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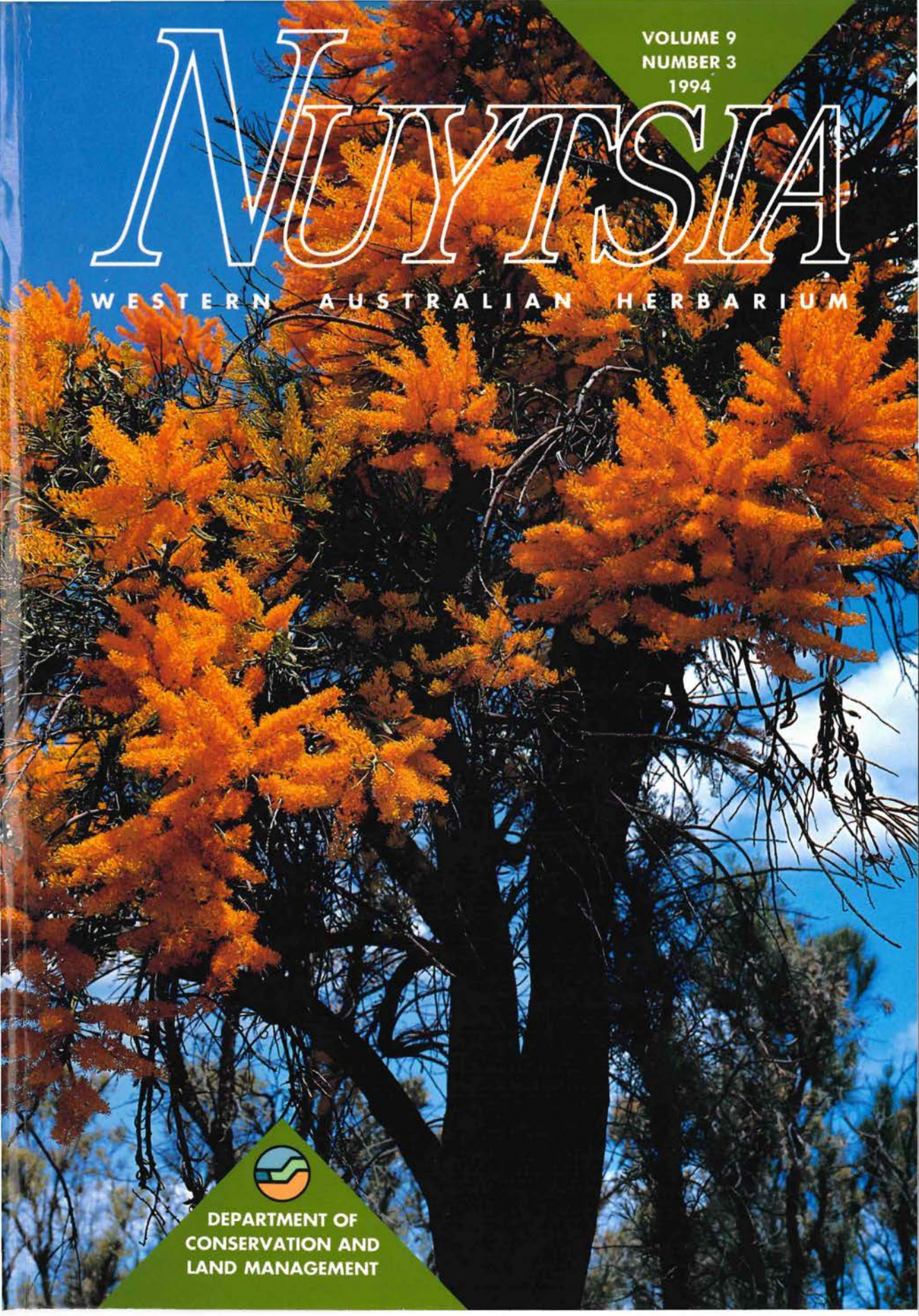

DEPARTMENT OF
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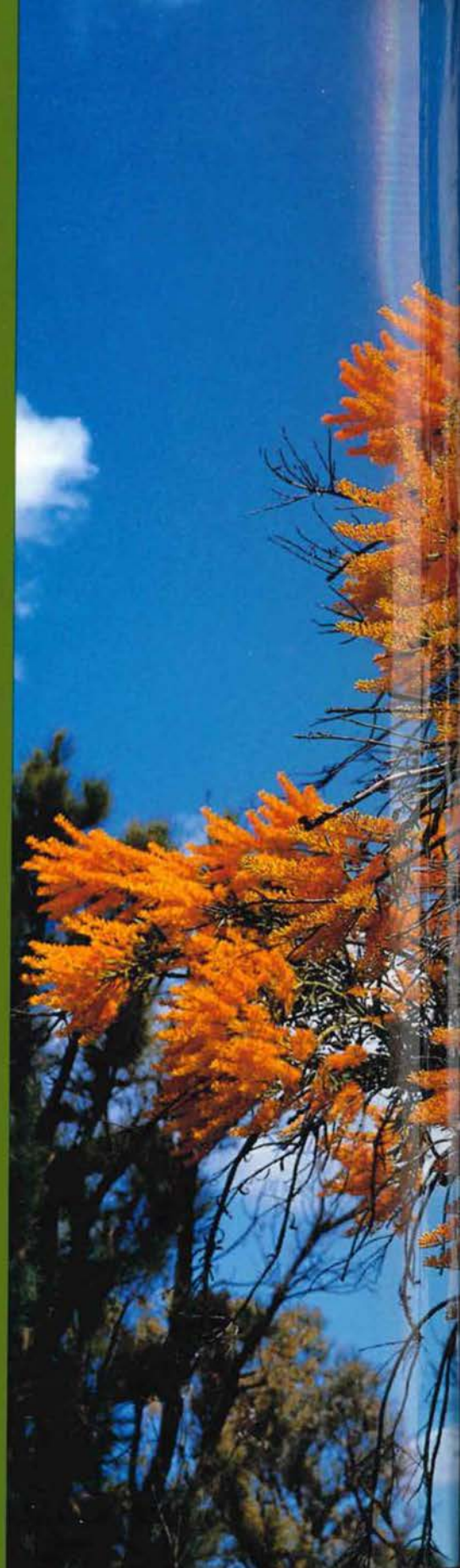

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Cover

Nuytsia floribunda (Labill.) R. Br. ex Fenzl (Loranthaceae) - the Western Australian Christmas Tree is one of the few aborescent mistletoes in the world. This endemic tree is a semi-parasite common in sandy soil from the Murchison River to Israelite Bay. The journal is named after the plant, which in turn commemorates Pieter Nuijts, an ambassador of the Dutch East India Company, who in 1627 accompanied the "Gulde Zeepard" on one of the first explorations along the south coast of Australia.

Cover design by Sue Marais

Photograph A.S. George

Eucalyptus series *Brevifoliae* (Myrtaceae), a new series of northern Australian eucalypts

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Abstract

Brooker, M.I.H. and Slee, A.V. *Eucalyptus* series *Brevifoliae* (Myrtaceae), a new series of northern Australian eucalypts. Nuytsia 9 (3): 307-314 (1994). A new infrageneric taxon, *Eucalyptus* series *Brevifoliae* is described. The group consists of six species of northern Australian white gums, *viz. E. confluens, E. rupestris* and *E. ordiana*, endemic to the Kimberley in Western Australia, *E. brevifolia,* from the Kimberley and adjacent parts of the Northern Territory, *E. umbrawarrensis* endemic to the Top End of the Northern Territory, and *E. leucophloia* which occurs from the Pilbara across the Northern Territory to western Queensland. The series is diagnosed by seed and leaf characters.

Introduction

The first species of the new series to be published is *Eucalyptus brevifolia* F. Muell. in 1858. The subsequent history of this species and its implied synonymy with *E. microtheca* (Bentham 1867) were meticulously researched by Blake (1953), who rejected this synonymy and classified *E. brevifolia* with a subgroup of red gums, *E.* ser. *Subexsertae* (Benth.) Blakely.

The next species of the series to be published is *E. pallidifolia* F. Muell. which Bentham (1867) placed in the heterogeneous *E.* subser. *Exsertae* Benth., the other subgroup of red gums typified by *E. exserta* F. Muell. Blake, much later (1953), concluded that *E. pallidifolia* was a taxonomic synonym of *E. brevifolia.* The third species is *E.confluens* W.V. Fitzg. ex Maiden whose affinities Maiden considered to be "unsolved", despite Fitzgerald's suggestion quoted by Maiden (1919), of a relationship to *E. rudis* Endl. Blakely (1934) placed *E. confluens* in *E.* ser. *Exsertae* (Benth.) Blakely. The fourth of these early published species is *E. umbrawarrensis* Maiden, which the author associated with *E. pallidifolia.*

Blakely (1934) supported Bentham's synonymy of *Eucalyptus brevifolia* with *E. microtheca.* He placed *E. pallidifolia* in the *Subexsertae,* maintained *E. confluens* in the *Exsertae* and placed *E. umbrawarrensis* in the *Subulatae*, a series otherwise comprising species with bisected cotyledons.

Blake (1953) maintained the erroneous placement for *E. umbrawarrensis* although *E. umbrawarrensis* has reniform cotyledons in common with the *Exsertae* and *Subexsertae*.

Pryor & Johnson (1971) associated both *E. brevifolia* (syn. *E. pallidifolia*) and *E. confluens* with *E. alba* in the extracodical ser. *Albae* in their classification (ser. *Subexsertae*). However, they classified *E. umbrawarrensis* in an ambiguously-placed monotypic series, well isolated in their system from all three series, *Exsertae, Subexsertae* and *Subulatae*. Subsequent unpublished research by Johnson has resulted in the segregation in a subseries of all three species within ser. *Albae*.

Three more species with affinity to the above-mentioned have been published, *viz. E. leucophloia* Brooker (1976), *E. rupestris* Brooker & Done (1986), and *E. ordiana* Dunlop & Done (1992). The first five of these species reviewed in this study were included in the *Subexsertae* by Chippendale (1988). The more recently published *E. ordiana* was placed in the *Subexsertae* by Dunlop & Done, the authors acknowledging its particular affinity within the series, based on seed characters, with *E. brevifolia, E. confluens, E. umbrawarrensis* and *E. leucophloia*.

Seed characters

Dunlop & Done associated the seed form of *Eucalyptus ordiana* with that of a "subgroup of species" given in Boland *et al.* (1980), i.e. those named above, without contrasting it with the seed of the remainder of the *Subexsertae*.

Both the *Subexsertae* (less the species treated above), typified by *E. alba*, and the *Exsertae*, typified by *E. exserta*, have similar and characteristic seeds. The morphology of this form of seed was treated at length by Maiden (1925) and Boland *et al.* (1980). The seeds are dark brown to black and have dorsal and ventral sides separated by a margin that is either partly or entirely toothed. The ventral side (Figure 1a) is elongated, pyramidal or somewhat flattened but always with angles and faces. The hilum is on a small terminal polygonal face or at the summit of the pyramid or more or less central to the angular flattened face. The dorsal surface (Figure 1b) is flat or slightly convex, without angles. Both surfaces of the seed show slight relief due to the collapsed or sunken outer cell walls of the testa. The walls of the cells towards the margin of the seed are characteristically sunken deeper and the outlines of the cell are always very irregular in shape (Figure 1c).

This seed form is diagnostic in the genus *Eucalyptus* for the *Exsertae* and *Subexsertae* and for series *Transversae*.

The seeds of *E. brevifolia, E. confluens, E. umbrawarrensis, E. leucophloia, E. rupestris* and *E. ordiana* do not fit this pattern. They are light brown, flattened and ventrally concave, without toothed edges, and with a more or less sunken ventral hilum (Figure 2a). The ventral and dorsal surfaces of the seed contrast, as well, with those of series *Exsertae* and *Subexsertae*. The integument is distinctly and regularly reticulate having cells, with uniformly and shallowly sunken outer cell walls, often arranged in lines over much of the surface (Figures 2a-c). There is characteristically no distinct edge separating the dorsal and ventral sides of the seed.

The general morphology of the seeds of the *E. brevifolia* group resembles superficially that of the seeds of several other series. Considering various series in the classification of Chippendale (1988) and dismissing any relationship with the groups having bisected cotyledons and those with adnate anthers, we make the following comparisons.

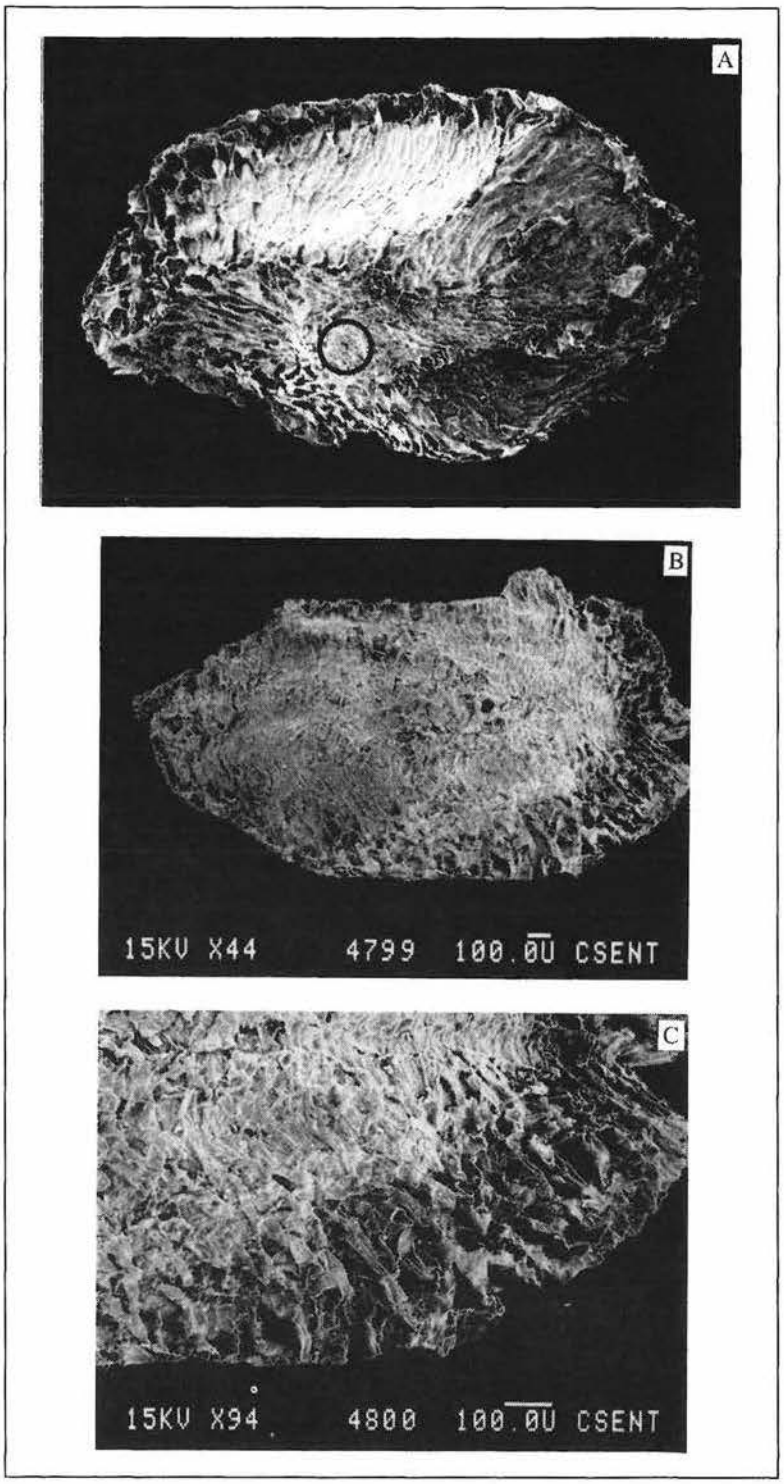

Figure 1. Seed of *Eucalyptus alba*, Timor, *J. Turnbull* 202. a - ventral (hilar) view, circle indicates hilum (x40), b - dorsal view (x30), c - detail of toothed margin (x62).

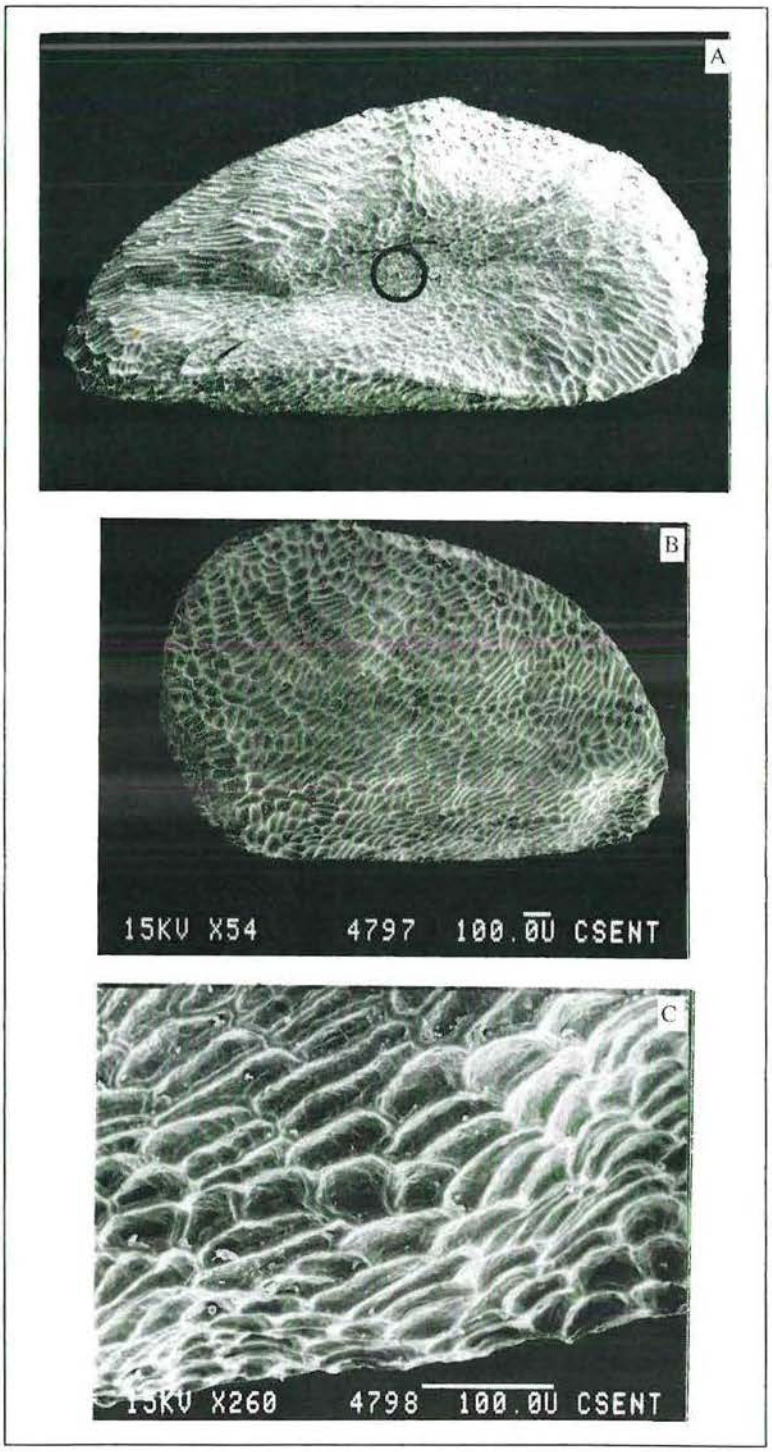

Figure 2. Seed of *Eucalyptus brevifolia*, King River crossing towards Karunjie, Western Australia, *M.I.H. Brooker* 4228. a - ventral (hilar) view, circle indicates hilum (x38), b - dorsal view (x35), c - detail of surface (x175).

The seeds of the monotypic series *Pumilae* and *Michaelianae* are toothed around the edges. The seed of *E. pumila* has, in addition, unique dorsal patterning while that of *E. michaeliana*, in most respects, resembles red gum seed (Boland *et al.* 1980). The seeds of series *Foveolatae, Microcarpae* and *Viminales* are similar in general shape to the seeds of the *E. brevifolia* group. They differ, however, in being grey-black, with a flatter, lacunose dorsal surface (Boland *et al.* 1980), that of the *E. brevifolia* group being light brown, plump, convex and lacking lacunae.

Leaf venation and oil gland patterns

Eucalypts have evolved a variety of leaf venation patterns which differ notably in the amount of reticulation, from none observable by casual inspection to extremely dense, and in the angle of departure of the side veins from the midrib, from parallel side veins (snow gums) to veins at an angle of almost 90 degrees (bloodwoods).

Endemic northern Australian species, including those of the *Brevifoliae,* invariably have extremely dense reticulation, e.g. *E. umbrawarrensis* (Figure 3). This distinguishes them from any species of south-eastern Australia belonging to other taxonomic groups, e.g. *E. viminalis* (Figure 4), which may have superficially similar seeds as referred to above.

Contrary to common belief, many eucalypts are almost completely lacking in visible oil glands and do not have the characteristic eucalyptus smell when leaves are crushed. This is so with many endemic northern species. Exceptions include *E. staigeriana* and *E. camaldulensis* (Figure 5) which are, however, northern representatives of predominantly southern series, in terms of numbers of species. In the *Subexsertae*, e.g. *E. bigalerita* (Figure 6) some oil glands are invariably present although they are often obscure and many fewer than in the *Exsertae*.

The leaves of all the species of the *E. brevifolia* group are almost entirely lacking in visible oil glands (Figure 3). This distinguishes them from most southern species in the genus that have similar seeds (Figure 4). Also, oil glands which may be present in the leaves of the *E. brevifolia* group always appear at the intersections of veinlets only. In southern species, the oil glands are seen mainly within the areoles although intersectional ones are usually present.

We conclude that the *E. brevifolia* group of species are not red gums (*Exsertae* and *Subexsertae*), nor do they have natural affinity with any groups in southern Australia, but that they make up a discrete taxon. We erect therefore a new taxonomic series.

Taxonomy

Eucalyptus ser. **Brevifoliae** Brooker & Slee, ser. nov.

Arbores parvae vel "mallees" cortice laevi. Reticulum foliorum densissimum et glandulae si manifestae intersectionales. Semina plus minusve complanata sed dorsaliter convexa, elliptica, pallido-brunnea, integumento scalariformi, hilo ventrali, marginibus sinuato-dentatis omnino deficientibus.

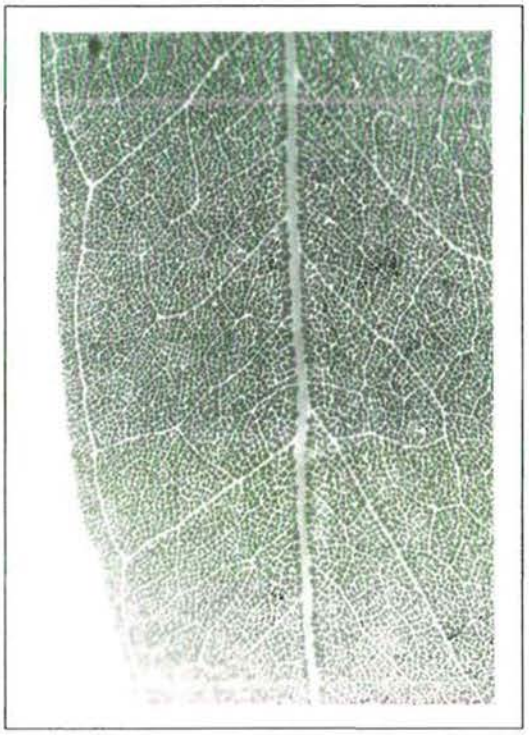

Figure 3. Leaf venation in *E. umbrawarrensis* (*Brooker s.n.*, road to Umbrawarra Gorge, Northern Territory, June 1988).

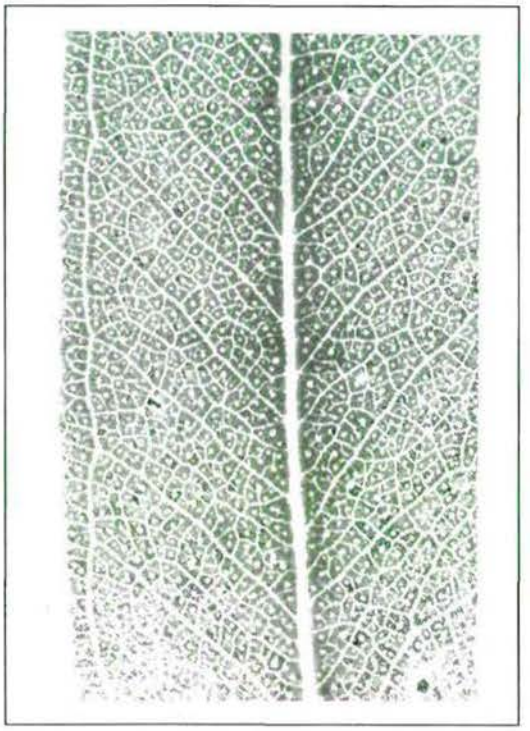

Figure 4. Leaf venation in *E. viminalis* (*Brooker* 11229).

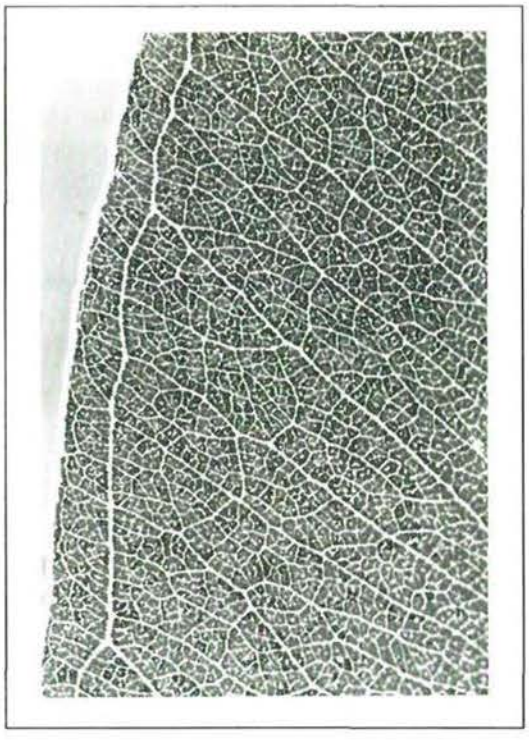

Figure 5. Leaf venation in *E. camaldulensis* (*Brooker s.n.*, Gibb River, Western Australia, April 1991).

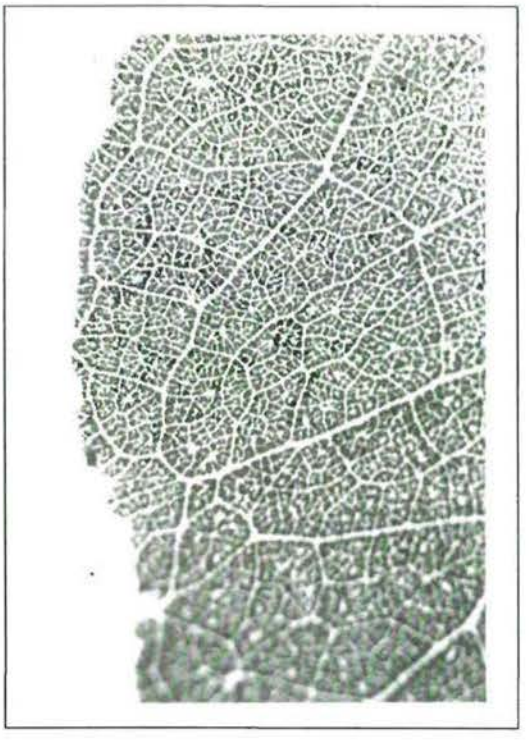

Figure 6. Leaf venation in *E. bigalerita* (*Brooker s.n.*, Hann River, Western Australia, April 1991).

