 2; styles 2.7–3.1 mm long, glabrous. Fruits sessile, ± ovoid, laterally compressed, 3.5–5.2 mm long, mm 3.3–3.5 wide, 3.1–3.9 mm across, smooth or slightly rugose in dried state, glabrous. Seeds subglobose, 3.2–3.7 mm long, 3–3.4 mm across; exostome pit well developed but not prominent; caruncle irregularly shaped, c. 0.8 mm long, c. 1 mm wide.

***Selected specimens (from 42 examined)*: Western Australia.** along track S of Jerramungup - Ravensthorpe road, along No.2 Rabbit-proof Fence, c. 13 km in toward Twertup Quarry, Nov 1968, *Canning* WA/68 7502 (CANB, PERTH); c. 48 km ESE of Ravensthorpe, on road to Esperance, Sep 1988, *Henderson* H3187 (BRI); Phillips River, Sep 1962, *Cough* 32 (PERTH); Hopkins Nature Reserve No.35134, 15 km SE [of] Kulin, Oct 1984, *Brown* 113 (PERTH); No Tree Hill area, near Fitzgerald River Reserve, Oct 1970, *Maslin* 976 (PERTH); 16 miles [c. 26 km] E of Lake Grace, Oct 1963, *Newbey* 1023 (PERTH); c. 35 km NNW of Young River crossing on Ravensthorpe-Esperance main road, Oct 1968, *Jackson* 1418 (AD, PERTH); c. 14 km E of the mouth of the Oldfield River, Oct 1969, *Orchard* 1497 (AD, PERTH); near Pallarup Rocks, Lake King - Ravensthorpe road, Oct 1960, *George* 1651 (PERTH); 22.7 km SE of Muckinwobert Rock, Oct 1983, *Burgman* 2716 & *McNee* (PERTH); West Mt Barren, Oct 1963, *Aplin* 2766 (MEL, PERTH); No.2 Rabbit-proof Fence, 1 mile [c. 2 km] SE of Albany-Esperance road, Oct 1966, *Muir* 4104 (MEL); Fitzgerald River NP, 7 km SW of Annie Peak, Jan 1979, *Crisp* 5023 (CANB); 22 miles [c. 35 km] W of West River, Jan 1974, *Demarz* 5040 (PERTH); 34 km from Hopetoun along Ravensthorpe road, Sep 1983, *Purdie* 5390 (CANB); c. 62 km W of Ravensthorpe on Ongerup Road, Oct 1966, *Wilson* 5412B (PERTH); 25 miles [c. 40 km] W of Bremer Bay, Oct 1965, *George* 6936 (PERTH); Thumb Peak Range, Oct 1965, *George* 7136 (PERTH); 25 km N of Esperance - Ravensthorpe Road, Sep 1968, *Wilson* 7922 (PERTH); 17 km from Newdegate along road to Lake King, Oct 1982, *Strid* 21090 (K, PERTH).

***Distribution and habitat*:** *Stachystemon polyandrus* occurs from near Kulin southwards to Fitzgerald River National Park and east to Israelite Bay in south-western Western Australia. It is recorded as growing on plains and gentle hillslopes, in shrubland with scattered mallee on grey sandy loam or white sand over gravel, and in heathland sometimes with scattered mallees on white to yellow sand or brown sandy gravel over laterite; it is also found growing on rocky ridges in heathland on skeletal sand soils over quartzite rocks and on coastal sand dunes in heathland on well-drained deep sandy soils. **Map 17.**

***Phenology*:** Flowers have been collected in June and from September to January, fruits from September to November.

***Typification*:** In the protologue of *Pseudanthus polyandrus*, Mueller (1861) cited "In Nova Hollandia austro-occidentali promontorium Cape le Grand versus, Maxw. [G. Maxwell]". In MEL there are two Maxwell specimens from south-western Australia (MEL2065950 and MEL2065951). Both are without a collection date, but both are labelled *Pseudanthus polyandrus* in Mueller's hand. The material on these sheets agrees with the description in the protologue and it is, therefore, considered to be type material. Sheet MEL2065950 is chosen as the lectotype for *Pseudanthus polyandrus* because it is the more ample specimen.

7. Stachystemon vermicularis Planch., London J. Bot. 4: 471, t.15 (1845) as 'vermiculare'; *Pseudanthus vermicularis* (Planch.) F.Muell., Syst. Census Austral. pl. 1: 18 (1882). **Type:** [Western Australia.] Swan River, [without date,] [*J.*] *Drummond* s.n. (lecto, here chosen: K (specimen on far right of sheet (ex herb. Hook.)).

***Illustrations*:** J.E. Planchon (1845: t.15); G. Grüning (1913: p. 34, fig.7).

Diffuse, glabrous shrub to 1 m high; stems erect, sparingly branched; branchlets smooth, glabrous. Leaves evenly spaced along stems and branchlets, alternate; stipules narrowly triangular, 1.1–1.5 mm long, 0.2–0.4 mm wide, glabrous except for a few simple hairs adaxially, pale brown becoming grey coloured with age, attenuate with red-brown gland at tip, and with margins entire; decurrent margins glabrous; petioles 0.6–1.2 mm long, smooth; laminae flat

or slightly concavo-convex, linear or linear-ovate, 4.5–30 mm long, 1–1.3 mm wide, smooth except for minute papillae on margins, glabrous adaxially and abaxially; midrib slightly prominent adaxially, prominent abaxially; tip acute or obtuse; margins flat, not prominently thickened. Flowers solitary in axils of upper leaves, grouped into terminal clusters with subtending leaves sometimes reduced and bract-like; bracts triangular to subulate, 1.7–2.2 mm long, with a few cilia on margin, reddish brown coloured; bracteoles 1 or 2, similar to but smaller than bracts. Male flowers on stout, tapered pedicels 1.5–1.6 mm long; tepals 6, ± similar, ± flat, linear-ovate to ovate, 1.5–2 mm long, 0.3–0.7 mm wide, scarious, red coloured, erect, with apex acute and margins entire or sparsely minutely toothed; receptacle cylindrical, 6–20 mm long, 0.9 mm diameter, glabrous; stamens numerous, with filaments irregularly-shaped, tumid, 0.2–0.5 mm long, and anthers ellipsoid, 0.3–0.6 mm long, papillose, purplish red coloured. Female flowers sessile or shortly pedicellate on slender pedicels up to 0.5 mm long; tepals 5 or 6, ± similar or inner whorl slightly smaller, narrowly ovate to ovate, 2–4.8 mm long, 0.6–2.1 mm wide, yellowish coloured, keeled, scarious, glabrous; apex acuminate with hard apiculum up to 0.2 mm long; margins erose or irregularly toothed. Ovary 0.6–0.9 mm diameter; locules 2; styles 3.2–5.1 mm long, glabrous. Fruits ± sessile, ± ovoid but a little laterally compressed, 6.5–7 mm long, 3.5–4.5 mm across, smooth or slightly rugose in dried state, glabrous. Seeds subglobose, 3.3–4.7 mm long, 2.7–3.6 mm across; exostome pit well developed; caruncle subconical, 1.1–1.3 mm long, 1–1.2 mm wide.

***Selected specimens (from 23 examined)*: Western Australia.** 5 km from Collie along road to Mumballup, Jan 1979, *Barnsley* 825 (CANB); Jarrah Road, South Perth, Feb 1981, *Cranfield* R403 (PERTH); Gosnells, Nov 1975, *Demarz* 5842 (PERTH); Jarrahdale, Jan 1900, *Fitzgerald* s.n. (PERTH); Mundijong, Jan 1924, *Gardner* 2082 (PERTH); Mundijong, Jan 1924, *Gardner* 1582 (PERTH); Armadale, Nov 1920, *Gardner* s.n. (PERTH); 1 mile [c. 1.6 km] S of Yarloop, Apr 1966, *George* 7727 (PERTH); Dwellingup, Sep 1982, *Keighery* 5212 (PERTH); Yarloop, Oct 1983, *Keighery* 6357 (PERTH); 8 km E of Waroona, Jul 1983, *Keighery* 6164 (PERTH); Collie basin, Dec 1980, *Koch* CJK175 (PERTH); Armadale, Nov 1922, *Koch* 2681 (K, PERTH); Smith's Mill, Jan 1903, *Morrison* s.n. (PERTH); Yarloop, Feb 1947, *Royce* 1471 (PERTH); Bushmead, Jan 1956, *Royce* 5207 (PERTH); Belmont, Nov 1925, *Steedman* 1166 (PERTH); Collie, Jun 1916, *Wakefield* 344 (PERTH).

***Distribution and habitat*:** *Stachystemon vermicularis* occurs from near Eneabba south to Collie in south-western Western Australia. It is recorded as growing on gentle undulating country in open forest or woodland dominated by *Eucalyptus marginata* and *Corymbia calophylla* usually on grey to yellow grey sandy soils sometimes with lateritic gravel in profile. **Map 18.**

***Phenology*:** Flowers have been collected throughout the year, fruits in September and from November to January.

***Notes*:** In the protologue of *Stachystemon vermicularis*, Planchon (1845) cited 'Prope Flumen Cygnorum, legit Drummond' for the material he studied. At the time Planchon was an assistant to W.J. Hooker at Kew. From the material on loan to us from K we have located a sheet which is stamped as originating from Hooker's herbarium. This sheet appears to have two separate Drummond collections mounted on it. The five stems on the left belong to one collection and is associated with the information "Swan River, N. Holland, Drummond" while the single stem on the right of the sheet is the other collection with the information "Swan River Drummond" associated with it. Both collections agree with the protologue description for the species. The specimen on the right closely matches the illustration in the protologue and is, therefore, selected here as lectotype for *Stachystemon vermicularis*.

8. Stachystemon vinosus Halford & R.J.F.Hend., **sp. nov.** distincta sed affinitatibus incertis. Ab speciebus *Stachystemonis* Planch. ceteris omnibus lamina foliorum anguste ovata vel anguste oblongo-elliptica et mucrone albido usque ad 0.4 mm longis ad apicem, et floribus masculinis tepalis externis majoribus et marroninis ad vinosis differt. **Typus:** Western Australia. c. 40 km N of mouth of Oldfield River, 21 Oct 1968, *Hj. Eichler* 20361 (holo: PERTH; iso: AD).

Stachystemon sp. Mt Baring (K.R.Newbey 9773); Robinson & Coates (1995), Paczkowska & Chapman (2000).

Compact shrub to 10 cm high; stems decumbent to erect, much-branched; branchlets, smooth, glabrous. Leaves evenly spaced along stems

and branchlets, alternate or decussate; stipules narrowly triangular, 0.8–1.5 mm long, 0.4 mm wide, glabrous, red-brown becoming grey-white coloured with age, attenuate, and with margins entire; decurrent margins papillose; petioles 0.5–0.9 mm long, smooth; laminae concavo-convex, narrowly ovate or narrowly oblong-elliptic, 6–10 mm long, 1.5–2 mm wide, minutely papillose and glabrous adaxially and abaxially; midrib obscure adaxially, prominent abaxially; tip straight or slightly recurved, acute with white-coloured mucro 0.1–0.4 mm long; margins flat, prominently thickened. Flowers solitary in axils of upper leaves, grouped into terminal clusters with some subtending leaves reduced and bract-like; bracts triangular, c. 1 mm long, with a few crisped hairs on adaxial surface, reddish brown coloured; bracteoles 1 or 2, similar to but smaller than bracts. Male flowers on stout pedicels c. 0.5 mm long, tepals 6, dissimilar, with inner whorl longer than outer whorl, erect, tumid; outer tepals 3, ovate, (1.2–)2.5–3 mm long, (0.8–)1.5–2 mm wide, with two of them maroon to purplish red coloured and one white, with tip obtuse or shortly acuminate and with margins irregularly toothed; inner tepals 3, linear to narrowly obovate, 6.5–7 mm long, 1–1.5 mm wide, purplish red coloured, with tip acute, and margins entire; receptacle hemispherical, c. 0.5 mm long, c. 1 mm diameter, glabrous; stamens 26–40, with filaments of uneven length, dorsi-ventrally flattened, 0.5–1 mm long, and anthers obloid, 0.4–0.6 mm long, papillose, dark purplish red coloured. Female flowers sessile; tepals (4 to) 6, ± similar, narrowly ovate, 1.5–2.5 mm long, 0.4–0.7 mm wide, white, slightly keeled, scarious, glabrous on both surfaces; apex acuminate; margins minutely irregularly toothed. Ovary 0.4–0.5 mm diameter; locules 2; styles c. 1.2 mm long, papillose proximally. Fruits sessile, ± ovoid though laterally compressed, c. 6.5 mm long, c. 3.2 mm wide, c. 2.7 mm across, smooth, glabrous. Seeds subglobose, c. 3.2 mm long, c. 2.7 mm across; exostome pit poorly developed; caruncle irregularly shaped, c. 1 mm long, c. 1 mm wide. **Fig. 6.**

***Additional specimens*: Western Australia.** 10 km NW of Mt Baring, *Newbey* 9773 (BRI); Bandalup Hill, 3.2 km S of Highway, Sep 1993, *Robinson* 1139 (PERTH); Mt Ragged, Nov 1976, *Wittwer* W1909 (PERTH).

***Distribution and habitat*:** *Stachystemon vinosus* is recorded from along the south coast of Western Australia from near the Oldfield River, Bandalup Hill, Mt Baring and Mt Ragged. It is recorded as growing on stony slopes, in rock crevices on breakaways and on well-drained fine loamy sand on sandplains in associated with *Eucalyptus tetraptera*. **Map 19.**

***Phenology*:** Flowers and fruits have been collected from September to November.

***Affinities*:** *Stachystemon vinosus* is a distinctive species though its exact affinities are uncertain. It is distinguished from other species of *Stachystemon* by its narrowly ovate or narrowly oblong-elliptic leaf laminae with a whitish coloured mucro up to 0.4 mm long at the apex, and the larger, ovate, maroon to purplish red coloured outer tepals in its male flowers.

***Etymology*:** The specific epithet is from the Latin *vinosus*, meaning 'wine-coloured' or 'purplish red', a reference to the colour of the perianth of male flowers in this species.

***Notes*:** The conservation status of *Stachystemon vinosus* (as *Stachystemon* sp. Mt Baring (K.R.Newbey 9773) is given as Priority 1 (Westerrn Australian Herbarium 1998-2003) under the Western Australian Flora Conservation Codes.

9. Stachystemon virgatus (Klotzsch) Halford & R.J.F.Hend., **comb. nov.**

Chrysostemon virgatus Klotzsch in Lehm., Pl. Preiss. 2: 232 (1848); *Pseudanthus virgatus* (Klotzsch) Müll.Arg., Linnaea 34: 56 (1865). **Type:** [Western Australia.] In limoso-lapidosis planitiei montis, Bakewell (York), 12 September 1830, *L. Preiss* 1230 (holo: LD [LD99/018–0880]; iso: B (ex Herb. L.C. Treviranus), G-DC *n.v.*, microfiche IDC 800–73. 2454: I. 3 (bottom right element), MEL [MEL2062935]).

Pseudanthus occidentalis F.Muell., Fragm. 1: 107/108 (1859). **Type:** [Western Australia.] Fitzgerald and Gardner [Rivers], [without date and collector; *G. Maxwell*?] (holo: MEL [MEL2066092]).

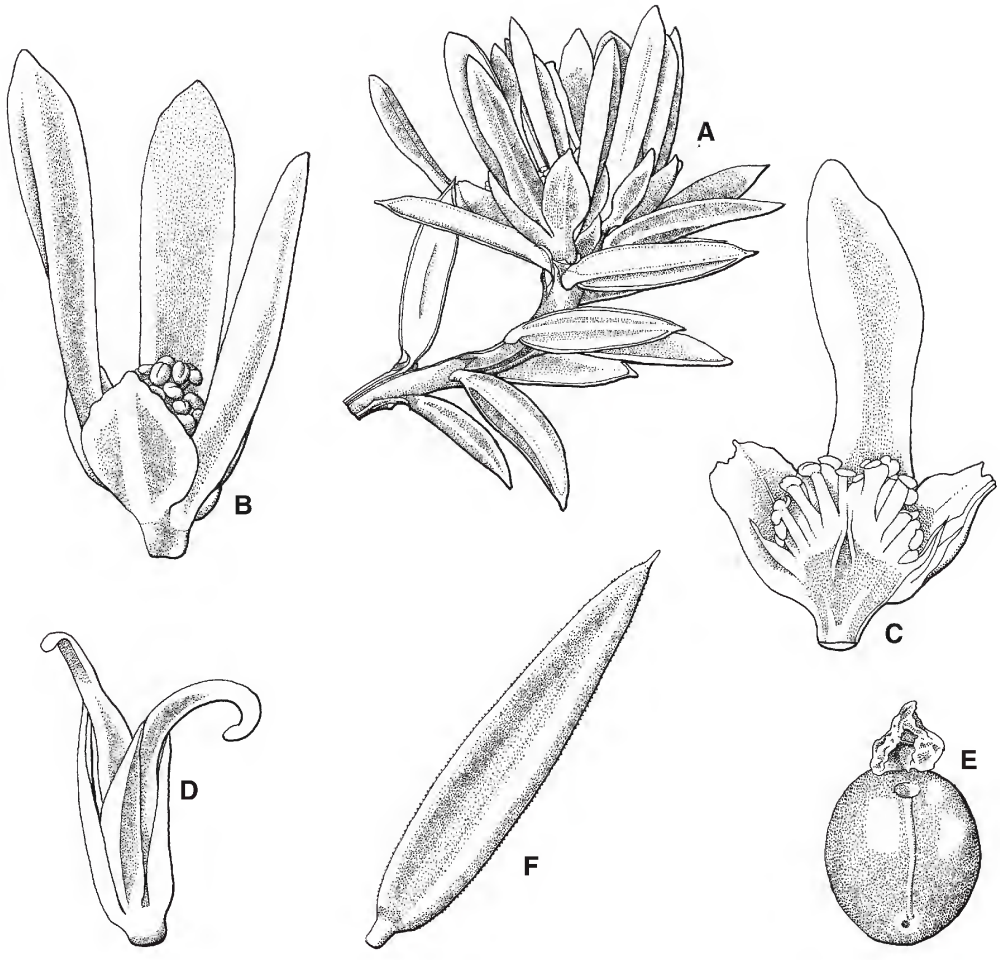


Fig. 6. ***Stachystemon vinosus***. A. branchlet with flowers × 4. B. male flower from side × 8. C. longitudinal section of male flower × 8. D. female flower × 12. E. seed × 8. F. leaf × 6. A, B from *Robinson* 1139 (PERTH); C, E, F from *Wittwer* 1909 (PERTH); D from *Eichler* 20361 (PERTH). Del. W. Smith.

Chorizotheca micrantheoides Müll.Arg., Linnaea 32: 76 (1863). **Type:** [Western Australia.] Swan River, [without date,] [*J.*] *Drummond* s.n. (holo: G-DC *n.v.*, microfiche IDC 800–73. 2454: I. 3 (top left element)).

Pseudanthus nitidus Müll.Arg. in A. DC., Prodr. 15(2): 197/8 (1866). **Type:** [Western Australia.] King George's Sound, [without date,] *Cuming* s.n. (holo: G-DC *n.v.*, microfiche IDC 800–73. 2454: I. 5).

Compact shrub to 40 cm high; stems ascending or erect, much-branched; branchlets smooth, with scattered spreading unicellular hairs up to 0.8 mm long. Leaves evenly spaced along stems and branchlets, decussate or sometimes alternate; stipules subulate, somewhat setaceous, 0.9–1.6 mm long, 0.2–0.3 mm wide, glabrous or with a few hispid hairs on margins and abaxial surface, pubescent adaxially, pale red becoming grey coloured with age, attenuate with a dark brown gland at tip, and with margins entire; decurrent margins hispidulous; petioles 0.4–0.8 mm long, smooth or papillose; laminae slightly concavo-convex, elliptic, narrowly oblong-elliptic or rarely orbicular, 1.9–9.7 mm long, 1.3–3.1 mm wide, smooth adaxially and abaxially, glabrous or with scattered hispidulous hairs adaxially and abaxially; midrib obscure adaxially, slightly prominent abaxially; tip straight or slightly recurved, rounded to obtuse sometimes with a minute brown-coloured apiculum; margins flat, thickened but not obviously so. Flowers solitary in axils of upper leaves with subtending leaves rarely reduced and bract-like; bracts narrowly triangular, 0.2–0.4 mm long, glabrous, reddish brown coloured; bracteoles absent or up to 2, when present similar to but smaller than bracts. Male flowers on slender pedicels 1.5–3 mm long; tepals (3 or) 4, morphologically ± similar, convex, ovate, 1.1–1.8 mm long, 0.8–1.1 mm wide, somewhat tumid, yellow coloured sometimes with a reddish blush distally, with apex acute, and margins irregularly toothed; receptacle slightly convex, c. 0.2 mm long, c. 0.5 mm diameter, glabrous; stamens (7–)10–14, with filaments of uneven length, terete, 0.2–1 mm long, and anthers ellipsoid, 0.3–0.4 mm long, ± smooth, yellow coloured. Female flowers sessile or pedicellate on slender pedicels up to 0.8 mm long; tepals 4 (or 5), morphologically similar, narrowly ovate to ovate, 1–1.8 mm long, 0.3–0.6 mm wide, greenish yellow coloured with a reddish flush distally, keeled, scarious, with scattered spreading hairs up to 0.1 mm long on abaxial surface, glabrous on adaxial surface; apex acute; margins irregularly toothed. Ovary 0.4–0.5 mm diameter; locules 2; styles 1.4–1.5 mm long, glabrous. Fruits sessile or on pedicel up to 0.5 mm long, ellipsoidal or ovoid but laterally compressed, 5.4–6 mm long, 3.2–4.5 mm wide, 2.6–3 mm across, ± smooth, with scattered minute spreading hairs up to 0.3 mm long. Seeds obloid, 3.5–3.8 mm long, 1.9–2.5 mm wide, 1.9–2 mm across; exostome pit well developed; caruncle subconical, c. 0.7 mm long, 0.8–0.9 mm wide.

***Selected specimens (from c. 55 examined)*: Western Australia.** between Ravensthorpe and Esperance, between 395 and 396 mile pegs from Perth, Nov 1968, *Canning* WA/68 7150 (CANB); Gibson's Soak, between Norseman and Esperance, Sep 1934, *Gardner* s.n. (PERTH); between Toodyay and Bindoon, Oct 1947, *Gardner* 8718 (PERTH); Oldfield River, Oct 1960, *Gardner* s.n. (PERTH); Cape Riche, Oct 1942, *Gardner* 6536 (PERTH); West Mt Barren, Oct 1965, *George* 6964 (PERTH); SW side of Mt Desmond, c. 10 km ESE of Ravensthorpe, Sep 1988, *Henderson* H3190 (BRI); between Esperance and Munglinup, c. 7 km W of Lort River crossing, Sep 1988, *Henderson* H3183 (BRI); c. 40 km from Jerramungup on road to Ravensthorpe, Sep 1988, *Henderson* H3193 (BRI); W of Munglinup, Sep 1976, *Hnatiuk* 761265 (PERTH); between Lort River and Munglinup, Sep 1976, *Hnatiuk* 761268 (PERTH); Kojaneerup Springs, eastern Stirling Range, Oct 1982, *Keighery* 5722 (PERTH); northern foot of Bluff Knoll, Stirling Ranges, Sep 1966, *Muir* 3867 (MEL); Capel, Sep 1951, *Royce* 3787 (PERTH); Abba River, Sep 1951, *Royce* 3803 (PERTH); Cut Hill, York, Sep 1923, *Sargent* s.n. (PERTH); 80 miles [c. 129 km] ENE of Esperance, Sep 1965, *Turner* 5549F (PERTH); c. 67 km E of Esperance, near Mungliginup Creek, Sep 1968, *Wilson* 8077 (PERTH); Stirling Range, 1 km N of base of Bluff Knoll, Sep 1966, *Wilson* 4188 (PERTH); 10 miles [c. 16 km] from Red Gum Pass - Kendenup road, along Stirling Range Drive, Stirling Range NP, Oct 1968, *Wrigley* WA/68 4378 (CANB).

***Distribution and habitat*:** *Stachystemon virgatus* occurs in coastal and subcoastal districts of south-western Western Australia, from the Stirling Ranges eastward to Esperance, with disjunct populations between Bunbury and Busselton, and near York. It is recorded as growing on gentle slopes in mallee heath on lateritic gravelly brown loam or stony sandy clay, or in eucalypt woodland on brown sandy loam, on sandplain in heathland on sand or sandy loam with considerable gravel intermixed, in open forest dominated by *Eucalyptus marginata* and *Corymbia calophylla* on rocky lateritic soils; also recorded on a rocky knoll in crevices of quartzite rock and in swampy areas. **Map 20.**

***Phenology*:** Flowers and fruits have been collected from September to November.

***Notes*:** *Stachystemon virgatus* is the only species of *Stachystemon* that has a hispidulous indumentum of unicellular hairs up to 0.8 mm long on its branchlets. All other species of *Stachystemon* have glabrous branchlets.

Acknowledgements

We would like to thank Dr Gordon Guymer for making space and facilities available at BRI for the first author; the directors and curators of AD, B, CANB, K, LD, MEL, NE, NSW, PERTH for loan of their holdings for study at BRI, Alex Chapman for searching for types on our behalf at E while acting as Australian Botanical Liaison Officer at K and Peter Bostock (BRI) for preparing the maps. Associated fieldwork from 1988 to 1992 by the second author and salary support for the first author in 1999 and 2000 were funded by grants from the Australian Biological Resources Study (ABRS), Department of Environment and Heritage, which are gratefully acknowledged.

References

Baines, J.A. (1981). *Australian Plant Genera.* Chipping Norton, New South Wales: Surrey Beatty & Sons for Society for Growing Australian Plants.

Bentham, G. (1873). Euphorbiaceae. *Flora Australiensis* 6: 41–153. London: L.Reeve.

Bentham, G. (1880). Euphorbiaceae. In G. Bentham & J.D. Hooker, *Genera Plantarum* 3: 239–340.

Corrick, M.G. & Fuhrer, B.A. (1996). *Wildflowers of southern Western Australia.* Noble Park, Victoria: The Five Mile Press Pty Ltd in association with Monash University.

Corrick, M.G. & Fuhrer, B.A. (2000). *Wildflowers of Victoria and adjoining areas.* Hawthorn, Victoria: Blooming Books.

Dallwitz, M.J., Paine, T.A. & Zurcher, E.J. (1993). *DELTA user's guide, a general system for processing taxonomic descriptions*, 4th edn. East Melbourne: CSIRO.

Forster, P.I. & Halford, D.A. (2002). Euphorbiaceae. In R.J.F. Henderson (ed.), *Names and Distribution of Queensland Plants, Algae and Lichens*, 68–74. Brisbane: Environmental Protection Agency.

George, A.S. (1968, '1967'). 12.-Additions to the flora of Western Australia: ten miscellaneous new species. *Journal of the Royal Society of Western Australia* 50(4): 97–100.

Grüning, G. (1913). IV. 147 Euphorbiaceae - Porantheroideae et Ricinocarpoideae. In A. Engler (ed.), *Das Pflanzenreich, Regni vegetabilis conspectus* H.58: 1–97. (1968 facsimile-H.R. Engelmann (J. Cramer): Weinheim/Bergstrasse.).

Hayden, W.J. (1994). Systematic anatomy of Euphorbiaceae subfamily Oldfieldioideae. I. Overview. *Annals of the Missouri Botanical Garden* 81: 180–202.

Holmgren, P.K., Holmgren, N.H. & Barnett, L.C. (1990). *Index Herbariorum. Part1. The Herbaria of the World,* 8th edn. New York: New York Botanic Gardens.

Hopper, S.D., van Leeuwen, S. Brown, A.P. & Patrick, S.J. (1990). *Western Australia's endangered flora and other plants under consideration for declaration.* Wanneroo: Department of Conservation and Land Management.

Jeanes, J.A. (1999). Euphorbiaceae. In N.G. Walsh & T.J. Entwisle (eds), *Flora of Victoria* 4: 55–82. Melbourne: Inkata Press.

Levin, G.A. & Simpson, M.G. (1994). Phylogenetic implications of pollen ultrastructure in the Oldfieldioideae (Euphorbiaceae). *Annals of the Missouri Botanical Garden* 81: 203–238.

Mueller, F. (1858). Account of some new Australian plants. *Transactions and Proceedings of the Philosophical Institute of Victoria* 2: 62–77.

Mueller, F. (1860). *Fragmenta Phytographiae Australiae* 2: 14. Melbourne: Victorian Government.

Mueller, F. (1861). *Fragmenta Phytographiae Australiae* 2: 153. Melbourne: Victorian Government.

Müller, J. (1866). Euphorbiaceae. In A.L.P.P. de Candolle (ed.), *Prodromus Systematis Naturalis Regni Vegetabilis.* 15(2): 189–214.

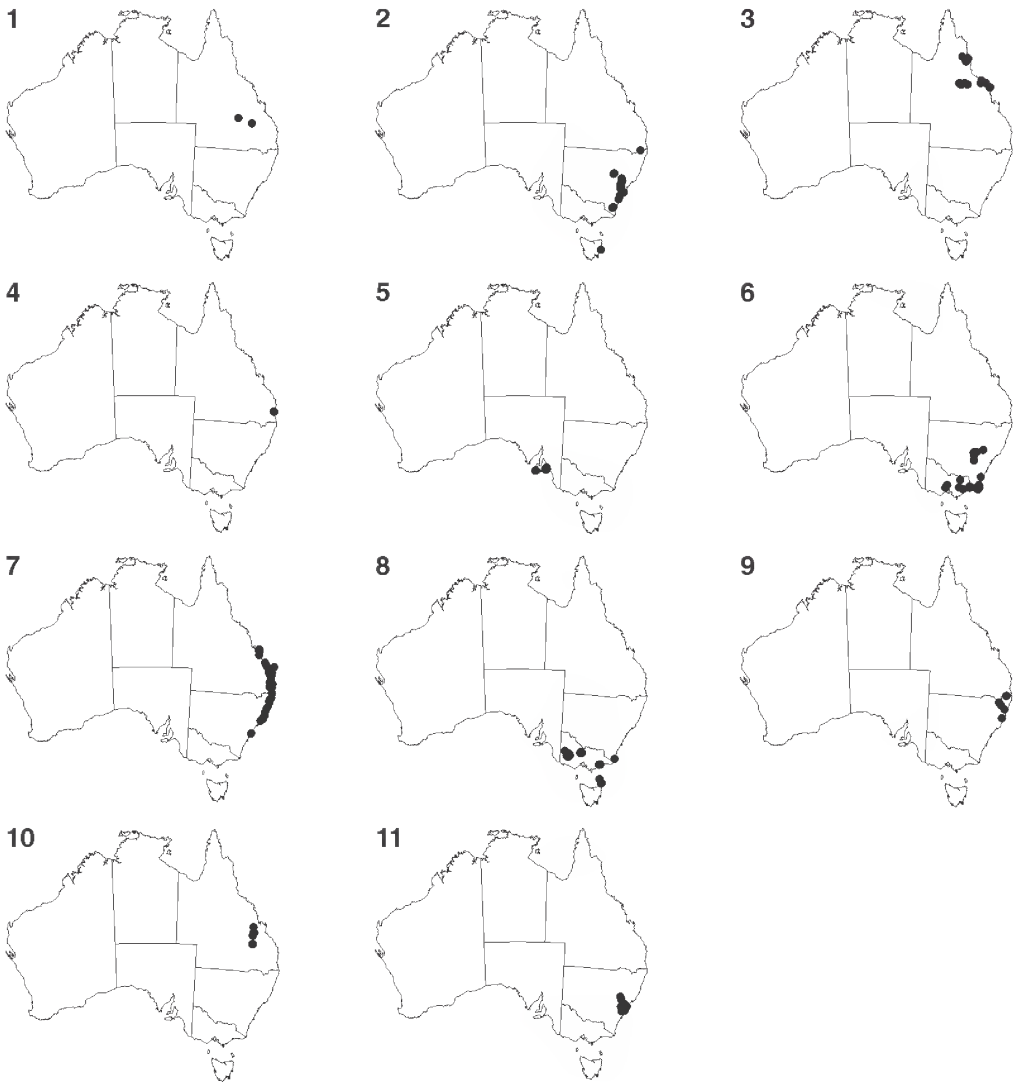
Paczkowska, G. & Chapman, A.R. (2000). *The Western Australia flora: a descriptive catalogue.* Perth: Wildflower Society of Western Australia (Inc.), the Western Australia Herbarium, CALM and the Botanic Garden and Parks Authority.

Pax, F. & Hoffmann, K. (1931). Euphorbiaceae. In A. Engler & K. Prantl (eds), *Die Natürlichen Pflanzenfamilien,* 2nd edn, 19c: 11–233.

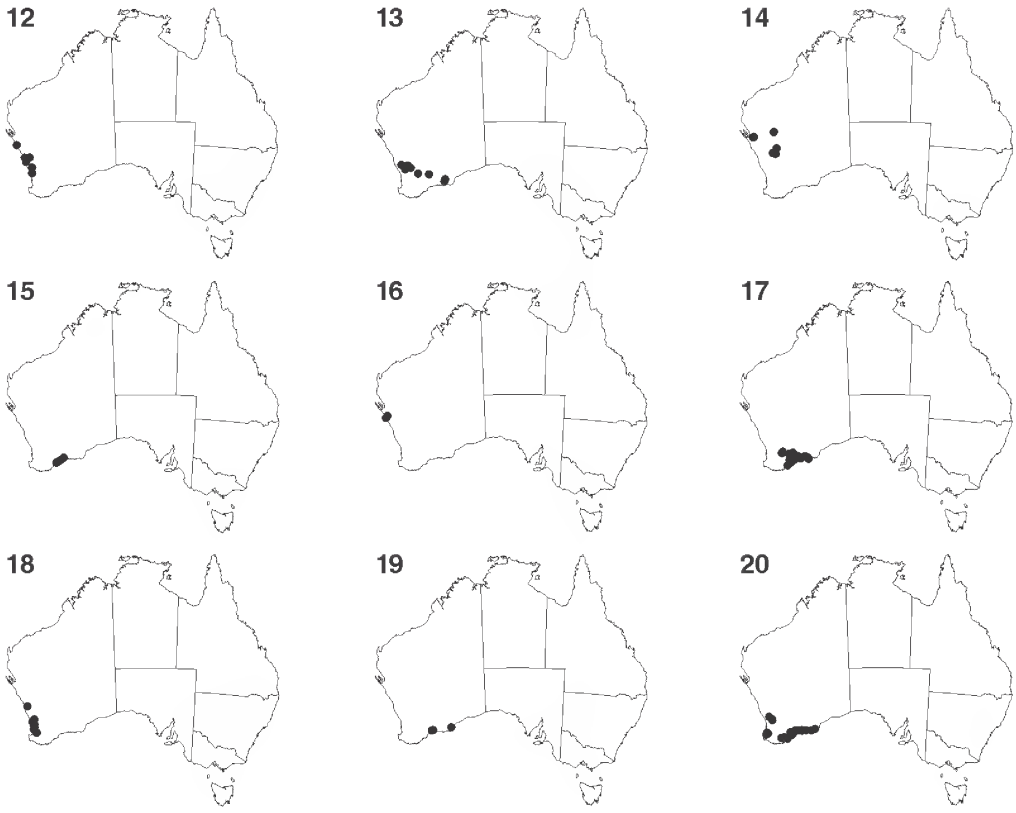
Planchon, J.E. (1845). Description de deux genres nouveaux de la famille Euphorbiacées. *London Journal of Botany.* 4: 471.

Radcliffe-Smith, A. (1993). Notes on Australian Euphorbiaceae II: *Pseudanthus* and *Stachystemon*. *Kew Bulletin* 48(1): 165–168.

Robinson, C.J. & Coates, D.J. (1995). *Declared rare and poorly known flora in the Albany district.* Wildlife Management Program No. 20. Como: Department of Conservation and Land Management, Western Australia.



Maps 1–11. Distribution of *Pseudanthus* taxa. **1.** *Pseudanthus ballingalliae* **2.** *Pseudanthus divaricatissimus* **3.** *Pseudanthus ligulatus* subsp. *ligulatus* **4.** *Pseudanthus ligulatus* subsp. *volcanicus* **5.** *Pseudanthus micranthus* **6.** *Pseudanthus orbicularis* **7.** *Pseudanthus orientalis* **8.** *Pseudanthus ovalifolius* **9.** *Pseudanthus pauciflorus* subsp. *pauciflorus* **10.** *Pseudanthus pauciflorus* subsp. *arenicola* **11.** *Pseudanthus pimeleoides*



Maps12–20. Distribution of *Stachystemon* species. **12.** *Stachystemon axillaris* **13.** *Stachystemon brachyphyllus* **14.** *Stachystemon intricatus* **15.** *Stachystemon mucronatus* **16.** *Stachystemon nematophorus* **17.** *Stachystemon polyandrus* **18.** *Stachystemon vermicularis* **19.** *Stachystemon vinosus* **20.** *Stachystemon virgatus*

SPRENGEL, K.P.J. (1827). *Systema vegetabilium*, 16th edn, 4(2) *curae posteriores*: 22, 25. Gottingae: Dietrich.

STAFLEU, F.A. & COWAN, R.S. (1985). *Taxonomic Literature*, 2nd edn, Vol. 5. Utrecht, Bohn: Schetema & Bolkema.

WALSH, N.G. (1996). Polygonaceae. In N.G. Walsh & T.J. Entwisle (eds), *Flora of Victoria* 3: 282. Melbourne: Inkata Press.

WEBER, J.Z. & MORLEY, D.J. (1985). Plant Portraits. *Journal of the Adelaide Botanic Gardens* 7: 212–215.

WEBER, J.Z. (1986). Euphorbiaceae. In J.P. Jessop & H.R. Toelken (eds), *Flora of South Australia*, 4th edn, 2: 735–768. Adelaide: South Australian Government Printing Division.

WEBSTER, G.L. (1994). Synopsis of the genera and suprageneric taxa of Euphorbiaceae. *Annals of the Missouri Botanical Garden* 81: 33–144.

Western Australian Herbarium (1998–2003). *Flora Base – The Western Australian Flora*. Version 2.0, 4 July 2003. Department of Conservation and Land Management. http://florabase.calm.wa.gov.au

Index to Scientific Names

Names in **bold type** are accepted names and those in light are synonyms, etc. The numbers refer to pages in the text.

Backhousia oligantha (Myrtaceae), a new species from Queensland

A.R. Bean

Summary

Bean, A.R. (2003). *Backhousia oligantha* (Myrtaceae), a new species from Queensland. *Austrobaileya* 6(3): 533–536. A distinctive new species of *Backhousia* is described and illustrated. It is diagnosed against related species and notes on habitat and conservation status are provided.

Keywords: *Backhousia*, Myrtaceae, taxonomy, Queensland, Australian flora.

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Introduction

Backhousia is a small genus of trees and shrubs endemic to Australia. Most of the accepted species were described before 1910. J.W. Vickery added *B. anisata* in 1941, a rare species from New South Wales with a very strong aniseed smell to the leaves. Wilson *et al.* (2000) found that *B. anisata* differs significantly from all other *Backhousia* species, and placed it in a new monotypic genus *viz. Anetholea* Peter G.Wilson.

Guymer (1988) described *B. kingii*, a species reasonably widespread in south-eastern Queensland. The species described here as *B. oligantha* has been known for about two decades, but lack of adequate fertile material has, until now, prevented its formal naming. In a survey of essential oils of *Backhousia* (Brophy *et al.* 1995), the oils of *B. oligantha* were found to be most similar to those of *B. bancroftii* F.M.Bailey & F.Muell., but on morphological grounds, *B. oligantha* is most closely related to *B. kingii* Guymer.

Taxonomy

Backhousia oligantha A.R.Bean **sp. nov.** affinis *B. kingii* autem cortice laevigata nitida, foliis angustioribus, inflorescentiis 3-floribus, pedunculis brevioribus differt. **Typus:** Queensland. Wide Bay District: 0.7 km SW of Mt Biggenden, WSW of Biggenden, 17 November 2001, *A.R. Bean* 18024 & *J. Randall* (holo: BRI; iso: CANB, K, MEL, MO, NSW).

Accepted for publication 7 October 2002

Backhousia sp. (Stony Creek P.I.Forster 37B) in Henderson (2002).

Backhousia sp. (Didcot P.I.Forster PIF12617) in Brophy *et al.* (1995).

Tree to 12 metres high, or sometimes shrubby, rarely procumbent; all forms producing prostrate vegetative self-layering shoots. Bark deciduous throughout, smooth, quite shiny, pink, white or grey in colour. Branchlets terete, puberulent. Juvenile leaves opposite, elliptical to lanceolate, very shortly petiolate, laminae 4–8 mm long, 2–3.5 mm wide. Adult leaves opposite, discolorous; petioles 2–3 mm long; laminae elliptical, 12–22 mm long, 4.5–7 mm wide, apex obtuse, base cuneate; midvein depressed above, raised below, leaf venation obscure on upper surface, visible on lower surface, with 4–6 pairs of lateral veins, proximal pairs at low angle to midrib, tertiary venation not visible; intramarginal vein complete or present on distal half of lamina only; margin flat or recurved; oil glands dense and conspicuous on both surfaces. Indumentum uniform throughout (branchlets, petioles, laminae, pedicels and calyces), comprising erect to somewhat adpressed uniseriate white trichomes up to 0.15 mm long, dense on branchlets, young leaves, pedicels and calyces, but sparse to absent on fully expanded leaves. Inflorescences axillary or supra-axillary, comprising single 3-flowered (rarely 1-flowered) cymes. Peduncle 1–3 mm long; bracteoles brown, caducous, acute, c. 0.5 mm long; pedicels filiform (0.25–0.3 mm diameter when dried), 4–8 mm long. Flowers white. Hypanthium campanulate, 1.6–2.0 mm long;

calyx lobes 4, with a smaller and a larger pair (opposite each other), the smaller ones 1.0–1.3 mm long, 1.2–1.5 mm wide; the larger 1.5–2.3 mm long, 1.5–1.6 mm wide; all obtuse, persistent. Petals 4, 1.2–2.3 x 0.8–1.7 mm, deciduous, shortly clawed, recurved, margin erose. Stamens 32–40, in two whorls; filaments of variable length within a single flower, between 1.5–4.0 mm long; anthers basifixed, dehiscing by longitudinal slits. Style glabrous, 3.9–4.3 mm long, stigma tapered; ovary glandular-punctate, puberulent, 2-locular, with 3 or 4 ovules per loculus, arranged around an axile placenta. Fruits indehiscent, c. 1.8 mm long, c. 2.5 mm diameter excluding persistent calyx lobes. Seeds 2–4 per loculus, 1.3–1.5 mm long, yellow-brown, with rounded outer surface and flat sides. **Fig. 1.**

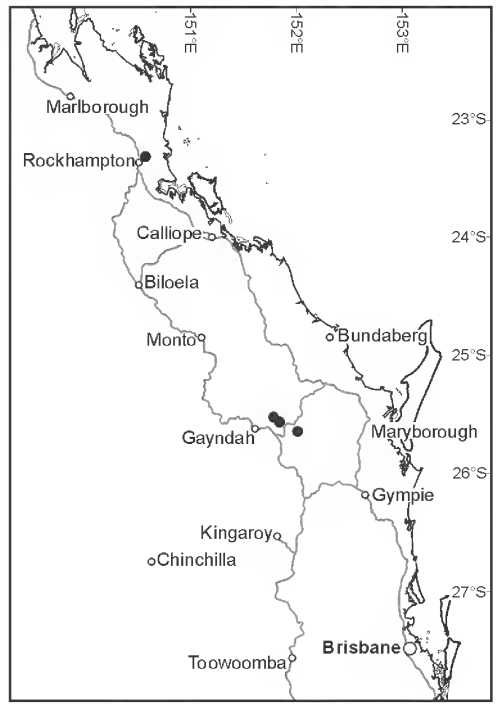
***Specimens examined*: Queensland.** Port Curtis District: Berserker Wilderness, Mount Archer, Rockhampton, Jun 2000, *Brushe* JB2301 et al. (BRI); same locality, Mar 2002, *Brushe s.n.* (BRI). Wide Bay District: 0.7 km SW of Mt Biggenden, WSW of Biggenden, Nov 2001, *Bean* 18027 & *Randall* (BRI, NSW); Stony Creek, 4 km E of Didcot, Biggenden shire, Oct 1982, Forster PIF37B (BRI); Stony Creek, 4 km E of Didcot, Jan 1993, *Forster* PIF12617 (BRI, NSW); headwaters of Stony Creek, Didcot, Aug 1979, *Young* 343 & *Randall* (BRI); The Bluff, Mount Walsh, S of Biggenden, Aug 1979, *Young* 299 & *Randall* (BRI); c. 1 km SW of Mt Biggenden, Feb 1991, *Young* 651 & *Randall* (BRI).

***Distribution and habitat*:** *B. oligantha* is largely confined to the Biggenden area of south-eastern Queensland, with an outlier on Mt Archer outside Rockhampton on the central Queensland coast (**Map 1**). It inhabits Araucarian microphyll vine-forest, and associated tree and shrub species include *Archidendropsis thozetiana, Alectryon diversifolius, Canthium odoratum* and *Gossia bidwillii.*

***Phenology*:** Flowers are recorded for November; fruits are recorded for February.

***Notes*:** *B. oligantha* is most closely related to *B. kingii* (both have inflorescences in umbel-like cymes, flowers 4-merous, calyx lobes of two sizes, pedicels filiform and similar venation). It differs from *B. kingii* by the smooth shiny bark, narrower leaves, 3-flowered inflorescences, and the shorter peduncles.

B. oligantha and *B. angustifolia* F.Muell. sometimes occur in the same general locality,



Map 1. Distribution of *Backhousia oligantha.*

but *B. oligantha* inhabits rockier, more exposed sites with shallower soil.

The recent collection from Mt Archer by Joy Brushe (cited above) was made from a number of plants, including prostrate wind-shorn shrubs through to well-developed trees. These specimens showed a clear transition from small juvenile leaves to larger adult leaves. Sterile specimens from Mt Walsh match the juvenile Mt Archer specimens. The Didcot specimens (also sterile) have leaves that are larger and lanceolate in shape, but they are tentatively included within this species as they share the distinctive bark character.