Typus: *E. brevifolia* F. Muell.

Small trees or more rarely mallees, usually on rocky sites. Bark always smooth. Reticulation of leaves very dense and oil glands, if present, appearing at the intersections of the veinlets. Seeds more or less flat but convex on the dorsal side, elliptic, light brown, distinctly scalariform on the dorsal surface, never toothed at the edges.

Notes. The series comprises six species, *viz. E. brevifolia, E. confluens, E. leucophloia, E. rupestris, E. umbrawarrensis* and *E. ordiana*. The series is distributed from the western scarps of Arnhem Land to the Kimberley and south to the Pilbara and east across northern central Australia to western Queensland. The trees are sometimes dominant in arid areas and rocky sites, and are conspicuous with their smooth white bark.

Etymology. The name for the series is taken from the epithet of its first published species.

Key to the species and subspecies of *E.* ser. *Brevifoliae*

1. Adult leaves glossy green
   2. Fruit with annular disc ..... *E. confluens*
   2. Fruit with inconspicuous narrow descending disc ..... *E. umbrawarrensis*
1. Adult leaves dull blue-green to glaucous
   3. Whole plant glaucous; leaves opposite, ovate to orbicular ..... *E. ordiana*
   3. Otherwise
      4. Fruit with prominent annular disc ..... *E. brevifolia*
      4. Fruit with inconspicuous narrow descending disc
         5. Petioles of adult leaves >1 cm long, slender; fruit cupular ..... *E. rupestris*
         5. Petioles of adult leaves < or = 1 cm long; fruit hemispheric
            6. Valves of fruit enclosed or to rim level ..... *E. leucophloia* subsp. *leucophloia*
            6. Valves of fruit strongly exserted ..... *E. leucophloia* subsp. *E* *

* To be published by others.

Acknowledgements

We are grateful to Helen Geier for some of the scanning electron micrographs taken in the CSIRO Microscopy Unit at Black Mountain, Canberra, and to Lawrie Johnson for helpful suggestions made concerning an earlier draft.

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Mueller's "The Plants Indigenous to the Colony of Victoria" - Is Volume 2 effectively published?

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Abstract

Court, A.B., Cowan, R.S. and Maslin, B.R. Mueller's "The Plants Indigenous to the Colony of Victoria" - Is Volume 2 effectively published? Nuytsia 9 (3): 315-318 (1994). Historical notes are provided to support the conclusion that the second volume of this work was not effectively published and the new names it included are therefore invalid. A summary is appended that will be of assistance to librarians and bibliographers in understanding the chronology and content of the several publications concerned.

Introduction

Knowledge of the circumstances surrounding Mueller's (1863) controversial "publication" of volume 2 of "The Plants Indigenous to the Colony of Victoria" (referred to as "Pl. Victoria" in the following text), is neither voluminous nor unequivocal. However, in connection with the preparation of the "Flora of Australia" account of *Acacia* we found it necessary to determine whether or not this title was effectively published in order to establish the status of the new names it contained. Very little other than *Acacia* is involved and the following discussion concerns only the taxa of this genus. The resumé at the end of the text summarises what is known of this and related publications.

Is Mueller's "Pl. Victoria" volume 2 effectively published?

In a particularly thorough paper Cavanagh (1988) traced the beginnings of scientific printing by Government Printer in Victoria, especially with reference to publications by F. Mueller. Using files of the Chief Secretary and of the Government Printer, as well as Mueller's annual reports for the period 1858-1862, Cavanagh was able to settle rather certainly the question of whether or not the "Pl. Victoria" had been issued in parts. He pointed out that publication in parts had been considered earlier when the purpose of the work was less ambitious, but was abandoned by January 1860 in favour of a more voluminous treatment of the flora. The first volume of "Pl. Victoria" appeared in February 1862, the date given on page 242 of the volume and accepted by Stafleu and Cowan (1981) as the date of publication.

Printing of the second volume began but was halted at the end of page 40, the end of the fifth fascicle, and descriptive work was deferred, as Mueller (1864-1865) wrote in his introduction to a volume of lithograms he published, "in order that precedence of publication may be given to the corresponding volumes on the universal empire of plants of Australia." This statement may be taken to mean that his time for working on his own projects had become so compromised by his cooperation with George Bentham in the production of "Flora Australiensis", that "Pl. Victoria" had to be at least temporarily put aside.

The printing of the fragment of volume 2 probably occurred between March and September 1863. This suggestion is based on the fact that Mueller cited *Acacia acanthoclada* in his "Fragmenta III" (published March 1863) and referred to it as having been published in volume 2 of the "Pl. Victoria"; he cited his *A. trineura* in the same way in "Fragmenta IV" (i.e. as having been published in "Pl. Victoria" vol. 2) which was published in September 1863. After printing of volume 2 had been discontinued, Mueller took a handful of broadsheets from the Government Printing Office and despatched a set to Bentham at Kew and possibly to another one or two European workers. Churchill *et al.* (1978), in a list of the published works of Mueller, noted: "Apparently distributed as page proofs by the author."

Court (1973) questioned the status of the names in this work in his unpublished "Australian *Acacia* Species Index". The "International Code of Botanical Nomenclature"(Art. 29) (Greuter *et al.* 1988) requires effective publication of botanical works for the validation of new names they contain and it defines effective publication (in part) as "only by distribution of printed matter (through sale, exchange or gift) to the general public or at least to botanical institutions with libraries accessible to botanists generally." In the case of Kew, the copy of the broadsheets sent to Bentham did not in itself constitute effective publication as defined by the "Code", for a library attached to the herbarium came into existence only with the purchase of Hooker's library after his death in 1865 (Perredes 1906). Consequently, we are of the opinion that Mueller's despatch of a set of broadsheets to one or a few close associates in Europe does not constitute effective publication of the names in that portion of volume 2. Indeed, it appears to us unlikely that Mueller had any intention of making generally available to anyone the first few pages of an aborted publication, certainly not "to the general public" or "to botanists generally". We therefore conclude that none of the new names which appear in volume 2 of Mueller's "Pl. Victoria" are valid because the work was not effectively published and that such names should date from their later publication.

Acacia taxa in Mueller's "Pl. Victoria" volume 2

Mueller intended to publish four new species of *Acacia* in volume 2 of "Pl. Victoria", namely, *A. nyssophylla, A. subporosa, A. subtilinervis* and *A. trineura*; these names were validly published in September of the same year by Mueller (1863a) in his "Fragmenta". Names for two other new acacias were proposed by Mueller in volume 2 of "Pl. Victoria", namely, *A. pycnostachya* and *A. visciflua*. Even if they had been effectively published, neither name is valid, because Mueller advanced them merely as provisional names for taxa, should the species be accepted in the future (see Art. 34.1 of the "International Code of Botanical Nomenclature") (Greuter *et al.* 1988). *Acacia pycnostachya* was subsequently validated by Bentham (1864) but we know of no validation of the name *A. visciflua* (although it was cited as a synonym of *A. dodonaeifolia* by Bentham 1864).

Mueller's treatment of *A. longifolia* (Andrews) Willd. in this volume is more complicated, although the difficulties are more taxonomic than nomenclatural. He described what he considered to be the typical element of the species and then listed five earlier binomials (*A. sophorae* R. Br., *A. alpina* F. Muell., *A. floribunda* (Vent.) Willd., *A. mucronata* Willd. ex H.L. Wendl. and *A. linearis* Sims) and provided the new name, *A. phlebophylla* (based on *A. sophorae* var. *montana* F. Muell.), all of which he considered "varieties" of *A. longifolia*, although not actually making formal combinations as varieties. Bentham (1864) accepted four of the "varieties" at that rank but maintained the other two at the rank of species, namely *A. alpina* and *A. linearis*.

Acknowledgements

We are grateful for the able assistance of both Paul G. Wilson and Gillian Perry who by their experience and knowledge of the "Code" have helped us immeasurably in reaching the conclusions we have. We are especially grateful to the reviewers, J. Ross in particular who with Helen Cohn, librarian at Melbourne's National Herbarium, called to our attention the important work by Tony Cavanagh.

Addendum

Because some botanists, bibliographers (including the authors of the second edition of "Taxonomic Literature"!) and librarians both here and overseas have not had access to the available data concerning "The Plants Indigenous to the Colony of Victoria" and related publications, the following resumé is presented in an effort to help to clear away some of the confusion that has surrounded the listing of these works.

1. Mueller, F.J.H.: "The Plants Indigenous to the Colony of Victoria". Volume 1. 1862. Issued as a complete volume February 1862; tabled before the Royal Society of Victoria on 28 April 1862.

We have accepted that this work was issued only as a complete volume in February 1862 but the possibility that it may have been issued in several parts is suggested by Mueller's "Second Systematic Census of Australian Plants" (1889). There he lists various species which were published in volume 1 with dates between 1860 and 1862.

2. Mueller, F.J.H.: "The Plants Indigenous to the Colony of Victoria". Volume 2. 1863. Almost certainly printed during the period March to September 1863.

The final printing of this work stopped abruptly, although it is quite likely that Mueller had written considerably more of this volume. Preparation of copy for the work was well underway in 1862 and many plates had been prepared and apparently printed off for it. Plates which were intended for publication in this volume were cited by Mueller from time to time, particularly in his "Fragmenta". As pointed out above, the fragment of volume 2 cannot be regarded as published within the meaning of the rules in the "International Code of Botanical Nomenclature" and consequently it is not taken into consideration. Photocopies of volume 2 are in several herbaria, including K, MEL (J.Ross, pers. comm.) and PERTH.

3. Mueller, F.J.H.: "The Plants Indigenous to the Colony of Victoria". Lithograms, 1864-1865. Precise date of issue is uncertain but it was mentioned in "The Journal of Botany" in August 1865.

In his Introduction to this volume, Mueller wrote: "This volume, illustrative of Victorian Plants, has been issued separately from the descriptive portion of the work ..... [which] has been temporarily deferred, in order that precedence of publication may be given to the corresponding volumes on the universal empire of plants of Australia, emanating in London [Bentham's "Flora Australiensis"]". Mueller was concerned that abandoning his work, although perhaps only temporarily, denied the scientific fraternity access to the excellent plates that had been prepared. With this in mind Mueller issued a number of plates under the title of "Lithograms". Clearly, he was very careful not to call this publication volume II, particularly since he must have wanted to continue the work at a later date. Some workers, including librarians, quite erroneously catalogue this publication as "The Plants Indigenous to the Colony of Victoria", Volume II", but it must be emphasised that it is not Volume II and was never intended as such. Reference to Mueller's Introduction to this work shows very clearly that this is so.

From time to time, Mueller cited other plates intended for Volume II and future volumes but most of these remained unpublished until 1910 when A.J. Ewart gathered them together in a work entitled "Plants indigenous to Victoria", Volume II (see following entry). However, Mueller published a few plates over the years in some of his other works.

4. Ewart, A.J.: "Plants indigenous to Victoria". Volume II. 1910. The precise date of publication is uncertain but page 2 bears the date 30 June 1910.

Ewart realised the value of the unpublished plates that were intended for publication in Mueller's work and set about publishing them. Ewart gave a good account of these plates in his Preface and referred to their history. However, he somewhat confused the situation by titling his work "Plants indigenous to Victoria", Volume II. It should be noted that in the strict sense there is no Volume I of Ewart's work and that it stands alone.

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Three new species, a new name and notes on Australian *Polycarpaea* (Caryophyllaceae)

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Abstract

Cowie, I.D. Three new species, a new name and notes on Australian *Polycarpaea* (Caryophyllaceae). Nuytsia 9 (3): 319-332 (1994). *Polycarpaea incana, P. microceps* and *P. tenax* are described and illustrated and a new name, *P. multicaulis,* is chosen for the later homonym *P. microphylla* Pedley. Variation in these taxa, as well as *P. breviflora, P. corymbosa, P. involucrata, P. spirostylis* and *P. violacea* is discussed. A key to Australian species is included.

Introduction

The genus *Polycarpaea* was described by Lamark (1792) and has since been conserved against the earlier name *Pollia* Lour. (Rickett & Stafleu 1959). The name *Polycarpaea* has been used in Australia since Mueller's (1859) treatment of the genus, with subsequent accounts by Bentham (1863), Domin (1925) and Pedley (1977). Although Kuntze (1891) transferred many species to *Polycarpa* (an orthographic variant of *Polycarpon*), his treatment appears not to have been widely applied to Australian material. Since Pedley's paper was published many specimens have been collected from more remote parts of northern Australia, especially Arnhem Land and the Kimberley Region. Although a treatment for the "Flora of Australia" is in preparation, this precursory paper allows more complete descriptions of new taxa and discussion of patterns of variation and synonymy in several other taxa.

The study was based on the gross morphology of herbarium specimens and measurements were derived from dried and detergent softened material. The morphology of the seed testa was considered of possible taxonomic value. Seeds were therefore examined using a scanning electron microscope.

The conservation status of new taxa was assessed and coded using the criteria and abbreviations of Briggs and Leigh (1988)

Morphology

Habit. Most species are annual or perennial herbs, although *P. multicaulis* is an erect, many-stemmed subshrub with a woody base. Among the annual species, lifeforms range from few-stemmed, erect and slender (most forms of *P. corymbosa, P. longiflora, P. staminodina* and *P. violacea)* to low and bushy (*P. arida, P. involucrata).* This range of variation may often be present within the one species (e.g. *P. spirostylis, P. breviflora, P. holtzei).* The perennial species are usually small, and are wiry with numerous stems arising from a woody base.

Indumentum. All species are hairy to some degree, ranging from almost glabrous (*P. breviflora* and *P. spirostylis*) to hoary and woolly*(P. incana* and *P. tenax).* Hair types in the genus consist of branched and unbranched crisped septate hairs. *Polycarpaea breviflora* and *P. spirostylis* have tufts of branched hairs in the leaf axils but are otherwise glabrous. At least the stems of all other species are thinly pubescent to woolly with branched hairs. The stipules, bracts and sepals of most species are glabrous (often with ciliate or fimbriate margins) but may be hairy in *P. staminodina* and *P. tenax.* The leaves of most species have simple and/or branched hairs except those of *P. arida,* the common annual form of *P. corymbosa* and *P. holtzei* which are glabrous. The stipules and bracts of *P. holtzei* commonly have a long bristle arising from near the base on the abaxial surface.

Leaves. Basal leaves are often present on young plants but are lost on older plants. In shape, they range from oblanceolate to orbicular. In most species found on sandstone outcrops (*P. incana, P. microceps, P. multicaulis* and *P. tenax*), cauline leaves are short, stiff, opposite and are narrowly oblanceolate or linear. Cauline leaves are relatively long, soft, linear and whorled in most other species. In *P. arida* and *P. involucrata* the cauline leaves are whorled but are otherwise similar to those of the sandstone species.

Inflorescences. Variation in compactness and placement of inflorescences and the presence or absence of floral leaves can be of some value as taxonomic characters. Inflorescences vary from reduced and capitate (in *P. incana, P. involucrata, P. microceps,* and *P. tenax*) to open (*P. breviflora, P. corymbosa, P. longiflora, P. spirostylis* and *P. violacea).* However, among the latter group there is often variation in density within a species with some forms having relatively compact (but not capitate) inflorescences. Those of *P. arida* and *P. holtzei* are intermediate in compactness, and in common with the 'capitate' species, have one or more pairs of subtending floral leaves. Most species have terminal inflorescences whilst those of *P. arida* and *P. involucrata* are axillary as well as terminal.

Flowers. Sepals within the genus are relatively constant in shape, but vary in colouration and the prominence of the midrib. The midrib may be accentuated by red or pink colouration in some forms of *P. breviflora, P. corymbosa, P. longiflora, P. spirostylis* and *P. violacea* but appears less prominent in forms and species with hyaline sepals. The base of sepals is often thickened and yellowish but varies within a species. Discrete red-brown resinous exudates are often present between the outer sepals and at the nodes. However, except for *P. arida* where they are always absent, the presence or absence of exudates is not consistent within a species. Petals are narrowly triangular to oblong and the apices may be bifid (some forms of *P. breviflora* and *P. spirostylis),* entire or erose. In *P. breviflora, P. longiflora, P. spirostylis* and *P.tenax* the petals and staminal filaments are adnate at their bases to form a short tube, ranging from 0.5 mm long in *P. tenax* to 7 mm long in *P. spirostylis. Polycarpaea violacea* and *P. staminodina* have minute linear staminodes 0.2 to 0.6 mm long inside the base of each petal. *Polycarpaea arida, P. corymbosa, P. holtzei, P. incana, P. involucrata, P. microceps, P. multicaulis* and *P. tenax* have a minute corona c. 0.05 mm long inside the corolla.

Fruit. Capsules in most species are ovoid or ellipsoid, while in some forms of *P. corymbosa, P. longiflora, P. spirostylis, P. staminodina* and *P. tenax* capsules are narrowly ovoid before dehiscence, often becoming urceolate once the valves open. *Polycarpaea holtzei* is unusual in having ellipsoid to narrowly obovoid capsules, probably the result of the solitary seed.

Seeds. Numbers of seeds per capsule vary from 1 in *P. holtzei* to 30 in *P. tenax.* Seed numbers mostly fall in the range 10-20, although *P. violacea* can have as few as 4 and *P. corymbosa* as few as 6, while *P. incana* can have up to 27. Except for *P. tenax* and *P. holtzei*, seed number does not appear of great value as a taxonomic character. The shape of seeds within the genus varies from almost discoid (*P. longiflora* - Figure 1A and *P. violacea)* to subcylindrical (some forms of *P. staminodina* - Figure 1B and *P. corymbosa)* but is often relatively constant within a species or group of species. Seeds of some species are comma-shaped in outline (*P. spirostylis* - Figure 1C) while others are dimidiate (*P. incana, P. tenax* - Figures 1E, F). The testa can be almost smooth as in *P. holtzei* (Figure 1H) but is more usually ornamented. In some forms of *P. longiflora* it is reticulate-areolate (Figure 1A), while that of *P. tenax, P. multicaulis* and *P. microceps* (Figures 1E-G) is reticulate-areolate or reticulate-foveolate with a minute reticulum. It is reticulate-areolate or reticulate-foveolate and minutely muricate in some forms of *P. breviflora, P. spirostylis* (Figures 1C, D), *P. corymbosa* and *P. longiflora.*

The perennial xerophytic lifeform

The perennial species of *Polycarpaea* display a distinct xerophytic lifeform. They are small, wiry, microphyllous, have numerous stems, reduced inflorescences, often have a dense hoary indumentum and resprout each wet season from a woody base. These perennial species have close affinities with the annuals *P. involucrata* and *P. corymbosa,* and with which some species intergrade (as discussed below). Characters linking the perennial species to *P. corymbosa* and *P. involucrata* (and to a lesser extent *P. arida* and *P. holtzei)* are the presence of a minute corona between the stamens, the usual lack of a floral tube (except *P. tenax),* the lack of staminodes, ornamentation of the seed testa and seed shape. In addition, *P. involucrata* has the reduced inflorescences common to the perennial species and has a similar growth habit and occupies a similar habitat. Although *P. tenax* is anomalous among these species in having a short floral tube, the presence of the characters discussed above indicates that it is otherwise closely related. These species (as well as *P. arida*) are best placed with *P. corymbosa* and *P. involucrata* in *Polycarpaea* section *Polycarpia* as recognised by Bentham (1863).

Perennation and xeromorphy in the species occurring on rock outcrops appears to be related to climate. *Polycarpaea involucrata,* an annual, occurs largely in drier areas receiving 200 mm to 800 mm annual rainfall while the perennial species occur mainly in higher rainfall areas receiving 800 mm to 1400 mm annual rainfall (although some forms of *P. multicaulis* are exceptions) (Plumb 1977). However, even in the higher rainfall areas the climate is strongly seasonal with a dry season of 5 to 7 months duration. It seems unlikely that life history is related to habitat or soil fertility as the substrate and habitat (crevices in sandstone outcrops) are very similar for all the species involved. It is postulated that in the drier areas the climate is too extreme to support perennials and that an annual life history allows plants to cope effectively with the longer dry season or irregular rainfall without the need to evolve a suite of xeromorphic characters. In the wetter areas rainfall (or perhaps dew runoff) is regular enough to support a perennial life history but the strongly seasonality has led to the development of xeromorphic characters described above. It is interesting to note that perennation has evolved on what would appear to be the most extreme habitat in the regions involved, not on a more mesic habitat.

The fragmented nature of the habitat occupied by the group has probably contributed to the genetic isolation of populations and hence the process of speciation. The residual land surfaces (commonly outcropping sandstone) occupied by these species form an archipelago of suitable habitats across northern Australia. At the species level, this isolation is reflected in the occurrence of the closely related but geographically isolated species *P. involucrata, P. multicaulis, P. incana,* and *P. tenax. Polycarpaea microceps* is unusual in that it is sympatric with another member of the group, *P. tenax.* Apart from morphological differences, the two occur in separate habitats, the former usually in crevices in rock faces and the latter in crevices in rock platforms. Within species, this geographic isolation can explain the many variants encountered in *P. multicaulis* and some of the variation in *P. involucrata.*

Key to Australian species

1a. Stems and leaves glabrous (except for tufts of hairs in axils of bracts and leaves); stipules <3 mm long 2
b. Stems and often leaves thinly pubescent to hoary; stipules usually >3 mm long 3
2a. Sepals <4.5 mm long; corolla <4 mm long ..... *P. breviflora*
b. Sepals >4.5 mm long; corolla >4 mm long ..... *P. spirostylis*
3a. Cauline leaves in 2-several pairs per node; plants usually annual; stems usually grey, green, stramineous or brown 4
b. Cauline leaves in one (rarely 2) pairs per node; plants perennial; stems often white-hoary 10
4a. Staminodes linear, 0.2-0.6 mm long, at the base of each petal 5
b. Staminodes absent 6
5a. Sepals usually >3.5 mm long; stipules, bracts and sepals glabrous ..... *P. violacea*
b. Sepals ≤3.5 mm long; stipules, bracts and sepals hairy at least towards base ... *P. staminodina*
6a. Corolla and stamens adnate at base for 1-3.5 mm ..... *P. longiflora*
b. Corolla and stamens free or adnate at base for <0.5 mm 7
7a. Pedicels glabrous; seed 1, often falling as a unit with pedicel, perianth and capsule; petals <0.3 times as long as sepals ..... *P. holtzei*
b. Pedicels hairy (flowers sometimes sessile); seeds >4, at maturity shed from capsule; petals usually >0.3 times as long as sepals 8
8a. Inflorescences lacking a subtending involucre of leaves ..... *P. corymbosa*
b. Inflorescences subtended by an involucre of leaves 9
9a. Inflorescences capitate and sessile; leaves cobwebbed; pedicels ≤1.5 mm long ..... *P. involucrata*
b. Inflorescences open; leaves glabrous; most pedicels >1.5 mm and up to 5 mm long ..... *P. arida*
10a. Inflorescences usually open, with conspicuous, dichotomous branching, lacking subtending leaves ..... *P. multicaulis*
b. Inflorescences capitate and sessile, subtended by a pair or involucre of leaves 11
11a. Stipules, bracts, sepals and stems red-brown; stems cobwebbed ..... *P. microceps*
b. Stipules, bracts and sepals hyaline; stems white-hoary 12
12a. Corolla and stamens adnate at base for ≥0.5 mm; sepals 3.2-5 mm long ..... *P. tenax*
b. Corolla and stamens free or adnate at base for <0.5 mm; sepals 1.8-3 mm long ..... *P. incana*

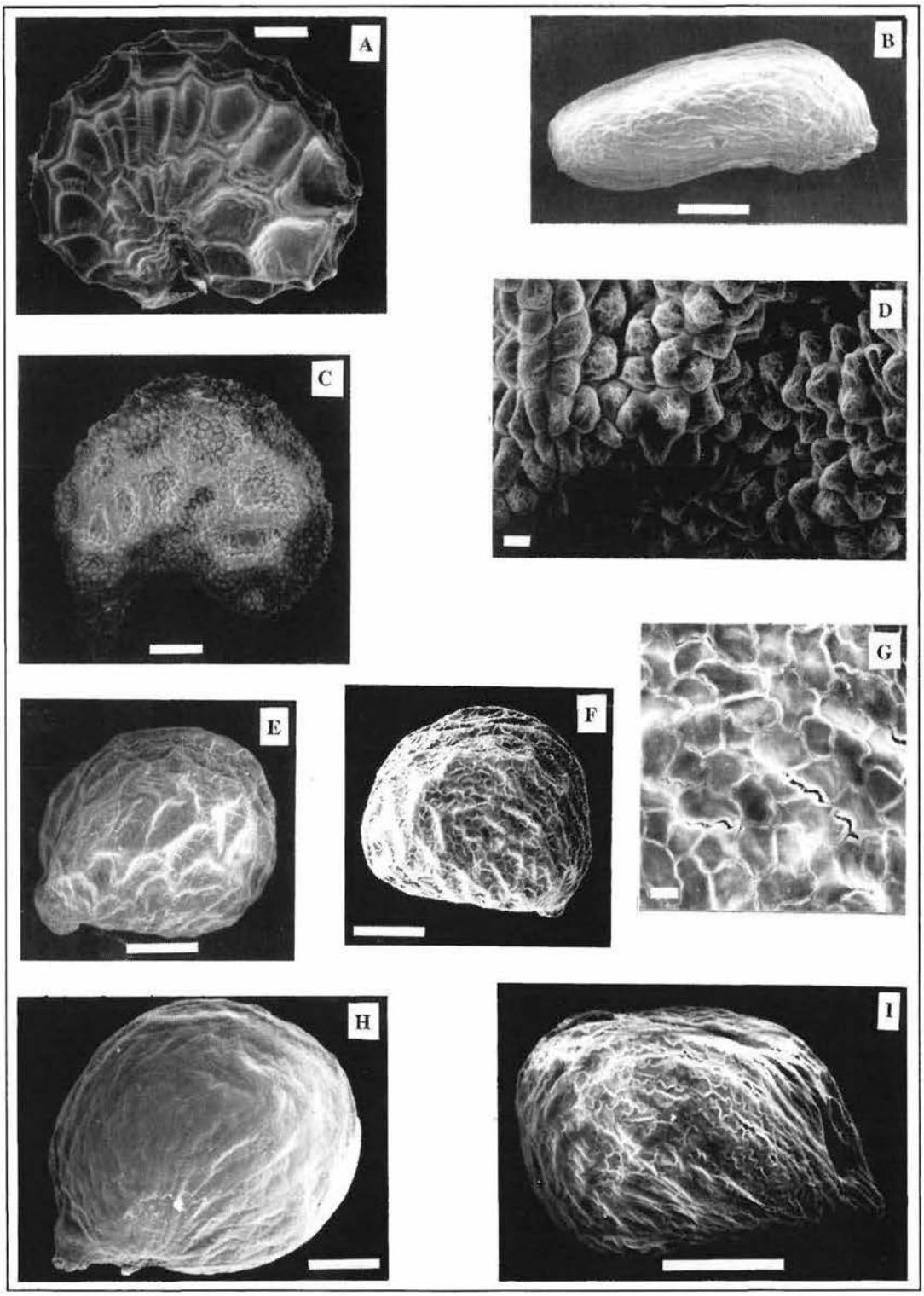

Figure 1. Scanning electron micrographs of *Polycarpaea* seeds (lateral view). A-*P. longiflora* (*J. Clarkson* 6552). B - *P. staminodina* (*S.T. Blake* 17470). C, D - *P. spirostylis* (*L. Pedley* 2661). E - *P. incana* (*P.K. Latz* 3113). F, G - *P. tenax* (*M. Lazarides* 9017). H - *P. holtzei* (*T. Hartley* 13908). I - *P. microceps* (*C.R. Dunlop* 3705). All scale bars are 0.1 mm, except D & G which are 0.01 mm.