***Conservation status*:** *B. oligantha* has a peculiar growth habit, where prostrate vegetative shoots are abundantly produced. These shoots layer themselves opportunistically, eventually giving rise to a new stem. In this way, a large colony may be produced, all derived from a single genotype. At the type locality there are 100–200 stems, but only about 6 clumps, and hence possibly as few as 6 individuals. The Mt Archer population is

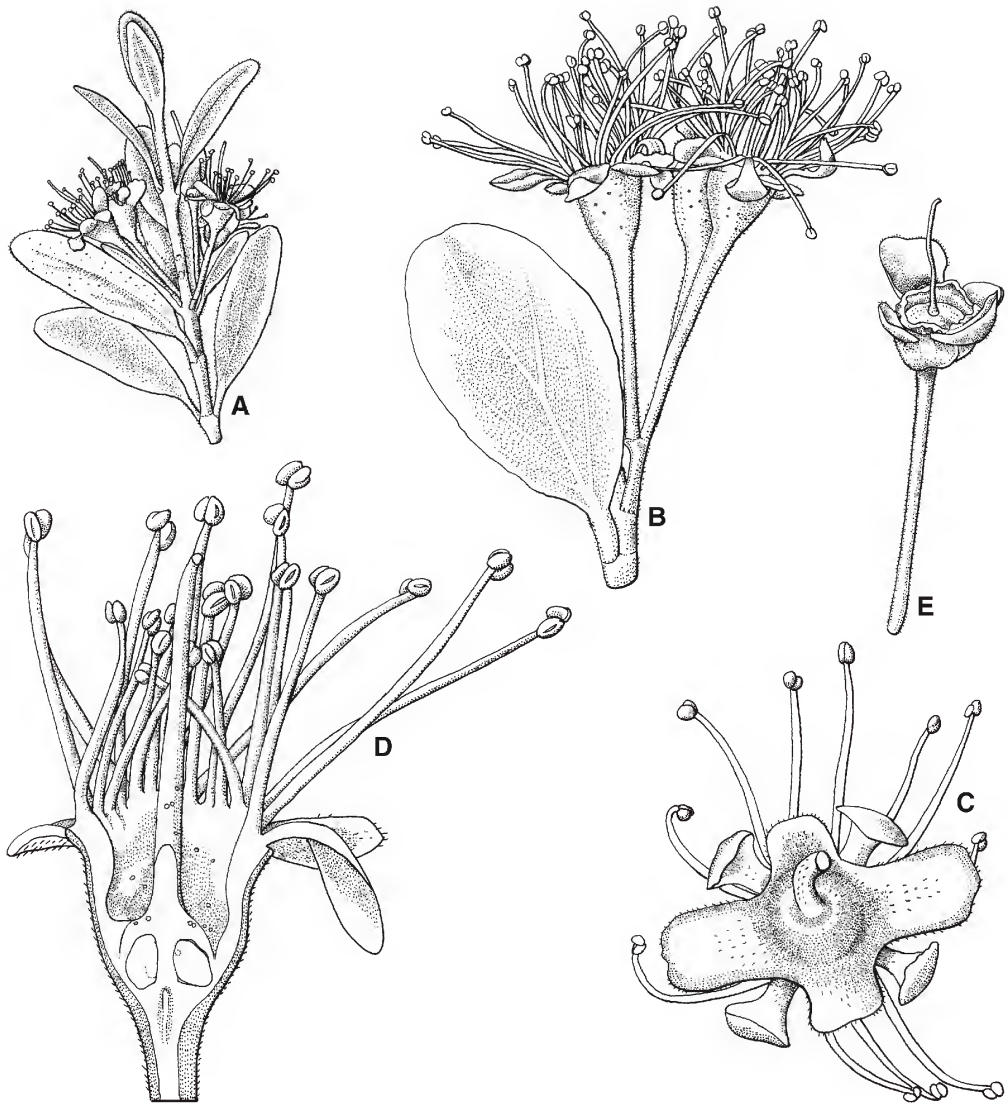


Fig 1. ***Backhousia oligantha.*** A. flowering branchlet × 2. B. unit inflorescence × 4. C. underside of flower, showing unequal sepals and recurved petals × 8. D. half-flower x 12. E. young fruit × 4. A, *Bean* 18027 & *Randall*; B-D, *Bean* 18024 & *Randall*; E, *Young* 651 & *Randall* (all BRI). Del. W. Smith.

of similar size (J. Brushe, pers. comm.). There are two small populations on Mt Walsh, each with 5 or 6 stems (P. Young, pers. comm.) and a single shrubby population at Didcot with several hundred stems covering less than a hectare (P. Forster, pers. comm.). Applying the guidelines of the IUCN (Anon. 2001), a status of "Vulnerable" is recommended, (VU D1+D2).

Etymology: From the Greek *oligos* meaning few, and *anthos* meaning flower. This is in reference to the (1–) 3-flowered inflorescences. No other *Backhousia* species has so few flowers per inflorescence.

Acknowledgements

I am grateful to Jim Randall of Childers for taking me to see this species in the field and for providing photographs of the tree, and Peter Young for distributional and habitat data. Thanks to Joy Brushe for sending a range of specimens from the Mt Archer population, to Will Smith (BRI) for providing the illustrations, and Les Pedley for the Latin diagnosis.

References

Anonymous (2001). Iucn Red List Categories and Criteria. Switzerland: International Union for Conservation of Nature and Natural Resources.

Brophy, J.J., Goldsack, R.J., Fookes, C.J.R. & Forster, P.I. (1995). Leaf Oils of the Genus *Backhousia* (Myrtaceae). *Journal of Essential Oil Research* 7: 237–54.

Guymer, G.P. (1988). A new species of *Backhousia* Hook. & Harvey (Myrtaceae) from Queensland and a reappraisal of *Backhousia floribunda* A.J.Scott. *Austrobaileya* 2: 567–9.

Henderson, R.J.F. (ed.) (2002). Names and Distribution of Queensland Plants, Algae and Lichens. Brisbane: Environmental Protection Agency.

Wilson, P.G., O'Brien, M.M. & Quinn, C.J. (2000). *Anetholea* (Myrtaceae), a new Genus for *Backhousia anisata*: a cryptic member of the *Acmena* Alliance. *Australian Systematic Botany* 13: 429–35.

Six new species of *Hydrocotyle* L. (Apiaceae) from Queensland

A.R. Bean & M.J. Henwood

Summary

Bean, A.R. & Henwood, M.J. (2003). Six new species of *Hydrocotyle* L. (Apiaceae) from Queensland. *Austrobaileya* 6(3): 537–548. Descriptions, illustrations and a distribution map are provided for six new Queensland species of *Hydrocotyle, viz. H. digitata, H. dipleura, H. miranda, H. oraria, H. paludosa* and *H. tumida*. A key to all Queensland species is provided.

Keywords: *Hydrocotyle*, taxonomy, new species, Queensland flora, Apiaceae, Umbelliferae.

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Introduction

Hydrocotyle is found throughout the world, but especially in the southern hemisphere. Estimates of the total number of species vary from 75 (Mathias & Constance 1976) to "over 130" (Eichler 1986). Recent molecular studies (Plunkett *et al*., 1996, 1997) have indicated that *Hydrocotyle* is nested within a redefined Araliaceae. However, with the exception of a somatic chromosome number of 12, non-molecular evidence for this placement has proven to be somewhat elusive (Henwood & Hart, 2001).

Few taxonomic studies into Australian *Hydrocotyle* have been undertaken since the time of Mueller and Bentham. Wakefield (1951) provided a new combination, and then a new species (Wakefield 1955). Eichler (1965) named *H. foveolata*, and subsequently published a series of excellent nomenclatural papers for the genus as a whole.

In common with most species of the genus, Queensland *Hydrocotyle* species are found in rather mesic sites, either in areas of high rainfall, or in damp areas (creek banks, springs, seepage areas or swamp margins).

The new species described here show morphological affinity with *H. pedicellosa* F.Muell. (*H. miranda*); *H. tripartita* R.Br. ex Rich. (*H. digitata, H. oraria, H. paludosa*); *H. peduncularis* R.Br. ex Rich. (*H. dipleura)* and *H. grammatocarpa* F.Muell. *(H. tumida)*. Each species is, however, clearly separable by a number of vegetative and floral characters outlined in the following treatment.

Hydrocotyle pedicellosa occurs in rainforest and extends from northern New South Wales to New Guinea, while *H. tripartita* extends from Victoria (Duretto 1999) to the central coast of Queensland (at Eungella). Its Queensland occurrences are on rainforest margins, often at high altitudes. *H. peduncularis* is widespread in south-eastern Australia, whereas *H. grammatocarpa* is distributed across northern Australia.

Descriptive terminology for the 'ribs' of mericarps follows Tseng (1967). The ribs (and their underlying veins) closest to the commissure are referred to as marginal ribs, lateral ribs sit between the marginal and dorsal ribs on the lateral faces of the mericarps.

Accepted for publication 28 March 2003

Taxonomy

Key to the Queensland species of *Hydrocotyle* (Apiaceae)

1. Leaves peltate 2
   Leaves not peltate 3

2. Inflorescence a many-branched umbel, each branch racemose; leaf lamina broadly elliptic, crenate . . . . . ***H. bonariensis**
   Inflorescence spike-like in appearance, not or sparsely branched; leaf lamina orbicular, crenulate . . . . . **H. verticillata**

3. Lamina palmate, comprising 3–5 leaflets 4
   Lamina simple, variously lobed or divided 7

4. Mericarps conspicuously winged; leaflets (3–)5, terminal leaflet longest, 1.5–4 cm long . . . . . **H. geraniifolia**
   Mericarps not winged; leaflets 3, all about the same length, 0.5–1.5 mm long 5

5. Leaflets narrowly cuneate; 0–10 hairs on abaxial surface of each leaflet . . . . . **H.paludosa**
   Leaflets broadly cuneate; 20–100 hairs on abaxial surface of each leaflet 6

6. Mericarps 0.9–1.2 mm long; peduncles 4–9 mm long; lateral leaflets incised for 70–90% of length . . . . . **H. digitata**
   Mericarps 0.6–0.8 mm long; peduncles 13–35 mm long; lateral leaflets incised for 30–60% of length . . . . . **H. tripartita**

7. Leaves palmatifid, 3–lobed, with the incisions extending 70–90% of lamina radius . **H. oraria**
   Leaves entire or 3–9–lobed, incised to <50% of lamina radius 8

8. Lamina glabrous 9
   Lamina sparsely to densely hairy 12

9. Fruits not markedly laterally flattened; mericarps indistinct 10
   Fruits markedly laterally flattened; mericarps readily distinguished 11

10. Stems glabrous; fruits pyriform to obconical, 0.8–1.0 mm long; pedicels 0.1–0.3 mm long . . . . . **H. tumida**
    Stems sparsely hairy; fruits ellipsoidal, 0.5–0.6 mm long; pedicels 0.4–0.6 mm long . . . . . **H. grammatocarpa**

11. Lamina unlobed or with 3–5 broad obtuse lobes; stipules deeply laciniate; mericarps with 2 pairs of lateral ribs; petiole glabrous . . . . . **H. dipleura**
    Lamina consistently lobed, and the lobes further divided; stipules entire or shortly toothed; mericarps with 1 pair of lateral ribs; distal end of petiole usually with a few hairs . . . . . **H. peduncularis**

12. Inflorescence typically branched with numerous pedunculate umbels of flowers at various positions on the rachis 13
    Inflorescences consisting of a single umbel 14

13. Pedicels 1–1.7 mm long; peduncles 1–8 mm long; mature mericarps 1.4–1.7 mm long . . . . . **H. miranda**
    Pedicels 3–8 mm long; peduncles up to 30 mm long; mature mericarps 1.1–1.3 mm long . . . . . **H. pedicellosa**

14. Flowers with pedicels 1.5–5 mm long ..... **H. laxiflora**
Flowers and/or fruits sessile or pedicels up to 0.5 mm long 15

15. Fruiting styles 0.2–0.35 mm long, not readily visible to naked eye; lateral rib on mericarp conspicuous; leaves with 5 indistinct to prominent lobes ... **H. acutiloba**
Fruiting styles 0.6–1 mm long, readily visible, giving clusters a "hairy" appearance; lateral rib on mericarp obscure or lacking; leaves usually with 7 lobes ..... **H. laxiflora**

Hydrocotyle dipleura A.R.Bean **sp. nov.** affinis *H. pedunculari* foliis non lobatis vel lobis 3–5 latis obtusis praeditis, stipulis profunde laciniatis (integris vel breve dentatis in *H. pedunculari*s), inflorescentiis 6–9-floris (3–6-floris in *H. pedunculari*), mericarpis paribus duobus costarum intermediis praeditis (pare uno in *H. pedunculari*) differt. **Typus:** Queensland. South Kennedy District: Carmichael River, "Doongmabulla", north-west of Clermont, 3 February 1998, *R.J. Fensham* 3338 (holo: BRI).

Perennial glabrous prostrate herb with creeping stems, mostly rooting at the nodes. Leaves occurring singly at the nodes. Stipules white, laciniate, 0.4–2.5 mm long, margin deeply dissected. Petioles erect, 6–50 mm long. Lamina orbicular-cordate or reniform (subtending 270–350 degrees of arc), pale yellowish-green, 2–8 mm in radius, palmately 5–7–veined, glabrous; margin entire or with 3–5 broad shallow obtuse lobes. Inflorescences simple, umbellate, 6–9 flowered, peduncles 3–17 mm long (shorter than adjacent petiole), pedicels lacking at anthesis, bracts 0.4–0.6 mm long. Calyx absent. Petals greenish-white, deltate, c. 0.4 mm long. Fruits comprising two laterally flattened mericarps, each 0.55–0.65 mm long, 0.45–0.6 mm wide. Lateral ribs in 2 pairs, prominent; dorsal ribs prominent and forming a narrow wing; surface smooth, carpophore absent. Fruiting pedicels absent or up to 0.4 mm long. Styles divergent to reflexed, 0.25–0.3 mm long. **Fig. 1.**

Specimens examined: **Queensland.** Mitchell District: Smoky Spring, Lake Huffer, N of Aramac, Apr 1999, *Fensham* 3807 (BRI); c. 80 km NNE of Aramac, Nov 1997, *Thompson* MUT64 & *Baumgartner* (BRI). South Kennedy District: Moses Spring, "Doongmabulla", NW of Clermont, Apr 1999, *Fensham* 3808 (BRI). Warrego District: "Bundoona", c. 50 km NW of Eulo, Feb 1999, *Fensham* 3655 (BRI).

***Distribution and habitat*:** *H. dipleura* is endemic to Queensland, and is known from the Aramac, Clermont and Eulo areas (**Map 1**). It has a very specialised habitat, growing only on the dried-out margins of artesian springs, in highly saline soils.

***Phenology*:** Flowers and fruits are recorded from February, April and November.

***Affinities*:** *H. dipleura* is morphologically similar to *H. pedunculari*s, but differs by the thicker yellowish-green leaves, unlobed or with 3–5 broad obtuse lobes (consistently lobed, and the lobes further divided in *H. pedunculari*s); the deeply laciniate stipules (entire or shortly toothed for *H. pedunculari*s), the 6–9 flowered inflorescences (3–6 flowered for *H. pedunculari*s) and the mericarps with 2 pairs of lateral ribs (1 pair in *H. pedunculari*s). While *H. dipleura* is glabrous, *H. pedunculari*s often has a few hairs at the distal end of the petiole where it joins the lamina.

***Conservation status*:** Under the IUCN guidelines (IUCN. 2001), a category of Vulnerable is proposed (VU B2 ab (iii)). Six locations are known, following a comprehensive floristic study of Great Artesian Basin spring systems (R. Fensham pers. comm.).

***Etymology*:** From the Greek *di-* meaning twice and *pleura* meaning rib, and referring to the two lateral ribs on each mericarp.

Hydrocotyle miranda A.R.Bean & Henwood **sp. nov**. affinis *H. pedicellosae* autem pilis albidis longioribus in petiolis, pedunculis pedicellisque multo brevioribus, mericarpis longioribus differt. **Typus:** Queensland. Cook District: Longlands

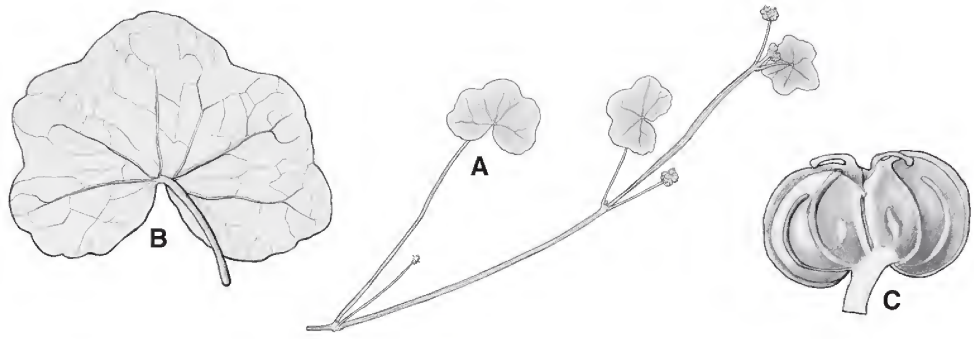


Fig. 1. *H. dipleura.* A. flowering stem. B. leaf underside. C. fruit. A,B from *Fensham* 3338 (BRI); C from *Thompson* MUT64 (BRI).

Gap State Forest, S of Atherton, 21 April 2002, *A.R. Bean* 18786 (holo: BRI; iso: CANB, K, L, MEL, NSW).

Perennial herb with creeping stems, mostly rooting at the nodes. Leaves occurring singly at the nodes. Stipules very broad, scarious, to 2.5 mm long, margin entire. Petioles erect, 8–15 cm long, densely hispid apically, with simple eglandular white trichomes 0.5–2.0 mm long. Lamina orbicular-cordate or reniform (subtending 270–350 degrees of arc), 45–90 mm across, with 6–9 radiating veins; margin crenate with occasional deeper incisions to 5 mm deep; lower surface moderately densely pubescent, particularly along veins, with hairs to 1.0 mm long; upper surface sparsely pubescent to almost glabrous, with hairs to 0.5 mm long. Inflorescences 2–15 cm long (shorter than adjacent petiole), proliferous, with clusters of umbels at various positions on the rachis. Individual umbels 15–30–flowered, pedicels almost lacking at anthesis. Calyx absent. Petals greenish-white, deltate, 0.5–0.7 mm long. Fruits schizocarpous, mericarps laterally flattened, 1.4–1.7 mm long, 0.7–0.8 mm wide, surface smooth; marginal and lateral ribs absent or obscure, dorsal ribs prominent and forming a narrow wing; carpophore absent. Fruiting peduncles 1–8 mm long, fruiting pedicels 1–1.7 mm long. Styles divergent, 1–1.5 mm long. **Fig. 2.**

***Specimens examined*: Queensland.** Cook District: Bellenden Ker Range, S. Peak, E. slope 1450 m, Aug 1971, *Balgooy* 1497 (NSW); SFR 185, Edith L.A., Feb 1972, *Dockrill & Stevens* 391 (BRI); Forestry Reserve 194, Atherton district, Jun 1963, *Hyland* AFO/2656 (BRI). North Kennedy District: SFR251, Tableland L.A., 400 m down Ebony road off Tully Falls Road, May 2001, *Ford* AF2807 (BRI, NSW).

***Distribution and habitat*:** Found on parts of the Atherton Tableland and adjacent areas in north Queensland (**Map 1**). It inhabits rainforest clearings or rainforest margins, on clay-loam soils.

***Phenology*:** Flowers recorded for April and June; fruits from February to June.

***Affinities*:** *H. miranda* is morphologically similar to *H. pedicellosa*. Both species have large deeply cordate leaves, orbicular in outline, and both have a proliferous inflorescence, with clusters of umbels at various positions on the rachis. However, *H. miranda* differs by the pedicels 1–1.7 mm long (3–8 mm long for *H. pedicellosa*), the peduncles 1–8 mm long (up to 8–40 mm long for *H. pedicellosa*), mericarps 1.4–1.7 mm long (1.1–1.3 mm long for *H. pedicellosa*) the very obscure lobing of the lamina (distinctly 7–9 lobed for *H. pedicellosa*) and the upper petiole with white hairs 0.5–2 mm long (fawn to brown hairs 0.1–0.7 mm long for *H. pedicellosa*).

***Notes*:** We have been unable to match this species with any named species from New Guinea or Indonesia. Some of the specimens of *H. miranda* cited above were determined as *H. javanica* Thunb. by P. Buwalda, but the latter species (as to type) has leaves where the lamina subtends less than 250 degrees of arc, and has non-proliferous (simple) inflorescences.

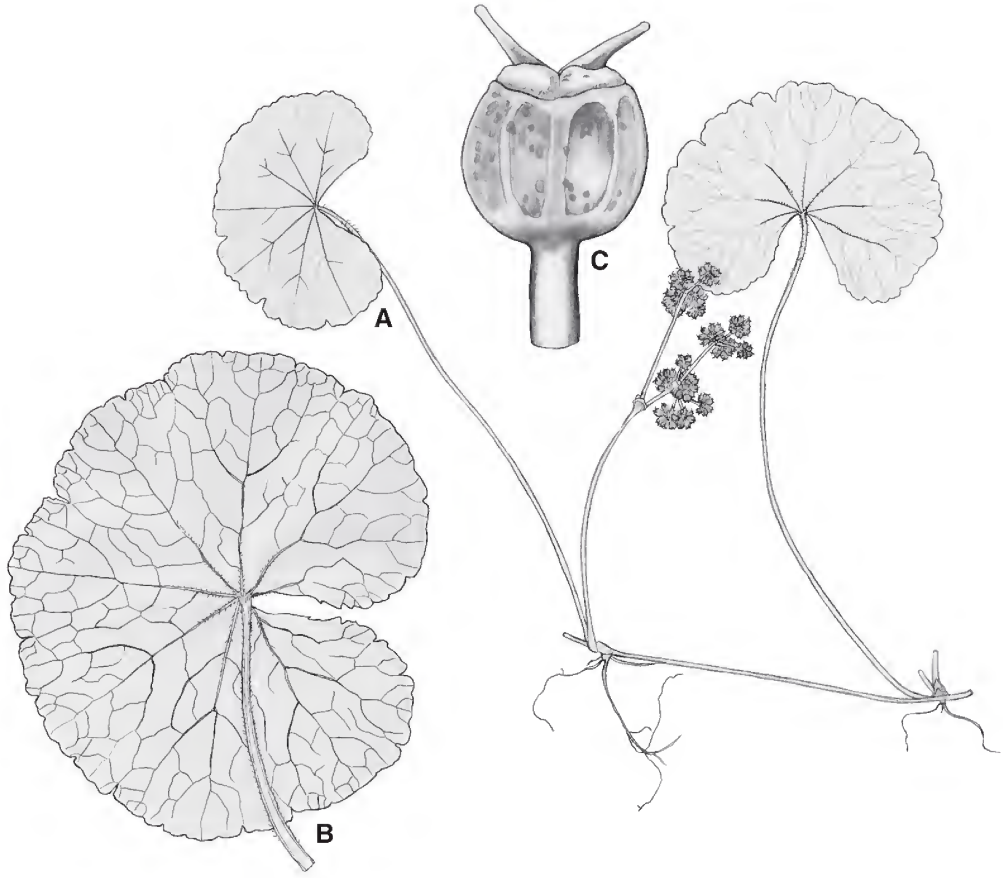


Fig. 2. *H. miranda.* A. portion of fertile plant. B. leaf underside and distal part of petiole. C. fruit. A–C from *Bean* 18786 (BRI).

***Conservation status*:** Data deficient (IUCN 2001). Only a few collections are known, but as *Hydrocotyle* is a poorly collected genus, it may be more common than collections indicate.

***Etymology*:** From the Latin *mirandus*, meaning wonderful or strange.

Hydrocotyle tumida A.R.Bean & Henwood **sp. nov.** affinis *H. grammatocarpae* autem caulibus glabris, floribus fructibusque costa conspicua transversa, et fructibus obconicis usque pyriformibus grandioribus, pedicellis brevioribus differt. **Typus:** Queensland. Cook District: c. 8.5 km north-west of Kennedy River bridge, between Laura and Coen, 6 July 1998, *A.R. Bean* 13496 (holo: BRI; iso: MEL).

Hydrocotyle sp. (Strathmay J.R. Clarkson 3498A) in Henderson (2002).

Annual glabrous prostrate herb with creeping stems, mostly rooting at the nodes. Leaves occurring singly at the nodes. Stipules white, laciniate, 0.6–1.3 mm long, margin deeply dissected. Petioles erect, 4–40 mm long. Lamina orbicular-cordate (subtending 270–350 degrees of arc), green, 4–10 mm in radius, palmately 5–9-veined; margin with 5–7 shallow obtuse lobes, each lobe divided into 2–4 lobules. Inflorescences simple, umbellate, 17–25 flowered, peduncles 4–21 mm long (about same length as adjacent petiole), pedicels lacking at anthesis, bracts linear to narrowly-spathulate, c. 0.5 mm long. Calyx absent. Petals purplish-white, deltate, c. 0.3 mm long. Fruits obconical

to pyriform, elliptical in cross-section, 0.8–1.0 mm long, 1.2–1.5 mm wide on longest axis, with ribs obscured by 8 longitudinal rounded swellings on the intercostal areas and a rather prominent transverse swelling near the distal end of the fruit. Mericarps 2, indistinct, coherent. Carpophore absent. Fruiting heads forming a tight globular cluster up to 3.5 mm diameter. Fruiting pedicels 0.1–0.3 mm long; bracts 0.8–1.2 mm long. Styles divergent to erect, 0.1–0.2 mm long. **Fig. 3.**

***Specimens examined*: Queensland.** Cook District Coleman River, 17 km by road W of Musgrave on road to Edward River, Oct 1980, *Clarkson* 3462 (BRI, CANB); 60 km W of Strathmay on Musgrave-Edward River road, Oct 1980, *Clarkson* 3498A (BRI); 20 km south of Wakooka on the track to Starke Station, Jul 1987, *Clarkson* 7303 (BRI); 0.8 km S of the Alice River on the road from 'Oroners' to 'Koolatah', Aug 1992, *Clarkson* 9739 & *Neldner* (BRI); Bamboo Range, N of Musgrave on Peninsula Development road, Jul 1993, *Forster* PIF13455 (BRI); 28 km ENE of Violet Vale HS., Aug 1978, *Paijmans* 2890 (CANB); North Kennedy R., 8 km NW of Breeza HS., Aug 1978, *Paijmans* 3232 (CANB); Hopevale, near Isabella Falls, Aug 1976, *Scarth-Johnson* 308A (BRI); Bloodwood Lagoon, 16 miles [26 km] S of 'Dunbar', Jun 1943, *Whitehouse* (BRI, AQ 486653).

***Distribution and habitat*:** Endemic to Queensland, and confined to lower Cape York Peninsula (**Map 1**). It grows in *Eucalyptus* or *Melaleuca* dominated woodland, in damp microhabitats.

***Phenology*:** Flowers and fruits are recorded from June to October.

***Affinities*:** *H. tumida* differs from *H. grammatocarpa* by its glabrous stems (sparsely hairy for *H. grammatocarpa*); flowers and fruits with a conspicuous transverse swelling (lacking in *H. grammatocarpa*); fruits obconical to pyriform (ellipsoidal for *H. grammatocarpa*); fruits 0.8–1.0 x 1.2–1.5 mm (0.5–0.6 x 0.5–0.7 mm for *H. grammatocarpa*); fruiting pedicels 0.1–0.3 mm long (0.4–0.6 mm long for *H. grammatocarpa*).

***Conservation status*:** This is a common species with a relatively wide distribution, and the habitat is largely intact. No conservation coding is recommended.

***Etymology*:** From the Latin *tumidus* meaning 'swollen'. This is a reference to the swollen or inflated intercostal regions of the fruits.

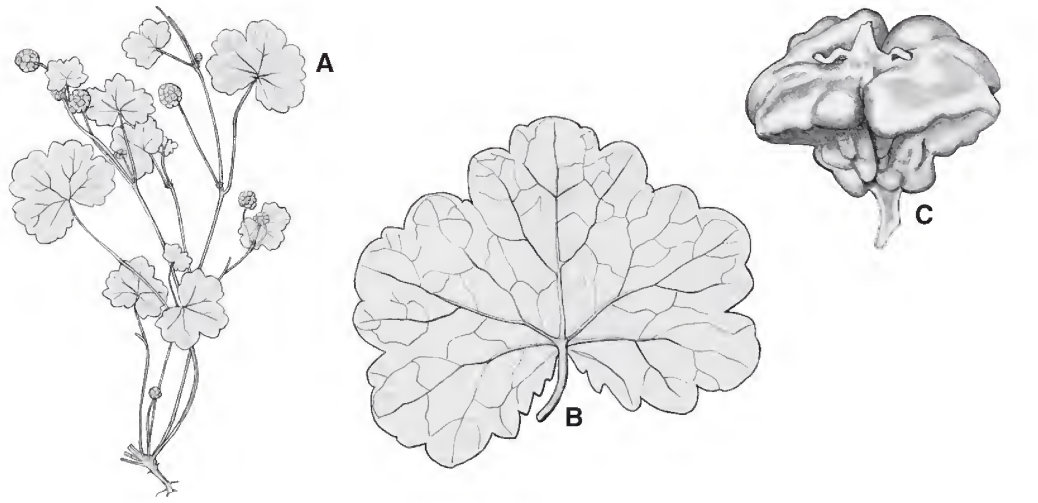


Fig. 3. *H. tumida*. A. fruiting plant. B. leaf underside. C. fruit. A–C from *Bean* 13496 (BRI).

Hydrocotyle digitata A.R.Bean & Henwood **sp. nov.** affinis *H. tripartitae,* sed foliis segmentis laminae profunde divisis, pedunculis 4–9 mm longis (13–35 mm in *H. tripartita*), mericarpis 0.9–1.2 mm longis (0.6–0.7 mm in *H. tripartita*) differt. **Typus:** Queensland. DARLING DOWNS DISTRICT: Turner Creek, 11.9 km N of Dalveen, 26 January 1995, *A.R. Bean* 8214 (holo: BRI; iso: CANB, HO, MEL, NSW).

Perennial herb with creeping stems, mostly rooting at the nodes. Leaves occurring singly at the nodes. Stipules broader than long, 1.2–2 x 1.5–2.5 mm, brown-streaked, margin entire or fimbriate. Petioles 50–130 mm long, with 10–30 white and brown retrorse hairs near the apex or sometimes extending along the petiole, up to 2 mm long, rarely glabrous. Leaves trifoliolate, 13–30 mm across. Lamina narrowly cuneate (60–90 degrees of arc), 6.5–15 mm long, 7–15 mm wide; upper lamina surface bright green, glabrous or with 1–5 erect white trichomes, each 1.7–2.4 mm long; lower surface pale green, moderately hairy, with 20–50 white trichomes, each 0.7–2 mm long. Central leaflet with two shallow to deep sinuses, apex 3-lobed, each lobe divided into 3 lobules, and often with a small acute tooth laterally; lateral leaflets with 19–28 teeth, with one deep sinus (0.7–0.9 times segment length) and the two lobes divided into 3–4 lobules, each of which is 2–4 toothed. Inflorescences simple, umbellate, 10–13-flowered, peduncles 4–9 mm long (much shorter than adjacent petiole), pedicels almost lacking at anthesis, bracts c. 0.6 mm long. Calyx absent. Petals white or purple, deltate, 0.5–0.7 mm long. Styles 2, each 0.6–0.8 mm long in fruit. Fruits comprising two laterally compressed mericarps, each 0.9–1.2 mm long, 0.6–0.9 mm wide. Dorsal and lateral ribs acute, marginal ribs obscure; surface smooth. Fruiting pedicels 0.3–1.5 mm long. **Fig. 4.**

***Specimens examined*: Queensland.** NORTH KENNEDY: S.F.R. 755 Johnstone L.A., North Johnstone River, Nov 1974, *Hyland* 7873 (CANB). DARLING DOWNS DISTRICT: Condamine River, at Warwick, Dec 1990, *Bean*

Fig. 4. *H. digitata.* A. flowering stem x 0.5. B. leaf underside × 1. C. fruit × 12. A,B from *Bean* 8214 (BRI); C from *Bean* 8218 (BRI).

2721, 2722 (BRI, CANB); Connolly Dam, S of Warwick, Oct 1996, *Bean* 10887 (BRI). **New South Wales.** North Coast: below Callawajune Mtn (the Beehive or South Obelisk), c. 5.5 km SSW of Urbenville, Nov 1987, *Coveny* 12794 et al. (BRI, CANB, K, MO, NSW). Northern Tablelands: Little Llangothlin Lake Nature Reserve, NNE of Guyra, Jan 1995, *Bean* 8284 (BRI).

***Distribution and habitat*:** Known from near the Atherton Tableland in north Queensland, the Warwick district in far south-east Queensland (Map 1), and extending to Guyra in New South Wales. It occurs at altitudes above 500 metres, in moist to swampy areas in eucalypt woodland.

***Phenology*:** Flowers and fruits have been recorded between October and January.

***Affinities*:** *H. digitata* is morphologically similar to *H. tripartita*, but differs by the deeply divided lateral lamina segments (divisions 0.7–0.9 times length of segment vs. 0.3–0.6 for *H. tripartita*), the peduncles only 4–9 mm long (13–35 mm for *H. tripartita*), and the mericarps 0.9–1.2 mm long (0.6–0.7 mm long for *H. tripartita*) (**Table 1**).

***Conservation status*:** Data deficient (IUCN 2001).

***Etymology*:** From the Latin *digitatus*, meaning digitate or finger-like. This is in reference to the many finger-like lobes on the leaves.

Hydrocotyle oraria A.R.Bean **sp. nov.** affinis *H. tripartitae* autem foliis segmentis laminae incomplete dissectis tantum 3–8 dentibus praeditis, pilis infra et in petiolo paucioribus, umbellis floribus paucioribus constructis differt. **Typus:** Queensland. Cook District: Eubenangee Swamp National Park, Alice River end, 29 October 2001, *P.I. Forster* 27656, *R. Booth & R. Jensen* (holo: BRI).

Annual? herb with creeping stems, mostly rooting at the nodes. Leaves occurring singly at the nodes. Stipules broader than long, 0.7–0.9 x 1–1.2 mm, white, translucent, margin laciniate or fimbriate. Petioles 6–30 mm long, with 5–10 white retrorse hairs near the apex, 0.4–0.7 mm long, otherwise glabrous. Lamina simple, palmatifid, 7–14 mm across, divided into 3 segments, with the incisions extending 70–90% of lamina radius; upper surface bright green, glabrous; lower surface pale green, glabrous or with 1–5 white trichomes. Lamina segments narrowly to broadly cuneate (45–120 degrees of arc), 3.5–7 mm long, 2.5–6 mm wide, central segment with two shallow sinuses, apex 3-lobed and sometimes with a small acute tooth on each side; lateral segments with 3–8 teeth, with one moderately deep sinus (0.2–0.4 times segment length) and apex with 2–4 lobes. Inflorescences simple, umbellate, 4–8 flowered, peduncles 5–15 mm long (shorter than adjacent petiole), pedicels almost lacking at anthesis, bracts c. 0.7 mm long. Calyx absent. Petals white or purple, deltate, 0.7–0.8 mm long. Styles 2, each 0.3–0.4 mm long in fruit. Fruits comprising two laterally compressed mericarps, each 0.6–0.8 mm long, 0.45–0.6 mm wide. Dorsal and lateral ribs acute, marginal ribs obscure; surface smooth or with a few irregular papillae. Fruiting pedicels 0.2–0.6 mm long. **Fig. 5.**

***Specimens examined*: Queensland.** Cook District: Eubenangee Swamp, N of Garradunga, Dec 1941, *Blake* 14498 (BRI). North Kennedy District: Cardwell, Sep 1935, *Blake* 9686 (BRI); Murray River, Bruce Highway, Jul 1960, *Trapnell* 47 (BRI).

***Distribution and habitat*:** Confined to coastal areas of north Queensland between Innisfail and Cardwell (**Map 1**). It grows in moist areas in fragmented rainforest or as a component of *Melaleuca* dominated forests. Altitudes are between 0–30 metres.

***Phenology*:** Flowers and fruits have been recorded between July and December.

***Affinities*:** *H. oraria* differs from *H. tripartita* by its simple leaves. The leaf segments of H. oraria bear only 3–8 teeth (12–30 teeth on the leaflets of *H. tripartita*), the fewer hairs on the lower leaf surface and petiole, and the 4–8 flowers per umbel (8–14 flowers for *H. tripartita*). *H. oraria* is also related to *H. paludosa*, but differs by the simple leaves, the lateral segments less deeply divided, the 3–8 terminal teeth per segment (10–16 teeth on the leaflets of *H. paludosa*), and the mostly shorter petioles and peduncles (**Table 1**).

***Conservation status*:** Data deficient (IUCN 2001). The few known collections probably are not indicative of its abundance. A survey is needed to determine the degree of threat to the species.

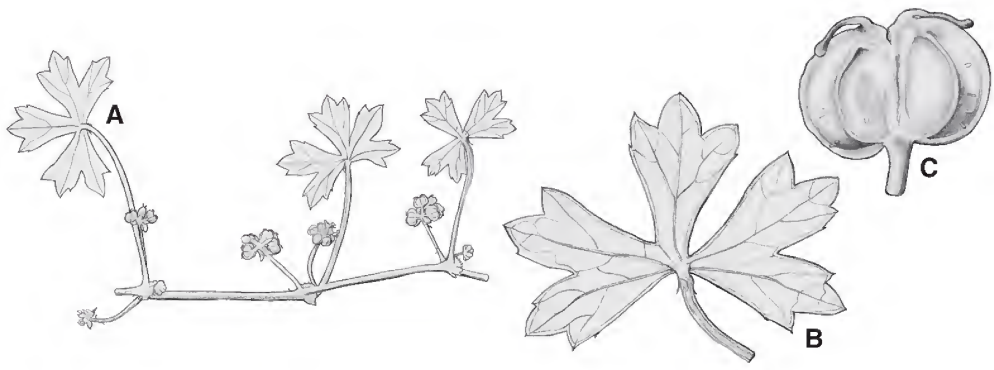


Fig. 5. *H. oraria.* A. fruiting stem. B. leaf underside. C. fruit. A,B from *Bean* 8214 (BRI); C from *Bean* 8218 (BRI).

***Etymology*:** From the Latin *orarius* meaning 'of the coast'. This species is apparently confined to coastal lowlands.

Hydrocotyle paludosa A.R.Bean **sp. nov.** affinis *H. tripartitae*, autem foliis segmentis laminae angustioribus sparsim dentatis, glabris vel sparsim pubescentibus infra, petiolis pilis albis ad apicem limitatis, fructibus saepe papillosis superficiaribus, mericarpis longioribus differt. **Typus:** Queensland. Moreton District: Nairn Road, Morayfield, c. 35 km N of Brisbane, 11 March 2000, *A.R. Bean* 16124 (holo: BRI; iso: MEL, NSW).

Perennial herb with creeping stems, mostly rooting at the nodes. Leaves occurring singly at the nodes. Stipules broader than long, 0.7–0.9 x 1–1.2 mm, brown-streaked, margin entire or fimbriate. Petioles 20–160 mm long, with 5–20 white retrorse hairs near the apex, c. 1.5 mm long, otherwise glabrous. Lamina trifoliolate, 8–25 mm across; upper lamina surface bright green, glabrous or with 1–10 erect white trichomes, each 0.7–1.5 mm long; lower surface pale green, glabrous or with 1–10 white trichomes. Leaflets narrowly cuneate (30–60 degrees of arc), 4.5–14 mm long, 3–8 mm wide, central leaflet with two shallow sinuses, apex 3–lobed with a small acute tooth on each side; lateral leaflets with 10–16 teeth, with one deep sinus (0.6–0.8 times leaflet length) and apex with 3–5 (rarely more) small teeth. Inflorescences simple, umbellate, 6–11 flowered, peduncles 10–40 mm long (shorter than adjacent petiole), pedicels almost lacking at anthesis, bracts c. 0.5 mm long. Calyx absent. Petals white or purple, deltate, 0.5–0.8 mm long. Styles 2, each 0.3–0.4 mm long in fruit. Fruits comprising two laterally compressed mericarps, each 0.7–0.8 mm long, 0.5–0.6 mm wide, surface smooth or often with a few irregular papillae. Dorsal and lateral ribs prominent, acute, marginal ribs obscure. Fruiting pedicels 0.5–0.8(–1.5) mm long. **Fig. 6.**

***Specimens examined*: Queensland.** Port Curtis District: Compartment 28, S.F. 898, N of Watalgan, Oct 1996, *Bean* 11052 (BRI). Burnett District: Mt Perry, undated, *Keys* s.n. (BRI); Maidenwell-Nanango road, at Kingaroy turnoff, Sep 1996, *Bean* 10642 (BRI, MEL); N end of Tarong S.F., c. 13 km SW of Nanango, Apr 1998, *Bean* 13185 (BRI); Ettiewyn, Jan 1999, *Fensham* RJF3623 (BRI). Wide Bay District: Verrierdale road, 8 km W of Peregian Beach, May 1990, *Bean* 1590 (BRI); Hortons Camp Creek headwaters, 4 km from Didcot on Gooroolba road, Feb 1999, *Forster* PIF24077A (BRI). Moreton District: Kedron Brook, undated, *Bailey* s.n. (BRI); Doonan Creek swamp, 5 km W of Peregian, Dec 1993, *Bean* 7193 (BRI); Yandina-Dunethin Rock road, Dec 2000, *Bean* 17099 (BRI); German Church Road, Mt Cotton, SE of Brisbane, Nov 2001, *Bean* 18155 (BRI); Albert River, S of Brisbane, Aug 1930, *Hubbard* 3854 (BRI, K); Jacobs Well, c. 0.4 km from shore, Sep 1995, *Leiper* (BRI); 0.5 km N of Warwick Street, Coolum Beach, Dec 1982, *Sharpe* 3281 & *Windolf* (BRI). **New South Wales.** North Coast: adjacent to Bungawalbin N.P., SE of Casino, Sep 1999, *Bean* 15464 (BRI).

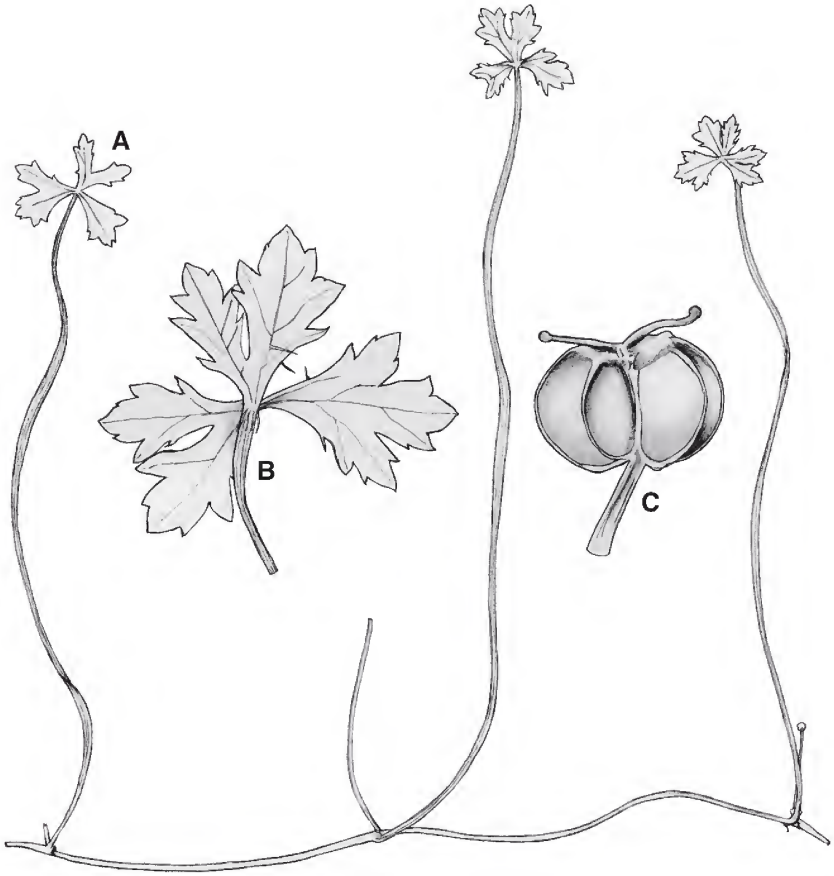


Fig. 6. *H. paludosa.* A. flowering stem. B. leaf underside. C. fruit. A–C from *Bean* 16124 (BRI).

***Distribution and habitat*:** Distributed from north of Bundaberg to south-east of Brisbane in Queensland (Map 1), and also known from near Casino in New South Wales. It is found in coastal or near-coastal areas, very often in *Melaleuca quinquenervia* dominated forest, in association with species in the family Cyperaceae. Sites are invariably poorly drained.

***Phenology*:** Flowers and fruits have been recorded throughout the year.

***Affinities*:** *H. paludosa* is morphologically similar to *H. tripartita*, but differs by the narrower sparsely-toothed leaflets (30–60 degrees of arc, 6–14 teeth vs. 60–90 degrees, 12–33 teeth for *H. tripartita*); the deeply divided lateral leaflets (0.6–0.8 times length of leaflet vs. 0.3–0.6 times for *H. tripartita*); the leaflets longer than broad (length less than breadth for *H. tripartita*); the 0–10 hairs on the lower leaf surface (hairs 20–100 on lower surface for *H. tripartita*); the petiole hairs white and confined to apex (brown-white and extending some distance along petiole for *H. tripartita*); and the fruit surface often papillose (smooth for *H. tripartita*) (**Table 1**).

***Conservation status*:** This species is widely distributed and not uncommon. No conservation coding is recommended.

***Etymology*:** From the Latin *paludosus* meaning marshy or swampy, referring to the habitat.

Table 1 - Comparison of *Hydrocotyle tripartita* and its allies

Character	*H. tripartita*	*H. paludosa*	*H. digitata*	*H. oraria*
leaf form	trifoliolate	trifoliolate	trifoliolate	palmatifid
leaf segment/leaflet angle (degrees)	60–90°	30–60°	60–90°	45–120°
division of lateral leaflets/leaf segments	0.3–0.6	0.6–0.8	0.7–0.9	0.2–0.4
number of lobes or teeth per leaf segment or leaflet	12–33	10–16	19–28	3–8
number of hairs on lower surface of lamina	20–100	0–10	20–50	0–5
petiole hairs; number, colour and position	10–30 white and brown at junction with lamina and along distal part	5–20 white at junction with lamina only	10–30 white and brown at junction with lamina and sometimes along distal parts	5–10 white at junction with lamina only
peduncle length (mm)	13–35	10–40	4–9	5–15
mericarp surface	smooth	often papillose	smooth	smooth or papillose
mericarp length (mm)	0.6–0.8	0.7–0.8	0.9–1.2	0.6–0.8

Acknowledgements

Thanks are due to Rod Fensham for supplying information about *H. dipleura*, Will Smith for the illustrations and distribution map, Peter Bostock (Australian Botanical Liaison Officer) for supplying photographs of relevant types, Les Pedley for the Latin diagnoses, and Andrew Ford for field collections.

References

Duretto, M. (1999). *Hydrocotyle*. in Flora of Victoria, Volume 4. (eds N.G.Walsh & T.J. Entwisle). Melbourne: Inkata Press.

Eichler, Hj. (1965). Supplement to J.M. Black's Flora of South Australia, edition 2. Adelaide: Government Printer.

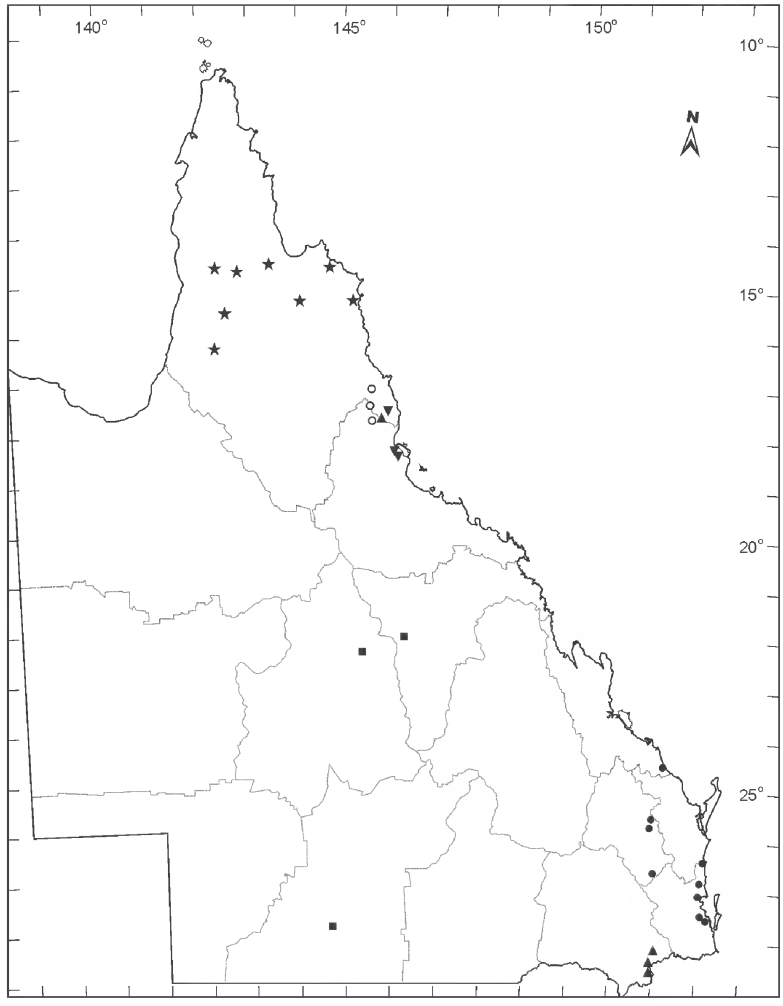
Eichler, Hj. (1986). *Hydrocotyle*, in Flora of South Australia, Volume 2. (eds J.P. Jessop & H.R. Toelken). Adelaide: South Australian Government Printing Division.