Descriptions

P. incana I.D. Cowie, sp. nov.

P. involucrata arcte affinis, a qua imprimis differt habitu perenni, indumento incano, inflorescentiis axillaribus absentibus, bracteis ac calycibus abbreviatis, et foliis angustatis.

Typus: near Kurundie Creek, Kakadu National Park, Northern Territory, 20 April 1990, *G.J. Leach* 2795 & *I.D. Cowie* (holo: DNA!; iso: BRI, MEL!).

An erect perennial *herb* to 15 cm tall. *Stems* numerous, hoary, stout, 1-1.4 mm diam., with branched crisped septate hairs; internodes 1.5-10 mm long. *Stipules* hyaline, 2-3 mm long, triangular, midrib present, cobwebbed with crisped septate hairs, margins ciliate, apex attenuate. Cauline *leaves* opposite, rarely whorled, narrowly oblanceolate or linear, 2-5 mm long, 0.5-0.7 mm wide, glabrous to cobwebbed with branched or unbranched crisped septate hairs. *Inflorescence* terminal, sessile, capitate, 1-11-flowered, subtended by 1-2 pairs of leaves; bracts stipule-like, 1.8-3 mm long, thinly pubescent, bifid; pedicels 1-1.2 mm long. *Sepals* hyaline, lanceolate, 1.8-3 mm long, midrib present, margin ciliate, apex acute. *Petals* reddish, free, lanceolate to oblong, 1.2-2 mm long, 0.6-0.9 times as long as sepals, glabrous, apex rounded. *Stamens* 0.9-1.4 mm long, 0.6-0.8 times as long as petals; filaments 0.7-1.1 mm long; anthers 0.3-0.5 mm long; staminodes absent. *Style* 0.2-0.3 mm long; stigma capitate. *Capsule* brown, ovoid, 1.3-2.2 mm long, 0.5-0.8 times as long as calyx. *Seeds* 11-27, brown, dimidiate in outline, c. 0.4 mm long, 0.3 mm wide, surface reticulate-areolate or reticulate-foveolate with a minute reticulum. Figures 1E, 2F-H.

Other specimens examined. NORTHERN TERRITORY: Nitmiluk (Katherine Gorge) National Park, 14° 19' S, 132° 25' E, *P.K. Latz* 3113 (DNA); *N. Byrnes* 679 (DNA); 14° 19' S, 132° 28' E, *C. Dunlop & N. Byrnes* 2161 (DNA); 14° 20' S, 132° 30' E, *M. Evans* 3267 (DNA); 10 km SSW of El Sharana, 13° 34' S, 132° 29' E, *T.M. Orr* 358 (DNA).

Distribution. Endemic to the Northern Territory, in Nitmiluk (Katherine Gorge) National Park and Kakadu National Park (south of the South Alligator River).

Habitat. Grows in crevices in sandstone rock platforms.

Flowering and fruiting. Between March and May.

Conservation status. 3RC-t. All known populations of this species are in Nitmiluk (Katherine Gorge) National Park or Kakadu National Park.

Notes. Differs from *P. multicaulis* by the sessile, capitate inflorescences, presence of floral leaves and relatively shorter stamens; from *P. involucrata* by the perennial habit, hoary indumentum, narrower leaves, lack of axillary inflorescences, and shorter bracts and sepals; from *P. microceps* by the narrower leaves, thicker stems, hyaline bracts and calyx and hoary indumentum and from *P. tenax* by the lack of a floral tube, and shorter floral parts. *Polycarpaea incana* is geographically isolated by the South Alligator River valley from *P. microceps* and *P. tenax* to the north and by the Roper River valley and several other rivers from *P. multicaulis* and *P. involucrata* to the south. Two specimens from the Kimberley region of Western Australia (*Fryxell* 4726 and *Dunlop* 5241) are intermediate between

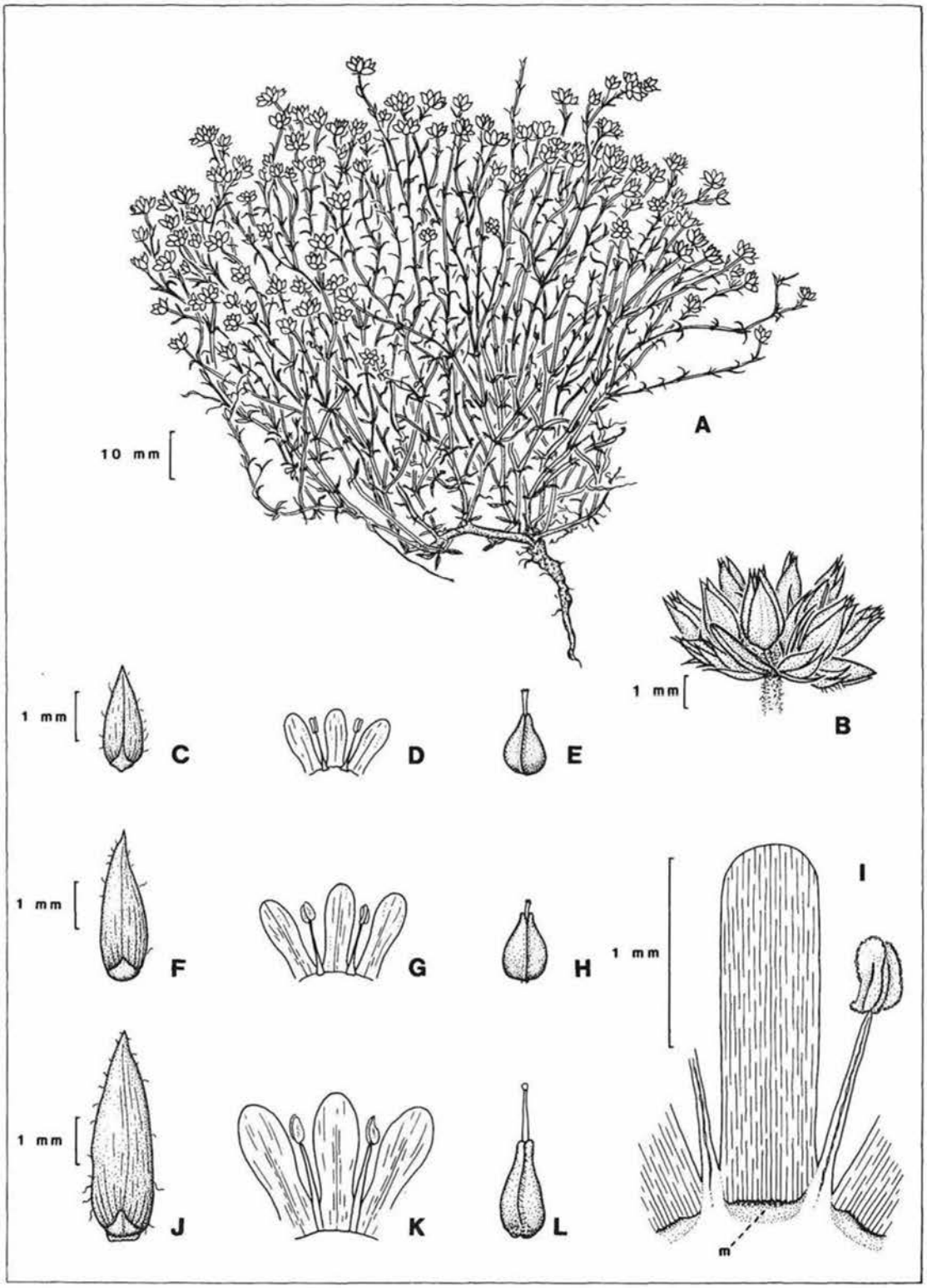

Figure 2. *Polycarpaea microceps* A - habit, B - inflorescence, C - sepal, D - petals and stamens, E - capsule (from *C.R. Dunlop* 4704). *P. incana* F - sepal, G - petals and stamens, H - capsule, I - petal and stamen showing corona at base of petal (m) (from *G.J. Leach* 2795 & *I.D. Cowie*). *P. tenax* J - sepal, K - petals and stamens, L - capsule (from *B. Rice* 3206).

P. involucrata and *P. incana* in growth habit, inflorescence, floral and indumentum characters. Further collecting would help clarify the relationship of these entities to *P. incana* and *P. involucrata.*

Etymology. The specific epithet refers to the hoary stems.

P. microceps I.D. Cowie, sp. nov.

P. incana affinis sed habens foliis latis, caulibus tenuibus, bracteis ac calycibus ferrugineis, et carens indumento incano.

Typus: Little Nourlangie Rock, Northern Territory, 17 March 1978, *C. Dunlop* 4704 (holo: DNA!; iso: BRI).

An erect perennial *herb* to 15 cm tall. *Stems* numerous, red-brown, slender, 0.6-0.7 mm diam., cobwebbed with branched crisped septate hairs; internodes 6-12 mm long. *Stipules* red-brown, 1.6-2 mm long, triangular, midrib present, margins ciliate, apex attenuate. Cauline *leaves* opposite, occasionally in several pairs at nodes, narrowly oblanceolate or linear, 2.3-9 mm long, 0.7-1.3 mm wide, glabrate with crisped septate hairs. *Inflorescence* terminal, capitate, 3-12-flowered, subtended by 1-2 pairs of leaves; bracts stipule-like, 1.7-3 mm long, bifid; pedicels 0.5-1.5 mm long. *Sepals* red-brown, lanceolate, 2.1-3 mm long, midrib present, margin ciliate, apex acute. *Petals* reddish, free, lanceolate to oblong, 1.2-2 mm long, 0.6-0.8 times as long as sepals, glabrous, apex rounded. *Stamens* 0.8-1.4 mm long, 0.4-0.6 times as long as petals; filaments 0.7-1.2 mm long; anthers 0.3-0.4 mm long; staminodes absent. *Style* 0.3-0.5 mm long; stigma capitate. *Capsule* brown, ovoid, 1.2-1.5 mm long, 0.5-0.7 times as long as calyx. *Seeds* c. 12, red-brown, rhomboidal-ellipsoid, c. 0.4 mm long, 0.25 mm wide, surface foveolate with a minute reticulum. Figures 1I, 2A-E.

Other specimens examined. NORTHERN TERRITORY: 1 km upstream from Twin Falls, 13° 20' S, 132° 42' E, *R. Fensham* 781 (DNA); 70 km S of Jabiru, 13° 19' S, 132° 47' E, *L.A. Craven & G. Whitbread* 7887 (CANB); SE face of Nourlangie Rock, Kakadu National Park, 12° 57' S, 132° 50'E, *R. Cunliffe* UNSW19984 (CANB, DNA); 5 km SE of East Alligator River Crossing, 12° 25'S, 132° 55' E, *van Balgooy & Byrnes* 1314 (CANB); 2 km NW of Koongarra Saddle, 12° 45' S, 132° 55'E, *I.R. Telford* 8119 & *J.W. Wrigley* (BRI); Deaf Adder Gorge, 13° 02' S, 132° 58' E, *C. Dunlop* 4406 (BRI, DNA); Nabarlek, 12° 17' S, 133° 19' E, *M.O. Rankin* 2090 (CANB, DNA); 8 km E of East Alligator River Crossing, 12° 25' S, 133° 29' E, *C. Dunlop* 3705 (DNA); Liverpool River Headwaters, 12° 46' S, 133° 44' E, *G. Wightman* 1441 & *L. Craven* (DNA).

Distribution. Endemic to western Arnhem Land in the Northern Territory, in Kakadu National Park and adjoining areas of the Arnhem Land Reserve.

Habitat. Grows in crevices in sandstone rock faces and rarely in crevices in rock platforms.

Flowering and fruiting. Between February and July.

Conservation status. Not rare or threatened.

Notes. Similar to but geographically disjunct from *P. incana* and having broader leaves, finer stems, red-brown bracts and calyx, and lacking the hoary indumentum of that species. Sympatric with *P. tenax* but differing from that species in the lack of a floral tube, smaller floral parts, red-brown bracts

and calyx and lack of a hoary indumentum. One collection, *Wightman* 1441 & *Craven,* however does have the hoary indumentum of *P. incana.*

Etymology. The specific epithet refers to the relatively small, compact inflorescences.

P. multicaulis I.D. Cowie, nomen nov.

Polycarpaea microphylla Pedley, Austrobaileya 1:55 (1977), *nom. illeg., non* Cav., Anales Ci. Nat. 3:25 (1801). *Type:* Robinson River, Northern Territory, July 1925, *L.J.Brass* 415 (holo: BRI, iso: CANB!).

Distribution. Occurs inland of the Gulf of Carpentaria in Queensland and the Northern Territory, and in western Queensland.

Habitat. Grows on shallow soils on residual land surfaces, often associated with sandstone outcrops.

Flowering and fruiting. Mainly between April and August.

Conservation status. Not rare or threatened.

Discussion. This species is closely related to some forms of *P. corymbosa,* with which it sometimes intergrades in western Queensland. The distinctive features of *P. multicaulis* are the perennial habit, often subwoody base, typically numerous wiry stems, hoary at least in the upper parts, short stipules and leaves, few pairs of leaves per node and long petals and capsule relative to the length of the sepals. However, the two species are quite distinct over much of the range of *P. multicaulis* and are usually separated by habitat. In northern areas where *P. multicaulis* and *P. corymbosa* are sympatric, the latter is typically a slender few-stemmed annual with longer more numerous leaves, longer floral parts and lacks a hoary indumentum. A series of intermediate specimens mainly from western Queensland have many hoary perennial stems, but these have longer leaves and more pairs of leaves per node. (e.g.*Blake* 9969, *Ballingall* 1654, *Beeston* 1250c, *Bredillet s.n.* Aug.1983, *McDonald* 2620, *Palmer s.n.* 1883, *Wauchope s.n.* 10/2/1975 and *Wilson* 438 & *Pickering).* There are some short-lived perennial forms of *P. corymbosa* from eastern Queensland and New South Wales with short floral parts, but in other respects they are typical of *P. corymbosa.*

Northerly forms of *P. multicaulis* have more strongly branched inflorescences than do forms from south western Queensland. Some specimens from the Gulf of Carpentaria have reduced inflorescences and appear intermediate between this species and *P. incana* (*Brass* 415 and *Brass s.n.* Gilbert River). *Everist* 5292 may represent an undescribed species. It has the floral tube and longer floral parts of *P. tenax* but the inflorescence of *P. multicaulis* and the more numerous leaves of *P. corymbosa.* Another specimen of *P. corymbosa* from near Cooktown (*Bredillet s.n.* August 1983) has the perennial habit of *P. multicaulis.*

P. tenax I.D. Cowie, sp. nov.

P. incana affinis, a qua differt inflorescentiis habens paucifloribus, tubus flore praesens, partibus floribus longioribus et capsula ellipsoidea ad urceolata.

Typus: Nabarlek, Northern Territory, 26 April 1979, *B. Rice* 3206 (holo: DNA!; iso: BRI, CANB!).

An erect perennial *herb* to 10 cm tall. *Stems* numerous, hoary with branched crisped septate hairs; internodes 2-4 mm long. *Stipules* hyaline, 1.8-3 mm long, triangular, midrib present, glabrate to cobwebbed, margins ciliate, apex attenuate. Cauline *leaves* opposite, occasionally in several pairs at nodes, linear, 2-3 mm long, 0.3 mm wide, glabrous to woolly with branched or unbranched crisped septate hairs. *Inflorescence* terminal, solitary on stem, compact, 1-several flowered, subtended by 1 pair of leaves; bracts stipule-like, 3-3.5 mm long, bifid; pedicels 0.5-2 mm long. *Sepals* hyaline, lanceolate, 3.2-5 mm long, midrib present, glabrous to cobwebbed, margin ciliate, apex acute. *Petals* reddish, connate with stamens into a tube 0.5-1 mm long, oblong, 2.4-3.2 mm long, 0.6-0.8 times as long as sepals, glabrous, apex rounded. *Stamens* 1.6-2.7 mm long, 0.5-0.8 times as long as petals; filaments 1.6-2.5 mm long; anthers 0.4-0.5 mm long; staminodes absent. *Style* 1-1.7 mm long; stigma capitate. *Capsule* brown, narrowly ovoid to urceolate, 2.3-2.6 mm long, c. 0.5 times as long as calyx. *Seeds* c. 30, pale brown, dimidiate in outline, c. 0.4 mm long, 0.2 mm wide, surface reticulate-areolate or reticulate-foveolate with a minute reticulum. Figures 1F-G, 2J-L.

Other specimens examined. NORTHERN TERRITORY: Deaf Adder Gorge, 13° 07' S, 132° 56' E, *I.R. Telford* 7968 & *J.W. Wrigley* (CANB); 14.5 km NE of Jabiru East, 12° 33' S, 132° 59' E, *M. Lazarides* 9017 (CANB, DNA); Nabarlek, 12° 30' S, 133° 21' E, *R. Hinz* 165 (DNA); 44 km SE Oenpelli, 12° 34' S, 133° 23' E, *P.K. Latz* 7837 (DNA); Arnhem Land, 12° 51' S, 133° 32' E, *P.K. Latz* 2994 (DNA); Cadell River, 12° 39' S, 134° 18' E, *D.E Symon* 7888 (AD).

Distribution. Endemic to the Northern Territory in northern parts of Kakadu National Park and adjacent areas of western Arnhem Land.

Habitat. Grows in crevices in sandstone platforms.

Flowering and fruiting. Between February and July.

Conservation status. Not rare or threatened.

Discussion. Vegetatively this species is very similar to *P. incana* but is readily distinguished by the few-flowered inflorescences, presence of a floral tube, longer floral parts and narrowly ovoid to urceolate capsule (see also notes under *P. multicaulis*).

Comments on other species

Polycarpaea breviflora F. Muell., Rep. pl. Babbage's Exped. 9 (1859).- *Polycarpon breviflorum* (F. Muell.) Kuntze, Revis. gen. pl. 1:51 (1891). - *Polycarpaea corymbosa* var. *breviflora* (F. Muell.) Domin, Biblioth. Bot. 89:101 (1925). *Type*: Gulf of Carpentaria, *F. Mueller* (holo: MEL).

P. brevianthera Ewart & Cookson, Fl. N. Territory 109 (1917). *Type*: Roper River, N.T., 1911, *W. Baldwin Spencer* (holo: MEL).

P. triloba Ewart & Cookson, Fl. N. Territory 109 (1917). *Type*: Georgina River, Qld, 1889, *A. Henry* (holo: MEL).

P. parviflora Domin, Biblioth. Bot. 89:100 (1925). *Type*: Cloncurry, Qld, Feb. 1910, *Domin* (holo: PR) *n.v.*

P. synandra var. *gracilis* Benth., Fl. Austral. 1:165 (1863). - *P. breviflora* var. *gracilis* (Benth.) Pedley, Austrobaileya 1:60 (1977). *Type*: Port Essington, Apr. 268/1818, *A. Cunningham* (isolecto: MEL), *fide* L. Pedley, Austrobaileya 1:60 (1977).

This species exhibits some variation in floral colouration and compactness of the inflorescence. The extremes of the variation have been recognised as varieties by Pedley (1977). Variety *breviflora* was distinguished by the spreading inflorescence and white, ovate sepals while var. *gracilis* was distinguished by the compact inflorescence and white, narrowly ovate sepals with a distinct purplish midrib. However, there are also extreme forms with very open inflorescences and purplish midribs, with more or less continuous variation between all the extremes. Some forms have hyaline rather than white sepals. The species is closely related to and is not clearly distinguished from *P. spirostylis* in inland western Queensland and adjacent areas of the central Northern Territory, from where there are a series of specimens with sepals in the 4 to 5 mm size range. However, the two species appear to be distinct in coastal areas of the Northern Territory. Specimens with sepals 4.5 mm long or less have been retained as *P. breviflora*. A detailed morphometric analysis may help resolve problems in *P. spirostylis* and *P. breviflora*.

Polycarpaea corymbosa (L.) Lam., Ill. Gen. Encycl. 2:129 (1797). - *Achyranthes corymbosa* L., Sp. Pl. 205 (1753). *Type*: Ceylon [Sri Lanka], Herb. Herman (lecto: BM) *n.v.*, *fide* W.B. Turrill, Fl. Trop. E. Africa (1956).

P. diversifolia Domin, Biblioth. Bot. 89:102 (1925). *Type*: between Ashburton and Yule River, Western Australia, *E. Clement n.v.*

P. corymbosa var. *minor* Pedley, Austrobaileya 1:52 (1977). *Type*: Darling Downs, Queensland, *Pedley* 1234 (iso: CANB).

P. corymbosa var. *torrensis* Pedley, Austrobaileya 1:52 (1977). *Type*: Badu Is., Queensland, *Bick* 83 (holo: BRI).

This species has a pantropical distribution and in Australia there appear to be several forms. The most common and widespread of these has filiform, glabrous leaves which are relatively few at nodes; usually entire sepals without a distinct midrib and large cymes. A distinctive ecotype occurs on sandstone substrates in the western Top End of the Northern Territory and is generally smaller in stature with densely whorled, short, flat, hairy, narrowly oblanceolate leaves, sparser inflorescences and ciliate, ribbed sepals. Another form found around the Gulf of Carpentaria and on islands of Torres Straight has long, narrowly ovoid fruit and subcylindrical seeds. In the past, specimens from this area with short internodes and more distinct midribs, some with the above fruit and seed characters have been referred to *P. corymbosa* var. *torrensis*. Perennial forms with relatively small flowers and often with reddish sepals and a more dense indumentum occur in some inland areas and grade into *P. multicaulis*. Some of these have been referred to *P. corymbosa* var. *minor* which was distinguished by the smaller flowers and reddish bases on the sepals. Turrill (1956) working on east African material noted that the species is extremely variable and commented that it appears "of doubtful value to give names to slight variants until modern methods of synthetic taxonomy...have been applied to the whole group". These comments could equally well apply to *P. spirostylis* and some other species.

Polycarpaea diversifolia is here regarded as a synonym of *P. corymbosa*. Pedley (1977) stated that the two species differ in that *P. diversifolia* is annual and has obscure folds inside the petals at the base (a minute corona). He used as a key character the presence of persistent, broad basal leaves. However,

P. corymbosa in northern Australia is nearly always annual and has a minute corona. Also, there are a number of shorter specimens of *P. corymbosa* in which the basal leaves have persisted (e.g. *Evans* 3641; *Fryxell & Craven* 4078; *Latz* 9490, 10696; *A.S. Mitchell* 230, 714, 1203). *Adams* 952, the only specimen of *P. diversifolia* which Pedley cited (apart from the type) is clearly one of these. Basal leaves are sometimes persistent in other Australian species (e.g. *P. arida, P. holtzei, P. involucrata*) as well as the east African *P. eriantha* (Turrill 1956) but are of little taxonomic significance. Also, both Pedley's and Domin's descriptions of *P. diversifolia* are otherwise consistent with that of *P. corymbosa*.

Polycarpaea involucrata F. Muell., Rep. pl. Babbage's Exped. 9 (1859). *Lectotype*: Sturt's Creek and Upper Victoria River, March 1856, *F. Mueller* (MEL 49074) *lecto. nov.*

This species has affinities with *P. arida, P. incana* and *P. microceps,* but is distinguished by the annual habit; sessile, capitate inflorescences which are both axillary and terminal; flowers consistently on short pedicels; and oblanceolate, hairy leaves which are in several pairs at nodes. Several intergrading forms of the species are known. Diminutive forms with smaller floral parts occur in the northern Kimberley. A few of these have hoary stems and are perennial (e.g. *Cowie* 4357), and one (*Fryxell* 4726) in part lacks axillary inflorescences and approaches *P. incana.* West of Mitchell Falls, these diminutive annual and hoary perennial forms have been observed growing side by side. Some small flowered specimens also have red-brown bracts and sepals. Further collecting of these forms is needed.

In central Australia, where *P. involucrata* is sympatric with *P. arida,* there is a distinct form of *P. involucrata* with slightly more open inflorescences than the typical form. The two species occur in different habitats with *P. involucrata* occurring in crevices on sandstone outcrops (as elsewhere) and *P. arida* on flat country on areas receiving local run-on water.

Polycarpaea spirostylis F. Muell., Rep. pl. Babbage's Exped. 8 (1859). - *Polycarpon spirostyle* (F.Muell.) Kuntze, Revis. gen. pl. 1:51 (1891). *Type*: Tropical Australia, *F. Mueller* (holo: MEL).

P. synandra F. Muell., Rep. pl. Babbage's Exped. 8 (1859). - *Polycarpon synandrus* (F.Muell.) Kuntze, Revis. gen. pl. 1:51 (1891). *Lectotype*: Victoria River, 1855-56, *F. Mueller* (lower, right-hand specimen of MEL 49121) (MEL) *lecto. nov.*

P. synandra var. *densiflora* Benth., Fl. Austral. 1:165 (1863). - *P. spirostylis* subsp. *densiflora* (Benth.) Pedley, Austrobaileya 1:59 (1977). *Type*: Cape Flinders, [14° 08'S, 144° 14'E], July 131/1819, *A. Cunningham* (lecto: K), *fide* L. Pedley, Austrobaileya 1:59 (1977), *n.v.*

P. burtonii F.M. Bailey, Proc. Roy. Soc. Queensland 1:85 (1885). - *P. spirostylis* var. *burtonii* (Bailey) Domin, Biblioth. Bot. 89:99 (1925). *Syntypes*: Walsh Range, between the Tate River and Thornborough, Qld, *R.C. Burton* (BRI *n.v.*; isosyn: MEL 49038); Herberton, *Stuart* (BRI *n.v.*)

P. spirostylis var. *intercedens* Domin, Biblioth. Bot. 89:100 (1925). *Type*: Walsh R., Qld, Feb. 1910, *Domin* (holo: PR) *n.v.*

P. spirostylis var. *intricata* Domin, Biblioth. Bot. 89:100 (1925). *Type*: Burketown, Qld, *L.C. Ball* (holo: PR) *n.v.*

P. spirostylis var. *rosulans* Domin, Biblioth. Bot. 89:100 (1925). *Type*: Chillago, Qld, Feb. 1910, *Domin* (holo: PR) *n.v.*

P. glabra White & Francis, Proc. Roy. Soc. Queensland 37:152 (1926). - *P. spirostylis* subsp. *glabra* (White & Francis) Pedley, Austrobaileya 1:58 (1977). *Type*: Dugald silver-lead lodes, Cloncurry District, Queensland, *J.B. Miller*, 16th April 1924, *n.v.*

P. gamopetala Berhaut, Bull. Mus. Hist. Nat. (Paris) ser. 2, 25:210 (1953). *Type*: Senegal. Ex. herb. DC., Herb. Moquin-Tandon (holo: PR) *n.v.*

P. spirostylis subsp. *compacta* Pedley, Austrobaileya 1:59 (1977). *Type*: Croydon, Queensland, *Speck* 4720 (iso: CANB, MEL).

Mueller gave the type localities for *P. synandra* as "Wirrawirraloo. Also in Arnhem's Land and in other parts of tropical Australia." The Wirrawirraloo specimen was not located by Pedley (1977) although he discussed a sheet at MEL (MEL 4912). The Victoria River specimen on that sheet is almost certainly another syntype, since that locality lies within Mueller's concept of Arnhem Land, is annotated as *P. synandra* by Mueller and was collected by him several years prior to publication of the description of that species. This specimen also fits the description given by Mueller. Although the Wonamulla specimen on the same sheet is probably from about 150 km north-west of Wirrawirraloo (Pedley 1977), there is no evidence that it predates the description of *P. synandra*.

Although *P. spirostylis* is variable in flower size, lobing of the petals and compactness of the inflorescence, no sharp discontinuity in the variation is apparent and circumscription of the previously recognised subspecies is regarded as arbitrary. The apex of the petals varies continuously from deeply bifid in the northern Northern Territory to entire in some parts of north Queensland. Lobing of the petals also tends to be less pronounced in specimens with smaller flowers. Although some forms have more compact inflorescences, this character has little geographical basis and is not correlated with the lobing of the petals, with flower size, degree of colouration or vegetative characters. Specimens from more southerly and more inland localities tend to have shorter flowers, although all sizes of flowers can be found in some northern areas. Sepal length reaches a maximum in populations from Cape York (13 mm) with specimens from the Top End of the Northern Territory reaching 9.7 mm.

Polycarpaea violacea (Mart.) Benth., Fl. Austral. 1:165 (1863). - *Aylmeria violacea* Mart., Nova Acta Phys.-Med. Nat. Acad. Caes. Leop.-Carol. Nat. Cur. 13:277 (1826). - *Achyranthes violacea* (Mart.) Sprengel, Syst. veg. 4(2):102 (1827). - *Polycarpon violaceum* (Mart.) Kuntze, Revis. gen. pl. 1:51 (1891). *Type*: Croker Is., Northern Territory, 1818, *A. Cunningham* 267 (iso: BRI, MEL).

Aylmeria rosea Mart., Nova Acta Phys.-Med. Nat. Acad. Caes. Leop.-Carol. Nat. Cur. 13:277 (1826). - *Achyranthes rosea* (Mart.) Sprengel, Syst. veg. 4(2):103 (1827). *Type*: Ex herb, Lambert, *n.v.*

P. fallax Pedley, Austrobaileya 1:51 (1977), *nom. illeg., non* J. Gay ex Oliver, Fl. T. Af. 1:145 (1868). *Type*: Port Bradshaw, Northern Territory, July 1948, *R. Specht* 708 (holo: BRI; iso: MEL).

Colourless forms of this species have been described as *P. fallax* by Pedley (1977) who separated *P. violacea* by its glabrous stems, shorter capsule and coloured sepals. However, the supposed lack of an indumentum in *P. violacea* appears to be an error as Bentham stated that the stems are hairy and of

the five specimens cited by Pedley the four seen (including the isotypes) have hairy stems. All other material with reddish sepals which had been referred to *P. violacea* also has hairy stems.

Pedley (1977) also separated the species on capsule length which he gave as c. 1/3 the length of the corolla in *P. violacea* and at least 1/2 the length of the corolla in *P. fallax*. However, the type of *P. violacea* has capsules subequal in length to the petals and in almost all mature specimens of both major colour forms the capsule is more than 2/3 the length of the petals. Some specimens of both major colour forms have immature fruit and this may well be the basis of the supposed difference.

Sepal colour was also used to separate the two species but as a character in isolation is not sufficient to maintain the species as separate. Colouration of sepals ranges from occasionally almost completely coloured (*Wightman* 370, 3441; *Hinz* 27), through partly coloured (coloured tops and hyaline bases - common) to completely hyaline (also common). There are occasional intermediate forms where the sepals are hyaline with coloured midribs (*Cowie* 2769, 2921) or where coloured and hyaline flowers occur in the same inflorescence (e.g. *McKean* B486, *Wightman* 3827, *Musprat* 2948). At a gross level the ranges of both major colour forms largely overlap, although they rarely grow together. Coloured forms occur in near-coastal areas of the Top End of the Northern Territory, while colourless forms occur across the entire range of the species.

The compactness of the inflorescence and staminode length also varies. Forms from the Kimberley and Victoria River regions have less compact inflorescences and longer staminodes than those from the northern and eastern Northern Territory.

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New taxa of *Verticordia* (Myrtaceae: Chamelaucieae) from Western Australia

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Abstract

Elizabeth A. George and Alex S. George. New taxa of *Verticordia* (Myrtaceae: Chamelaucieae) from Western Australia. Nuytsia 9 (3): 333-341 (1994). Four recently discovered new taxa are described and discussed: *Verticordia aereiflora, V. apecta, V.* x *eurardyensis* (a presumed hybrid between *V. dichroma* and *V. spicata*) and *V. luteola* var. *rosea.*

Introduction

Following the publication of a review of *Verticordia* (A.S. George 1991), no further new taxa were recognised until the 1993-94 season, when the following were found by observers assisting the first author to prepare a book on the genus. All occur in the South-West Botanical Province of Western Australia and are restricted in distribution. Re-examination of material previously referred to *Verticordia dichroma* necessitated redetermination of two collections as the new species *V. aereiflora*. *Verticordia* now contains 100 species and 43 infraspecific taxa (autonyms excepted). These discoveries are further evidence of the need for continuing survey of this floristically rich region.

Verticordia aereiflora E.A. George & A.S. George, sp. nov. (subg. *Eperephes*, sect. *Pennuligera*) (Figure 1)

Ad *Verticordiam chrysostachidem* Meisner affinis, sed foliis minoribus, floribus flavis et rufis minoribus in turmis 1-3, et petalis minoribus, differt; etiam ad *V. dichromam* A.S. George affinis, sed floribus turmis 1-3, pedunculis longioribus, petalis minoribus, staminibus brevioribus, et styli barbae pilis brevioribus, differt.

Typus: NE of Yuna, Western Australia, 11 Dec. 1993, *E.A. George* 527A-B &*B. Moyle* (holo: PERTH 03461254; iso: CANB).

Slender *shrub* to 1 m, without lignotuber. *Leaves* orbicular, obtuse, 2-2.5 mm long, ascending to spreading, concave, entire, prominently glandular, with dark brown petiole 0.3-0.4 mm long. *Flowers* solitary or in groups of 2 or 3, but often several groups along one branchlet; peduncles 2-3 mm long, thickened below flower; bracteoles very concave, 3.5 mm long, scarious, cuspidate, entire but margin

often broken at anthesis, persistent, yellow in lower half grading to deep red in upper half. *Hypanthium* broadly turbinate, 2.5 mm long, glabrous, prominently 5-ribbed; reflexed green appendages cuneate, obtusely rounded, 1 mm long, thick. *Sepals* greenish yellow to yellow with a deep red or reddish bronze fringe, horizontal, 4-4.5 mm long, the lamina transversely elliptic, 1 mm long, 2.5 mm wide; lobes 8-10, fimbriate; reflexed lobes pale yellow with red fringe, orbicular, auriculate on prominent concave stalk, scarious, fimbriate, c. 4 mm long, 5 mm wide, concealing hypanthium. *Petals* yellow with red spots, erect, concave, crown-like and closed around style after anthesis, ovate, 4.5-5 mm long, the lamina 2.5-3 mm long, 2-2.3 mm wide, fimbriate, deeply so across apex; auricles small. *Stamens* at first curved inwards but then recurved and the anthers opening outwards, 1.8-2 mm long, united with staminodes for c. 1/2 length; anthers 0.5-0.6 mm long; *staminodes* 2-2.3 mm long, linear, the free part prominently glandular, abruptly narrowed and acute. *Style* pink with red apex, curved to lower side of flower, then sigmoid towards apex, 6-7 mm long, thick; beard unilateral, dense, over c. 1 mm below apex on outside of curve; hairs c. 0.2 mm long. *Ovules* 8 or 9.

Distribution and habitat. Occurs north-east of Yuna (Figure 3). Grows in yellow sand on the lower slopes of sand dunes and in the intervening swale, in open shrubland with *Grevillea candelabroides*, *Grevillea gordoniana*, *Hakea bucculenta*, *Eucalyptus*, *Acacia*, *Scholtzia* etc.

Flowering period. November-December.

Other collections examined. WESTERN AUSTRALIA: near Yuna, 6 Dec. 1959, *C.A. Gardner* 12041 (PERTH); East Yuna Reserve, 15 Dec. 1968, *A.C. Burns* 128 (PERTH); type locality, *E.A. George* 522 A-D, 525, 526 & *B. Moyle* (PERTH).

Conservation status. CALM Conservation Codes for Western Australian Flora: Priority Two - Poorly Known Taxa. The population at the type locality extends over c. 1 kilometre and contains c. 200 plants. It is on a farm but is protected by the owners. The two other localities have not been sought out.

Etymology. The specific epithet is from the Latin *aereus* - bronze and *flos* - a flower, in reference to the colour of the flowers. The combination of red and yellow gives an overall impression of bronze.

Discussion. Verticordia aereiflora is in subg. *Eperephes*, sect. *Pennuligera*, and is related on the one hand to *V. chrysostachys* Meisner and on the other to *V. dichroma* A.S. George. It differs from both in the small groups of flowers (1-3) and smaller petals. It differs further from *V. chrysostachys* in the yellow and red colour and the smaller leaves. From *V. dichroma* it also differs in the longer peduncles, shorter stamens and short hairs of the style beard. Neither relative has been found close to the locality where the new species occurs.

In the Key to species given in George (1991), this species and *V.* × *eurardyensis* (described below) would key out to couplet 93, which should be modified as follows:

93a Style hairs 0.2-0.5 mm long

94a Peduncles 2.5-4 mm long; flowers golden or pale yellow ..... *V. chrysostachys*

94b Peduncles 0.5-2 mm long, sometimes to 3 mm; flowers cream to silvery pink, pink-maroon, maroon, magenta, or yellow and deep red to bronze

95a Leaves 1-4 mm long; flowers pink-maroon, maroon, magenta, or yellow and deep red to bronze; style curved, sigmoid or geniculate below apex

95aa Peduncles 0.5 mm long ..... *V.* x *eurardyensis*

95bb Peduncles 1.5-2 mm long

95aaa Flowers pink-maroon; ; stamens 3.5 mm long; style 5 mm long; Perenjori to Wongan Hills and Bencubbin ..... *V. venusta*

95bbb Flowers yellow and deep red to bronze; stamens 1.8-2 mm long; style 6-7 mm long; north of lower Murchison River. ..... *V. aereiflora*

95b Leaves 4-7 mm long; flowers cream to silvery pink; style straight ..... *V. argentea*

93b Style hairs 0.7-1.2 mm long

Verticordia apecta E.A. George & A.S. George, sp. nov. (subg. *Verticordia*, sect. *Catocalypta*) (Figure 1)

Ab *Verticordia inclusa* A.S. George hypanthio brevissime pubescente, sepalis auriculisque sparsiore fimbriatis, petalis profundiore fimbriatis, staminodiis minus fimbriatis, stylo breviter barbato, et laminis lobisque sepalorum et petalorum roseis, praecipue differt.

Typus: Sheepwash Reserve, off Spencer Road, SW of Mount Barker, Western Australia, 34° 47' S, 117° 34' E, 16 Nov. 1993, *E.A. George* 494A-D, *T. Annels & C. Vellios* (holo: PERTH 03461246; iso: CANB, K, MEL).

A slender, erect *shrub* with 1 stem to 45 cm tall, ?with lignotuber. *Lower leaves* linear, triquetrous, obtuse, often minutely mucronate, 3-9 mm long; stem leaves narrowly elliptic, obtuse but minutely mucronate, c. 7 mm long; floral leaves elliptic to obovate, triquetrous, obtuse. *Flowers* few, in upper axils. *Peduncles* 9-19 mm long, ascending, thickened upwards. *Bracteoles* not cuspidate. *Hypanthium* broadly turbinate, 1.5 mm long, 10-ribbed, shortly and finely pubescent; top of hypanthium finely pitted. *Sepals* deep pink including main lobes, the finer fringe segments white, widely spreading but main lobes upturned, 4 mm long overall; lamina semi-elliptic, c. 1 mm long, 2 mm wide ; fringe finely scabrid; auricles on broad claw, the upturned lamina semi-orbicular, deeply fimbriate, exceeding hypanthium. *Petals* deep pink, the finer fringe lobes white, 4 mm long overall, spreading with upturned fringe; lamina transversely semi-orbicular, deeply lacerate with 4-6 main lobes and many smaller ones; lamina 1 mm long, 1.8 mm wide. *Stamens and staminodes* united for c. 0.5 mm; stamens 0.8-1 mm long, glabrous; anthers 0.5-0.7 mm long, strongly incurved, depressed-globular with lateral shallow vertical grooves, and with small obtuse umbonate apical appendage; staminodes 3.5 mm long, irregularly lacerate, otherwise glabrous. *Style* erect, 0.3 mm long, with short hairs around stigma; stigma slightly enlarged. *Ovules* 2, laterally attached at base of ovary.

Distribution and habitat. Known only from the type locality (Figure 3). Grows in sandy clay with loam and broken granite, on an upper west-facing slope in *Eucalyptus wandoo* low open woodland and low open shrubland.

Flowering period. November.

Conservation status. CALM Conservation Codes for Western Australian Flora: Priority Two - Poorly Known Taxa. Known only from the type collection which is from a population of c. 30 plants.

Etymology. The specific epithet is taken from the Greek *apektos* - uncombed, unkempt, in reference to the somewhat untidy appearance of the flowers.

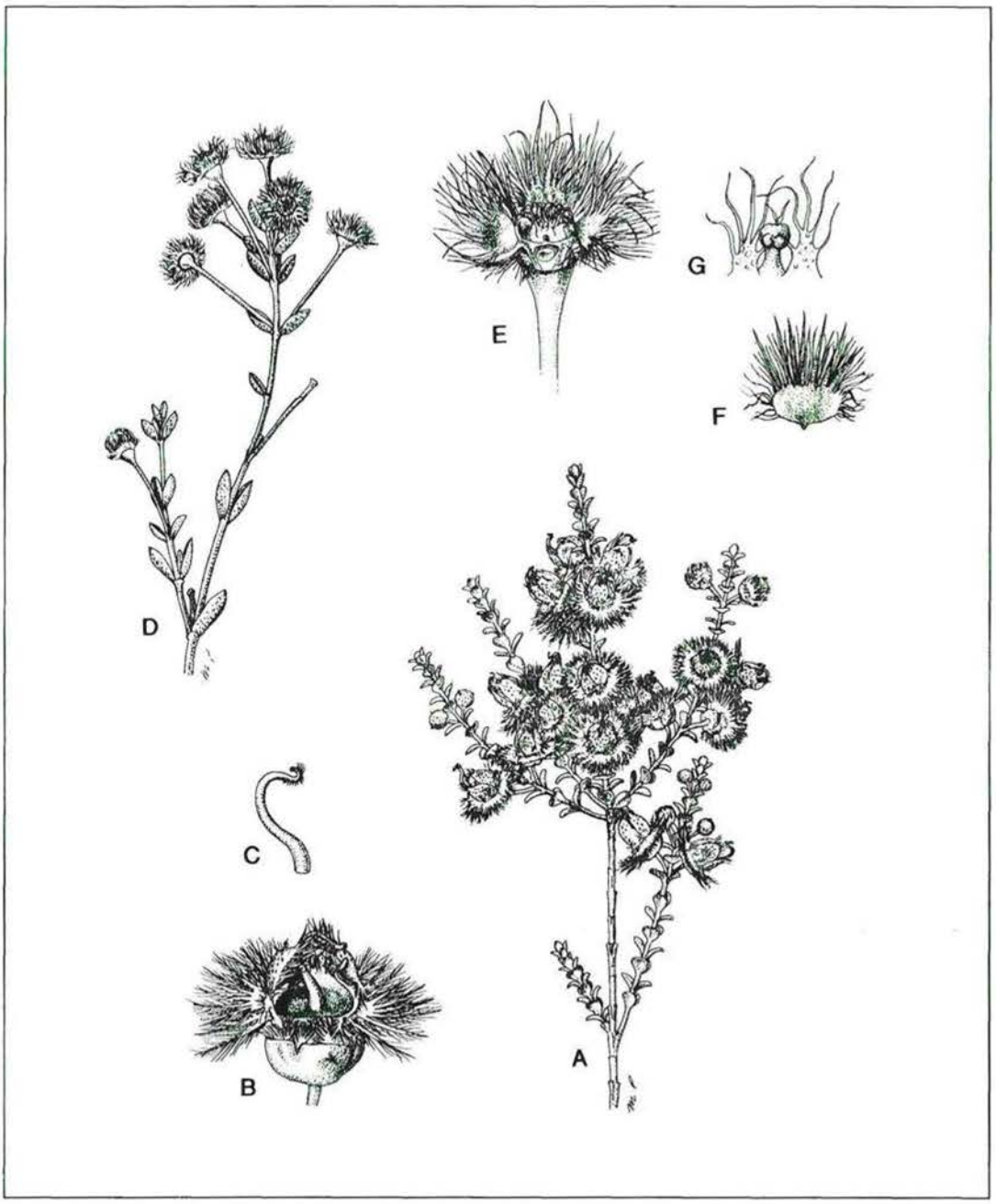

Figure 1. A-C *Verticordia aereiflora*. A - flowering branchlet (x1); B - flower with 2 sepals and petals removed, bracteoles intact (x3); C - style (x3). D-G *Verticordia apecta*. D - flowering branchlet (x1); E - flower with 2 sepals and petals and part of hypanthium removed (x3); F - petal (x4); G - a stamen and 2 staminodes (x6). Drawn by Margaret Pieroni.

Discussion. Verticordia apecta is in subg. *Verticordia*, sect. *Catocalypta*, and is related most closely to *V. inclusa* A.S. George. It differs from that species in its spindly habit, its very shortly pubescent hypanthium, its shortly bearded style, its more sparsely fimbriate sepals (and their auricles), its more deeply fimbriate petals, its less fimbriate staminodes, and the pink colouration of the sepals and petals. It grows some distance (c. 200 km) WSW of the nearest population of *V. inclusa* (near Fitzgerald). There is a strong superficial resemblance to *V. habrantha* (which occurs at the type locality) in habit, leaves and floral arrangement, but the shortly bearded style and fimbriate, pink petals readily distinguish it from that species. It is likely that there are further populations in appropriate habitats, especially to the west and north-west.

In the Key to species given in George (1991), this species would key out to couplet 47, which should be modified as follows:

47a Style with lateral beard or with a ring of short hairs just below stigma
48a Style 0.3 mm long, with ring of hairs below stigma ..... *V. apecta*
48b Style 4.5-7 mm long, with a lateral beard ..... *V. pritzelii, V. lehmannii*
47b Style glabrous or very shortly pubescent at base ..... *V. habrantha* etc.

Verticordia x eurardyensis E.A. George & A.S. George, sp. nov. (subg. *Eperephes*, sect. *Pennuligera*) (Figure 2)

Species nova, verosimiliter originis hybridae inter *Verticordiam dichromam* A.S. George var. *dichromam* et *V. spicatam* F. Muell. subsp. *spicatam*, ab ambobus floribus magentis vel atro-rubris distinguibilis. Ab *V. dichroma* foliis angustioribus confertioribus, pedunculis brevioribus, hypanthii appendiculis longioribus acutis, sepalorum lobis angustioribus acutis, petalis latioribus etiam differt. Ab *V. spicata* foliis minus confertis, hypanthio majore, et styli pilis longioribus, etiam differt.

Typus: Eurardy Station, 28 km N of Galena Bridge [North West Coastal Hwy], Western Australia, 22 Nov. 1992, *E.A. George* 437 with *N. & P. Moyle* and *M. Quicke* (holo: PERTH 02838893).

A *shrub* to c. 1 m tall, with lignotuber, much-branched. *Stem leaves* spathulate or obovate to elliptic, concave, 1-4 mm long; margins narrow, translucent, erose to minutely ciliate. *Floral leaves* similar to stem leaves but wider. *Flowers* spreading, crowded in spike-like groups, faintly scented. *Peduncles* c. 0.5 mm long. *Bracteoles* obscurely keeled, cuspidate, persistent. *Hypanthium* turbinate, c. 3 mm long, prominently 5-ribbed, rugose, glabrous; reflexed appendages present, very thick, one- to two-thirds the length of the hypanthium. *Sepals* 4.5-5 mm long, spreading, dark magenta to maroon; lobes 8-11, plumose, the midribs 0.1-0.3 mm wide, acuminate; auricles present, broad, deeply fringed, as long as hypanthium. *Petals* 2.5-3 mm long, 2.5-3 mm wide, orbicular, scarcely auriculate, erect, similar to sepals in colour or slightly paler; fringe c. 2 mm long, the segments acute. *Stamens and staminodes* united; *stamens* uniform, incurved, 2 mm long; filaments terete, swollen below anthers, smooth, glabrous; anthers oblong, opening by slits, 0.5 mm long; appendage none; *staminodes* terete, acute, incurved, as long as stamens, sparsely glandular-verrucose. *Style* 5.5-6.5 mm long, geniculate below apex, bearded all round, sometimes more densely so on one side, with hairs to 0.5 mm long; stigma slightly enlarged. *Ovules* 7 or 8.

Distribution and habitat. Known only from the type locality on Eurardy [pastoral] Station, N of Northampton (Figure 3). Grows in yellow sand over clay overlying rock, along shallow drainage line with *Actinostrobus arenarius* and low heath.

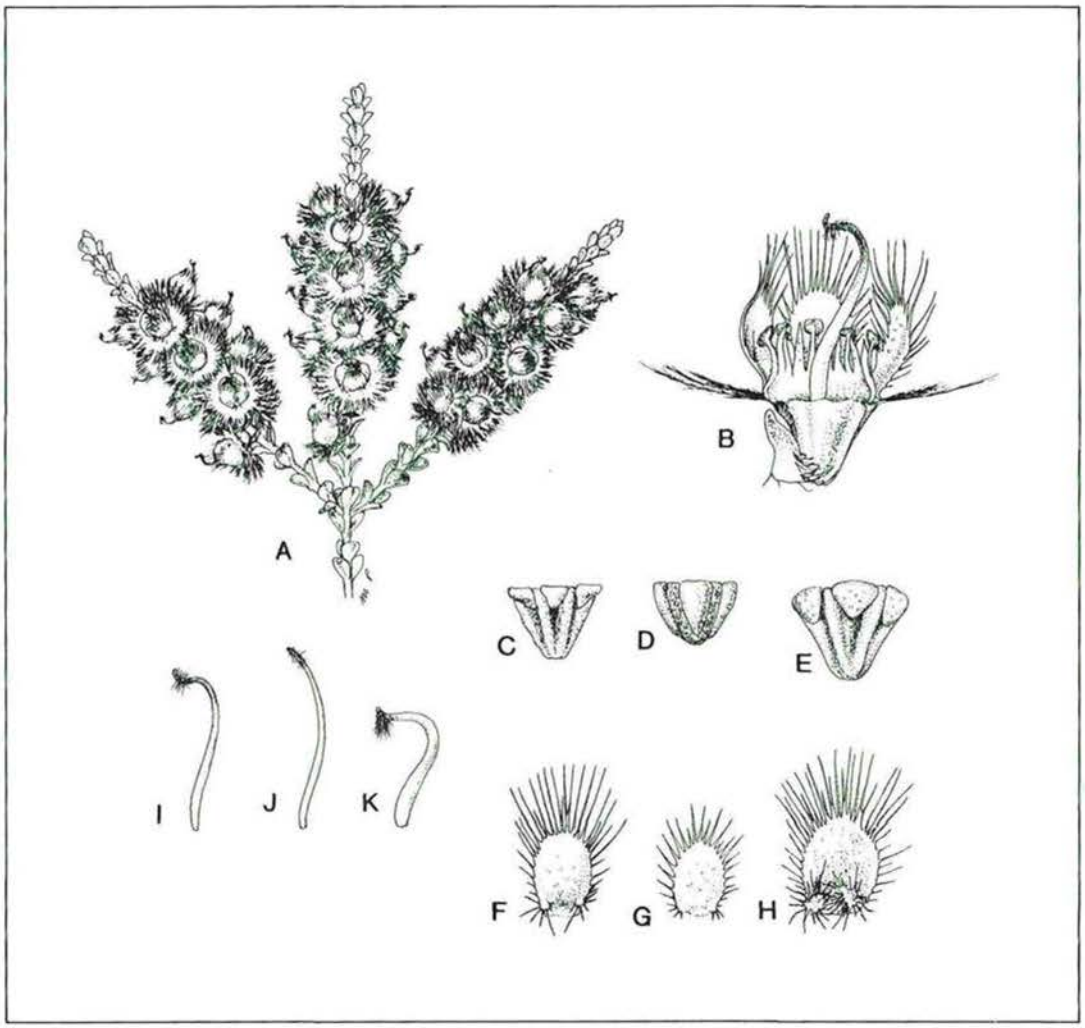

Figure 2. A, B, C, F, I - *Verticordia* x *eurardyensis*. D, G, J - *V. spicata* subsp. *spicata*. E, H, K - *V. dichroma* var. *dichroma*. A - flowering branchlet (x1); B - flower, with 2 sepals and petals and half the androecium removed (x3); C-E - hypanthium (x3); F-H - petal (x3); I-K - style (x3). Drawn by Margaret Pieroni.

Flowering period. October-November.

Other collections examined. WESTERN AUSTRALIA: Type locality, 30 Nov. 1992, *Margaret Quicke* 6-10 (PERTH).

Conservation status. CALM Conservation Codes for Western Australian Flora: Priority One - Poorly Known Taxa.. There are 30 plants over a distance of 3-4 km. The location is on a pastoral lease but is protected by the present lessees.

Etymology. Epithet formed from the name of the pastoral station on which the species occurs, with the Latin suffix *-ensis* indicating origin or place.

Discussion. This new plant was discovered by Margaret and Bruce Quicke in November 1992. Searches have located 27 plants, of which two occur in undisturbed vegetation about 30 m apart and some 30 m from a firebreak. The remainder occur in an area adjacent to the firebreak that was cleared in 1985-86 but then left to regenerate. Both presumed parents - *V. dichroma* var. *dichroma* and *V. spicata* subsp. *spicata* - occur with the hybrids. The hybrid plants are morphologically intermediate between the parents, are relatively uniform, and show no indication of back-crossing with either parent. The magenta to maroon flowers are distinctive (deep red or deep red and yellow in *V. dichroma*, pale to dark pink in *V. spicata*).

From *V. dichroma* the new species differs in having more crowded, narrower leaves, shorter peduncles, a smaller hypanthium with more acute appendages, sepals with narrower acute lobes, and smaller, broader petals. From *V. spicata* it may be distinguished by the less crowded leaves, larger hypanthium, longer fringe to the petals and differently coloured flowers, *V. spicata* having flowers that usually open pale pink to almost white and become deeper pink with age.

Both presumed parents are in subg. *Eperephes* but *V. spicata* is in sect. *Verticordella* and *V. dichroma* in sect. *Pennuligera*. For both species, n = 11 (Tyagi *et al.* 1991).

Many non-lignotuberous species of the genus germinate prolifically in burnt or once-disturbed sites but tend to die out after some years and persist as soil-borne seed awaiting the next disturbance event. Since *V.* × *eurardyensis* has a lignotuber it should persist now that it is established in the firebreak area.

Presumed hybrids previously recorded in the genus have been either single plants or hybrid swarms showing great variation indicating probable backcrossing (George 1991).

In the Key to species given in George (1991), this species would key out to couplet 93; for the required modification, see above under *V. aereiflora*.

Verticordia luteola A.S. George var. **rosea** E.A. George & A.S. George, var. nov.

Ab *Verticordia luteola* sensu typico floribus roseis; foliis, petalorum fimbriis et androecio parum majoribus; et florescentia serotiniore, differt.

Typus: W of Brand Hwy, S of Arrowsmith R., Western Australia, 8 Jan. 1994, *E.A. George* 542G, *M. Pieroni & A. Tinker* (holo: PERTH 03461130).