Henderson, R.J.F. (ed.) (2002). Names and Distribution of Queensland Plants, Algae and Lichens. Brisbane: Environmental Protection Agency.

Henwood, M.J & Hart, J.M. (2001). Towards an understanding of the phylogenetic relationships of Australian Hydrocotyloideae (Apiaceae). *Edinburgh Journal of Botany* 58: 269–89.

Iucn. (2001). *IUCN Red List Categories and Criteria: Version 3.1*. IUCN Species Survival Commission. IUCN, Gland, Switzerland and Cambridge, UK. ii + 30 pp.

Mathias, M.E. & Constance, R.L. (1975). 145. Umbelliferae. in Flora of Ecuador (eds G. Harling & B. Sparre). *Opera Botanica* Ser. B, No. 5.



Map 1. Distribution of *Hydrocotyle* spp. (square) *H. dipleura;* (star) *H. tumida;* (open circle) *H. miranda;* (triangle) *H. digitata;* (reverse triangle) *H. oraria;* (closed circle) *H. paludosa.*

PLUNKETT, G.M., SOLTIS, D.E. & SOLTIS, P.S. (1996). Higher level relationships of Apiales (Apiaceae and Araliaceae) based on phylogenetic analysis of rbcL sequences. American Journal of Botany 83: 499–515.

PLUNKETT, G.M., SOLTIS, D.E. & SOLTIS, P.S. (1997). Clarification of the relationship between Apiaceae and Araliaceae based on matK and rbcL sequence data. American Journal of Botany 84: 565–80.

TSENG, C.C. (1967). Anatomical studies of flowers and fruit in the Hydrocotyloideae (Umbelliferae). University of California Publications in Botany 42: 1–79.

WAKEFIELD, N.A. (1951). Notes on some Australian species of *Hydrocotyle*. *Victorian Naturalist* 68: 7–9.

WAKEFIELD, N.A. (1955). Genus *Hydrocotyle*: A new species from the Australian Alps. *Victorian Naturalist* 72: 55.

A new species of *Mimulus* L. (Scrophulariaceae) from Queensland, Australia

A.R. Bean

Summary

Bean, A.R. (2003). A new species of *Mimulus* L. (Scrophulariaceae) from Queensland, Australia. *Austrobaileya* 6(3): 549–552. A new species, *Mimulus aquatilis*, is described, illustrated and a distribution map provided. It is found in a restricted area of north Queensland, where it is associated with permanent springs. An identification key to the Queensland *Mimulus* species is provided.

Keywords: *Mimulus*, Scrophulariaceae, Queensland, taxonomy, new species, key.

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Introduction

Recent fieldwork devoted to the study of spring wetlands throughout Queensland (Fensham and Fairfax, in press) has revealed several new taxa belonging to various plant families. While the species described here was collected before this survey, it had not been recognised as distinct.

Mimulus is a large genus with members in each continent, and occurring in both tropical and temperate areas (Grant 1925), although Australia has only a few representatives. Bentham (1868) listed four native Australian species, and only the poorly known *Mimulus clementii* Domin from Western Australia has been added since that time.

Five *Mimulus* species are indigenous to Queensland. There are no naturalised taxa in Queensland, but two naturalised species (*M. guttatus* DC. and *M. moschatus* Lindl.) occur in south-eastern Australia.

Taxonomy

Key to Queensland species of *Mimulus*

1. Leaves 1–3 mm long ..... **M. repens** R.Br.
   Leaves 4–45 mm long 2

2. Leaves and/or branchlets hairy ..... **M. prostratus** Benth.
   Leaves and branchlets glabrous 3

3. Leaves with 3–5 longitudinal veins, serrulate, 1.5–3 times longer than wide; habitat aquatic ..... **M. aquatilis**
   Leaves with only midvein visible, entire, 5–14 times longer than wide; habitat terrestrial ... 4

4. Marginal ciliae on calyx teeth 0.2–0.3 mm long; corolla 6–9 mm long; growing on sandy soils ..... **M. uvedaliae** Benth.
   Marginal ciliae on calyx teeth absent or up to 0.1 mm long; corolla 10–12 mm long; growing on heavy clay soils ..... **M. gracilis** R.Br.

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Mimulus aquatilis A.R.Bean **sp. nov.** affinis M. gracili autem foliis late ovate serrulatis venis 3–5 longitudinalibus instructis, calyce longiore, habitu aquatico differt. **Typus**: Queensland. North Kennedy District: GW Spring, 'Minnamoolka', S of Mt Garnet, 24 May 2001, *R.J. Fensham* 4416 (holo: BRI (1 sheet + spirit); iso: AD).

Erect or sprawling herb to 50 cm high, rooting freely at the nodes on lower parts. Stems quadrangular to grooved, glabrous. Leaves ovate to broadly-ovate, prominently 3-veined throughout and 5-veined in lower half, 14–45 × 5–26 mm, 1.5–3 times longer than broad; apex obtuse, base obtuse to auriculate; margins serrulate, with 4–11 pairs of teeth each up to 1.5 mm long. Leaf lower surface glandular-punctate. Inflorescences solitary, axillary. Flowers with pedicels 3–9 cm long, 2–4 times longer than subtending leaf, not elongating after anthesis, bracteoles absent. Calyx fused throughout most of its length, 6.0–8.2 mm long (including teeth), cylindrical, 5-ribbed, not elongating after anthesis; calyx teeth deltate, 1.2–1.8 mm long, apex acute, marginal ciliae absent or up to 0.05 mm long. Corolla gamopetalous, 5-lobed, but distinctly 2-lipped with the lower lip longer and somewhat recurved, blue with a yellow centre, 13–16 mm long; tube bisulcate, outer surface glabrous or very sparsely furnished with short glandular hairs; inner surface with very numerous patent ensate eglandular hairs. Stamens 4, epipetalous, all perfect, in two pairs, the lower pair slightly longer, not or slightly exserted from corolla. Anther cells 2, confluent. Style glabrous, exserted; stigma comprising 2 thin spathulate flaps. Ovary smooth, surface sparsely glandular. Capsule smooth, 2-locular, at maturity c. 7 mm long, not extending beyond calyx. Seeds ellipsoidal, yellow-brown, 0.35–0.45 mm long, with minute papillae in longitudinal rows. **Fig. 1.**

Map 1. Distribution of *Mimulus aquatilis*

Fig. 1. *Mimulus aquatilis.* A. flowering stem × 0.6. B. lateral view of an open flower × 4. C. flower slit longitudinally to show ovary, style and stamens × 4. A, *Fensham* 4537; B-C, *Fensham* 4416.

***Specimens examined*: Queensland.** Cook District: Twelve Mile Spring, Undara NP, Jun 2001, *Fensham* 4518 (BRI); Big Oasis Spring, 'Rocky Springs', E of Mt Surprise, Jun 2001, *Fensham* 4537 (BRI); Elizabeth Spring, 'Mt Surprise', Jul 2001, *Fensham* 4576 (BRI); Swamp Ck, on road to Spring Creek HS, Sep 1976, *Williams* 76091 (BRI). North Kennedy District: 'Conjuboy', Jan 1993, *Fensham* 392 (BRI); spring near 'Conjuboy' homestead, Mar 2001, *Fensham* 4665 (BRI).

***Distribution and habitat*:** Endemic to Queensland and confined to the Mt Garnet–Mt Surprise–Greenvale area (**Map 1**). It grows only in springs associated with basalt, where there is permanently flowing water. The lower parts of the plant are usually submerged.

***Phenology*:** Flowers and fruits have been recorded at various times of the year.

***Affinities*:** *M. aquatilis* is closely related to *M. gracilis*, but differs by the leaves 1.5–3 times longer than broad (6–14 times for *M. gracilis*), with 3–5 longitudinal veins (midvein only for *M. gracilis*), and with serrulate margins (entire margins for *M. gracilis*), and by the calyx 6.0–8.2 mm long (4–6 mm for *M. gracilis*).

***Conservation status*:** Applying the guidelines of the IUCN (Anon. 2001), a status of "Vulnerable" is recommended, (VU C1; D1+2). The main threat to *Mimulus aquatilis* is the introduction into the springs of the aggressive *Brachiaria mutica* (Forssk.) Stapf (para grass).

***Etymology*:** From the Latin *aquatilis,* meaning "growing in water".

Acknowledgements

Thanks to Rod Fensham for advice on habitat and conservation status. Will Smith (BRI) provided the illustrations of this species. Les Pedley provided the Latin translation of the diagnosis.

References

Anonymous (2001). IUCN Red List Categories and Criteria. International Union for Conservation of Nature and Natural Resources: Switzerland.

Betham, G. (1868). *Mimulus*. in Flora Australiensis 4: 481–3. L.Reeve & Co.: London.

Fensham, R.J & Fairfax, R.J. (in press). Spring wetlands of the Great Artesian Basin, Queensland, Australia. *Wetland Ecology and Management*.

Grant, A.L. (1925). A monograph of the genus *Mimulus*. *Annals of the Missouri Botanic Gardens* 11: 99–388.

Polycarpelly in *Idiospermum australiense* (Calycanthaceae)

Stuart J. Worboys

Summary

Worboys, S.J. (2003). Polycarpelly in *Idiospermum australiense* (Calycanthaceae). *Austrobaileya* 6(3): 553–556. *Idiospermum australiense* (Diels) S.T. Blake (Calycanthaceae) is restricted to two relatively small regions in the lowland tropical rainforests of north-east Queensland, Australia. Previous morphological studies have focussed on specimens from the northernmost of these two regions. Examination of flowers from all known populations of the species revealed significant differences between the northern and southern regions with respect to numbers of floral parts, especially carpels. Polycarpelly was found to be widespread in the southern populations, a feature previously unreported in the literature.

Keywords: *Idiospermum,* polycarpelly, Queensland flora, Calycanthaceae, Idiospermoideae.

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Introduction

Idiospermum australiense (Diels) S.T. Blake is a geographically and taxonomically isolated tree species, restricted to very wet lowland mesophyll vine forests in north-east Queensland. It was first described by Ludwig Diels (1912) as *Calycanthus australiensis* and placed in the family Calycanthaceae, a group previously known only from eastern Asia and the southern United States (Nicely 1965). Diels, however, based his description on incomplete material. When complete fertile material became available, notably the enormous polycotyledonous embryos, its distinctiveness became apparent. In consequence, Blake (1972) erected a new family and genus: Idiospermaceae, *Idiospermum australiense*. The family Idiospermaceae, although recognised by some authors (Wilson 1976, Cronquist 1981), is now generally regarded as a subfamily, Idiospermoideae, of Calycanthaceae, as proposed by Thorne (1974), and later supported by Endress (1983) and Kubitzki (1993).

The type specimen of *Calycanthus australiensis* described by Diels (1912) was collected near the mouth of Harvey Creek, south of Cairns. Although insect damaged, Diels was able to make out two intact carpels. However, the specimens examined by Blake (1972) and Wilson (1976) were collected from the Daintree region, to the north of Cairns. Flowers from these populations were described as having 0 or 1 carpel, rarely two. Because of this, Blake (1972) considered *Idiospermum* to be taxonomically isolated, in particular noting that "... two combinations of characters appear to be unique to *Idiospermum* – numerous spiral tepals, hollowed receptacle and a single carpel, laminar stamens and absence of endosperm."

This note presents the results of investigations into floral morphology, which for the first time involves the examination of specimens from across the known range of the species. Consideration is given to the taxonomic implications of these studies. These data were collected as part of a broader study into the reproductive biology of the species.

Methods

Idiospermum occurs in two regions in the lowland wet tropical rainforests of north eastern Queensland. Two populations are known from the foothills of the Bellenden Ker Range to the south of Cairns (Russell River valley and Harvey Creek) while two larger populations occur in the coastal lowlands and foothills of the Daintree region (Cooper Creek catchment and Noah Creek catchment), to the north of Cairns. In total, the known extent of these populations is 22.5 km^2. Flowers were collected from across all populations.

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Flowering occurs annually, reaching a maximum intensity in June and July (Worboys 1998). Flowers were collected and examined while fresh or preserved in 70% ethanol. Counts were made of the following floral organs: outer hemispherical bracts, tepals, fertile stamens, staminodes and carpels (terminology follows that of Wilson 1976). For various reasons, including floral age and insect damage, not all features could be examined on all flowers. A small proportion of flowers contained small, narrow vestigial carpels, lacking ovules but occasionally bearing a stigma. Such carpels were considered to be sterile.

For the purposes of analysis, flowers were grouped into northern (north of Cairns) and southern (south of Cairns) populations. A total of 441 flowers from 20 northern trees and 144 flowers from 10 southern trees were examined. The location of the sampled trees is listed below. One way analysis of variance was used to compare the mean number of each floral organ, testing the null hypothesis that no difference existed between samples from northern and southern populations.

***Selected specimens*: (All Worboys collections): Queensland.** Cook District: Near Jiyer Cave, Russell River Valley 17°27'S, 145°47'E, Jun 1995, *SJW* 395 (BRI); Bruce Highway bridge over Harvey Creek, near Deeral, 17°15'S, 145°55'E, Jul 1995, *SJW* 396 (BRI); Harvey Creek, near Deeral, 17°15'S, 145°54'E, Jun 1994, *SJW* 397 (BRI); ditto, Jul 1995, *SJW* 398 (BRI); ditto, Jul 1995, *SJW* 399, (BRI, CANB); Near end of Carbeen Road, Cow Bay, 16°12'S, 145°25'E, Aug 1995, *SJW* 400 (BRI); ditto, Aug 1995, *SJW* 401 (BRI); On Little Cooper Creek at the top end of Turpentine Road, Cow Bay, 16°10'S, 145°25'E, Jul 1996, *SJW* 402 (CANB); ditto, Jun 1995, *SJW* 403 (BRI); ditto, Jul 1995, *SJW* 404 (BRI); Candlenut Road, Cow Bay, 16°10'S, 145°25'E, Aug 1996, *SJW* 405 (BRI); ditto, Jun 1995, *SJW* 411 (CANB); Lower reaches of Cooper Creek, Cow Bay, 16°10'S, 145°25'E, Aug 1995, *SJW* 407 (BRI, CANB); ditto, Jul 1995, *SJW* 410 (BRI); Oliver Creek, approx 100m N of Maardja Boardwalk car park, 16°9'S, 145°24'E, Aug 1995, *SJW* 408 (BRI); ditto, Aug 1995, *SJW* 412 (BRI); Lower reaches of Noah Creek, near Cape Tribulation, 16°9'S, 145°25'E, Aug 1995, *SJW* 409 (BRI); ditto, Aug 1995, *SJW* 413 (BRI).

Results and Discussion

Flowers from northern populations of *Idiospermum australiense* are markedly different from those of southern populations (**Table 1**). They have, on average, fewer tepals, more stamens, and most significantly, fewer carpels (**Fig 1**).

It has previously been reported that, in collections from trees in the northern populations, both male and hermaphrodite flowers occur on the same tree (Blake 1972, Endress 1983), *i.e.* these populations are andromonoecious. This study confirms these observations, with 55.7% of flowers collected

Character	Northern Populations	Southern Populations	ANOVA	
			df	*F*
Tepals (not including basal pairs)	42.45 (92) 34–52	38.71 (62) 32–48	1, 152	50.778*
Functional stamens	14.45 (282) 10–20	13.61 (144) 10–17	1, 424	32.238*
Staminodes	17.07 (230) 8–28	16.71 (63) 8–23	1, 291	0.492
Carpels	0.51 (404) 0–2	2.33 (144) 1–5	1, 461	610.3*

Table 1. Comparisons of the number of floral organs found in flowers of *Idiospermum*. Values are mean (sample size), with the range of observed values immediately below. * indicates $P < 0.001$.

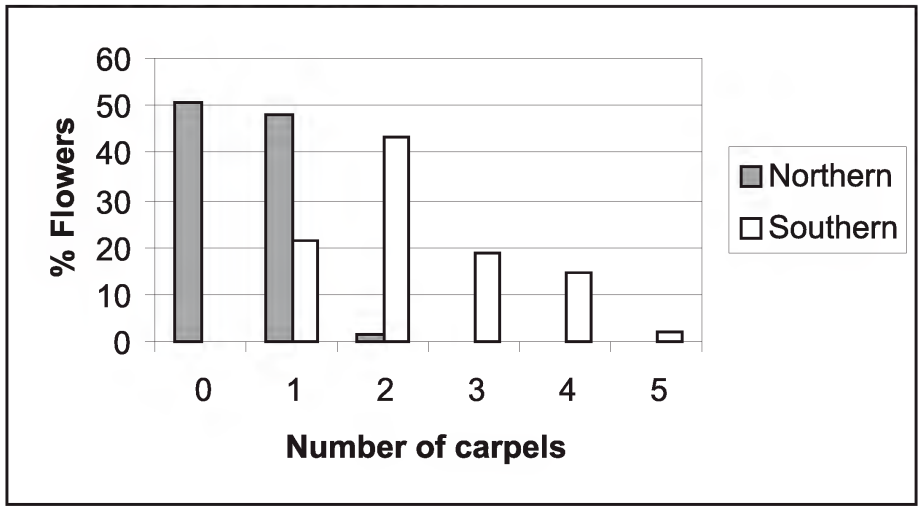

Figure 1. Number of carpels per flower, and proportion of flowers bearing that number in *Idiospermum* flowers from northern and southern populations.

from northern trees lacking functional carpels. In contrast, all flowers from southern populations were carpellate. A significant proportion of these had three carpels (Figure 1), a character state previously noted as unusual or rare (Cronquist 1981). One of the southern trees (*SJW* 397) bore flowers with up to five carpels.

The discovery of polycarpelly as a common feature in *Idiospermum* informs the debate regarding the family status of Idiospermaceae. The significance of the characters used to separate the family has been subject to varying interpretations by different authors. Thus, in comparative studies of *Idiospermum* and its temperate-zone northern hemisphere relatives (Calycanthaceae *sensu stricto*), differences have been noted in aspects of vegetative habit (Wilson 1979, Kubitzki 1993), floral anatomy and morphology (Blake 1972, Wilson 1976, Friis *et al.* 1994, Endress and Igersheim 1997), seed characteristics (Blake 1972, Wilson 1979), phytochemicals (Sterner and Young 1980), and gene sequence data (Ablett *et al.* 1997, Renner 1999). However, many morphological differences have been attributed to adaptations to contrasting moist tropical, and cool temperate, drought-prone environments, and that "[to] recognize the Idiospermaceae as a separate family overstresses the multiple expressions of a single basic difference, the tropical rainforest ecology of *Idiospermum* and the adaptations to that habitat." (Carlquist 1983). Similarly, the significance of the chemical dichotomies noted by Sterner and Young (1980) has also been discounted, on the basis that similar differences can be found within a single genus, or in different populations of the same species (Kubitzki 1993). Renner's (1999) analyses, based on sequence data and morphological character states, group *Idiospermum* with the Calycanthaceae. The degree of divergence between *Idiospermum* and Calycanthaceae *sensu stricto*, is less than that present within, for example, the Lauraceae and the Monimiaceae. Renner (1999) notes that "whether or not ... *Idiospermum* is recognized as a family (Idiospermaceae) depends on taste...".

Two unambiguous character combinations were cited by Blake (1972) as unique to the Idiospermaceae - laminar stamens and absence of endosperm, and numerous spiral tepals, hollowed receptacle with a single carpel. However, evidence gathered recently has called into question the significance of these character combinations. Friis *et al.* (1994)

reported laminar stamens in combination with Calycanthaceae-like floral features in a fossilised calycanthaceous flower (although the poor state of gynoecial preservation did not permit the confirmation of the presence or absence of endosperm). The authors of this paper concluded that, given the character combination seen in the fossil, the separation of *Idiospermum* from Calycanthaceae *sensu stricto* was poorly supported. The presence of polycarpelly in southern populations of *Idiospermum* indicates a higher degree of diversity in this character than has previously been reported. Evidence presented here shows that the character combination of numerous spiral tepals, hollowed receptacle and a single carpel is not a unique and definitive feature of the species, and cannot therefore be utilised in support of the family Idiospermaceae.

Acknowledgments:

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References:

Ablett, E.M., Playford, J. and Mills, S. (1997) The use of rubisco DNA sequences to examine the systematic position of *Hernandia albiflora* (C.T. White) Kubitzki (Hernandiaceae), and relationships among the Laurales. *Austrobaileya* 4:601–607.

Blake, S.T. (1972) *Idiospermum* (Idiospermaceae), a new genus and family for *Calycanthus australiensis*. *Contributions from the Queensland Herbarium* No. 12:1–37.

Carlquist, S. (1983) Wood anatomy of Calycanthaceae: Ecological and systematic implications. *Aliso* 10:427–441.

Cronquist, A. (1981) *An Integrated System of Calssification of Flowering Plants*. New York: Columbia University Press.

Diels, L. (1912) Über primitive Ranales der australischen Flora: 1. Die Auffindung von *Calycanthus* im australischen Regenwald. *Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie: Beiblatt zu den Botanischen Jahrbüchern* Nr. 107:7–13.

Endress, P.K. (1983) Dispersal and distribution in some small archaic relic angiosperm families (Austrobaileyaceae, Eupomatiaceae, Himantandraceae, Idiospermoideae-Calycanthaceae). *Sonderbaende naturwissenschaftlicher Verein, Hamburg* 7:201–217.

Endress, P.K. and Igersheim, A. (1997) Gynoecium diversity and systematics of the Laurales. *Botanical Journal of the Linnean Society* 125:93–168.

Friis, E.M., Eklund, H., Pedersen, K.R. and Crane, P.R. (1994) *Virginianthus calycanthoides gen. et sp. nov.* – A calycanthaceous flower form the Potomac Group (early Cretaceous) of eastern North America. *International Journal of Plant Sciences* 155:772–785.

Kubitzki, K. (1993) *Calycanthaceae*. In, K. Kubitzki, J.G. Rohwer and V. Bittrich (Editors): *The Families and Genera of Vascular Plants*. Volume II. Flowering Plants - Dicotyledons: Magnoliid, Hamamelid and Caryophyllid Families. Berlin: Springer-Verlag.

Nicely, K.A. (1965) A monographic study of the Calycanthaceae. *Castanea* 30: 38–81.

Renner, S.S. (1999) Circumscription and phylogeny of the Laurales: evidence from molecular and morphological data. *American Journal of Botany* 86:1301–1315.

Sterner, R.W. and Young, D.A. (1980) Flavonoid chemistry and the phylogenetic relationships of the Idiospermaceae. *Systematic Botany* 5:432–437.

Thorne, R.F. (1974) A phylogenetic classification of the Annoniflorae. *Aliso* 8: 147–209.

Wilson, C.L. (1976) Floral anatomy of *Idiospermum australiense* (Idiospermaceae). *American Journal of Botany* 63:987–996.

Wilson, C.L. (1979) *Idiospermum australiense* (Idiospermaceae) – aspects of vegetative anatomy. *American Journal of Botany* 66:280–289.

Worboys, S.J. (1998) Pollination processes and population structure of *Idiospermum australiense* (Diels) S.T. Blake, a primitive tree of the Queensland Wet Tropics. Unpublished M.Sc. Thesis. James Cook University of North Queensland, Cairns Campus.