Slender shrub to 2 m, without lignotuber. Stem leaves obovate on broad base, shortly cuspidate, ± erect, 3-4 mm long, shortly ciliate; leaves of lateral branchlets similar but crowded and more spreading, 2-2.5 mm long; floral leaves similar to stem leaves but wider. *Flowers* in elongating racemes. *Peduncles* 1-2 mm long. *Bracteoles* cuspidate, falling before anthesis. *Hypanthium* turbinate, 2.5-3 mm long, deeply 5-ribbed, scarcely rugose; reflexed green appendages obtuse to almost acute, c. 1-1.5 mm long. *Sepals* greenish pink with silver fringe, turning lemon-cream and brown, spreading, 4.5-5.5 mm long; lamina transversely elliptic, 1 mm long, 2 mm wide; main lobes 7 or 8, deeply fimbriate. *Petals* bright pink with pale pink to white fringe, turning cream or brownish, erect, obovate, 6-6.5 mm long; lamina 3-3.5 mm long, 2.5 mm wide, fimbriate, the apical fringe itself finely fringed. *Stamens* 1.5-2 mm long; anthers 0.5 mm long; *staminodes* 1-1.5 mm long, with prominent oil glands, acute. *Style* 5-6 mm long, densely bearded over c. 1 mm, the longest (lowest) hairs 0.4-0.5 mm long. *Ovules* 5 or 6.

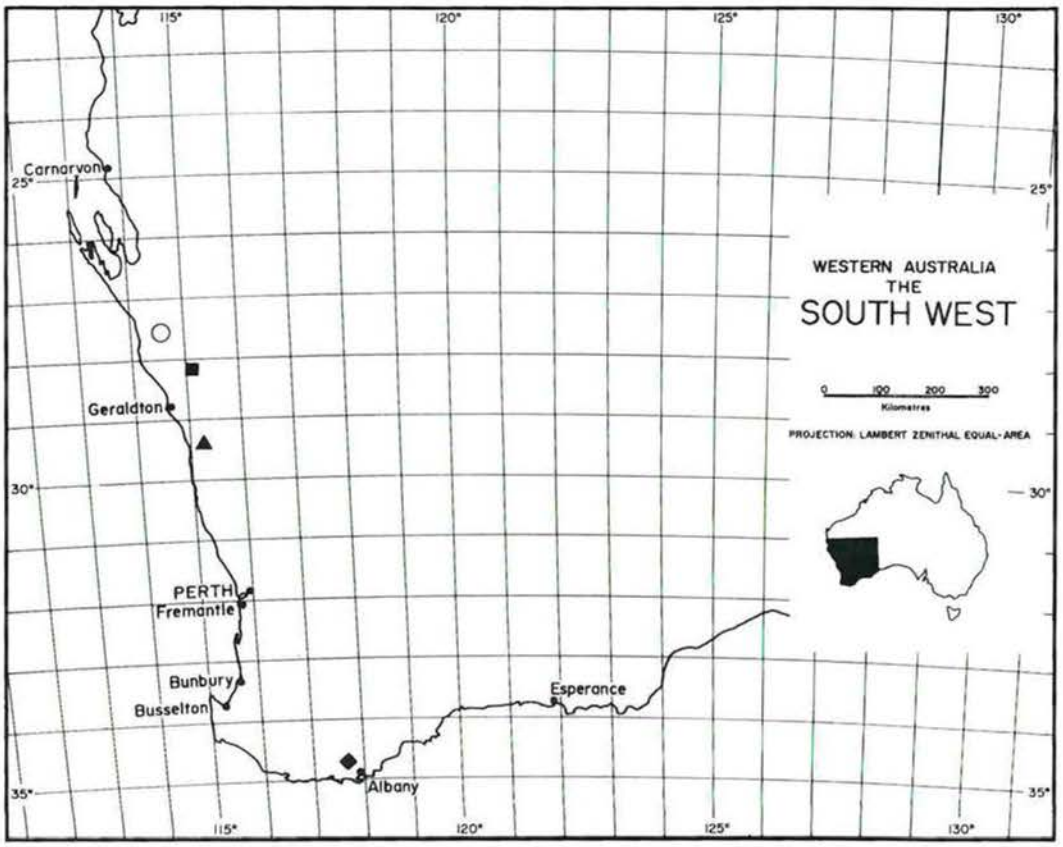

Figure 3. Distribution of *Verticordia aereiflora* (■), *V. apecta* (◆), *V.* x *eurardyensis* (○) and *V. luteola* var. *rosea* (▲).

Distribution and habitat. Occurs to the north and south of Eneabba (Figure 3). Grows on plain in deep white sand, in shrubland with *Eucalyptus todtiana*, *Banksia attenuata*, *Banksia menziesii*, *Xylomelum angustifolium*, *Calothamnus* etc.

Flowering period. December-January.

Other collection examined. WESTERN AUSTRALIA: Type locality, 12 Dec. 1993, *E.A. George* 529, 542A-F, H, I, *M. Pieroni* & *A.Tinker* (PERTH).

Conservation status. CALM Conservation Codes for Western Australian Flora: Priority One - Poorly Known Taxa The population extends over c. 6 km.

Etymology. The varietal epithet is taken from the Latin *roseus* - pink, in reference to the flower colour.

Discussion. The publication of this taxon creates the autonym *V. luteola* A.S. George var. *luteola*. Var. *rosea* differs from typical var. *luteola* essentially in its pink flowers that open about a month later than those of var. *luteola*. The leaves are slightly larger (2.5-3.5 mm in var. *luteola*), the petal fringe longer (2-2.5 mm in var. *luteola*) and the stamens and staminodes longer (1.5 mm and 1 mm respectively in var. *luteola*). The locality is to the west and south-west of the distribution of var. *luteola*.

In the Key to species given in George (1991), this taxon would key out to couplet 78, which should be modified as follows:

78a Sepals auriculate; stamens 3 mm long ..... *V. bifimbriata*

78b Sepals not auriculate; stamens 1.5-2 mm long

79a Hypanthium 2 mm long; reflexed appendages merging into hypanthium; sepals and style 4 mm long; Mogumber-Regans Ford area ..... *V. paludosa*

79b Hypanthium 2.5-3 mm long; reflexed appendages distinct, flap-like; sepals 4.5-5.5 mm long; style 5-6 mm long; Eneabba-Three Springs area ..... *V. luteola*

Acknowledgments

Margaret and Bruce Quicke of Eurardy Station kindly brought *V.* x *eurardyensis* to our attention and assisted with field work. Jan and Norm Tunbridge of Caratti Farm near Yuna discovered the population of *V. aereiflora* and allowed access to their property on several occasions. Alan Tinker, of Western Flora Caravan Park, near Eneabba, brought *V. luteola* var. *rosea* to our attention and assisted with field work. Tony Annels and Chris Velios, Department of Conservation and Land Management, Manjimup, kindly provided transport to the population of *V. apecta* and assisted with field work. Pat and Norm Moyle and Brian Moyle also assisted with field work and transport. The illustrations were skilfully prepared by Margaret Pieroni. Constructive comments were received from two referees.

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Stylidium costulatum (Stylidiaceae), a new tropical species of triggerplant from the Kimberley, Western Australia and the lectotypification of *S. floodii*

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Abstract

Kenneally, Kevin F. and Lowrie, Allen. *Stylidium costulatum* (Stylidiaceae) a new tropical species of triggerplant from the Kimberley, Western Australia and the lectotypification of *S. floodii.* Nuytsia 9 (3): 343-349 (1994). A new species of *Stylidium* (Stylidiaceae) from the Kimberley Region, *S. costulatum* Lowrie and Kenneally is described and illustrated and *S. floodii*, its closest relative, is lectotypified. The terms *cunabulum* (for the dilated part of the column) and *torosus* (for the mobile column hinge) are proposed.

Introduction

A new species of tropical triggerplant, *Stylidium costulatum,* an apparent Kimberley endemic is described in order to validate the name for use in a forthcoming book on the plants of Broome and the Dampier Peninsula. It was referred to as a variant of *S. floodii* F. Muell. in the "Flora of the Kimberley Region" (Wheeler *et al.* 1992).

Its nearest relative appears to be the northern Australian tropical triggerplant *S. floodii* F. Muell. (*sensu* lectotypification) described by Ferdinand von Mueller in 1859 from specimens that he collected in the Roper River area of Northern Territory during A.C. Gregory's North Australian Exploring Expedition (July 1855-December 1856). Examination of type material at the National Herbarium of Victoria (MEL) and the Royal Botanic Gardens, Kew (K) revealed that the collection represents more than one taxon, necessitating lectotypification of *S. floodii.*

Taxonomy

Stylidium costulatum Kenneally and Lowrie, sp. nov. (Figures 1-3)

Differt a *S. floodii* labello glabro, appendicibus faucis binatis, columna dilatata lorata, hypanthio manifeste costato, sepalis 5 duobus connatis.

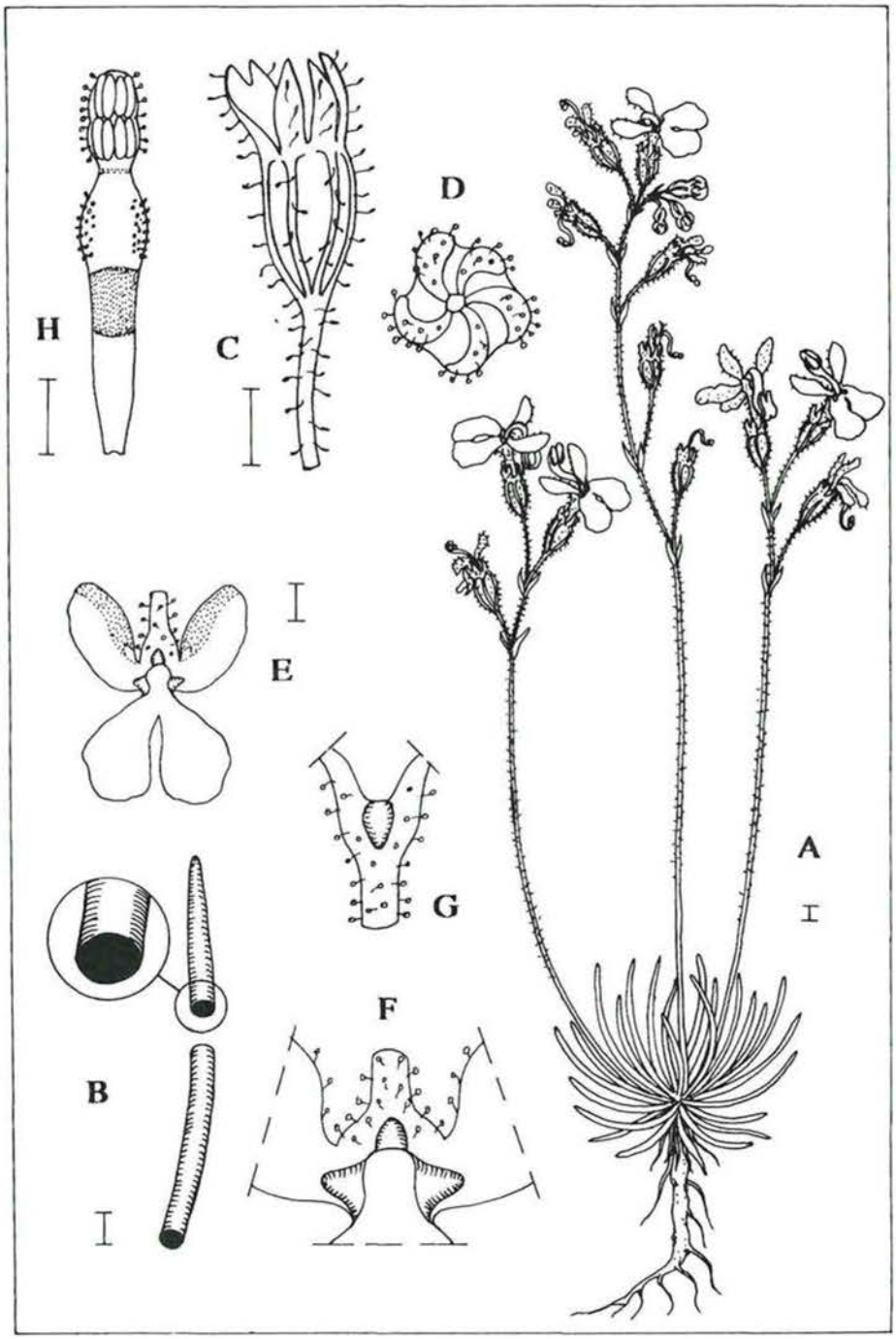

Figure 1. *Stylidium costulatum*. A - flowering plant; B - leaf of basal tuft; C - hypanthium showing glandular hairs on ribs and fusion of two sepals almost to apex; D - enlarged view of base of hypanthium showing helical ribs; E - corolla; F - enlarged section of corolla showing throat appendages; G - enlarged section of corolla tube showing labellum on sinus; H - adaxial view of column and anthers showing hinged portion (dotted) immediately below anthers, the dilated cunabulum with marginal papillae and the sensitive torosus (stippled). Scale bar = 1 mm. All from *M.D. Barrett* 17 (PERTH).

Typus: Wonganut Spring, 19 km ESE of Coulomb Point, Dampier Peninsula, 17°25'S 122°19'E, Western Australia, 18 June 1984, *K.F. Kenneally* 9054/A (holo: PERTH 03058271; iso: MEL).

Erect annual herb to 10 cm high; stem reddish, glabrous, lower leaves scattered and often caducous. *Upper* leaves in a terminal tuft which may appear basal when the stem is short. *Leaves* linear, 7-25 mm long, c. 0.7 mm wide, glabrous, acute. *Inflorescence* of many cymose racemes, with 1 flower in the fork, sparsely glandular-hairy. *Scape* reddish, slender, 20-80 mm long, glabrous at base, glandular-hairy above. *Bracts* narrowly lanceolate, 1-4 mm long, usually acute; pedicels slender, 3-8 mm long. *Hypanthium* obovoid, 2-2.5 mm long at anthesis, glandular-hairy along ribs, helically coiled upwards. *Sepals* oblong to elliptic, 1.5-2 mm long, glandular-hairy, 2 fused almost to the apex, 3 free to base. *Corolla* yellow, lobes vertically paired; anterior lobes orange at the tips, elliptic, 3 mm long, 1.5 mm wide; posterior lobes obovate, 4 mm long, 2 mm wide; abaxial surface glandular-hairy. *Throat* appendages 2, opposite. *Labellum* ovate, 0.4 mm long, 0.4 mm wide, attached to base of corolla tube sinus. *Column* strap-like, 5.7 mm long, hinged below the anthers, with a dilated cunabulum bearing short papillae along the margins above the sensitive torosus. *Capsule* obovoid, 4.5 mm long and 1.2 mm wide, slightly compressed, with small, distinct, glandular- hairy ribs. *Seeds* light brownish orange, 0.2 mm long.

Other specimens examined. WESTERN AUSTRALIA: Coolabah Creek, Beverley Springs Station, 14 May 1992, *M.D. Barrett* 17 (PERTH); Wonganut Spring, 19 km ESE of Coulomb Point, Dampier Peninsula, 18 June 1984, *S.J. Forbes* 2372 (MEL, PERTH); ± 8 km W of Beverley Springs homestead, 12 August 1974, *A.S. George* 12254 (PERTH, CANB, K); 4 km E of Beagle Bay Mission, Dampier Peninsula, 30 May 1985, *J.B. Martin* 20 (PERTH); Mt Barnett Station, adjacent main road, 13 April 1980, *D.E. Symon* 12088 (AD, CANB, PERTH).

Figure 2. *Stylidium costulatum* photographed at Coolabah Creek, Beverley Springs Station, north-west Kimberley. *R. Barrett* 262 (PERTH).

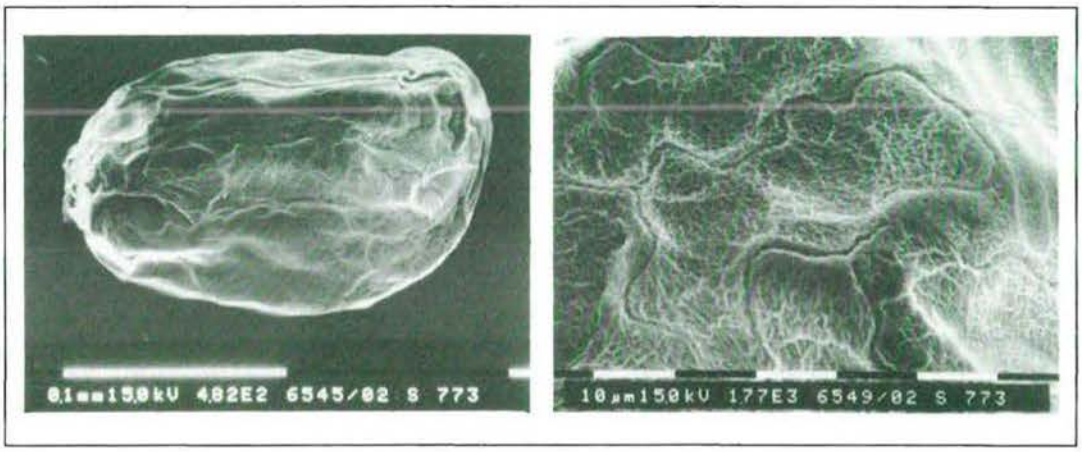

Figure 3. SEM photographs of a seed of *S. costulatum* showing the smooth surface and cells with ruminate margins. From *George* 12254 (PERTH).

Distribution. Dampier and Fitzgerald Districts, Northern Botanical Province (Beard 1980), extending from Coulomb Point Nature Reserve north of Broome, east to Beverley Springs Station, north east of Derby.

Ecology. In seasonally wet grasslands on sandy or clay soils, often adjacent to creeks or seasonally wet areas.

Flowering period. April-August.

Conservation status. CALM Conservation Codes for Western Australian Flora: Priority Three - Poorly Known Taxa - known from several populations, at least some of which are not believed to be under immediate threat (i.e. not currently endangered). This species appears to be widely distributed and at least one population is known to occur in the Point Coulomb Nature Reserve.

Etymology. The specific epithet alludes to the small ribs on the hypanthium and capsule.

Notes. Stylidium costulatum differs from *S. floodii* in having a glabrous labellum (not glandular-hairy), paired throat appendages (not crown-like), dilated strap-like column (not narrowed and tapered), prominently ribbed hypanthium (not ribbed), and in having two fused sepals (not 5 free). The seed coat of *S. costulatum* is smooth and has cells with ruminate margins. (Figure 3)

Both Carlquist (1978) and Wheeler *et al.* (1992) mention that *Stylidium floodii* and *S. desertorum* Carlq. are close. However, *S. costulatum* is differentiated from *S. desertorum* by the prominently ribbed hypanthium, smaller flowers and leaves lacking the hair-like mucro.

Lectotypification of *Stylidium floodii* F. Muell.

There are four "type" sheets of *Stylidium floodii* F. Muell. known to us, two at the National Herbarium of Victoria (MEL) and two at Royal Botanic Gardens, Kew (K). Examination of these "types" has shown an admixture of two distinct species on two of the sheets and the description by

Mueller is based on both entities. We have chosen to lectotypify the name *S. floodii* F. Muell. on MEL 233150 as this sheet bears Mueller's orginal handwritten label. The specimens on this sheet all represent the one taxon and appear to be the taxon on which Mueller principally based his description. It is our intention to revise the "*S. floodii*" complex at a later date when we will deal with the identity of the element excluded from the type of *S. floodii.*

Taxonomy

Stylidium floodii F. Muell., Fragm. Phyt. Austral. 1:149 (1859). - *Candollea floodii* (F. Muell.) F. Muell., Systematic census of Australian plants 86 (1883). (Figures 4 and 5)

Type citation: "Ad ripas glareoso-arenosas prope originem fluminis Victoriae et rivi Roper River". *Lectotype* (here selected): F. Mueller (MEL 233150). There are two handwritten labels on the sheet. The top one in pencil in Mueller's writing reads: "*Stylidium Floodii*, n. sp. Dry lagoons, tribut[ary] of the Roper. 8.7.56". The bottom label written in ink in Mueller's writing reads: "*Stylidium Floodii* F. V. Mueller. Dry lagoons on the Roper River, Gulf of Carpentaria". Both labels have been annotated on the back of their upper left corners with the letter "B" signifying that they had been seen by George Bentham during his preparation of Stylidiaceae for volume 4 of Flora Australiensis (Figure 4). *Isolectotype:* F. Mueller. "*Stylidium Floodii* f.v. Mueller. Roper River". Herbarium Hookerianum 1867 (K).

Small slender annual sometimes branching at base, with a shortly elongated stem with scattered leaves, often bearing a basal tuft of leaves (sometimes forming a tuft at point of secondary branching). *Leaves* linear, 25 mm long, c. 0.5 mm wide, acuminate, glabrous. *Inflorescence* of few to numerous filiform scapes forming a compound raceme. *Scapes* filiform, to 10.5 cm long, glandular-pilose. *Bracts* very narrowly ovate, to 2 mm long, acute, usually glandular-pilose. *Pedicels* slender, 1-4 mm long, glandular-pilose. *Hypanthium* narrowly turbinate, 1.2-2 mm long at anthesis. *Sepals* 5, free to base, narrowly oblong 0.8-1.2 mm long, glandular-hairy. *Corolla*, "beautifully red", lobes vertically paired; anterior lobes elliptic, 2 mm long, 0.6 mm wide; posterior lobes obovate, 3 mm long, 0.8 mm wide; abaxial surface densely glandular-hairy. *Throat appendages* 5, crown-like. *Labellum* ovate, 0.4 mm long, 0.25 mm wide, glandular-hairy on margins and apex, attached to base of corolla tube sinus. *Column* strap-like, 5 mm long, 0.8 mm wide, narrowing away from sensitive torosus, abaxial surface slightly glandular-hairy towards the anthers. *Capsule* narrow-turbinate, 2.5-3.5 mm long, 1-1.5 mm wide, glandular-hairy. *Seeds* brownish orange, 0.2 mm long.

Discussion

The type of *Stylidium floodii* was collected from the Roper River in the Northern Territory. According to Mueller's annotation on a Herbarium Hookerianum sheet at the Royal Botanic Gardens, Kew, it was first seen by Mr J. Flood (Mueller's assistant on the A.C. Gregory's North Australian Expedition) at Depot Creek.

In her seminal work on triggerplants Erickson (1958) used the terms "locket and pouch" for the peculiar in-folding at the apex of the column of some species of *Stylidium.* She described the column as bending forward into a pouch formed by the dilation of the column itself and resembling a miniature locket, with elastic hinges, enclosing the anthers inside the lid. We suggest the term *cunabulum* be used

for the "pouch" (or dilated part of the column), where the anthers rest when the column is in the set position against the labellum. The term *cunabulum* is derived from the Latin for cradle. In tropical triggerplants the major mobile hinge on the column is a focus from which to describe taxonomic features. Previously there has been no term applied to this feature. The term *torosus*, from the Latin for muscular, aptly describes this mobile hinge.

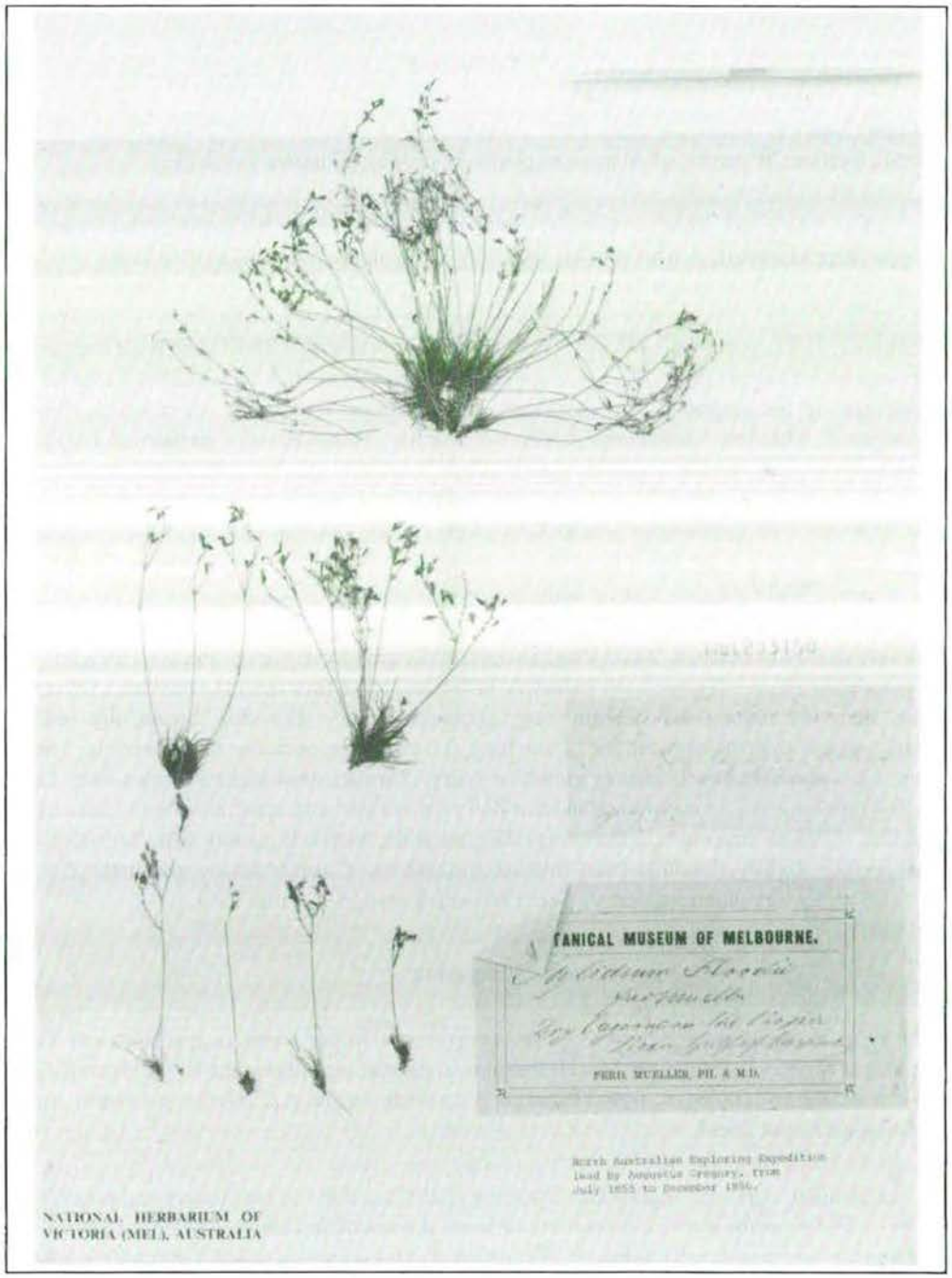

Figure 4. Lectotype of *S. floodii* F. Muell. (MEL 233150).