Austrobaileya 6 (3): 557–558 (2003)

Note

Jasminum longipetalum King & Gamble (Oleaceae), and its occurrence in Queensland, Australia

Jasminum longipetalum King & Gamble has not been recognised from Queensland in recent times (Forster 1994; Harris 1997, 2002), although Green (1984) included it in his revision of the Australian taxa in the genus, citing a single collection at MEL from 1886 collected by Sinclair on Thursday Island in Torres Strait. For some time, the existence of an unidentified *Jasminum* on Cape York Peninsula has been recognised at BRI as *Jasminum* sp. (Jardine River L.J.Brass 18869) (Forster unpubl. notes Nov. 1995). Although several fruiting collections existed at BRI, no flowering material was known, hence its true identity remained unresolved. Examination of recent herbarium collections at QRS revealed a single flowering collection of this taxon. This enabled confirmation that the various populations of the taxon on Cape York Peninsula are in fact *J. longipetalum* in the broad sense.

A comprehensive description of *Jasminum longipetalum,* together with a key that distinguishes it from the other Australian species, can be found in Green (1984). The Australian material does differ from that found in New Guinea in having considerably longer calyx lobes (3–7 mm long, versus < 2 mm long), but otherwise appears essentially the same. Further flowering material of the Australian populations are now required to determine if they are worthy of subspecific status under *J. longipetalum*.

Jasminum longipetalum King & Gamble, J. Asiat. Soc. Bengal 74: 262 (1906). **Type:** Malaysia: Perak, *King's Collector* 2765 & 6005 (isosyn: K, *n.v.*); Singapore, *Ridley* 10937 (isosyn: K, *n.v.*).

Jasminum dolichopetalum Merr. & Rolfe, Philipp. J. Sci. 3: 120 (1908). **Type:** Philippines. Luzon, *Ramos* Bur. Sci. 995 (iso: K, *n.v.*).

Jasminum turneri C.T.White, Proc. Linn. Soc. New South Wales, 51: 297, tab. 17 (1926). **Type:** Papua New Guinea. Rigo Valley, 1924, *R. Lister Turner*[a] (holo: BRI [AQ279445]; iso: K *n.v.*).

Jasminum pseudoanastomosans Lingelsh., Bot. Jahrb. Syst. 61: 20 (1927). **Type:** Papua New Guinea. bei der Djamu – Klamm, 30 September 1907, *R.Schlechter* 16601[a] (isosyn: BRI; K *n.v.*). West Papua. Mamberamo, 7 September 1914, *A.C.Thomsen* 857 (isosyn: *n.v.*).

Jasminum sp. (Jardine River, L.J.Brass 18869) (Forster 1994; Harris 1997, 2002)

Specimens examined **(all BRI, unless cited otherwise; *fruiting, [a]flowering). Papua New Guinea.** Milne Bay Province: Fife Bay, Nov 1930, *Lister Turner* 115[a]. Western Province: Lower Fly River, east bank opp. Sturt Is., Oct 1936, *Brass* 8000[a]. Central Province: Port Moresby, Dec 1925, *Brass* 880[a]; Kwikila, Rigo subdist., 9°50'S, 147°45'E, Aug 1967, *Streimann & Kairo* NGF30795[a]; Brown River road, 16 miles [26.6 km] from Port Moresby, 9°23'S, 147°15'E, Feb 1964, *Womersley* NGF19113. Morobe Province: Nadzab airstrip, N of Lae, 6°35'S, 146°45'E, Sep 1963, *van Royen* NGF16489. West Sepik Province: along Pieni River near Walwali village, Aitape subdistrict, Jul 1961, *Darbyshire & Hoogland* 8063[a]. East Sepik Province: lower slopes of Suba, around Gahom, 4°39'S, 142°44'E, Sep 1990, *Takeuchi* 6678. **Australia.** Cook District: Jardine River, May 1948, *Brass* 18869; 3.3 km W of the beach on the track from Starke Station to the mouth of the McIvor River, 15°06'S, 145°13'E, Feb 1984, *Clarkson* 5178*; 3.5 km E of the Hopevale to Starke road on the track to the mouth of the McIvor River, 15°04'S, 145°09'E, Jul 1985, *Clarkson* 5984; 8.8 km S of the new road turnoff to the Jardine Ferry on the Telegraph Line road, c. 2 km N of Sailor Creek, 11°31'S, 142°26'E, Mar 1992, *Clarkson* 9288 & *Neldner**; 6 km SSE of Jardine River mouth, Starke Pastoral Holding, 14°42'S, 144°57'E, Oct 1992, *Fell* DGF2646 & *Stanton*; Silver Plains, E of Scrubby Creek crossing, E fall of McIlwraith Range, 13°43'S, 143°29'E, Jun 1995, *Forster* PIF17007*; Bolt Head, 12°15'S, 143°05'E, Jun 1996, *Gray* 6848 (QRS); cult. QRS Arboretum, Atherton, Jan 1999, *Gray* 7417* (QRS); cult. QRS Arboretum, Atherton, Jan 2000, *Gray* 7741[a] (QRS); off Nesbit River road, Silver Plains, 13°46'S, 143°29'E, Sep 1999, *Holmes* 108 (QRS); 8.8 km S of New Road turnoff, on Peninsula Development road, near microwave tower, 11°32'S, 142°26'E, Mar 1992, *Johnson* 5076*; Turtle Head Island, 10°56'S, 142°41'E, May 1995, *Le Cussan* 428; Mouth of Jardine

River, 10°56'S, 142°14'E, Feb 1983, *Morton* AM1786 & *Hiddins*; Heathlands, 11°42'S, 142°39'E, Sep 1989, *Sankowsky* 956; Hoop Pine area near McIvor, Sep 1960, *Smith* 11143; 10 km S of Christmas Creek, S of Holroyd River, 14°24'S, 141°34'E, Sep 1974, *Tracey* 14244; Quintil Beach, N of road from Lockhart River settlement, 12°50'S, 143°22'E, Nov 1977, *Tracey* 14361; N of Olive River near mouth, 12°07'S, 143°05'E, Sep 1974, *Tracey* 14478; 5 miles N of crossing on Massey Creek on road between Silver Plains Station and Rocky River, 13°50'S, 143°29'E, Oct 1969, *Webb & Tracey* 9724.

***Distribution and habitat*:** According to Green (1984), *Jasminum longipetalum* is widespread in Malesia from Malaysia, the Philippines and New Guinea. It has usually been recorded from rainforest or open woodland (savannah) communities in Queensland where it is widespread from Torres Strait, south to the McIvor River.

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References

Forster, P.I. (1994). Oleaceae. In R.J.F.Henderson (ed.), *Queensland Native and Naturalised Vascular Plants,* pp. 221–222. Brisbane: Queensland Department of Environment and Heritage.

Green, P.S. (1984). A revision of *Jasminum* in Australia. Allertonia 3: 403–438.

Harris, W.K. (1997). Oleaceae. In R.J.F.Henderson (ed.), *Queensland Plants: names and distribution,* pp. 138–139. Brisbane: Department of Environment.

Harris, W.K. (2002). Oleaceae. In R.J.F.Henderson (ed.), *Names and Distribution of Queensland Plants, Algae and Lichens,* p. 133. Brisbane: Environmental Protection Agency.

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Note

Lepisanthes senegalensis (Juss. ex Poir.) Leenh. (Sapindaceae), a new generic and specific record for Queensland

The genus *Lepisanthes* Blume has a wide distribution in the Old World tropics in Africa, Madagascar, Asia, Malesia and northwestern Australia (Reynolds 1985; Leenhouts 1994). A single non-endemic species, *Lepisanthes rubiginosa* (Roxb.) Leenh. has been recorded from the Kimberley region (Reynolds 1985), but is otherwise known from mainland Asia and Malesia (Leenhouts 1994).

In 1994, B.Hyland, formerly botanist at the Australian National Herbarium (QRS) collected an unknown Sapindaceae near Portland Roads on Cape York Peninsula, Queensland. These initial fruiting collections were filed at QRS as *Mischocodon* sp. ? (Claudie River BH 15243) and have also been referred to as *Glenniea* sp. (Claudie River BH 15243). A recent collection of flowering material (*Holmes* 200) enabled a tentative generic identification of *Lepisanthes* to be made. This was then corroborated by comparison with collections of *Lepisanthes* species at BRI, with the conclusion that the Australian collections were conspecific with *L. senegalensis* (Poir) Leenh. *s.l.*

Lepisanthes senegalensis is a variable 'superspecies' and encompasses an extensive list of synonymous taxa (Leenhouts 1969, 1994). The 'superspecies' has an extensive distribution in the Old World tropics, being found in tropical Africa, Madagascar, Sri Lanka, the Indian subcontinent, Indo-China and Malesia. It is widespread in New Guinea, with herbarium collections from the southern part of Papua New Guinea in Central, Milne Bay and Western Provinces, in close geographic proximity to north-eastern Australia. Leenhouts (1969) admitted that his polyglot concept for *Lepisanthes senegalensis* may not please everyone "especially for botanists working on the flora of a restricted region....[with]....two or more locally clearly distinguishable forms". In the advent that a narrower specific concept is taken for the populations in Australia and New Guinea, then the name *Sapindus cuspidata* Blume based on a *Zippelius* type from New Guinea would have to be considered.

A comprehensive generic description for *Lepisanthes* and a species description for *L. senegalensis s.l.* is given by Leenhouts (1994). Illustrations of fruiting material from the Australian population are appearing in the forthcoming book on Australian rainforest fruits by W. & W.T. Cooper.

Lepisanthes senegalensis (Juss. ex Poir.) Leenh., Blumea 17: 85 (1969). *Sapindus senegalensis* Juss. ex Poir., Encycl. 6: 666 (1805); *Aphania senegalensis* (Juss. ex Poir.) Radlk, Sitzungsber. Math.-Phys. Cl. Konigl. Bayer. Akad. Wiss. Munchen 8: 238 (1878). **Type:** Senegal, 30 Sept. 1788, *M. Geoffroy s.n.* (holo: P-JUSSIEU 11386 [3 sheets]; fiche at BRI!).

A comprehensive list of synonyms is given by Leenhouts (1994).

Specimens examined **(all BRI): Philippines.** Samar, Apr 1914, *Ramos* BS1634. **Indonesia.** SW of Tg. Parat, Pulau Panaitan (Prinseneiland), Sep 1951, *v. Borssum Waalkes* 676; SW Java, Udjung Kolon Reserve, Tjibunar, Nov 1960, *Kostermans* UNESCO 96; Gn. Klatakan, W. Bali, Oct 1985, *van Balgooy* 5246; Pulau Kobroor, 6°15'S, 134°17'E, Nov 1994, *van Balgooy* 6856. **Papua New Guinea.** Central Province: near Matapaili Village, Kairuku subdistrict, Jul 1962, *Darbyshire* 690; Fife Bay, Oct 1930, *Turner* 24. Madang Province: Gogol River, 5°10'S, 145°25'E, Sep 1969, *Katik* NGF46582; Josephstaal, 4°45'S, 145°00'E, Sep 1958, *White* NGF10247. Morobe Province: McAdam Park, East of Wau, 7°20'S, 146°45'E, Dec 1965, *Frodin & Hill* NGF26378; Garagos Creek, 6°40'S, 146°50'E, Oct 1971, *Womersley* NGF43866. West New Britain Province: 32 km SW of Linga Linga Plantation, 5°45'S, 149°35'E, May 1973, *Isles & Katik* NGF32271. Milne Bay Province: Sabari Is, 11°05'S, 153°05'E, Nov 1965, *Henty* NGF27124; along Dahi River, c. 4 km W of Tapio, Cape Vogel Peninsula, Jul 1954, *Hoogland* 4356; Miadaba, Normanby Island, Esa'ala subdistrict, 9°50'S, 150°50'E, Oct 1971, *Streimann & Lelean* LAE 52599; Biniguni – Maneau track, 9°38'S, 149°18'E, Jul 1972, *Streimann* NGF28806. Western Province: Fly River, c. 4 miles above Kiunga, 6°05'S, 141°15'E, *Henty &*

Barlow NGF42977; Middle Fly River, 7°06'S, Sep 1967, *Pullen* 7408. **Australia.** Cook District: Chili Creek, Portland Roads road, Aug 2002, *Holmes* 200; Chili Creek, 12° 39'S, 143° 23'E, Dec 1994, *Hyland* 15243, 15244.

***Typification*:** Leenhouts (1969) has listed the type for *Sapindus senegalensis* as "*Adanson & Geoffroi fils in herb. Jussieu n. 11386,* Senegal (P, not seen)" and in (1994) as "*Adanson & Geoffroi f. s.n.* (P, Herb. Jussieu 11386), Senegal". Perusal of the fiche of the three sheets under this number in the Jussieu herbarium, do not indicate any mention of Adanson as a collector. The date 30 Sept. 1788 is also given on the sheets, and is taken here as the date of actual collection in Senegal.

***Notes*:** The presence of this species at Chili Creek, is a further indication of the unusual nature of this locality, both for the presence of this species, and for *Croton caudatus* Geisel, otherwise known from other parts of Malesia and Asia (Forster 2003). The presence of both these species at this site, indicate either an anthropogenic mediated introduction at some time, or long range dispersal. It is unlikely that the populations represent relics from a formerly more widespread occurrence in Australia, as otherwise both should be found in other similar habitats on Cape York Peninsula. *Lepisanthes senegalensis* is used widely as a source of timber and medicine, it also has edible fruit (Leenhouts 1994). Hence it may well have been introduced to this locality either deliberately or inadvertently.

***Distribution and habitat*:** In Australia this species has been collected only at Chili Creek near Portland Roads from 'gallery rain forest' at an estimated altitude of 10 m. This habitat is below the level of annual wet season floods and is inundated on an irregular basis.

***Conservation status*:** The Australian occurrence of this species is apparently a single population, where the species is locally common. Whilst it cannot be considered as an endangered species on a world-wide scale, the restricted Australian occurrence has to be assessed for listing as endangered for the same reasons as the single populations of *Croton choristadenius* K.Schum. and *C. caudatus* (Forster 2003).

References

Forster, P.I. (2003). A taxonomic revision of *Croton* L. (Euphorbiaceae) in Australia. *Austrobaileya* 6: 349–436.

Leenhouts, P.W. (1969). A revision of *Lepisanthes* (Sapindaceae). *Blumea* 17: 3–91.

Leenhouts, P.W. (1994). *Lepisanthes* (Sapindaceae). *Flora Malesiana* ser. 1. 11(3): 627–653.

Reynolds, S.T. (1985). Sapindaceae. In A.S.George (ed.): *Flora of Australia* 4–114, 164. Canberra: Australian Government Publishing Service.

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Note

Steinchisma laxa (Sw.) Zuloaga, the correct name for *Cliffordiochloa parvispiculata*

B.K.Simon

In a recent paper describing the new South American panicoid genus *Canastra* (Morrone *et al.* 2001) the authors suggested that the genus *Cliffordiochloa* (Simon 1992) is likely to be conspecific with *Panicum laxum*, a C_3 species from South America. I have followed up this suggestion at the Queensland Herbarium, by comparing material of the 12 sheets of *Panicum laxum* in the BRI exotic collection with type material of *Cliffordiochloa parvispicula* and was able to confirm the authors to be correct.

The genus *Panicum*, as currently circumscribed is still highly polyphyletic (Aliscioni *et al.* 2003, Zuloaga *et al.* 2000), despite the considerable reduction in species numbers over the last two centuries with the segregation of groups of species into separate genera (Chase 1911, Palisot de Beauvois 1812, Stapf 1919–1920, Hughes 1923, Stapf & Hubbard 1930–1934). Further nomenclatural changes have been made for some of the clades discovered within the genus in more recent times. Zuloaga (1987) listed six subgenera of *Panicum* from the New World and of these *Phanopyrum, Dichanthelium* and *Steinchisma* have been elevated to generic rank by various authors (Aliscioni *et al.* 2003). *Megathyrsus* is elevated to generic rank in the current issue of this journal (Simon & Jacobs 2003).

In a recent update on the current status of *Panicum* worldwide (Aliscioni *et al.* 2003) it is recommended that the name *Panicum* be restricted to the subgenus *Panicum*, which is monophyletic and consists of five sections. Of the former members of the subgenus *Phanopyrum* in the sense of Zuloaga (1987), only one is retained in the genus *Phanopyrum*, with the remainder of the species needing to be segregated from *Panicum s.l.* "as new genera or within existing genera of the Paniceae" (Aliscioni *et al.* 2003). In the latter treatment the genus *Dichanthelium* is represented by 55 New World species and *Steinchisma* by seven New World species. The latter includes *Panicum laxum*, the type species of sect. *Laxa* of the subgenus *Phanopyrum* of Zuolaga (1987). On the basis of morphology (enlargement of the lower palea and the upper floret with compound papillae) and molecular evidence this species falls within the *Steinchisma* clade both on cladistic (Zuluoaga 1992) and phenetic (Zuluoaga *et al.* 1993) analyses.

S. laxa is the second member of the New World genus *Steinchisma* to be recorded in Australia and its presence is similar to a previous report of another American panicoid grass, *Steinchisma hians* (Elliot)Nash, originally nominated as the Australian endemic genus *Fasciculochloa* (Simon & Weiller 1995) and later synonymised (Simon 1999). Thus far only two naturalised specimens of *Steinchisma laxa* have been collected in Australia from one locality, Mena Creek Valley, North Queensland, where it is confined to water channels, although forming a "thick mat and spreading quickly". Given its potential to become a weed this species in North Queensland should be monitored for distribution and spread since first recorded in 1983.

A prostrate form of this species was introduced from Colonia Benitez, Argentina in 1971 by CSIRO under CPI53932 and selected by J.R.Wilson as having potential as a turf grass for shaded conditions, as *cv.* 'Shadegro' (Anon. 1994). It is presently established in a small area of the Brisbane Botanic Gardens, Mt Coot-tha.

References

Aliscioni, S.S., Giussani, L.M., Zuloaga, F.O., Kellogg, E.A. (2003). A molecular phylogeny of *Panicum* (Poaceae: Paniceae): Tests of monophylly and phylogenetic placement within the Painicoideae. *American Journal of Botany* 90: 796–821.

ANONYMOUS (1994). Panic Grass, *Panicum laxum* 'Shadegro' breeder's reference 'CPI53932'. *Plant Varieties Journal* 7:43–44.

CHASE, A. (1911). Notes on Genera of the Paniceae IV. *Proceedings of the Biological Society of Washington* 24: 103–160.

HUGHES, D.K. (1923). The genus *Panicum* of the Flora Australiensis. *Bulletin of Miscellaneous Information Royal Botanic Gardens, Kew,* 305–332

MORRONE, O., ZULOAGA, F.O., DAVIDSE, G, FILGUERAS, T.S. (2001). *Canastra*, a New Genus of Paniceae (Poaceae, Panicoideae) Segregated from *Arthropogon*. *Novon* 11: 429–436

PALISOT DE BEAUVOIS, A. M. F. J.(1812). *Essai d'une nouvelle Agrostographie ou nouveaux genres des Graminées*. Imprimerie de Fain, Paris

SIMON, B.K. (1992). Studies in Australian grasses. 6. *Alexfloydia, Cliffordiochla* and *Dallwatsonia*, three new panicoid genera from eastern Australia. *Austrobaileya* 3: 669–681.

SIMON, B.K. (1999). *Steinchisma hians* (Elliot)Nash, the correct name for *Fasciculochloa sparshottiorum* B.K.Simon & C.M.Weiller. *Austrobaileya* 5: 583–584.

SIMON, B.K. & JACOBS, S.W.L. (2003). *Megathyrsus*, a new generic name for *Panicum* subgenus *Megathyrsus*. *Austrobaileya* 6: 571–574.

SIMON, B.K. & WEILLER, C.M. (1995). *Fasciculochloa*, a new grass genus (Poaceae:Paniceae) from south-eastern Queensland. *Austrobaileya* 4: 369–379.

STAPF, O (1919–1920). *Gramineae* in *Flora of Tropical Africa*, 1-768, ed D.Prain. London, L.Reeve.

STAPF, O & HUBBARD, C.E. (1930–1934). *Gramineae* in *Flora of Tropical Africa*, 769–1132, ed D.Prain. London, L.Reeve.

ZULOAGA, F.O. (1987). Systematics of New World species of *Panicum* (Poaceae:Paniceae), pp 287–306 in Soderstrom, T.R., Hilu, K.W., Campbell, C.S., Barkworth, M.E (eds), *Grass Systematics and Evolution*. Washington DC., Smithsonian Institution Press.

ZULOAGA, F.O., ELLIS, R.P., MORRONE, O. (1992). A revision of *Panicum* subgenus *Phanopyrum* section *Laxa* (Poaceae: Panicoideae: Paniceae). *Annals of the Missouri Botanical Garden* 79: 770–818.

ZULOAGA, F.O., DUBCOVSKY, J. & MORRONE, O.(1993). Infrageneric phenetic relations in New World *Panicum* (Poaceae: Panicoideae: Paniceae): a numerical analysis. *Canadian Journal of Botany* 71: 1312–1327.

ZULOAGA, F.O., MORRONE, O., GIUSSANI, L.M. (2000). A cladistic analysis of the Paniceae: a preliminary approach pp.123–135 in Jacobs, Surrey W. L., Everett, Joy (eds) *Grasses, Systematics and Evolution.* Collingwood, CSIRO Publishing

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Note

The puzzle of *Eucalyptus hemilampra* F.Muell. (Myrtaceae)

Introduction

Ferdinand Mueller made many hundreds of collections of plant species from all families while he was botanist for the Gregory expedition to northern Australia in 1855–56. Not surprisingly, most of Mueller's collections were of undescribed species, which were described in his Fragmentae Phytographiae Australiae, but the eucalypts he treated separately in a monograph. His important paper on tropical and subtropical eucalypts, describing many new species, was published in 1858. Among them was *Eucalyptus hemilampra*, collected in December 1856, during the very last stages of the expedition as it approached Brisbane.

The expedition's route through south-eastern Queensland included Boondooma, Taabinga, Nanango, Colinton, Kilcoy and Caboolture (Gregory & Gregory 1884), and then to Brisbane. *E. hemilampra* was supposedly collected 'at woodland rivulets and torrents along parts of the upper Brisbane River' (Mueller 1858). Mueller (l.c.) stated that *E. hemilampra* has smooth bark, and that the tree is similar to *E. tereticornis*.

Bentham (1867) allied *E. hemilampra* with the rough-barked *E. resinifera* Sm., making it a synonym of his new variety *E. resinifera* var. *grandiflora* Benth., which he based on Mueller's collection and two others from the Sydney area.

The affinity suggested by Bentham obviously did not sit well with Mueller, for in his 'Eucalyptographia' (Mueller 1879), he considered *E. hemilampra* to be a variety of *E. saligna* Sm., again emphasising that *E. hemilampra* is a smooth-barked taxon.

All other subsequent botanists followed Bentham's opinion by submerging *E. hemilampra* under *E. resinifera*. Maiden (1917) synonymised *E. resinifera* var. *grandiflora* (and hence *E. hemilampra*) with *E. resinifera*. Domin (1928) reinstated the taxon as *E. resinifera* var. *hemilampra*, Chippendale (1988) again made it a synonym, while Johnson & Hill (1990) accorded the taxon subspecies rank, as *E. resinifera* subsp. *hemilampra*.

The puzzle

Because Mueller's protologue for *E. hemilampra* described the tree as smooth-barked (*E. resinifera* is rough-barked), and because there is no known occurrence of *E. resinifera* anywhere in the upper reaches of the Brisbane River, I decided that the matter needed further investigation.

If the bark character is ignored, the description in the protologue matches *Eucalyptus resinifera* well. However, it also matches *E. longirostrata* (Blakely) L.A.S.Johnson & K.D.Hill, a smooth-barked "Grey Gum" tree common in the Blackbutt-Benarkin-Yarraman district at the upper reaches of the Brisbane River, except that the fruits of *E. longirostrata* are somewhat larger than the measurement given by Mueller.

I have received on loan, a type specimen of *E. hemilampra* from MEL (labelled as holotype). However, it is imperfect. It comprises a flowering branchlet with senescing stamens but without any fruits or opercula. High quality images recently received of a type at Kew revealed a much more complete specimen with intact buds, open flowers and some fruits in a packet. There is no doubt that the flowering specimen at Kew, and the one at Melbourne, *do* represent *Eucalyptus resinifera*. Some of the diagnostic features visible on one or both types are the very glossy adaxial leaf surface (not very glossy in *E. longirostrata*), the conical operculum (rostrate in *E. longirostrata*), the often 9-flowered umbels (never more than 7-flowered in *E. longirostrata*) and the stamens erect in bud (completely inflexed in *E. longirostrata*). Brooker & Kleinig (1999) have

incorrectly coded this last character for *E. resinifera*.

A further complication is that the fruits in the packet on the Kew sheet belong to *E. grandis* W.Hill, judging by their size, shape, the hint of glaucousness, the incurved exserted valves and the short pedicels.

The puzzle is this. Mueller stated that *Eucalyptus hemilampra* is a smooth-barked tree that comes from the upper Brisbane River. This indicates that the Grey Gum, now known as *E. longirostrata*, was the species Mueller originally intended as his new species. But the type specimens represent *E. resinifera*, a completely rough-barked tree, and *E. grandis*. Neither of these species occurs in the upper Brisbane River area.

The hypothesis

I believe that Mueller confused the species now known as *E. longirostrata* and *E. grandis*, and I contend that Mueller's extant collections must have been made between Caboolture and Brisbane (where both *E. resinifera* and *E. grandis* are common).

According to my hypothesis, the chain of events is as follows:

Mueller reaches the upper Brisbane River [around Yarraman and Benarkin] and sees *E. longirostrata*. He decides it is a new species and coins the name *E. hemilampra*. But due to lack of time or excessive tree height, he is unable to collect a specimen.

A few days later, he observes *E. grandis* [between Caboolture and Brisbane] and considers it to be the same species as he earlier observed [Mueller's broad species concept is amply evident in Eucalyptographia]. He collects fruits from the ground under the tree as it is too tall [loose *E. grandis* fruits in packet of the Kew type], and collects a windfall flowering specimen, which he believes to be from the same species [actually *E. resinifera*, which does flower in December around Brisbane, and which often grows in association with *E. grandis*; violent summer storms could easily fling small branchlets many metres from the parent tree]. This hypothesis explains the make-up of the types at MEL and K, and explains Mueller's life-long belief that *E. hemilampra* was smooth-barked. It does not explain the lack of mention of a second collection site for *E. hemilampra*, but locality precision was not a big issue in the 1850's and Mueller probably didn't think it worthy of mention.

The protologue for *E. hemilampra* includes characters relating to the operculum and the fruits, which are present only on the sheet now at K. Hence that sheet is nominated as lectotype, and the MEL sheet as isolectotype.

There does not seem to be any firm basis for recognising *E. hemilampra* as a subspecies, as was proposed by Johnson & Hill (1990). They provided a key to the subspecies based on operculum length and peduncle length. Material from southern Queensland does seem to have longer operculae than central New South Wales material (as Johnson & Hill said), but northern N.S.W. material appears intermediate. The peduncle length character does not hold, as specimens from near Sydney have been observed to have peduncles up to 24 mm long.

Eucalyptus resinifera Sm. in J. White, John Whites Voyage 231 (1790). **Type:** New South Wales. Port Jackson, undated, *J. White s.n.* (iso: BM).

Eucalyptus hemilampra F.Muell., J. Linn. Soc., Bot. 3: 85–6 (1858); *E. resinifera* var. *hemilampra* (F.Muell.) Domin, Biblioth. Bot. 89: 468 (1928); *E. resinifera* subsp. *hemilampra* (F.Muell.) L.A.S.Johnson & K.D.Hill, *Telopea* 4(1): 46 (1990). **Type:** [Queensland.] 'upper Brisbane River', [December 1856], *F. Mueller* (**lecto:** (here chosen) K, excluding fruits in packet; isolecto: MEL).

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References

BENTHAM, G. (1867). *Flora Australiensis* Volume 3, p. 245–6. London: L. Reeve & Co.

BROOKER, M.I.H. & KLEINIG, D.A. (1999). *Field Guide to Eucalypts Volume 1, South-eastern Australia*, 2nd edition. Hawthorn: Bloomings Books.

CHIPPENDALE, G.M. (1988). *Eucalyptus, Angophora* (Myrtaceae). In A.S.George (ed.): *Flora of Australia* Vol. 19.

DOMIN, K. (1928). *Eucalyptus.* Beitrage zur Flora und Pflanzengeographie Australiens. *Bibliotheca Botanica* 89: 460–470.

GREGORY, A.C. & GREGORY, F.T. (1884). *Journals of Australian Explorations by A.C. and F.T. Gregory*. J.C. Beal, Brisbane: Government Printer.

JOHNSON, L.A.S. & HILL, K.D. (1990). New taxa and combinations in *Eucalyptus* and *Angophora* (Myrtaceae). *Telopea* 4(1): 37–108.

MAIDEN, J.H. (1917). *A Critical Revision of the genus Eucalyptus* 3: 209. Sydney: Government Printer.

MUELLER, F. (1858). Monograph of the *Eucalypti* of Tropical Australia; with an arrangement for the use of Colonists according to the Structure of the Bark. *J. Linn. Soc., Bot.* 3: 81–101.

MUELLER, F. (1879). *Eucalyptographia, a descriptive atlas of the Eucalypts of Australia and the adjoining islands, Decade II.* Melbourne: Government Printer.

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Austrobaileya 6 (3): 567–569 (2003)

Note

New combinations in *Lycianthes* (Dunal) Hassl. (Solanaceae) for New Guinea and Australia

Lycianthes (Dunal) Hassl. was erected as a genus by Hassler (1917), and greatly expanded in circumscription by Bitter (1920), but for many years subsequently, *Lycianthes* was treated as a subgenus or section of the huge genus *Solanum* L.

Symon & Clarkson (1985) discussed the status of *Lycianthes* and concluded that while some authors were using *Lycianthes* at generic rank, they preferred to accept it at a lower rank, because of a lack of distinguishing features. Symon (1985) followed the same course.

However, since the early 1970's, increasing numbers of publications have advocated generic status for *Lycianthes* (e.g. D'Arcy 1973; Deb 1980; D'Arcy 1986; Benitez de Rojas & D'Arcy 1997). The anatomical study by D'Arcy (1986) showed that the calyx of *Lycianthes* is quite unlike *Solanum sens. str.* but very similar to *Capsicum* L.

The molecular studies of Olmstead & Palmer (1992) and Olmstead *et al.* (1999) have produced cladograms where *Lycianthes* clusters with *Capsicum*, and where *Solanum sens. str.* comprises a separate clade. *Lycianthes* is now widely accepted as a genus by botanists in the New World, where the great majority of species occur.

This note provides new combinations for species occurring in Irian Jaya, Papua New Guinea and Australia. For several New Guinea species, combinations under *Lycianthes* already exist.

Lycianthes belensis (Merr. & L.M.Perry) A.R.Bean, **comb. nov.**

Solanum belense Merr. & L.M.Perry, J. Arnold Arbor. 30: 50–1 (1949). **Type:** Irian Jaya. Bele River, 18 km NE of Lake Habbema, November 1938, *L. Brass* 11223 (holo: A; iso: BM, L).

***Distribution*:** Endemic to the island of New Guinea; known from Irian Jaya and Papua New Guinea.

Lycianthes bitteriana (Symon) A.R.Bean, **comb. nov.**

Solanum bitterianum Symon, J. Adelaide Bot. Gard. 8: 34–6 (1985). **Type:** Papua New Guinea. C.N.G.T. Logging area, Stoney Creek, foot of Mt Missim (near Bulolo), 1 May 1977, *D.E. Symon* 10651 & *A. Kairo* (holo: ADW; iso: CANB, F, K, L, LAE, MO, US).

***Distribution*:** Endemic to the island of New Guinea; known from Papua New Guinea.

Lycianthes dendropilosa (Symon) A.R.Bean, **comb. nov.**

Solanum dendropilosum Symon, J. Adelaide Bot. Gard. 8: 44 (1985). **Type:** Papua New Guinea. near Kepilam village, Lagaip Valley, Laiagam, Western Highlands, 2 August 1960, *R.D. Hoogland & R.Schodde* 7291 (holo: CANB; iso: BM, BRI, L, LAE, US).

***Distribution*:** Endemic to the island of New Guinea; known from Papua New Guinea.

Lycianthes multifolia (Merr. & L.M.Perry) A.R.Bean, **comb. nov.**

Solanum multifolium Merr. & L.M.Perry, J. Arnold Arbor. 30: 50 (1949). **Type:** Irian Jaya. 6 km SW of Bernhard Camp, Idenburg River, February 1939, *L. Brass* 12907 (holo: A; iso: BM, BRI, L, LAE).

***Distribution*:** Endemic to the island of New Guinea; known from Irian Jaya.

Lycianthes peranomala (Wernham) A.R.Bean, **comb. nov.**

Solanum peranomalum Wernham, Trans. Linn. Soc. London, Bot. 9: 119 (1916). **Type:** New Guinea. Mt Carstensz, undated, *C.B.Kloss* (holo: BM).

***Distribution*:** Endemic to the island of New Guinea; known from Irian Jaya.

Lycianthes pustulata (Symon) A.R.Bean, **comb. nov.**

Solanum pustulatum Symon, J. Adelaide Bot. Gard. 8: 58, 60 (1985). **Type:** Papua New Guinea. confluence of Warapuri and Warrangga Rivers, Wahgi-Jimi Divide, north of Nondugl, Minj sub-dist., Eastern Highlands, 5 September 1963, *P. van Royen* NGF18229 (holo: BRI; iso: K, L, LAE).

***Distribution*:** Endemic to the island of New Guinea; known from Papua New Guinea.

Lycianthes rostellata (Merr. & L.M.Perry) A.R.Bean, **comb. nov.**

Solanum rostellatum Merr. & L.M.Perry, J. Arnold Arbor. 30: 51–2 (1949). **Type:** Papua New Guinea. East Mt Tafa, Central Division, May 1933, *L. Brass* 4135 (holo: A; iso: BRI, L, NY).

***Distribution*:** Endemic to the island of New Guinea; known from Papua New Guinea.

Lycianthes shanesii (F.Muell) A.R.Bean, **comb. nov.**

Solanum shanesii F.Muell., Fragm. 6: 144 (1868). **Type:** Queensland. Rockhampton, 25 February 1868, *P. O'Shanesy* (lecto: MEL [MEL 12404]), *fide* Symon, J. Adelaide Bot. Gard. 3: 136 (1981).

***Distribution*:** Endemic to Queensland. The distribution map of Symon & Clarkson (1985) shows a large disjunction between occurrences at Rockhampton and Cape York Peninsula, but the species is now known to occur more or less continuously from the Torres Strait to around Gladstone. *L. shanesii* is the only known species of *Lycianthes* in Australia.

Lycianthes umbonata (Symon) A.R.Bean, **comb. nov.**

Solanum umbonatum Symon, J. Adelaide Bot. Gard. 8: 63, 65 (1985). **Type:** Papua New Guinea. Edie Creek, c. 4 miles [6 km] SW of Wau, Morobe district, 26 April 1963, *T. Hartley* 11756 (holo: CANB; iso: BRI, L, LAE).

***Distribution*:** Endemic to the island of New Guinea; known from Papua New Guinea.

Lycianthes vitiensis (Seem.) A.R.Bean, **comb. nov.**

Solanum vitiense Seem., J. Bot. 1: 206 (1863), Fl. Vit. 176, t. 36 (1866). **Type:** Ovalau, Fiji Islands, July & October 1860, *B. Seemann* 340 (holo: K (2 sheets); iso: BM, GH, MEL, NSW, OXF).

***Distribution*:** Found in Papua New Guinea (Bougainville only), Solomon Islands, Fiji, Samoa and Tonga.

Lycianthes wollastonii (Wernham) A.R.Bean, **comb. nov.**

Solanum wollastonii Wernham, Trans. Linn. Soc. London, Bot. 9: 120 (1916). **Type:** New Guinea. Camp VIII–IX, [Mt Carstensz], undated, *C.B. Kloss* (holo: BM).

***Distribution*:** Endemic to the island of New Guinea; known from Irian Jaya.

References

Benitez De Rojas, C. & D'Arcy, W.G. (1997). The genus *Lycianthes* (Solanaceae) in Venezuela. *Ann. Missouri Bot. Gard.* 84: 167–200.

Bitter, G. (1920). Die Gattung *Lycianthes*. *Abh. Naturwiss. Vereine Bremen* 24: 292–520.

D'Arcy, W.G. (1973). Flora of Panama. Family 170, Solanaceae. *Ann. Missouri Bot. Gard.* 60: 573–780.

D'Arcy, W.G. (1986). The calyx in *Lycianthes* and some other genera. *Ann. Missouri Bot. Gard.* 73: 117–27.

Deb, D.B. (1980). Enumeration, synonymy and distribution of the Solanaceae in India. *J. Econ. Taxon. Bot.* 1: 33–54.

Hassler, E. (1917). Solanaceae. Austro-Americanae. *Annuaire Conserv. Jard. Bot. Genève* 20: 173–83.

Olmstead, R.G. & Palmer, J.D. (1992). A chloroplast DNA phylogeny of the Solanaceae: subfamilial relationships and character evolution. *Ann. Missouri Bot. Gard.* 79: 346–60.

Olmstead, R.G., Sweere, J.A., Spangler, R.E., Bohs, L. & Palmer, J.D. (1999). Phylogeny and provisional classification of the Solanaceae based on chloroplast DNA. In: M. Nee, D.E. Symon, R.N. Lester & J.P. Jessop (eds). *Solanaceae IV*, pp. 111–137. Royal Botanic Gardens, Kew.

SYMON, D.E. & CLARKSON, J.R. (1985). The Reinstatement of *Solanum shanesii* F.Muell. Section *Lycianthes* (Solanaceae) with discussion of its significance. *J. Adelaide Bot. Gard.* 7: 201–6.

SYMON, D.E. (1985). The Solanaceae of New Guinea. *J. Adelaide Bot. Gard.* 8: 1–171.

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Note

Megathyrsus, a new generic name for *Panicum* subgenus *Megathyrsus*

The pasture grass *Panicum maximum* Jacq. and its many cultivars are widely known in the tropics and subtropics as pasture grasses, that have also become environmental weeds in many places. This species, together with a lesser known African species *P. infestum*, is unique among all other *Panicum* species in having a transversely rugose upper lemma and palea together with the fact that it is a C_4 grass with a PCK physiological subtype of the Kranz syndrome (Brown 1977, Ellis 1988). For the first of these reasons the species was placed in a separate unranked group *Maxima* (Hitchcock and Chase 1910), assigned sectional rank by Stapf (1920) and Pilger (1931) and a separate subgenus *Megathyrsus* (Pilger 1931). Its distinctness was corroborated by discovery of its C_4 status.

The genus *Panicum* is currently the largest genus of the Poaceae, with about 600 species of worldwide distribution (Zuloaga 1987). Historically the genus has had an even larger number of species, mostly because of a considerable number of genera of the tribe Paniceae had their nomenclatural origins in the genus *Panicum.* Nevertheless, even though many large genera were separated from *Panicum* when the floras and accounts of the tropical and subtropical regions were written in the 19th century (Palisot de Beauvois 1812) and first half of the 20th century (Chase 1911, Stapf 1920, Stapf & Hubbard 1930–1934, Hughes 1923), the residual taxa remaining in the genus, after these major splits, still results in a polyphyletic *Panicum* (Zuloaga *et al.* 2000). Since the major splits from *Panicum* referred to above, there have been some nomenclatural changes, particularly in the New World (Zuloaga 1987, Zuloaga *et al.* 2000, Aliscioni *et al.* 2003), to accommodate the non-monophyletic situation in *Panicum*, although this position has not been universally accepted (Webster 1988). Of the six subgenera of *Panicum* from the New World recognised by Zuloaga (1987) (*Panicum, Agrostoides, Megathyrsus, Phanopyrum, Dichanthelium* and *Steinchisma*) the last three have been recognised as valid genera by various authors, and currently followed for the New World (Barkworth 2003, Soreng *et al.* (ongoing), Aliscioni *et al.* 2003).

Webster (1987), in his treatment of Australian Paniceae transferred *Panicum maximum* and all species of *Brachiaria*, except *Brachiaria eruciformis,* to the genus *Urochloa* on the basis of common features of "numerous spikelet, vegetative and anatomical characters". Zuloaga *et al.* (2000) and Wipff & Thompson (2003) support Webster's decision. The spikelet characters were not specifically mentioned by Webster but they presumably refer to the transverse rugose surface of the upper lemma and palea. On the basis of chloroplast molecular data Giussani *et al.* (2000) and Aliscioni *et al.* (2003), using the *ndh*F gene and Gomez-Martinez and Culham (2000) using the *trn*L-F gene, suggest that *Panicum* subgenus *Megathrysus* is a sister clade to *Urochloa* or *Brachiaria s.l.*. A closer examination of the cladogram, based on morphological data, presented by Zuloaga *et al.* (2000) suggests that they likewise have support for *Panicum maximum* as a sister to *Urochloa*. The data they present do not support inclusion of *P. maximum* in *Urochloa* though, and perhaps they were really more interested in demonstrating its misplacement in *Panicum* and its affinities than in its correct position. In fact if *P. maximum* was included in *Urochloa* using their data, the genus would have to be expanded to include *Eriochloa*, an option that no one has suggested seriously to date. The recent phylogenetic studies of the panicoid grasses based on molecular data using the chloroplast gene *ndh*F by Giussani *et al.* (2001) and Aliscioni *et al.* (2003), results in a phylogeny in which the polyphyletic nature of *Panicum* is well illustrated in their cladograms, with *Panicum* placed throughout the x=9 and x=10 clades. *Panicum maximum* (as *Urochloa maxima*) is placed with species of *Urochloa* (sensu Webster), and *Melinis, Chaetium* and *Eriochloa* are also embedded in the same clade. This even broader interpretation of *Urochloa* seems even less likely to be acceptable.

The open paniculate inflorescence of *Panicum maximum* is found in most other species of *Panicum*, and is a very strong morphological indication that the species should not be transferred to either *Bracharia* (Brown 1977, Guttierrez *et al.* 1976) or *Urochloa* (Webster 1987), which both have a strict paniculate inflorescence (raceme of racemes). Webster's transfer of most species of *Brachiaria* to *Urochloa* has been widely accepted worldwide (Ashalatha 1997, Davidse 1994, Jacobs & Wall 1993, Macfarlane 1992, Morrone *et al.* 1992, Veldkamp 1996b, Wheeler *et al.* 2002, Wipff & Thompson 2003) with the exception of the African floras (Clayton & Renvoize 1982, Clayton 1989, Gibbs-Russell *et al.* 1990), some tropical and South American books (Davidse 1994, Renvoize 1998) and the recent interactive key to Australian grasses (Sharp & Simon 2002). The transfer of *Panicum maximum* to *Urochloa* has not been accepted as readily (Jacobs & Wall 1993, Macfarlane 1992, Morrone *et al.* 1992, Veldkamp 1996a, Wheeler *et al.* 2002). The possession of the PCK C_4 Kranz subtype of leaf anatomy and photosynthetic subtype by *P. maximum* indicates that the retention of the species in the genus *Panicum* does not reflect its relationships well there either.

A solution is to raise the subgeneric name *Megathyrsus* to generic rank, following the trend set by other authors with the genera *Phanopyrum* (Raf.) Nash, *Dichanthelium* (Hitchc. & Chase) Gould and *Steinchisma* Raf. It is considered appropriate to do this at this time so that the new names can be included in the Flora of Australia account of the panicoid grasses.

The genus *Megathyrsus* as currently circumscribed, is limited to the two species, *M. maximus* and *M. infestus*. Previous authors have included within this subgenus other species, both with transversely rugose upper lemmas and paleas (*P. bulbosum* H.B.K. *fide* Hsu 1965) and without the rugose lemmas and paleas (*P. trichocladum* K. Schum, *P. monticola* Hook.f. as *P. transvenulosum* Stapf and *P. funaense* Vanderyst as *P. spongiosum* Stapf *fide* Stapf 1920), but none of these possess the PCK C_4 Kranz subtype of leaf anatomy and photosynthetic subtype, and they are accommodated elsewhere in the genus *Panicum*. There is even molecular evidence that *P. bulbosum* is really a species of *Setaria* (Giussani *et al.* 2001), although, at this stage there is no supporting morphological evidence to back this discovery.

Megathyrsus (Pilger) B.K.Simon & S.W.L. Jacobs, **stat. nov.**

Panicum subgenus *Megathyrsus* Pilg., Notizbl. Bot. Gart. Berlin-Dahlem 104:242 (1931).

Panicum sect. *Maxima* Hitchc. & Chase ex Pilg. Notizbl. Bot. Gart. Berlin-Dahlem 104: 242 (1931).

Panicum sect. *Maximae* Stapf, Fl. Trop. Afr. 9(4): 639, 642 (1920), in part

Panicum (unranked group) *Maxima* Hitchc. N. Amer. Fl. 3(2): 200, 203 (1915).

Megathyrsus maximus (Jacq.) B.K.Simon & S.W.L. Jacobs, **comb. nov.**

Panicum maximum Jacq., Ic. Pl. Rar. 1: 2, t. 13 (1781); *Urochloa maxima* (Jacq.) R.D.Webster, Austral. Paniceae 241 (1987). **Type:** Guadeloupe, Lesser Antilles, *N.J.Jacquin* (holo:W; iso: BM), *fide* F.O.Zuloaga, Darwiniana 22: 24 (1979).

For a complete synonymy of the species see Clayton & Renvoize (1982) and Tropicos (http://mobot.mobot.org/W3T/Search/vast.html)

Megathyrsus maximus var. **pubiglumis** (K.Schum) B.K.Simon & S.W.L. Jacobs, **comb. nov.**

Panicum maximum var. *pubiglume* K.Schum., in Engl., Pflanzenwelt Ost-Afrikas 85 (1895) as "*pubiglumis*". **Type:** West Usambara, Mashewa, Tanzania, *Holst* 8716 (lecto: B, isolecto: K), *fide* J.F.Veldkamp, Blumea 41:197 (1996).

Panicum maximum Jacq. var. *trichoglume* Robyns, Mem. Inst. Roy. Colon. Belge, Sect. Sci. Nat. 1: 31 (1932). *Urochloa*

maxima var. *trichoglume* (Robyns) R.D.Webster, Austral. Paniceae 242 (1987) **Type:** Moanda, Cotier District, Zaire, *Vanderyst* 27725 (lecto: BR), *fide* J.F.Veldkamp, Blumea 41:197 (1996).

The genus *Megathyrsus* as currently circumscribed, is limited to the two species, *M. maximus* and *M. infestus*. Previous authors have included within this subgenus other species, both with transversely rugose upper lemmas and paleas (*P. bulbosum* H.B.K. *fide* Hsu 1965) and without the rugose lemmas and paleas (*P. trichocladum* K. Schum, *P. monticola* Hook.f. as *P. transvenulosum* Stapf and *P. funaense* Vanderyst as *P. spongiosum* Stapf *fide* Stapf 1920), but none of these possess the PCK C_4 Kranz subtype of leaf anatomy and photosynthetic subtype, and they are accommodated elsewhere in the genus *Panicum*. There is even molecular evidence that *P. bulbosum* is really a species of *Setaria* (Giussani *et al.* 2001), although, at this stage there is no supporting morphological evidence to back this discovery. Indeed a close examination of the cladograms and taxonomic results of recent work in the Paniceae indicate that further nomenclatural changes in the genus *Panicum sens. lat.* are likely in the future, as the more species are sampled.

Megathyrsus maximus var. **coloratus** (C.T.White) B.K.Simon & S.W.L. Jacobs, **comb. nov.**

Panicum maximum var *coloratum* C.T.White, Queensland Agricultural Journal 49: 112 (1938). **Type:** Lawnton, near Brisbane (cultivated), *F.B. Coleman* T.167 (holo: BRI).