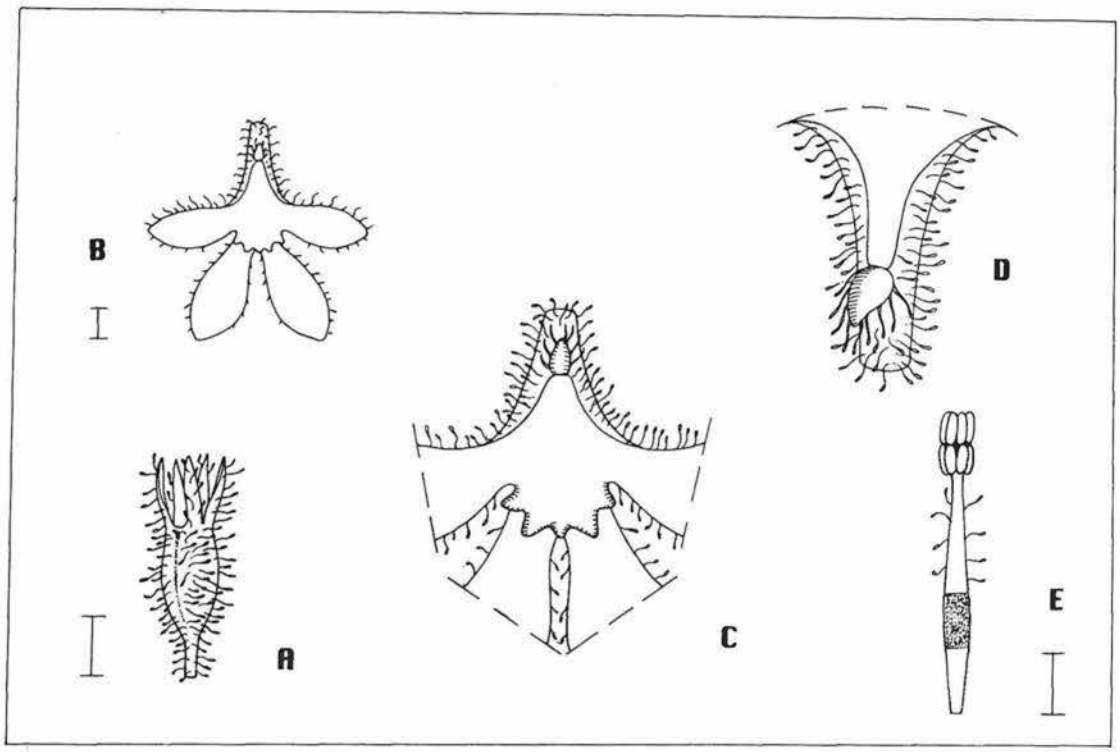

Figure 5. *Stylidium floodii*. A - hypanthium showing glandular hairs and five free sepals, B - corolla, C - enlarged section of corolla showing crown-like throat appendages, D - enlarged section of corolla tube showing labellum with glandular hairy margins, E - adaxial view of column showing sensitive torosus (stippled) and sparse glandular hairs on adaxial surface. From *Mueller* (MEL 233150). Drawing by A. Lowrie.

Acknowledgements

We wish to thank Brian Carter, John Martin and Tim Willing (Broome Botanical Society) and Anthony Raudino (CALM Volunteer), for assisting in the collection of *Stylidium costulatum* at Point Coulomb Nature Reserve. We also thank Matthew and Russell Barrett of Beverley Springs Station for their collections of Kimberley *Stylidium* species. Dr John Kuo, Electron Microscopy Centre, University of Western Australia, kindly provided the SEM photographs.

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Notes and new species of *Acacia* (Mimosaceae) from northern Australia

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Abstract

Leach, G.J. Notes and new species of *Aacia* (Mimosaceae) from northern Australia. Nuytsia 9 (3): 351-362 (1994). *Acacia tolmerensis* G. Leach is described as a new species in the informal *A. platycarpa* group (Sect. *Plurinerves*). The informal *A. plectocarpa* group (Sect. *Juliflorae)* is defined as including *A. plectocarpa* Cunn. ex Benth. subsp. *plectocarpa, A. plectocarpa* subsp. *tanumbirinensis* (Maiden) Pedley, *A. armitii* F. Muell. ex Maiden and a new species, *A. echinuliflora* G. Leach. Relationships within the group are discussed, descriptions and a key to all taxa in the group are provided. Distribution maps for all taxa are presented.

Introduction

The "Top End" of the Northern Territory (north of 18°S) still has extensive areas that are botanically poorly known. Within *Acacia* it is known that there are a number of undescribed taxa and many complexes that require further investigation. In preparing an account of the Mimosaceae for the "Flora of the Darwin Region", a new species of *Acacia* from the Litchfield area was discovered and problems in a group of taxa, informally referred to here as the *A. plectocarpa* group, required examination. Findings from this work are published here to clarify treatments of these taxa for the above-mentioned Flora and for the forthcoming volume on *Acacia* in the "Flora of Australia".

The codings for rare or threatened species follows Briggs & Leigh (1988). All measurements are from dry material. Distribution maps show all specimens examined which, unless otherwise stated, are based on collections at DNA and PERTH.

Taxonomy

Acacia tolmerensis G. Leach, sp. nov. (Figure 1)

A. tolmerensis species nova affinis *A. platycarpae* sed ramulis complanatis, nervis phyllodii duobus longitudinalibus inferioribus confluentibus et nervo marginali libero, inflorescentia plerumque racemosa, floribus capitulii circa 80, calyce longiore differt.

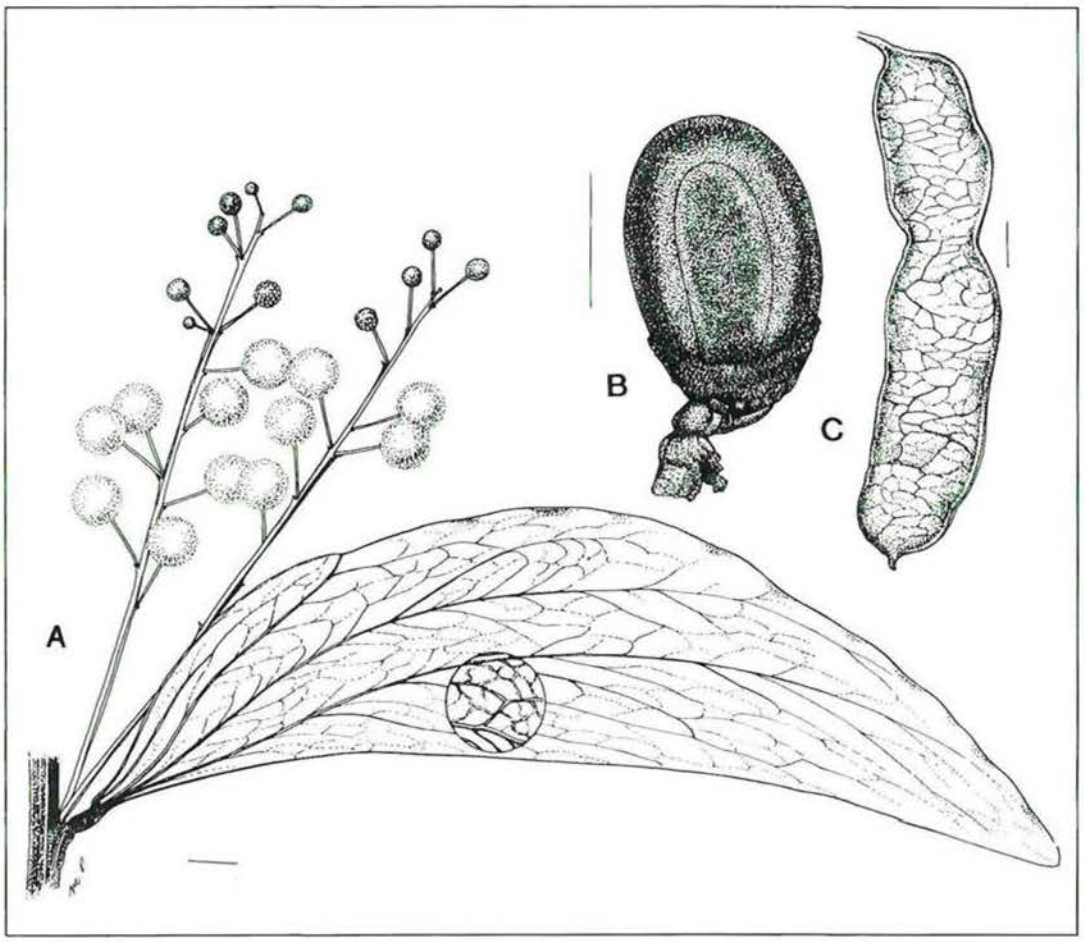

Figure 1. *Acacia tolmerensis* A - flowering branch, B - seed, C - pod. A from *I.D. Cowie* 1434 & *C.R. Dunlop* (DNA); B & C from *I.D. Cowie* 1844 (DNA). (A & C scale bar = 1 cm, B scale bar = 5 mm)

Typus: Litchfield National Park, Northern Territory, 13° 06'S, 130° 51'E, 23 Nov. 1990, *I.D Cowie* 1427 & *C.R. Dunlop* (holo: DNA; iso: BRI, CANB, K, NSW, PERTH 01851829).

Erect *shrub* to 1.5 m high, sometimes suckering, sub-pruinose on young phyllodes, branchlets and inflorescences. *Branchlets* flattened or angular, glabrous. Stipules early caducous. Pulvinus 4-7 mm long, glabrous. *Phyllodes* shallowly recurved, dimidiately narrowly elliptic, 110-245 mm long, 48-88 mm wide, 2.1-4.2 times long as wide, glabrous; main longitudinal nerves 3 to 4 (rarely to 6), distant, basally confluent but remaining free from abaxial marginal nerve, anastomoses numerous and forming a somewhat open and irregular reticulum; base asymmetric; margin rarely indented at the glands; apex acute to obtuse with an obscure mucro. *Glands* ± prominent, 3-4, lowermost at distal end of pulvinus, additional glands scattered along adaxial margin, narrow and elongated, 1-2 mm long. *Inflorescences* typically 1-2 axillary racemes, sometimes forming terminal panicles, 6-12 heads per raceme; raceme axis 55-150 mm long, rather stout, straight, glabrous. *Heads* globular, white to cream or pale yellow, 7-11 mm wide, c. 80-flowered. Peduncles 9-26 mm long, glabrous; basal peduncular bracts persistent, 1 or on upper peduncles often 2, glabrous, ciliate; bracteoles peltate, 1.2-1.4 mm long, with a flattened, glabrous or ciliate stipe, laminae sub-circular, evident in young buds, fimbriolate with white or pale golden hairs. *Flowers* 5-merous. *Calyx* 1.2-1.5 mm long, sparsely puberulous at apex and abaxially on prominent midnerve, shallowly lobed, membranous other than midnerve; calyx lobes broadly

triangular, incurved, ciliate at apex. *Corolla* 2-2.5 mm long, 1.5-2.5 times as long as calyx, ciliate at apex, lobed to middle but often also separating at base leaving middle part of tube intact; lobes erect or slightly spreading but inflexed and concave at apex, spathulate to oblanceolate, 1-1.2 mm long, thickened and somewhat resinous, obtuse. Ovary glabrous. *Pods* stipitate, greyish to brown, narrowly oblong, straight, flat, 55-110 mm long, 20-30 mm wide, coriaceous to sub-woody, glabrous, transversely reticulately nerved, margin with obscure wing to 1 mm wide, apiculate. *Seeds* transverse in legume, brown, flattened, ellipsoid, 8-10 mm long, 7-7.5 mm wide; pleurogram open; funicle gradually expanded into an aril, folded 4-5 times, c. 0.4 times as long as the seed.

Other specimens examined. NORTHERN TERRITORY: Tolmer Range, 13°12'S, 130°48'E, 4 Nov. 1984, *D. Bowman* 50 (DNA); Florence Falls track, 13°02'S, 130°45'E, 1 Dec. 1984, *D. Bowman* 130 (DNA); near Survey Creek, Daly River Road, 13°36'S, 130°45'E, 9 Nov. 1990, *I.D. Cowie* 1408 & *C.R. Dunlop* (DNA); track to Lost City, Litchfield National Park, 13°09'S, 130°46'E, 23 Nov. 1990, *I.D. Cowie* 1434 & *C.R. Dunlop* (BRI, CANB, DNA, K, MEL, NSW, PERTH); near Litchfield Road, Finiss River, 12°59'S, 130°45'E, 6 May 1991, *I.D. Cowie* 1884 (AD, BRI, CANB, DNA, K, MEL, NSW, PERTH); 14 miles [22.4 km] from Daly River on Daly River Road, 13°32'S, 130°54'E, 4 Feb. 1964, *C.S. Robinson* 75 (DNA); Daly River, 13°40'S, 130°43'E, 16 Jan. 1992, *L.L.V. Williams* 173 & *N.F. Madrill* (DNA).

Distribution. Endemic in the Northern Territory and recorded from throughout the Tabletop Range, southwards to Daly River. (Figure 5)

Habitat. In open forest on sandy soils.

Flowering and fruiting periods. Flowering has been noted during the wet season from November-February. Legumes with mature seeds have been collected in May.

Affinities. A. platycarpa F. Muell. is a widespread variable species across northern Australia and is one taxon of a closely related group which includes *A. sericata* Cunn. ex Benth., *A. dunnii* (Maiden) Turrill and another as yet undescribed species from the sandstone plateau of Arnhem Land. *A. flavescens* Cunn. ex Benth. and *A. leptoloba* Pedley from Queensland are also probably best placed in this group (Pedley 1978). *A. tolmerensis* clearly belongs in this group and is most closely related to *A. platycarpa* from which it can be distinguished by the latter having terete branchlets, the abaxial longitudinal veins being basally confluent at the marginal vein, the fewer number of flowers per head (31-41) and the shorter calyx. There has been past confusion involving application of the name *A. sericata* and although it is reported to occur in the Northern Territory by Pedley (1978) and Wheeler (1992) it is restricted to the Isdell and Drysdale river areas of the Kimberley region of Western Australia. *A. sericata*, although not well known, is distinguished from other taxa in the group principally by the dense minutely stellate-velutinous branchlets and phyllodes. *A. dunnii* is distinguished from *A. tolmerensis* by the basal confluence of the longitudinal veins with the marginal vein, the ± terete branchlets and larger phyllodes (12-42 x 4-17 cm). Within the Northern Territory the natural occurrence of *A. dunnii* is restricted to the Victoria River region although it is now widely cultivated with occasional escapees becoming established.

Conservation status. Although of restricted distribution it is not considered threatened. *A. tolmerensis* is well represented in Litchfield National Park and appears to recover well after fires. Coding 2RC.

Etymology. The specific epithet derives from the distribution of the species being centred on the Tolmer Range.

Acacia plectocarpa Cunn. ex Benth. and allies

A. plectocarpa is a common, wide-ranging species from the Kimberley region of Western Australia through eastern Arnhem Land, Northern Territory to the Queensland Gulf area and it exhibits some variation which has caused confusion in identification. Specimens with narrow phyllodes have, in the past, generally been attributed to the taxon described as *A. tanumbirinensis* by Maiden (1917) but later reduced to a subspecies of *A. plectocarpa* by Pedley (1990). The geographic and morphological limits of subsp. *tanumbirinensis* were not well known. Pedley (1978) remarked that fruiting material was unknown. In the absence of fruits, specimens of *A. plectocarpa* have often been confused with *A. torulosa* Benth. ex F. Muell.

The sandstone escarpment of western Arnhem Land has been a particularly difficult area in terms of the variation exhibited within *A. plectocarpa sens lat.* Specimens with somewhat narrow but generally long, curved phyllodes have been considered as subsp. *tanumbirinensis*. Other forms showing differences of corolla indumentum and inflorescence or pod dimensions have been dealt with variously as belonging to *A. plectocarpa* or to undescribed taxa. In preparing to describe one of these segregate taxa it became obvious that some clarification of the complex was required. This task was greatly facilitated following the recent recognition by Tindale and Kodela (pers. comm.) that one of the Northern Territory entities in this complex was *A. armitii* F. Muell. ex Maiden, previously only known from the type collection in Queensland. Based on the immature pods of the type collection, Pedley (1978) considered *A. armitii* as conspecific with *A. torulosa*. However, in recent treatments he has reinstated it as a distinct species (Pedley 1987). The pods of *A. armitii* show no relationship to *A. torulosa* (which are clearly moniliform) but certainly support a close relationship with *A. plectocarpa*.

After further investigation other species may also be found to belong with this group. *A. hammondii* Maiden and the closely related but poorly known *A. malloclada* Maiden & Blakely have *plectocarpa* type pods. *A. hemsleyi* Maiden is also similar but the pods are not undulate, nor are the seeds alternate along the pod which suggests only superficial similarity. The complex in the Northern Territory is considered here to involve 4 closely related taxa namely, *A. plectocarpa* subsp. *plectocarpa* and subsp. *tanumbirinensis*, *A. armitii* and *A. echinuliflora*, with further work possibly establishing other species in the group. The latter species is described below as new. Because some of these taxa have been known from incomplete material or few specimens a key and descriptions are provided.

Key to *A. plectocarpa* and its closest allies

1a. Phyllodes linear, <4.5 mm wide, length to width ratio typically >40, rarely as low as 25 ..... 2b. *A. plectocarpa* subsp. *tanumbirinensis*

1b. Phyllodes narrow-elliptic or oblanceolate, rarely linear, >4.5 mm wide, length to width ratio typically <40 2

2a. Pods <4 mm wide; seeds longitudinal in pod; branchlets strongly ribbed or angular ..... 3. *A. armitii*

2b. Pods >6 mm wide; seeds oblique to transverse in pod; branchlets terete or slightly angular 3

3a. Corolla with dense yellow patent hairs; peduncles (5)7-17 mm long; spikes 50-70 mm long; pods stramineous, venation prominent ..... 1. *A. echinuliflora*

3b. Corolla with sparse hyaline hairs on tube; peduncles 1-6 mm long; spikes 20-55 mm long; pods dark brown, venation obscure ..... 2a. *A. plectocarpa* subsp. *plectocarpa*

1. Acacia echinuliflora G. Leach sp. nov. (Figure 2)

Ex affinitate *A. plectocarpai* Cunn. ex Benth. et specierum affinium, capitulis et pedunculis longioribus, indumento corollae tomentello flavo, leguminibus stramineis tenuioribus valde nervosis distinguenda.

Typus: Bower Bird Billabong, Kakadu National Park, Northern Territory, 12°43'S, 133°02'E, 12 September 1984, *G. Wightman* 1704 & *C.R. Dunlop* (holo: DNA; iso: AD, CANB, K, MEL).

Tree or rarely a shrub, (2.5)4-8 m high. Bark black to brown, fibrous or shaggy. *Branchlets* terete, with narrow, pale yellow rib below pulvinus for c. 10-15 mm, resinous, reddish brown, glabrous. Stipules persistent and prominent, brown, narrow-triangular to triangular, 1.2-2.5 mm long, glabrous, resinous, scarious, striate. Pulvinus 2.5-5.5 mm long, glabrous. *Phyllodes* straight or slightly curved, narrowly elliptic or oblanceolate, 90-185 mm long, 6-14 mm wide, 9-20 times long as wide, glabrous, shiny, punctules numerous; longitudinal nerves numerous, 1-3 more prominent than the rest, close, 4-8 per mm, minor nerves ± translucent, anastomoses absent; base attenuate; apex acute, the mucro short and oblique or rarely straight. *Gland* obscure, 0-4 mm above pulvinus, sunken, narrow and slit-like, c. 0.2 mm long. *Inflorescences* simple, 1-2 per axil, rarely contracted, 1-3 branched racemes to 2(11) mm long. *Spikes* 50-70 mm long, 3.5-5 mm wide, bright yellow to golden, densely flowered. Peduncle (5)7-17 mm long, resinous, glabrous or rarely with a few scattered hairs. Receptacle, calyx, corolla tube and base of lobes tomentose with dense, short, yellow or rarely hyaline, patent hairs. Bracteoles spathulate; stipes flattened, tomentose; laminae inflexed, glabrous. *Flowers* 5-merous. *Calyx* 0.45-0.9 mm long, sepals free, linear to narrow-oblong. *Corolla* 0.9-1.4 mm long, twice as long as calyx, glabrous at apex, lobed to middle; lobes erect, sometimes slightly incurved at apex, triangular, apex acute. Ovary densely sericeous with whitish hairs. *Pods* shortly stipitate, stramineous, linear to oblong, straight, undulate, raised over seeds alternately on each side, 24-54 mm long, 7-9 mm wide, thinly coriaceous to chartaceous, resinous, glabrous or with very sparse hairs on margins, transversely reticulately nerved, apiculate. *Seeds* transverse in legume, brown or black, obloid or ellipsoid, 2.7-3.8 mm long, 1.8-2.5 mm wide, pleurogram closed; funicle white to cream, gradually expanded into an aril, folded 3-6 times, 0.2-0.45 times as long as the seed.

Other specimens examined. NORTHERN TERRITORY: Jim Jim Creek, 12°55'S, 132°32'E, 14 July 1972, *N. Byrnes* 2729 (BRI, CANB, NSW, NT); Barramundie Gorge, 13°23'S, 132°28'E, 30 Aug. 1984, *I. Cowie* 141 (DNA); Mt Gilruth area, 12°58'S, 133°10'E, 2 June 1978, *C.R. Dunlop* 4868 (BRI, CANB, DNA, K, NSW, NT); Deaf Adder Gorge, 13°07'S, 132°56'E, 18 July 1978, *C.R. Dunlop* 4987 (BRI, CANB, DNA, NT); Jim Jim Falls, 13°17'S, 132°51'E, 31 Jan. 1981, *C.R. Dunlop* 5707 (BRI, DNA, NSW, PERTH); Jim Jim Falls, 13°16'S, 132°50'E, 3 Dec. 1989, *P. Forster* 6128 (BRI, DNA, MEL, MEXU); c. 10 km ESE Noranda Mining Camp, 12°52'S, 132°49'E, 12 July 1972, *P. Martensz* AE123 (CANB, DNA); Deaf Adder Creek basin, 13°03'S, 132°52'E, 18 Aug. 1972, *P. Martensz* AE281 (CANB, DNA, K); UDP Falls, 13°30'S, 132°31'E, 25 Aug. 1973, *J. Mckean* 1137 (CANB, DNA); Nixons Gorge, Katherine, 14°30'S, 132°15'E, 22 June 1964, *J. Muspratt* 647 (DNA); Edith Falls, 14°12'S, 132°11'E, 5 Oct. 1977, *J. Must* 164 (CANB, DNA, NSW, NT).

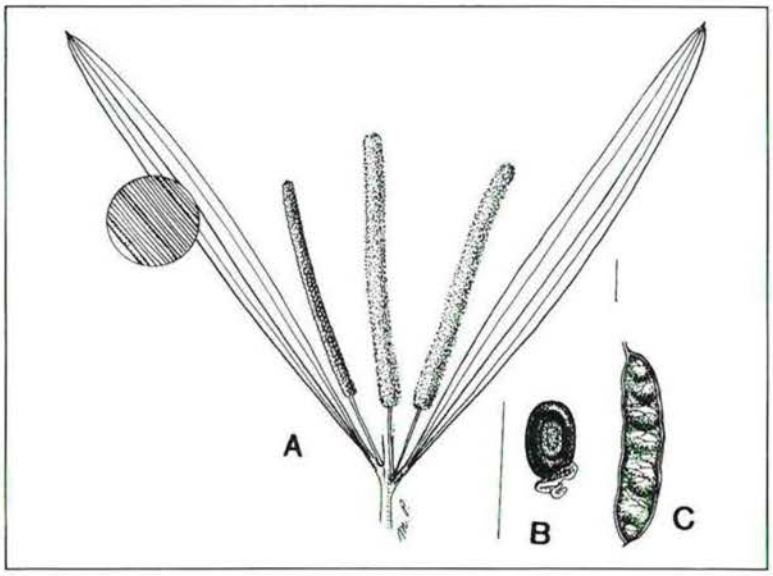

Figure 2. *Acacia echinuliflora* A - flowering branch, B - seed, C - pod. A from *C.R. Dunlop* 4868 (DNA); B & C from *P.I. Forster* 6128 (DNA). (A & C scale bar = 1 cm, B scale bar = 5 mm)

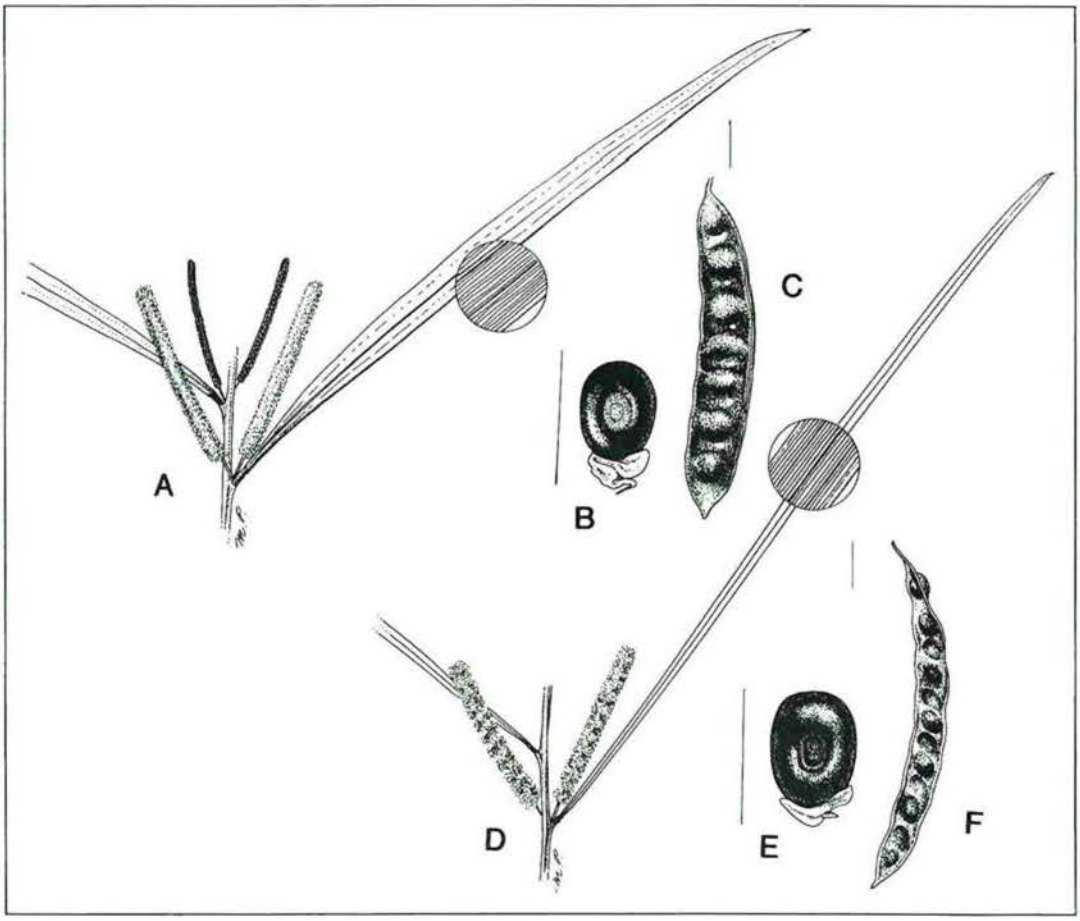

Figure 3. *Acacia plectocarpa* subsp. *plectocarpa* A - flowering branch, B - seed, C - pod. A from *K.F. Kenneally* 10783 & *B.P.M. Hyland* (PERTH); B & C from *B. Toohill* for *T. Willing* 44 (PERTH). *Acacia plectocarpa* subsp. *tanumbirinensis* D - flowering branch, E - seed, F - pod. D from *L. Craven* 3922 (PERTH); E & F from *G.J. Leach* 3321 (PERTH). (A,C,D & F scale bar = 1 cm, B & E scale bar = 5 mm)

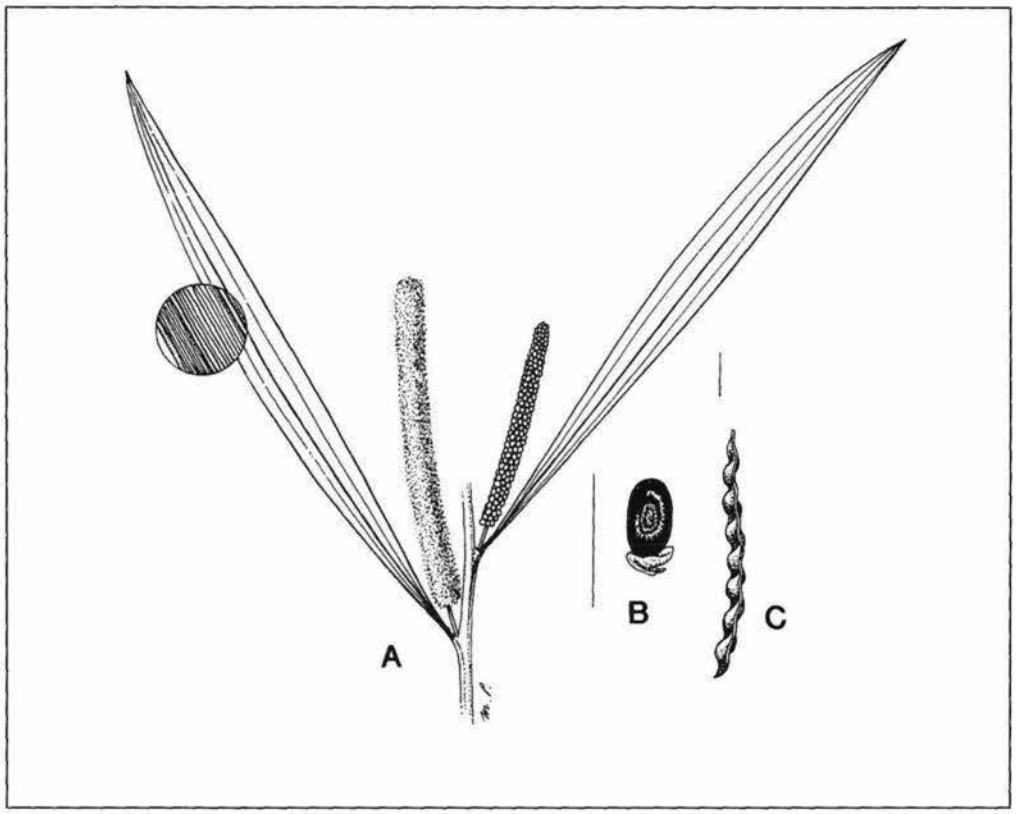

Figure 4. *Acacia armittii* A - flowering branch, B - seed, C - pod. A from *M. Lazarides* 7572 (DNA); B & C from *C.R. Dunlop* 7228 and *P.F. Munns* (DNA). (A & C scale bar = 1 cm, B scale bar = 5 mm)

Distribution. Endemic in the Northern Territory. Occurs along the escarpment of western Arnhem Land in Kakadu National Park with occurrences southwards to Edith Falls in Nitmiluk (Katherine Gorge) National Park. (Figure 5)

Habitat. On sandy soils associated with stream margins draining the sandstone escarpment.

Flowering and fruiting periods. Flowering occurs in the dry season from June-August. Mature legumes have been collected between October-January.

Affinities. A. echinuliflora differs from all taxa in the *A. plectocarpa* group by the corolla tube and base of lobes having a dense indumentum of patent yellow hairs. In addition, it differs from *A. plectocarpa* by the longer, more prominent stipules, the longer spikes and peduncles and the pod being thinner, stramineous and having conspicuous venation. It can be distinguished from *A. armitii* by the ± terete branchlets, broader pods with conspicuous venation and the seeds arranged transversely in the pod.

Conservation status. Although not under any threat and well represented in two National Parks, the species is quite restricted in its distribution and a coding of 3R is recommended.

Etymology. The epithet refers to the bristly appearance of the flowers on account of the indumentum on the corolla.

2. Acacia plectocarpa Cunn. ex Benth., London J. Bot. 1: 375 (1842). *Type*: Cambridge Gulf, W.A., Sept. 1819, *A. Cunningham* 482 (lecto: K, *n.v., fide* L. Pedley, Austrobaileya 1:161 (1978); iso: NSW, photo at PERTH 01827650!).

Tall *shrub* or small tree, 3-7(9) m high. Bark grey, fibrous or fissured. *Branchlets* terete or angular, with narrow yellowish ribs below pulvinus for c. 10 mm, slightly resinous, glabrous, rarely puberulous. Stipules persistent, brown or reddish, triangular, 0.5-1 mm long, glabrous. Pulvinus 1-4 mm long, glabrous. *Phyllodes* straight or curved, linear to narrowly elliptic, 90-200(260) mm long, 1.8-16 mm wide, 10.5-74 times as long as wide, ± shiny, punctules (?stomata) numerous, glabrous or rarely with closely appressed hyaline hairs on margins and nerves; longitudinal nerves numerous, 1-3 more prominent than the rest, close, 4-7 per mm, minor nerves usually translucent, anastomoses absent; base attenuate; apex acute, mucro short and oblique or straight. *Gland* inconspicuous, at distal end of pulvinus, circular or oval. *Inflorescences* simple, 1-5 per axil, rarely contracted, 2-branched racemes to c. 6 mm long. *Spikes* 20-55 mm long, 3-5 mm wide, pale to bright yellow, densely flowered. Peduncle 1-6 mm long, slightly resinous, glabrous or rarely sparsely hairy. Receptacle glabrous or hairy. Bracteoles peltate, stipe flattened, sparsely hairy. *Flowers* 5-merous. *Calyx* 0.3-0.7 mm long, hairy; sepals free, incurved, linear to oblong, ciliate. *Corolla* 1-1.25 mm long, twice as long as calyx, glabrous or hairy with sparse hairs on tube, lobed to middle; lobes erect or slightly spreading, triangular, 0.4-0.6 mm long, apex acute. Ovary hairy. *Pods* sessile or stipitate, brown, linear to oblong, straight, undulate, raised over seeds alternately on each side, 35-100 mm long, 5-12 mm wide, crustaceous to coriaceous, often resinous, glabrous, nerves obscure, acute or obtuse. *Seeds* oblique or transverse in legume, black or brown, discoid to ellipsoid, 2.9-4.5 mm long, 2.3-3.7 mm wide, pleurogram closed; funicle white to cream, gradually expanded into an aril, folded 2-4 times, 0.16-0.25 times as long as the seed.

2a. Acacia plectocarpa Cunn. ex Benth. subsp. **plectocarpa** (Figure 3)

A. numerosa Maiden & Blakely, J. Roy. Soc. W. Australia 13: 27, pl. 19, figs 5-9 (1928). *Type*: Napier Broome Bay, W.A., 1910, *G.F. Hill* per *A.J. Campbell* 148 (holo: NSW, fragment & photo at PERTH 01825658!; iso: MEL, fragment & photo at PERTH 01825623!).

Tall *shrub* or small tree, 3-7(9) m high. Stipules 0.6-1 mm long. Pulvinus 1.5-4 mm long. *Phyllodes* straight or curved, linear to narrowly elliptic, 98-200(260) mm long, 4.5-14 mm wide, 10.5-35(43) times as long as wide, 1-3 longitudinal nerves more prominent than the rest, 4-6 per mm. *Inflorescences* simple, 1-5 per axil, rarely contracted, 2-branched racemes to c. 6 mm long. Spikes bright yellow, 3-4 mm wide. Receptacle glabrous or hairy. *Calyx* 0.3-0.5 mm long. Corolla lobes erect or slightly spreading. Pods stipitate, 6-12 mm wide. Seeds transverse in legume, discoid to ellipsoid, funicle folded 4 times.

Selected specimens examined. WESTERN AUSTRALIA: Bull Creek, Bungle Bungle N.P., 17°19'S, 128°27'E, 16 June 1988, *I. Cowie* 962 (DNA, PERTH); 27.3 km NW of Doongan Station, 15°16'S, 126°12'E, 6 June 1987, *D.J. Edinger* 287 (DNA, PERTH); 3.5 km W of Cape St Lambert, 14°18'10"S, 127°43'10"E, 10 June 1987, *K.F. Kenneally* 10323 (DNA, PERTH); 6 km E of Mt Talbot, Walcott Inlet, 16°27'S, 124°50'E, *K.F. Kenneally* 10783 & *B.P.M. Hyland* (PERTH); 1.5 miles [2.4 km] W of Tableland Station, 17°16'S, 126°51'E, 20 Apr. 1955, *M. Lazarides* 5125 (CANB, DNA); Cockburn Range, 15°45'S, 127°59'E, 16 Mar. 1978, *M. Lazarides* 8597 (DNA, CANB); Smoke Creek, 16°45'S, 128°30'E, 28 Apr. 1980, *A.S. Weston* 12130 (DNA, PERTH); Weaver Creek, c. 3.5 km S of Kununurra, *B. Toohill* for *T. Willing* 44 (PERTH).

NORTHERN TERRITORY: Jabiru, 12°40'S, 132°50'E, 16 June 1984, *W. Bishop* 240 (BRI, DNA, MO, NSW); East Alligator River, headwaters of Hayward Creek, 13°36'S, 130°45'E, 4 May 1990, *I. Cowie* 1217 (BRI, DNA, MEL, NSW); Wigram Island, 11°45'S, 136°37'E, 24 July 1992, *G. Leach* 3056 (DNA, PERTH); Jasper Gorge, 16°02'S, 130°35'E, 30 Mar. 1981, *J.R. Maconochie* 2649 (DNA, NT, PERTH); Katherine Gorge N.P., 14°19'S, 132°25'E, 5 May 1977, *J. Must* 1497 (CANB, DNA, NSW, NT); Banmala, 12°30'S, 135°55'E, 26 Sep. 1992, *J. Russell-Smith* 8930 (DNA, PERTH).

Distribution. Widespread from eastern Arnhem Land, Northern Territory to the Kimberley, Western Australia (Figure 6)

Habitat. In open forest on sandy soils.

Flowering and fruiting periods. Flowering occurs over the dry season from April-July. Legumes have been collected from July-November.

Variation. Specimens of *Gardner* (1460) from Lawley River, Western Australia have atypical narrow phyllodes, (2)4-5 mm wide, which are within the range of subsp. *tanumbirinensis* but are considered to be subsp. *plectocarpa* on the basis of the following characters: stipules c. 1 mm long; phyllodes curved, nerves 4 per mm; spikes c. 3 mm wide; calyx c. 0.45 mm long; pod c. 8 mm wide; seeds transverse in pod.

Conservation status. Not considered rare or threatened.

2b. Acacia plectocarpa Cunn. ex Benth. subsp. **tanumbirinensis** (Maiden) Pedley, Austrobaileya 3: 216 (1990) (Figure 3)

A. tanumbirinensis (as *A. tanumbirinense*) Maiden in Ewart & Davies, Fl. N. Territory: 338 (1917). *Type*: Sandstone country near Tanumbirini, N.T., 26 Mar. 1911, *G.F. Hill* 802 (holo: NSW, photo!; iso: K, *n.v.*, MEL, fragment and photo at PERTH 01827847, 02221039!).

Tree or rarely a shrub, 3-6 m high. Stipules 0.5-0.6 mm long. Pulvinus 1-1.5 mm long. *Phyllodes* straight, linear, 95-190 mm long, 1.8-3.5(4.5) mm wide, (28)40-74 times as long as wide, midnerve more prominent than the rest, 6-7 per mm. *Inflorescences* simple, 1-2 per axil. *Spikes* pale yellow or yellow, 3.5-5 mm wide. *Receptacle* hairy with dense hyaline hairs. *Calyx* 0.5-0.7 mm long. *Corolla* lobes erect or slightly spreading to strongly reflexed. *Pods* sessile or shortly stipitate, 5-7 mm wide. *Seeds* oblique in legume, ellipsoid, funicle folded twice.

Selected specimens examined. NORTHERN TERRITORY: McArthur River area, 16°27'S, 136°10'E, *L. Craven* 3922 (PERTH); McArthur River area, 16°40'S, 135°51'E, 30 May 1976, *L. Craven* 3981 (CANB, DNA); 1 mile NE Borroloola, 16°02'S, 136°16'E, 9 June 1971, *N. Henry* 163 (BRI, DNA, MEL, NSW, PERTH); Cox River Station, 15°43'S, 134°32'E, 4 July 1977, *P.K. Latz* 7247 (BRI, CANB, DNA, PERTH); 40 km SSW of Nathan River Homestead, 15°56'S, 135°20'E, 27 Aug. 1985, *P.K. Latz* 10100 (CBG, DNA, PERTH); Cox River crossing, 15°20'S, 135°21'E, 30 Sep. 1992, *G. Leach* 3321 (BRI, DNA, NSW, PERTH); Nicholson River, 17°46'S, 137°42'E, 13 June 1974, *J.R. Maconochie* 2030 (DNA); 60 miles [96 km] N of Wollogorang, 16°35'S, 137°36'E, 3 June 1948, *R.A. Perry* 1231 (CANB, DNA); Bessie Spring, 16°40'S, 135°51'E, 27 Oct. 1988, *J. Russell-Smith* 6223 (DNA); Abner Range, 15°51'S, 135°48'E, 29 Jan. 1989, *J. Russell-Smith* 7029 (DNA, PERTH); Burktown crossing, 16°06'S, 134°54'E, 29 June 1988, *N. Smith* 1240 (DNA).

Additional specimen cited by Pedley (1978): QUEENSLAND: 22 km from Westmoreland Station on road to Corinda Station, 17°30'S, 138°24'E, May 1976, *Simon & Farrell* 3109 (BRI *n.v.*).

Distribution. The southern part of the Gulf of Carpentaria, predominantly in the Northern Territory but also recorded in the Burke District of Queensland. (Figure 6)

Habitat. On edges of watercourses or in seasonally dry creek beds on sandy soil; also recorded from stabilised sand dunes.

Flowering and fruiting periods. Flowering in the dry season from May-July with mature legumes recorded in October.

Conservation status. Not considered rare or threatened.

3. Acacia armitii F. Muell. ex Maiden, J. & Proc. Roy. Soc. New South Wales 51:84 (1917). *Type:* Near the Einasleigh River, Qld, *W. Armit* 1014 (holo: NSW, *n.v.;* iso: MEL, fragment & photo at PERTH 03452336!). (Figure 4)

Slender *tree* or shrub, 2.5-7.5 m high. Bark grey, fissured. *Branchlets* strongly ribbed, resinous, yellowish, glabrous. Stipules caducous, brown, triangular, 1.5 mm long, glabrous, resinous. Pulvinus 3-4.5 mm long, glabrous. *Phyllodes* straight, narrowly elliptic, 78-135 mm long, 7-14 mm wide, 7-14 times as long as wide, slightly shiny, punctules numerous, glabrous or with sparse hyaline hairs on margins; longitudinal nerves numerous, close, 4-6 per mm, midrib more evident than the rest and slightly excentric by displacement towards the lower margin, anastomoses absent; base attenuate, apex obtuse, mucro straight. *Gland* prominent, 1-2.5 mm above pulvinus, circular orifice on raised swelling. *Inflorescences* simple, 1-2 per axil, rarely racemose. *Spikes* cylindrical, yellow, 55-75 mm long, 5.5-6.5 mm wide, densely flowered. Peduncle (4)6-13 mm long, resinous, glabrous or sparsely hairy. Receptacle hairy. Bracteoles peltate with flattened sparsely hairy stipe. *Flowers* 5-merous. *Calyx* 0.4-0.8 mm long, hairy; sepals free, linear to oblong, ciliate. *Corolla* 1.3-1.5 mm long, twice as long as calyx, hairy on tube, lobed to middle; lobes glabrous and highly viscid, erect or slightly spreading, triangular, 0.5-0.6 mm long, apex acute. Ovary hairy. *Pods* sessile, yellowish to brown, linear to oblong, straight, undulate, raised over seeds alternately on each side, 27-52 mm long, c. 4 mm wide, coriaceous, resinous, sparsely hairy on margin and surface, nerves obscure, acute. *Seeds* longitudinal in legume, black, ellipsoid, 2.75-3 mm long, 1.75 mm wide, pleurogram closed; funicle white to cream, expanded towards the seed, folded 4 times, 0.4 times as long as the seed.

Specimens examined. NORTHERN TERRITORY: 24 miles SE of Oenpellii, 12°32'S, 133°19'E, 7 July 1972, *L.G. Adams* 2761 (BRI, CANB!, K); Upper Goomadeer River, 12°36'S, 133°26'E, 29 Oct. 1987, *C.R. Dunlop* 7228 & *P.F. Munns* (BRI, DNA, NSW, PERTH); Coopers Creek, Nabalek, 12°19'S, 133°19'E, 24 Sep. 1989, *R. Hinz* 596 (DNA); Arnhem Land, 12°36'S, 133°19'E, 8 July 1972, *M. Lazarides* 7572 (CANB, DNA).

Additional specimen cited byTindale & Kodela (pers. comm.): QUEENSLAND: 10 km S of the Einasleigh-Forsayth road on track to Robinhood Station, 18°20'S, 144°04'E, *J.R. Clarkson* 2576 & *N. Byrnes* (BRI).

Distribution. A disjunct distribution from the Cook Pastoral District of Queensland and Arnhem Land in the Northern Territory. (Figure 5)

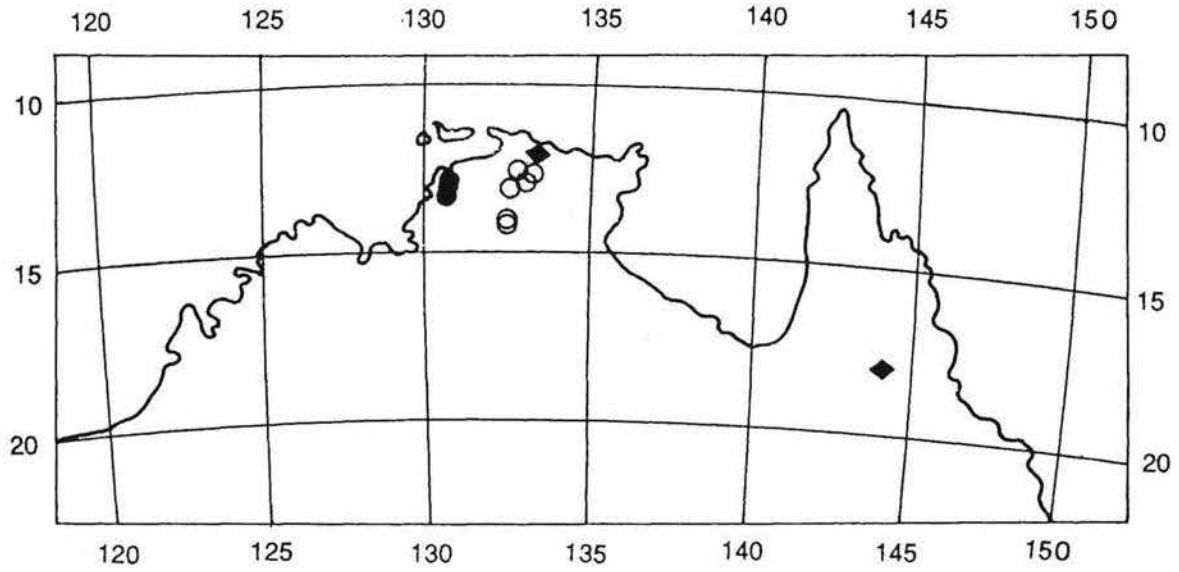

Figure 5. Distribution map of *Acacia echinuliflora* (○), *Acacia armitii* (◆) and *Acacia tolmerensis* (●).

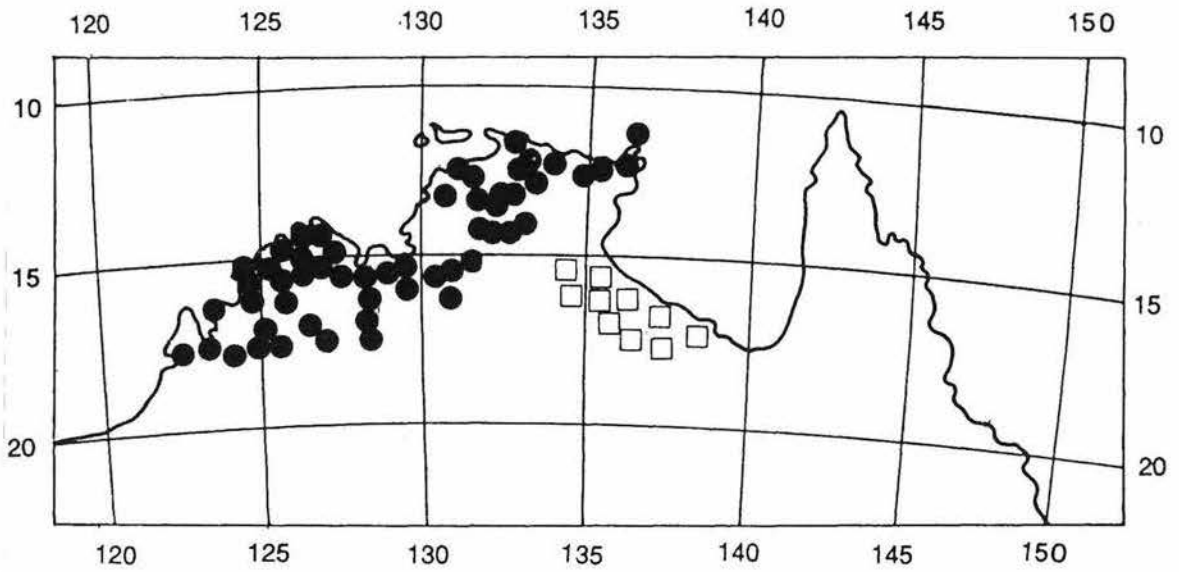

Figure 6. Distribution map of *Acacia plectocarpa* subsp. *plectocarpa* (●) and *Acacia plectocarpa* subsp. *tanumbirinensis* (□).

Habitat. Sand flats on sandstone plateau or permanently wet flats. Apparently associated with watercourses.

Flowering and fruiting periods. Flowers observed in July and September; legumes in August and October.

Notes. Two collectors have noted this species forming dense, even-aged stands or thickets; perhaps as a result of regrowth after fire. Due to possible confusion with *A. plectocarpa*, or for flowering material with *A. torulosa*, it is likely that this species is under collected. However, similar disjunct distribution patterns between Queensland and the Northern Territory have recently been observed for other taxa (e.g. *Drummondita calida* (F. Muell.) Paul Wilson). The general distribution pattern is probably valid and not an artifact of collection intensity.

A specimen with immature pods from Lakefield National Park (*Stanton s.n.*, BRI) in north Queensland shows some affinities to *A. armitii*, but differs in having narrower phyllodes, 2 prominent longitudinal veins, smaller floral parts and shorter spikes. The location is about 240 km to the north of known *A. armitii* populations in Queensland (Figure 5). Clearly further collections from this area are required to establish the morphological and geographical range of this species.

Conservation status. Based on the paucity of collections and the disjunct nature of the distribution a coding of 3K is recommended.

Acknowledgements

Bruce Maslin and Clyde Dunlop are gratefully acknowledged for providing a great deal of discussion during various stages of the manuscript. Richard Cowan assisted with the specific epithets. Phillip Kodela provided helpful discussion on the identity of *A. armitii*. Margaret Pieroni prepared the illustrations.

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Drosera ordensis (Droseraceae), a new tropical species of carnivorous plant from northern Australia

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Abstract

Lowrie, Allen. *Drosera ordensis* (Droseraceae), a new tropical species of carnivorous plant from northern Australia. Nuytsia 9 (3): 363-367 (1994). A new species, *Drosera ordensis* (Droseraceae) is described from tropical northern Australia. The features that distinguish this taxon from its nearest relatives are presented and an indication is given of its habitat preferences.

Introduction

Kondo (1984) studied the lectotype of *D. petiolaris* represented by a Banks and Solander (1770) collection (BM 40139) from the Endeavour River in north Queensland, Australia. He recognised species in the *Drosera petiolaris* complex, three of these he described as new, *D. dilatato-petiolaris* Kondo, *D. falconeri* Kondo & Tsang and *D. lanata* Kondo. The author (AL) has seen the lectotype, examined by Kondo, and a photograph of a duplicate fragment in GDC, has collected and grown all the taxa in the *D. petiolaris* complex, and can confirm that they are good species. All these species except *D. falconeri* have been recorded for Western Australia. This paper describes the new species *Drosera ordensis* from near Kununurra, Western Australia.

The new species belongs in subgen. *Drosera*, sect. *Lasiocephala* Planchon (Marchant & George 1982). Six species are now listed in this section: *D. dilatato-petiolaris* Kondo, *D. falconeri* Kondo and Tsang, *D. lanata* Kondo, *D. ordensis* Lowrie, *D. petiolaris* R.Br. ex DC. (also recorded from Papua New Guinea by Conn 1980), and one species, *D. caledonica* Vieill. (confined to New Caledonia).

Key to *Drosera* section *Lasiocephala*

1. Leaf lamina narrowly obovate; inflorescence (including scape) covered with short glandular hairs ..... *D. caledonica*
1. Leaf lamina orbicular, suborbicular or reniform; inflorescence (including scape) covered with non glandular, long woolly hairs 2
2. Leaves sparingly covered with adpressed hairs, each hair simple or bearing a few small spurs, petiole visible through the hairy indumentum 4
2. Leaves densely covered with dendritic hairs, each hair bearing many long lateral spurs, petiole hidden by the dense hairy indumentum 3
3. Petiole linear with a maximum width 1-1.5 mm; lamina suborbicular, 2-2.5 mm long, 2.5-3 mm wide; pedicels 1.5-2.5 mm long ..... *D. lanata*
3. Petiole oblanceolate with a maximum width 2-4 mm; lamina suborbicular, 3-4 mm long, 3.5-5 mm wide; pedicels 2-4.5 mm long ..... *D. ordensis*
4. Leaf lamina reniform, 1.5 cm long, 2 cm wide ..... *D. falconeri*
4. Leaf lamina orbicular or suborbicular 2.5-3.5 mm wide 5
5. Petiole oblanceolate with a maximum width 2.5-3 mm; pedicels 3-7 mm long ..... *D. dilatato-petiolaris*
5. Petiole linear with a maximum width 0.4-0.8 mm; pedicels 1-1.5 mm long ..... *D. petiolaris*

Drosera petiolaris complex

Drosera ordensis is clearly related to other tropical *Drosera* species in the *D. petiolaris* complex. This new species is a perennial having fibrous roots, a basal rosette of leaves with a bulb-like structure of fleshy leaf bases, and an inflorescence (including the scape) covered with long woolly hairs. *D. ordensis* differs from all other species within the *D. petiolaris* complex by having oblanceolate petioles densely covered with long woolly dendritic hairs.

D. falconeri Tsang & Kondo sheds all its above surface leaves and retreats to a dormant bulb-like arrangement just below the hard-baked soil surface where it lies fully protected during the dry season. The bulb-like structure of *D. falconeri* is formed from the tightly packed accumulation of the persistent fleshy bases of the spent leaves.

D. lanata Kondo, however, forms a central bud of leaf bases (above ground) densely covered with white dendritic hairs to protect the dormant centre of the plant from desiccation during the dry season. The dense hairs are also capable of capturing any available moisture, such as that from condensation, as a further aid for survival during this period. The new species, *D. ordensis*, is also densely covered with white dendritic hairs and uses the same dry dormancy adaptation as *D. lanata.*

Description

Drosera ordensis A. Lowrie, sp. nov.

Drosera lanata Kondo affinis sed petiolo oblanceolato 2-4 mm lato, lamina 3.5-5 mm lata, scapo (inflorescentia includenti) 20-45 cm longo.

Typus: Weaber Plains Road, 7.6 km N from Hidden Valley Caravan Park, Kununurra, Western Australia, *Allen Lowrie* 4, 1 April 1988 (holo: PERTH 03391175; iso: BRI, DNA CANB, MEL, NSW).