Megathyrus infestus (Peters) B.K.Simon & S.W.L. Jacobs, **comb. nov.**

Panicum infestum Peters, Reise Mossamb., Bot. 2: 546. (1865). **Type:** Mozambique, Querimba, *Peters s.n.* (iso: K, *n.v.*), *fide* Clayton & Renvoize in Polhill, R.M. (ed). Flora of Tropical East Africa. Gramineae 3: 472 (1982).

References

Aliscioni, S.S., Giussani, L.M., Zuloaga, F.O., Kellogg, E.A. (2003). A molecular phylogeny of *Panicum* (Poaceae: Paniceae): Tests of monophylly and phylogenetic placement within the Painicoideae. *American Journal of Botany* 90: 796–821.

Ashalatha, V.N. & Nair, V.J. (1997). *Brachiaria* Griseb. and *Urochloa* P. Beauv. (Poaceae) in India - a conspectus. *Bulletin of the Botanical Survey of India* 35: 27–31.

Barkworth, M.E. (ed.). (2003). *Manual of Grasses for North America North of Mexico*. University of Utah, Logan. (http://www.herbarium.usu.edu/grassmanual/)

Brown, W.V. (1977). The Kranz syndrome and its subtypes in grass systematics. *Memoirs of the Torrey Botanical Club* 23: 1–97.

Chase, A. (1911). Notes on Genera of the Paniceae IV. *Proceedings of the Biological Society of Washington* 24: 103–160.

Clayton, W.D, (1989). XXIV. *Paniceae* R.Br. in Launert, E. & Pope, G.V. (eds) *Flora Zambaesiaca* 10(3). Flora Zambesiaca Management Committee.

Clayton, W.D. & Renvoize, S.A (1982). Gramineae (Part 3) in Polhill, R.M. (ed). *Flora of Tropical East Africa*. Rotterdam: A.A.Balkema.

Davidse, G. (1994). *Panicum* in Davidse,G., Sousa, M.S. & Chater, A.O. (eds), *Flora Mesoamericana* 6. UNAM, Missouri Botanical Gardden, The Natural History Museum (London).

Ellis, R.P. (1988). Leaf anatomy and systematics of *Panicum* (Poaceae:Panicoideae)in Southern Africa. *Monographs of Systematic Botany of the Missouri Botanical Garden* 25:129–156

Gibbs Russell, G. E., Watson, L., Koekemoer, M., Smook, L., Barker, N., Anderson, H. M. & Dallwitz, M. (1990). Grasses of Southern Africa. *Memoirs of the Botanical Survey of South Africa* 58.

Giussani, L.M., Cota-Sanchez, H., Zuloaga, F.O. & Kellogg, E.A. (2001). A molecular phylogeny of the subfamily Panicoideae (Poaceae) shows multiple origins of C_4 photosynthesis. *American Journal of Botany* 88: 1993–2012.

Gomez-Martinez, R. & Culham, A. (2000) pp.136–140 in Jacobs, Surrey W. L., Everett, Joy (eds) *Grasses, Sytematics and Evolution*. Collingwood: CSIRO Publishing.

GUTIERREZ, MARIA, EDWARDS, G. E. & BROWN, W. V. (1976). PEP Carboxykinase containing species in the *Brachiaria* Group of the Subfamily *Panicoideae*. Biochemical Systematics and Ecology 76:47–49.

HITCHCOCK, A.S. & CHASE, A.. (1910). The North American species of *Panicum*. *Contributions from the U.S. National Herbarium* 15: 396 pp.

HSU, C-C. (1965). The classification of *Panicum* (Gramineae) and its allies, with special reference to the characters of lodicule, style-base and lemma. *Journal of the Faculty of Science, University of Tokyo* 9:43–143.

HUGHES, D.K. (1923). The genus *Panicum* of the Flora Australiensis. *Bulletin of Miscellaneous Information Royal Botanic Gardens, Kew,* 305–332.

JACOBS, S.W.L. & WALL, C.A.(1993). *Urochloa* in Harden, G.J. (ed.) *Flora of New South Wales*, Vol 4. New South Wales University Press.

MACFARLANE, T.D. (1992). *Urochloa* in Wheeler, J.R. (ed.). *Flora of the Kimberley Region.* Western Australian Herbarium, Dept. of Conservation and Land Management.

MORRONE, O. & ZULOAGA, F. O. (1992). Revision de las especies sudamericanas nativas e introducidas de los generos *Brachiaria* y *Urochloa* (Poaceae: Panicoideae: Paniceae) *Darwiniana* 32: 43–109.

PALISOT DE BEAUVOIS, A. M. F. J.(1812). *Essai d'une nouvelle Agrostographie ou nouveaux genres des Graminées*. Paris: Imprimerie de Fain.

PILGER, R. (1931). Bemerkungen zu *Panicum* und verwandten Gattungen. *Notizblatt der Botanischen Gartens und Museums zu Berlin-Dahlem* 104:237–247.

RENVOIZE, S.A. (1998). *Gramineas de Bolivia*. Royal Botanic Gardens, Kew.

SORENG, R.J. , DAVIDSE, G., PETERSON, P.M., ZULOAGA, F.O., FILGUERAS, JUDZIEWICZ, E.J. & MORRONE, O.(onging). *Catalogue of New World Grasses (Poaceae)*. (http://mobot.mobot.org/W3T/Search/nwgc.html)

SHARP, D. & SIMON, B.K. (2002). *AusGrass : Grasses of Australia*. CD Rom & Manual.ABRS and Environment Protection Agency, Queensland. CSIRO Publishing.

STAPF, O (1919–1920). *Gramineae* in *Flora of Tropical Africa*, ed D.Prain. London: L.Reeve.

STAPF, O & HUBBARD, C.E. (1930–1934). *Gramineae* in *Flora of Tropical Africa*, 769–1132, ed D.Prain. London: L.Reeve.

VELDKAMP, J.F. (1996a). Revision of *Panicum* and *Whiteochloa* in Malesia (Gramineae-Paniceae). *Blumea* 41: 181–216.

VELDKAMP, J.F. (1996b). *Brachiaria, Urochloa* (Gramineae-Paniceae) in Malesia. *Blumea* 41:413–437.

WEBSTER, R. D. (1987). *The Australian Paniceae* (*Poaceae*). Stuttgart: J.Cramer.

WEBSTER, R.D. (1988). Genera of the North American Paniceae Poaceae: Panicoideae). *Systematic Botany* 134: 576–609.

WHEELER, D.J.B., JACOBS, S.W.L. & WHALLEY, R.D.B. (2002). *Grasses of New South Wales, Third Edition*. Armidale, University of New England.

WIPFF, J.K. & THOMPSON, R.A. (2003). *Urochloa* P.Beauv. in Barkworth, M.E., Capels, K.M., Long, S. & Piep, M.B. (eds). Flora of North America, Vol. 25. Oxford University Press.

ZULOAGA, F.O. (1987). Systematics of New World species of *Panicum* (Poaceae:Paniceae), pp 287–306 in Soderstrom, T.R., Hilu, K.W., Campbell, C.S., Barkworth, M.E (eds), *Grass Systematics and Evolution*. Washington DC: Smithsonian Institution Press

ZULOAGA, F.O., MORRONE, O., GIUSSANI, L.M. (2000). A cladistic analysis of the Paniceae: a preliminary approach pp.123–135 in Jacobs, Surrey W.L., Everett, J. (eds) *Grasses, Sytematics and Evolution*. Collingwood: CSIRO Publishing.

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Obituary

JOHN W. PARHAM, 1929-2002

John Willoughby Parham, the eldest child of Bayard Eugene Vincent and Dorothy Alice Parham was born in Christchurch, New Zealand, on 30th March 1929. In 1933, the family, now including a sister, Elizabeth, moved to Fiji, largely because of the depression but also because John's grandparents had moved there in 1919 to try to establish a coconut plantation. John's father was appointed Plant Pathologist, Mycologist and Agricultural Officer in the Fiji Department of Agriculture, and stationed at Nadururloulou, a Government 'station' about 17 miles from Suva. Because of poor roads and the necessity to cross a major river on a ferry, John and Elizabeth were taught by correspondence by their mother until the end of Form 1. It was, in his own words, a wonderful childhood, even though it was often a struggle for his parents who had to cope with low depression salaries, poor roads, tank water, no electricity and wood stoves. John then attended the Suva Boys Grammar School as a boarder until the end of his first year, 1941, when the war with Japan meant all the schools were closed. It was decided to send John and sister Elizabeth to boarding school in New Zealand, whilst youngest brother, Peter, remained in Fiji. John was enrolled at the Christchurch Boys High School in 1943. Neither he nor his sister were to see their parents for several years, but they were wonderfully supported by grandparents and the many relatives and friends of their parents then living in New Zealand. These close ties were nurtured throughout John's life.

In 1948, having completed his schooling, John returned to Fiji and joined the Department of Agriculture as a laboratory assistant at the princely salary of £10 per month. He was awarded a Colonial Development and Welfare

Scheme Scholarship and was able to enrol at Auckland University College, University of New Zealand. He later moved to Canterbury University College in Christchurch where he completed his BSc degree before returning to Fiji. In 1953, he was appointed Assistant Botanist in charge of the Fiji Herbarium, but with no one to assist. Eventually he became Senior Botanist, but with no one to be senior over. They were busy, often challenging, but always interesting years, with many varied jobs involving botany, plant introductions, plant quarantine and, sometimes, supervision of cocoa and other research stations. These experiences stood him in good stead for later life where he proved to be very understanding of the problems and challenges of working almost alone with very few resources. Fiji was the country he loved, and the anecdotes from these years that he related in later life to younger colleagues sounded like the stuff of a Somerset Maugham tale. Fiji represents the most enjoyed part of his career.

John Parham at work in the Suva Herbarium in 1967 (with Albert Smith, left, and Dominiko Koroiveibau).

In 1964, John married Margaret Elizabeth Bull, of Dreketi, Vanua Levu, the second biggest island in the Fiji Group. Margaret's parents owned and operated a coconut plantation and timber mill. With her brothers, she had also been taught by their mother and led an idyllic life on the plantation. John and Margaret built a house in the forest at Colo-i-Suva, about eight miles from Suva, a place they greatly loved. Their son and only child, David, was born in 1966.

Botany was very much a part of John's life and heritage. His grandmother, Helena Beatrice Richenda Parham had developed a keen interest in the indigenous flora of Fiji and was the author of numerous publications including *Fiji Native Plants, with their Medicinal and other Uses* (published in 1943). His father was also the author of numerous botanical papers including *Fijian Plant Names* (published in 1942); during his tenure as Director of Agriculture, Forestry and Fisheries in Samoa from 1956 to 1964, he had also written the key volume *Plants of Samoa* (published in 1972). John's uncle, Wilfred Laurier Parham likewise collected and studied the Fiji flora and published numerous papers.

Under John's tenure as Government Botanist in Suva, the Fiji Herbarium was greatly expanded to become a major repository of plants of Fiji and other islands in Polynesia and Melanesia. Fiji was the cross-roads of the Pacific, and John developed many contacts and friendships with the botanists that came to visit. A special friend and collaborator was Albert C. Smith, author of *Flora Vitiensis Nova*, who specifically acknowledges John's encouragement and advice, and for the preparations of the chapter on the Poaceae in the first volume of this major work. John's own publications were many and varied. His interests ranged across many topics, with special emphasis on grasses, weeds and cultivated plants. His greatest published work is his *Plants of the Fiji Islands* (published in 1964 and revised in 1972), an annotated checklist enhanced by several colour plates painted by Margaret, herself an accomplished botanical artist. This monumental work involved consulting widely with authorities on the Pacific flora throughout the world, as well as personal visits to the Smithsonian Institution in Washington DC, University of California and the New York Botanic Garden, U.S.A., the Royal Botanic Gardens at Kew, London, the Bishop Museum, Hawaii, and the Singapore Botanic Gardens. His work took him on other long trips as well, including a six month commission as Plant

Introduction and Exploration Officer to carry out surveys on coconuts and bread fruit in New Guinea, New Hebrides, Tonga, Samoa and other islands.

Independence for Fiji was granted in October 1970. In 1971, John was awarded the Fiji Independence Medal for those who have 'rendered outstanding public service to the country' and to 'mark the great constitutional change which will result in the Independence of Fiji'. However, it had been clear for some time that life would not be easy or straightforward for the old Colonial Service, and after much agonising, John and Margaret determined to leave. After a 'reconnaissance' trip to New Zealand and Australia, they chose to move to Brisbane in December 1970. It took a long time to be rid of the feeling that they were 'displaced persons' but time and their great appreciation of being so warmly accepted soon removed the feeling of isolation from 'home'. In the end John would remark that he was more 'Australian' than many Australians.

John commenced work at the Queensland Herbarium in early 1971 where he undertook a range of curatorial and administrative reponsibilties in the herbarium and library. He also supervised the HERBRECS Project, the initial attempt to computerise the herbarium specimen labels. He remained in this position until 1975 when he accepted an offer to spend a year in Tasmania, preparing a report on the plant collections and making recommendations for the establishment of a State Herbarium. The project was sponsored by the Trustees of the Royal Tasmanian Botanical Gardens and funded by the Australian Biological Resources Study. John thus became effectively the first Curator of what, at his recommendation, became the Tasmanian Herbarium; no doubt his experiences of working alone in Fiji stood him in good stead for this challenge. With Margaret's help, John curated the thousands of long-neglected specimens and instigated the protocols and procedures largely still in place today. He also familiarised himself with the local 'tribal politics', and it was at his recommendation that custodianship of the collection passed to the Trustees of the Tasmanian Museum and Art Gallery. Though many of his other recommendations were never adopted, at least some of the success and security enjoyed today by the Tasmanian Herbarium is due to John's pioneering painstaking efforts.

At the end of 1976, the Parhams returned to Queensland where they lived at Mount Tamborine in the Gold Coast hinterland and spent the next few years growing avocadoes, roses and other cut flowers. These were very happy years in a beautiful part of Australia but, in 1986, the family moved back to Brisbane. Margaret and John worked as Honorary Research Associates at the Queensland Museum and, in due course, John returned to the Queensland Herbarium as an Honorary Research Associate. He worked on the exotic collection which included old plant 'friends' from Fiji. He greatly enjoyed the detective work necessary to try and bring the old plant names up-to-date.

After David settled in Tasmania, John and Margaret became regular visitors every summer, never failing to renew their close friendship with Winifred Curtis and Dennis Morris, who were stalwart Honorary Botanists at the Tasmanian Herbarium, writing the *Students Flora of Tasmania*. In 1993, they moved permanently to Tasmania, settling in Sandy Bay in a comfortable house which afforded grand views of the Derwent Estuary and the passage of shipping to and from the Port of Hobart. Margaret was able to continue painting water colours with much encouragement from local artist friends, whereas John resumed work at the Tasmanian Herbarium as an Honorary staff member. Few institutions can boast having had someone so skilled offering their unpaid services. He greatly enjoyed this work, referring to his Monday session as 'it is really therapy but don't say so or the manager might get the idea to levy a charge'. They made many good friends in Hobart despite the fact that they were really 'foreigners'.

John loved a project, something to get his teeth into, and at length it was the algae collections that caught his fancy. Here were thousands of seaweeds- some beautiful, some valuable and none had been looked at for decades. They were loose in folders, sometimes

with barely legible handwritten labels or numbers. Most of his predecessors had avoided dealing with them for fear of destroying some long-forgotten order they may have been in. Surrounded by books, armed with labels, coloured pens to code the groups and the odd helper, he meticulously sorted the specimens into scientific groups and labelled and numbered them all. This was a task suited to his penchant for accuracy, detective work and order. Just as he thought it was finished, the Herbarium received a major donation of Southern Ocean seaweeds from phycologist Fiona Scott. The task began again, and John greatly appreciated having Fiona's assistance and company as they sorted through the extra several thousand specimens together. In between curation, John maintained his intense interest in the people he worked with, and his working day involved a pilgrimage around most desks and offices to catch up on the latest news. His experience of professional herbarium botany, people and life in general made him an excellent sounding board for ideas, mentor and confidante.

John Parham at work with the algae at the Tasmanian Herbarium in 2000 (assisted by Fiona Scott).

When confronted with failing health, John's love of order saw him prepare a meticulous account of his achievements with his algae project. His report catalogued all the specimens, the methods used to curate them and the references consulted. His recognition that his colleagues might not be quite as ordered as he was meant that he left several copies of his report in different places so that no one absent-minded person would mislay it.

John died on September 27th, 2002, leaving his family and many friends and associates with the fondest of memories of a warm and friendly, gifted man with a great sense of humour and an intense love of life. As a botanist he also left behind a great legacy of his work and interest in the herbaria of Suva, Brisbane and Hobart, and of the colleagues with whom he worked. Generations of botanists in the future will consult the specimens he collected or curated and benefit greatly from the thousands of annotation slips, signed with John's humble hand, and the notes he left behind. Those who worked with him and knew him miss him greatly.

Publications of John W. Parham

Parham, J.W. (1948) The Botanical Gardens, Suva. *Agric. Jour., Fiji* 19 (3&4): 88-105. (Reprinted in 1949 in *Dept. Agric. Bull.* 24:1-18.

Parham, J.W. & Mune, T.L. (1954) Tobacco Weed-Tavako ni Veikau (*Elephantopus mollis* H.B.K.). *Agric. Jour., Fiji* 25 (1): 21-22.

Parham, J.W. & Mune, T.L. (1954) Mint Weed- Tamoli ni Vavalagi (*Hyptus pectinata* (Linn.) Poit.). *Agric. Jour., Fiji* 25 (3&4): 80-81.

Parham, J.W. & Mune, T.L. (1954) Water hyacinth-Bekabekairaga (*Eichhornia crassipes* Solms.). *Agric. Jour., Fiji* 25 (3&4): 82-83.

Parham, J.W. & Mune, T.L. (1955) Johnson Grass-*Sorghum halepense* (Linn.) Pers. A declared noxious weed. *Agric. Jour., Fiji* 26 (1): 30-31.

Parham, J.W. & Mune, T.L. (1955) Prickly solanum-Kausoni - *Solanum torvum* Swartz. A declared noxious weed. *Agric. Jour., Fiji* 26 (3): 86-87.

Parham, J.W. (1955) The collection of plant specimens. *Agric. Jour., Fiji* 26 (1): 9-13.

Parham, J.W. (1956) The Grasses of Fiji. *Agric. Bull. Fiji* 30 (i-x):1-166, pl. I-XIII, figs. 1-61.

Parham, J.W. (1956) Seed germination testing: a preliminary report on the germination rate of Batiki Blue Grass seed. *Agric. Jour., Fiji* 27 (1&2): 24-25.

Parham, J.W. (1956) Navua Sedge. *Agric. Jour., Fiji* 27 (3&4): 94-95.

Parham, J.W., Mune, T.L. & O'Connor, B.A. (1956) Lantana and its control in Fiji. *Agric. Jour., Fiji* 27 (1&2): 28-32.

PARHAM, J.W. & MUNE, T.L. (1956) Guava and its control in Fiji. *Agric. Jour., Fiji* 27 (3&4): 103-108.

PARHAM, J.W. & MUNE, T.L. (1957) Ellington Curse and its control in Fiji. *Agric. Jour., Fiji* 28 (1&2): 24-25.

PARHAM, J.W. & MUNE, T.L. (1957) Muraina Grass and its control in Fiji. *Agric. Jour., Fiji* 28 (3-4): 54-55.

PARHAM, J.W. & MUNE, T.L. (1957) The declared noxious weeds of Fiji and their control. *Agric. Bull., Fiji* 31: 1-73, pl. I-XVIII, figs. 1-16. (revised edition issued in 1958)

PARHAM, J.W. (1957) Botany demonstrations. *Agric. Jour., Fiji* 28 (3&4): 83-85.

PARHAM, J.W. (1959) Plant introduction list no. 6, 1956-1958. *Dept. Agric., Fiji* 1-17.

PARHAM, J.W. (1959) The Suva Botanical Gardens. *Agric. Jour., Fiji* 29 (1): 31-34.

PARHAM, J.W. (1959) A new weed recorded. *Agric. Jour., Fiji* 29 (1): 35.

PARHAM, J.W. (1959) The weeds of Fiji. *Agric. Bull., Fiji* 35 (i-xviii): 1-196, figs. 1-98.

PARHAM, J.W. (1959) Botany notes: Navua Sedge; Batiki Blue Grass. *Agric., Jour. Fiji* 29 (4): 153.

PARHAM, J.W., WHITEHEAD, C.E. & TWYFORD, I.T. (1959) Watershed and rangeland management trials on the Ba Closed Area. *Agric., Jour. Fiji* 29 (1): 43-47.

PARHAM, J.W. (1960) Plant introduction list no. 7, 1959. *Dept. Agric., Fiji* 7–8.

PARHAM, J.W. (1960) The germination of Batiki Blue Grass seed. *Agric. Jour., Fiji* 30 (2): 71.

PARHAM, J.W. (1961) Plant introduction list no. 8, 1960. *Dept. Agric., Fiji* 1–8.

PARHAM, J.W. (1962) Plant introduction list no. 9, 1961. *Dept. Agric., Fiji* 1–10.

PARHAM, J.W. (1963) Plant introduction list no. 10, 1962. *Dept. Agric., Fiji* 1–9.

PARHAM, J.W. (1964) Plant introduction list no. 11, 1963. *Dept. Agric., Fiji* 1–8.

PARHAM, J.W. (1964) *Plants of the Fiji Islands*. Suva: Govt. Printer. i-lv: 1–353, pl. 1, figs 1–104.

PARHAM, J.W. (1965) Plant introduction list no. 12, 1964. *Dept. Agric., Fiji* 1–15.

PARHAM, J.W. (1965) The germination of Nadi Blue Grass seed. Agric. Science I. *Agric. Bull., Fiji* 44: 11.

PARHAM, J.W. (1966) Plant introduction list no. 13, 1965. *Dept. Agric., Fiji* 1-8.

PARHAM, J.W. (1966) Report on coconut and breadfruit surveys, 1960. *South Pacific Commission Technical Paper* 1:1-70, figs. 1-54.

PARHAM, J.W. (1967) Plant introduction list no. 14, 1966. *Dept. Agric., Fiji* 1-8.

PARHAM, J.W. & MUNE, T.L. (1967) The declared noxious weeds of Fiji and their control. *Agric. Bull., Fiji* 48 (i-v): 1-87, figs. 1-20. (Rewritten third edition).

PARHAM, J.W. (1968) Plant introduction list no. 15, 1967. *Dept. Agric., Fiji* 1-8.

PARHAM, J.W. (1968) Berthold Seemann. *Tr. Proc. Fiji Society* 9: 80-92 (Presidential Address, 1963).

PARHAM, J.W. (1969) Plant introduction list no. 16. *Dept. Agric., Fiji* 1-13.

PARHAM, J.W. (1970) Plant introduction list no. 17. *Dept. Agric., Fiji* 1-15.

PARHAM, J.W. (1972) *Plants of the Fiji Islands*. Second, revised edition. Suva: Govt. Printer. 1-462, i-xxix, pl. I-IV, figs 1-104.

PARHAM, J.W. (1979) Poaceae. In A.C. Smith, *Flora Vitiensis Nova* I. pp 290-391, figs 71-80. Kaui, Hawaii: Pacific Tropical Botanical Garden.

Unpublished works

PARHAM, J.W. (unpublished) The Fiji Herbarium: a brief history of its establishment and some suggestions for its future. (Paper read to Fiji Society on 12.8.69).

PARHAM, J.W. & KOROIVEIBAU, D. Botany Experiments for Fiji Schools. (An Illustrated Manual).

PARHAM, J.W. (1976) ABRS Tasmanian Herbarium Project. Final Report for the Trustees of the Royal Tasmanian Botanical Gardens. 1-166.

PARHAM, J.W. & PARHAM, M.E. (1990) The Museum of Economic Botany. 1-56.

PARHAM, J.W. (2001) Draft List of Algae in the Tasmanian Herbarium Collection. 1-68.

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