Fibrous rooted *perennial herb*, often forming large compact clumps. *Leaves* in a flat, semi-erect basal rosette; *petiole* oblanceolate in outline, 0.5-1 mm wide near base, 2-4 mm wide near apex, narrowed to 0.8-1 mm wide at the base of the lamina, commonly 35-50 mm long at flowering, later increasing in size, both surfaces densely covered with white, dendritic, long woolly hairs; *lamina* suborbicular, 3-4 mm long, 3.5-5 mm wide, adaxial surface with retentive glands marginal on the lamina and smaller glands within, abaxial surface densely covered with white, dendritic, long woolly hairs. *Inflorescence* 20-45 cm long (including scape), forming a many-flowered crowded raceme, covered with white, dendritic, long woolly hairs. *Sepals* obovate, 2.5-5 mm long, 1.2-3 mm wide, abaxial surface densely covered with white, dendritic, long woolly hairs; *petals* various shades of pink to almost white, obovate, with strong mid-vein, 7-10 mm long, 3.5-6 mm wide; *stamens* 3.5-4 mm long; *ovary* turbinate, 1-1.5 mm long, 1.5-1.7 mm diam. at anthesis, *carpels* 3, bilobed; *styles* 3, each repeatedly branched above the segments and terminating in a narrowly ovoid stigma, styles 2.7-3 mm long (including the stigmas). (Figure 1)

Other specimens examined. WESTERN AUSTRALIA: Revolver Creek, upper slopes of the southern Carr Boyd Ranges, 12 March 1978, *T.G. Hartley* 14503 (PERTH); 20 km north-west of Kununurra, northeastern Kimberley, 7 March 1978, *M. Lazarides* 8417 (PERTH); Bindoola Creek, 8.5 km west-south-west of Home Valley HS, northeastern Kimberley, 17 March 1978, *M. Lazarides* 8610 (PERTH); Carlton Hill Station, lower Ord River, 21 January 1951, *C.A. Gardner* 9823 (PERTH); Between Smoke Creek and Flying Fox Creek, SW of Lake Argyle, 2 May 1980, *A.S. Weston* 12211 (PERTH); 2.8 km SE from the entrance of Zebra Rock Farm on Pack Saddle Plains Road, then 3.5 km SW on dirt track, Kununurra, 16 June 1993, *A. Lowrie*708 (PERTH); 100 m SW of Victoria Highway, 22.9 km SE of Kununurra, 16 June 1993, *A. Lowrie* 712 (PERTH).

Affinities. The closest relative to *Drosera ordensis* appears to be *D. lanata* Kondo as the leaves of both species are densely covered with long woolly dendritic hairs. The collection of *Lazarides* 8610 was listed by Kondo (1984) as *D. lanata* but is here recognised as *Drosera ordensis*. The author has seen live specimens of *D. lanata* in the field at the type location near Mareeba, north Queensland and on the West Alligator River West Branch in the Northern Territory. Both *D. ordensis* and *D. lanata* grow in similar habitats, in sandy soils in regions more arid than the habitats of most other species in the *D. petiolaris* complex. The dense hairy covering is no doubt an adaptation for survival in this harsh environment and probably acts as insulation against desiccation.

The dense dendritic hairs of *D. lanata* capture minute droplets of water from the moisture laden early morning air. These minute droplets combine with each other to form larger droplets at the base of each hair which eventually fall to the soil at the base of the plant.

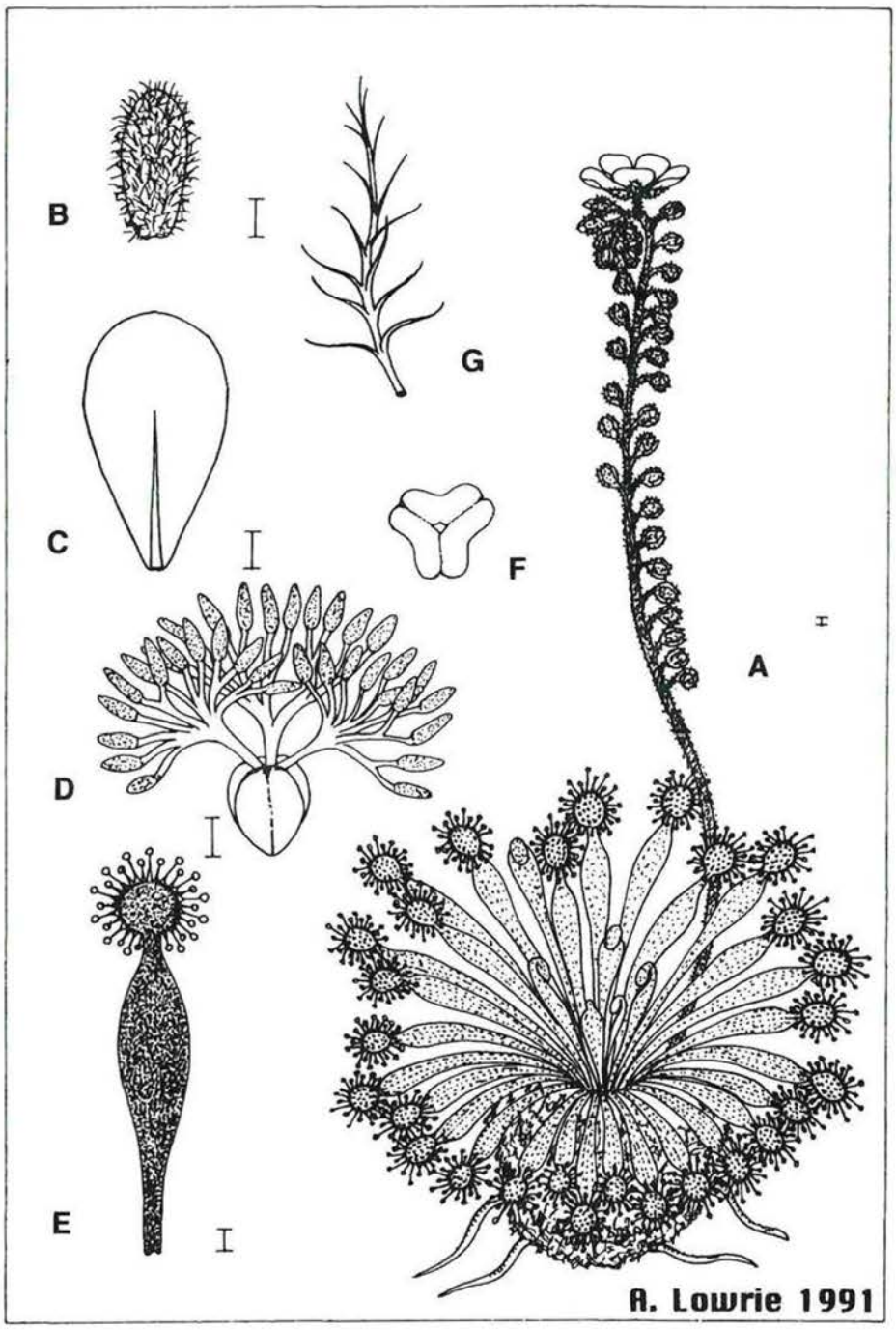

Figure 1. *Drosera ordensis* A - plant showing habit, B - sepal, C - petal, D - gynoecium, E - leaf, F - 3-carpellate ovary, base view, G - dendritic hair from leaf, not to scale. Scale bars = 1 mm.

Habitat. Drosera ordensis grows in sandy soils derived from sandstone rock. Large colonies of plants are commonly found near banded sandstone rock outcrop formations. Here the soil remains moist longer than in the surrounding open plains country because of the additional rain runoff from the nearby rock formations. The overall region is open woodland and the habitat is often well-covered with tall cane grass (*Sorghum* species). The cane grass is not thick and therefore quite open to the light at ground level. It is here amongst the cane grass stems, that offer just a little shade relief from the sun, that *D. ordensis* thrives.

Notes. The dry season is generally from May-November, however, shallow depressions, spring fed watersheds, rock outcrop areas and flood plains remain moist for long periods well into the dry season. Heavy condensation is also deposited on all low growing vegetation from early morning mists that have been observed close to the ground in the early months of the dry season.

The tropical *Drosera* species of Northern Australia in the *D.petiolaris* complex have evolved a number of different growth and dormancy strategies to suit their typical soil type and habitat preferences during the wet and dry seasons. The dry season is hot and extremely dry.

The species of the *D. petiolaris* complex (*sensu* Kondo 1984), respond to the first rain of the wet season by rapidly producing new leaf growth and inflorescences. By the time the heavier rains arrive, well into the wet season, flowering is well-advanced for most species of this complex, however *D. dilatato-petiolaris* and *D. falconeri* have finished flowering by this time. Leaf growth continues rapidly throughout this season, especially after anthesis. Most species in the complex grow in habitats that for the most part remain moist longer than the surrounding higher ground. Therefore the length of the dry period in these habitats is considerably shorter and dormancy in these species does not commence until well into the dry season.

Conservation status. Drosera ordensis is a common species within a 50 km radius of Kununurra and is not under threat.

Etymology. The epithet, *ordensis*, refers to the alluvial valley of the Ord River in which this species grows.

Acknowledgement

The author thanks the leaders of the 1993 LANDSCOPE Expedition to the Mitchell Plateau for the opportunity to collect material of *Drosera ordensis* in the Kimberley, and to the expedition members for their assistance and companionship in the field.

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Stylidium pulviniforme (Stylidiaceae), a new species of triggerplant from south-west Western Australia

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Abstract

Lowrie, Allen and Kenneally, Kevin F. *Stylidium pulviniforme* (Stylidiaceae), a new species of triggerplant from south-west Western Australia. Nuytsia 9 (3): 369-373 (1994). A new species of *Stylidium* (Stylidiaceae) endemic to south-west Western Australia, *S. pulviniforme* Lowrie and Kenneally, is described and illustrated.

Introduction

Stylidium pulviniforme described in this paper is endemic to the south-west of the state where it appears to be confined to white sand on the margins of winter freshwater pools and in salt-free soils above the high water line of salt lakes. It belongs to subgenus *Nitrangium* Endl., section *Sonderella* Mildbr. (Mildbraed 1908) and is most closely related to *S. corymbosum* R. Br. and *S. lepidum* Benth.

Taxonomy

Stylidium pulviniforme Lowrie and Kenneally, sp. nov. (Figures 1 and 2)

Herba perennis parvula, caudice caespitoso, ramoso pulviniformi. Folia omnia radicalia, linearilanceolata, margine hyalino, ad apicem serrata, infra carinata, mucronata, 3mm longa, 0.9 mm lata, glabra. Inflorescentia dense glandulosa, 2.5-4.5 cm alta. Flores 3-5 in cyma parva. Inflorescentiae bracteae lineares, 1-2 mm longae; bracteolae 0.6 mm longae. Calycis tubus glanduloso-pubescens, 4.5 mm longus; calycis lobi 2 mm longi, obtusi, glandulosi, albomarginati. Corolla alba; tubo lobos calycis aequans. Corollae laciniae 2 posteriores obovato-ellipticae, 7 mm longae, 2 anteriores ellipticae 6 mm longae, 2.7 mm latae, e basi roseomaculatae. Labellum minutum, 0.9 mm longum, ovatum, 2 basi appendiculis instructum. Appendices faucis 2, pegmatimorphae, in tubo paulo infra lacinias posteriores instructae. Capsula ellipsoidea, 6 mm longa, 2 mm lata.

Typus: near Mt Madden, 40 km N of Ravensthorpe, 33° 15'S, 119° 50'E, Western Australia, 28 November 1974, *E. Wittwer* 1507 (holo: PERTH 02991357; iso: CANB, K, KPBG, MEL, NSW).

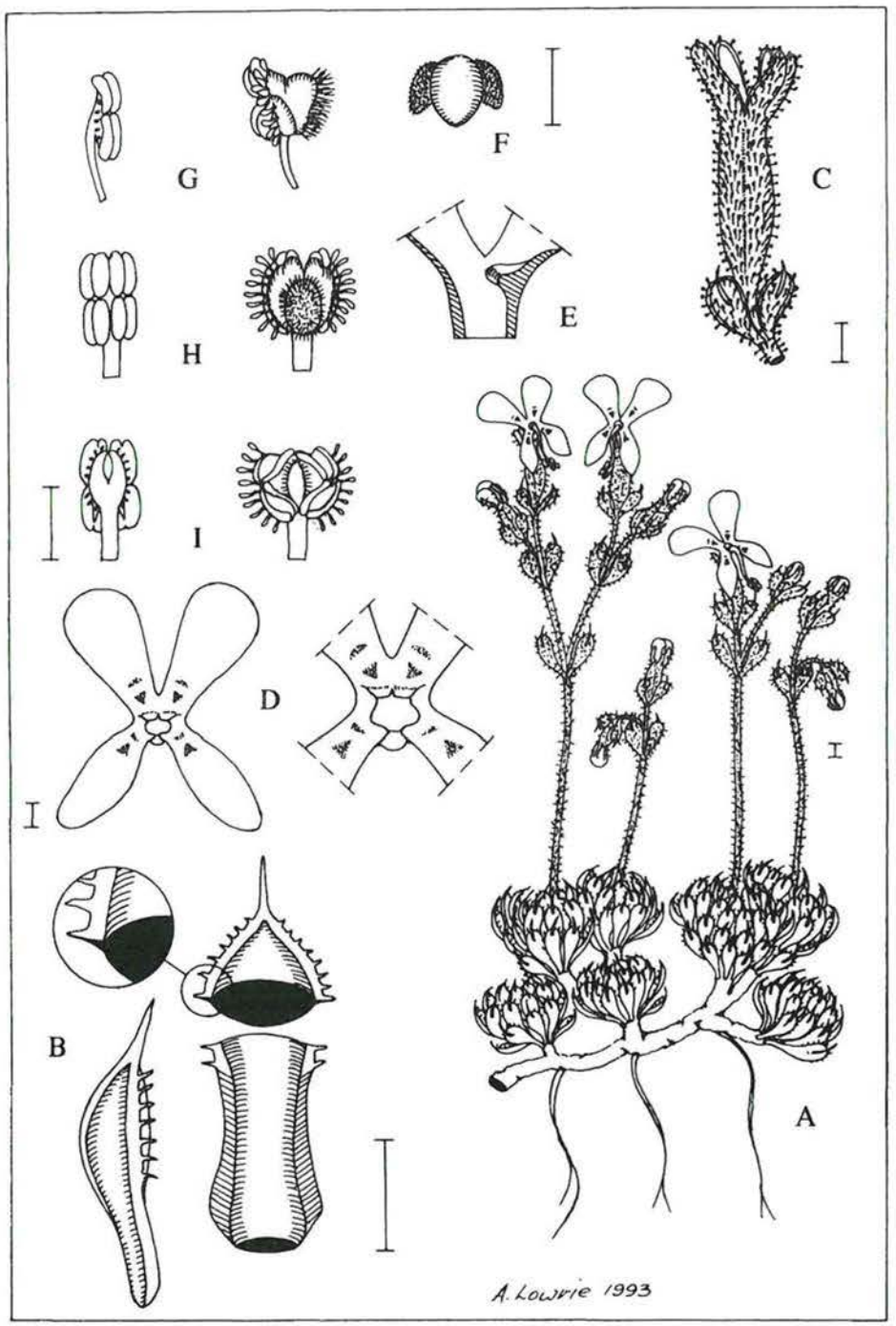

Figure 1. *Stylidium pulviniforme*. A - flowering plant; B - leaf of basal rosette showing adaxial view (right) and lateral view (left); C - hypanthium showing indumentum of glandular hairs; D - corolla (left) showing detail of throat (right); E - enlarged section of the corolla tube showing ledge-like appendage in throat; F - labellum; G - lateral view of column (left), with the stigma grown out (right); H - adaxial view of column and anthers (left), with the stigma grown out (right); I - abaxial view of column showing anther stage (left) and stigma stage (right). Scale bar = 1 mm. Drawn from *Lowrie* 121 (PERTH).

Small caespitose perennial, branched so as to form a dense flat-topped hard cushion up to c. 30 cm diameter. *Leaves* silvery grey, all basal, linear-lanceolate, glabrous, 3 mm long, 0.6 mm wide, with a white hyaline margin, serrate near apex; lower surface carinate, the ridge hyaline like the margins. *Inflorescences* cymose, 3-5 flowered, 2.5-4.5 cm high, densely glandular; bracts linear, 1-2 mm long; bracteoles 0.6 mm long. *Hypanthium* narrow-cylindrical 4.5 mm long, glandular-pubescent. *Sepals* 2 mm long, free to base, obtuse, glandular-pubescent, hyaline-margined. *Corolla* white, vertically paired; tube equal in length to sepals; two anterior lobes elliptic, 6 mm long, 2.7 mm wide with red marks at the base of each lobe; two posterior lobes obovate-elliptic, 7 mm long, 4 mm wide. *Labellum* minute, ovate, 0.9 mm long, with two basal appendages, positioned on a small keel-like ridge attached along the length of the corolla tube. *Throat* with 2 appendages in the form of minute ledges deep in throat below posterior lobes. *Capsule* ellipsoid, 6 mm long and 2 mm wide. *Seeds* pale, densely papillate.

Figure 2. *Stylidium pulviniforme*. Photograph of flowering material cultivated at the Western Australian Herbarium, grown from plants collected at the type locality by E. Wittwer, November 1974.

Other specimens examined. WESTERN AUSTRALIA: Lake Johnston, 17 October 1984, *H. Demarz* 10354 (KPBG); where the Phillips River crosses the Hyden-Ravensthorpe road, c. 4 km N of the junction of Fitzgerald and Beatty Roads, 17 October 1990, *Allen Lowrie* 121 (PERTH, MEL) and 7 December 1990, *Allen Lowrie* 220 (PERTH); 2 miles east of Duladgin Rocks (31°10'S 119°41'E) north of Yellowdine, 2 September 1966, *A.R. Main s.n.* (PERTH).

Distribution. Coolgardie District of the South-western Interzone and the Roe District of South-west Botanical Province (Beard 1980), extending from Yellowdine in the north to Mt Madden in the south and eastwards to Lake Johnston.

Ecology. This species occurs in white sand on the margins of winter freshwater pools and in salt-free soils above the high water line of salt lakes. The associated vegetation is a shrubland of *Melaleuca thyoides* Turcz. and *Darwinia diosmoides* (DC.) Benth.

Flowering period. September-November.

Conservation status. CALM Conservation Code for Western Australian Flora: Priority One - Poorly Known Taxa - known from one or a few (generally <5) populations which are under threat.

Chromosome number. n=14.

Etymology. The specific epithet alludes to the habit of the new species in forming colonies of cushion-like plants.

Discussion

The new species is distinctive, although clearly related to *S. corymbosum* R. Br. and *S. lepidum* Benth. These three species are similar in having small, cymose inflorescences (not racemes), and ledge-like throat appendages borne well down in the throat (Erickson 1958). *Stylidium pulviniforme* differs from *S. corymbosum* and *S. lepidum* in having a very short glandular scape, very short leaves with white hyaline margins (serrate near the apex) and a carinate ridge on their abaxial surface; white corolla lobes, which are marked red at base, and a short ovary. The column of *S. pulviniforme* is similar to that of *S. lepidum* in that they both work from below, the pollen or stigma touching the lower side of an insect's abdomen.

Key to *Stylidium pulviniforme* and related species

1. Leaf margins entire ..... *S.corymbosum*
1. Leaf margins serrate
   2. Scape glabrous; labellum with apical point ..... *S. lepidum*
   2. Scape densely glandular hairy; labellum without apical point ..... *S. pulviniforme*

The seed coats of *Stylidium* species appear to provide a useful taxonomic character for identification, and it is our intention to examine this feature in forthcoming publications. *S. pulviniforme* has a seed coat with a densely papillate surface. (Figure 3)

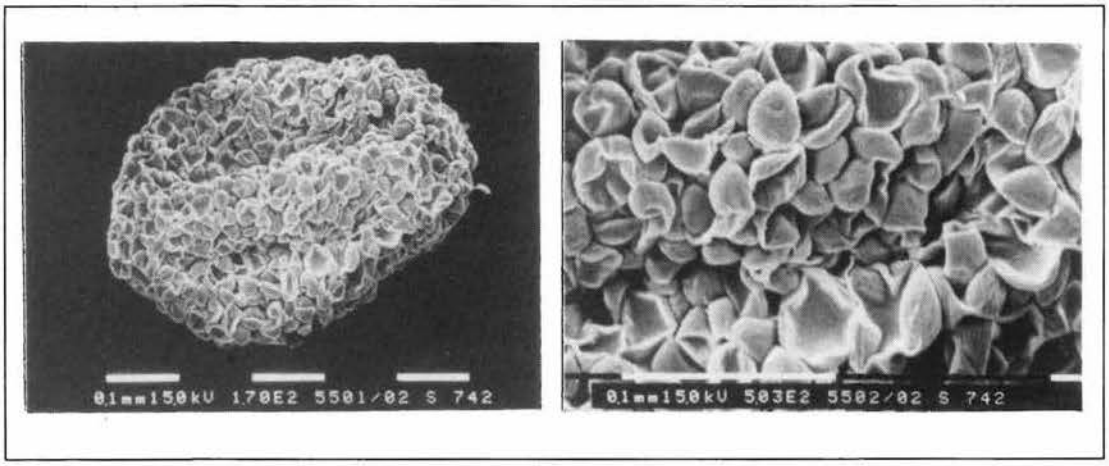

Figure 3. SEM photographs of a seed of *S. pulviniforme* showing the densely papillate surface. From *Lowrie* 220(PERTH).

Acknowledgements

We wish to thank Mrs Pauline Farrell, Kings Park and Botanic Garden, Perth for checking the collecting details of the type material. Dr John Kuo, Electron Microscopy Centre, University of Western Australia, kindly provided the SEM photographs and Dr S. James, Botany Department, University of Western Australia, the chromosome count.

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Chamaexeros longicaulis (Dasypogonaceae), a new species from Walpole, south western Australia, with additional notes on *Chamaexeros*

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Abstract

Macfarlane, T.D. *Chamaexeros longicaulis* (Dasypogonaceae), a new species from Walpole, south western Australia, with additional notes on *Chamaexeros*. Nuytsia 9 (3): 375-382 (1994). The new species is described and illustrated with photographs. *Chamaexeros longicaulis* is most closely related to *C. serra* but differs in several characteristics including three unique in the genus: elongated stems, elongated rhizomes resulting in vegetative reproduction, and thickened vertical rhizomes which presumably provide for storage of reserves. The species is of conservation interest owing to the small number of populations known, and is listed among conservation priority taxa for Western Australia. A revised key to the species of *Chamaexeros* is presented. Features of the ovary, capsule and seed are clarified for this genus. Floral measurement data are given for all species. A range extension is noted for *C. serra.*

Introduction

Two recent taxonomic accounts of *Chamaexeros* Benth. have been published (Kuchel 1976, George 1986). Three described species were recognised prior to this paper, although George (1986) refers to a possibly undescribed fourth taxon represented by a 1950 collection by D.M. Churchill housed in the Western Australian Herbarium. This specimen, which is (virtually) without flowers, was not seen by Kuchel because it was identified as *Tricoryne* sp. until recognised as belonging to *Chamaexeros* by G.J. Keighery in 1979.

Following discovery of plants matching the Churchill collection at Rest Point near Walpole, the author kept the population under observation until flowering occurred. The more extensive flowering and subterranean material then collected was sufficient to confirm that the plants represented a new species, which is here formally described.

Chamaexeros longicaulis T. Macfarlane, sp. nov. (Figures 1 and 2)

Herba perennis coloniam formans. Rhizomata longa praesentia, horizontalia, obliqua et verticalia. Caules ad 30 cm longi. Folia plana, membranacea mollia. Inflorescentia plerumque cymae compactae umbelliformis.

Typus: opposite Rest Point golf course, 150 m NW along Rest Point Road from Sandy Beach track, Rest Point, 1.5 km SW of Walpole, Western Australia, 34° 59' S, 116° 43' E, 5 Nov. 1986, *T.D. Macfarlane* 1731 (holo: PERTH 02664674; iso: AD, CANB, K, MEL, NSW, NY, P, PERTH 02664682 & 02664690).

Perennial colony-forming *semi-woody plants*. *Roots* wiry, arising from the rhizomes. *Rhizomes* of two kinds, slender and stout; slender rhizomes horizontal, ascending vertically or obliquely, or descending obliquely, located near soil surface or to 20 cm below it, up to 15 cm long, 1-2.5 mm diameter, with cataphylls c. 15 mm long, usually widely spaced, scarious, tough; stout rhizomes descending vertically, up to 20 cm long, 3-9 mm diameter, with cataphylls 2-8 mm long, closely spaced, fragile. *Stems* perennial, decumbent to erect, usually unbranched, arising usually 3-6 cm below ground level from the tip or along the length of the horizontal or ascending, slender rhizomes, occasionally from the upper region of stout rhizomes, up to 30 cm long, c. 3 mm diameter, woody, tough. *Young stems* covered by imbricate, white, sheathing cataphylls, changing to leaves above ground level. *Older stems* with crowded green leaves on upper 7-10 cm, with dead leaves or bare stem marked with leaf scars below. *Leaves* with blade 6-16 cm long, 2-5 mm wide, flat, relatively thin and soft, acute, obtuse or rounded, with margins white, scarious, the marginal membrane entire or fringed, sometimes absent or minute in the apical part of the blade. *Inflorescences* 1-3 per shoot, 2-20 cm long including peduncle, a compact umbel-like cyme on a simple peduncle or occasionally with a second cyme below the terminal one, occasionally with a short cyme-bearing branch arising from within a cyme on the main axis. Longest *bracts* (6)10-20(35) mm long, with broad sheathing base and short to long, leaf-like blade, green in centre with white entire sheath margins and white fimbriate blade margins. *Pedicels* 5-17 mm long. *Flowers* c. 7 mm long, faintly scented; sepals bright yellow with central green stripe; petals bright yellow; anthers 1-1.1 mm long; style c. 3.5 mm long. *Capsules* almost spherical (when all locules setting seed, otherwise asymmetrical), with apex slightly depressed, smooth except for grooves along the locule walls and the dehiscence zone in the middle of each locule, 3-locular, with 0-2 seeds maturing per locule. *Seeds* more or less reniform, c. 3.5 mm long, with endosperm, the ovule embedded, small, 0.5 - 0.7 mm long, cylindrical, basal.

Other specimens examined. WESTERN AUSTRALIA: N of Boggy Lake, Nov. 1950, *Dr [D.M.] Churchill s.n.* (PERTH); Rest Point, 2 km WSW of Walpole, 27 Feb. 1986, *G.J. Keighery* 7999 (PERTH); opposite golf course, Rest Point, 5 km *(sic)* W of Walpole, 3 Nov. 1986, *G.J. Keighery* 8741 (CBG *n.v.*, NT *n.v.*, PERTH); head of Forest of Arms, just NE of Mt Hopkins, 1 Aug. 1987, *S.D. Hopper* 5930 (CANB *n.v.*, PERTH); margin of camping ground, Rest Point, near Walpole, 4 Nov. 1986, *T.D. Macfarlane* 1732 (PERTH); type locality, 5 Nov. 1986, *T.D. Macfarlane* 1733 (PERTH).

Distribution. The species is known only from the vicinities of Rest Point (34° 59' S, 116° 43' E) and Boggy Lake (35° 02' S, 116° 40' E) near Walpole, on the south coast of south western Australia. The above two localities are 7.5 km apart and separated by Deep River. Near Rest Point there are large populations of *Chamaexeros longicaulis,* but these are close to roads or recreational facilities. Further populations occur at places along a 1 km track leading from the type locality through forest to Sandy Beach. Areas away from roads have not been extensively searched for the species. The Boggy Lake area is difficult of access and has not been extensively searched for *C. longicaulis.* Two populations have been documented in that area, from north of Boggy Lake and c. 1 km south eastwards in the Forest of Arms. Further undocumented information deriving from trekkers indicates another large population a short distance north of Crystal Lake near Boggy Lake (A.S. Weston, personal communication).

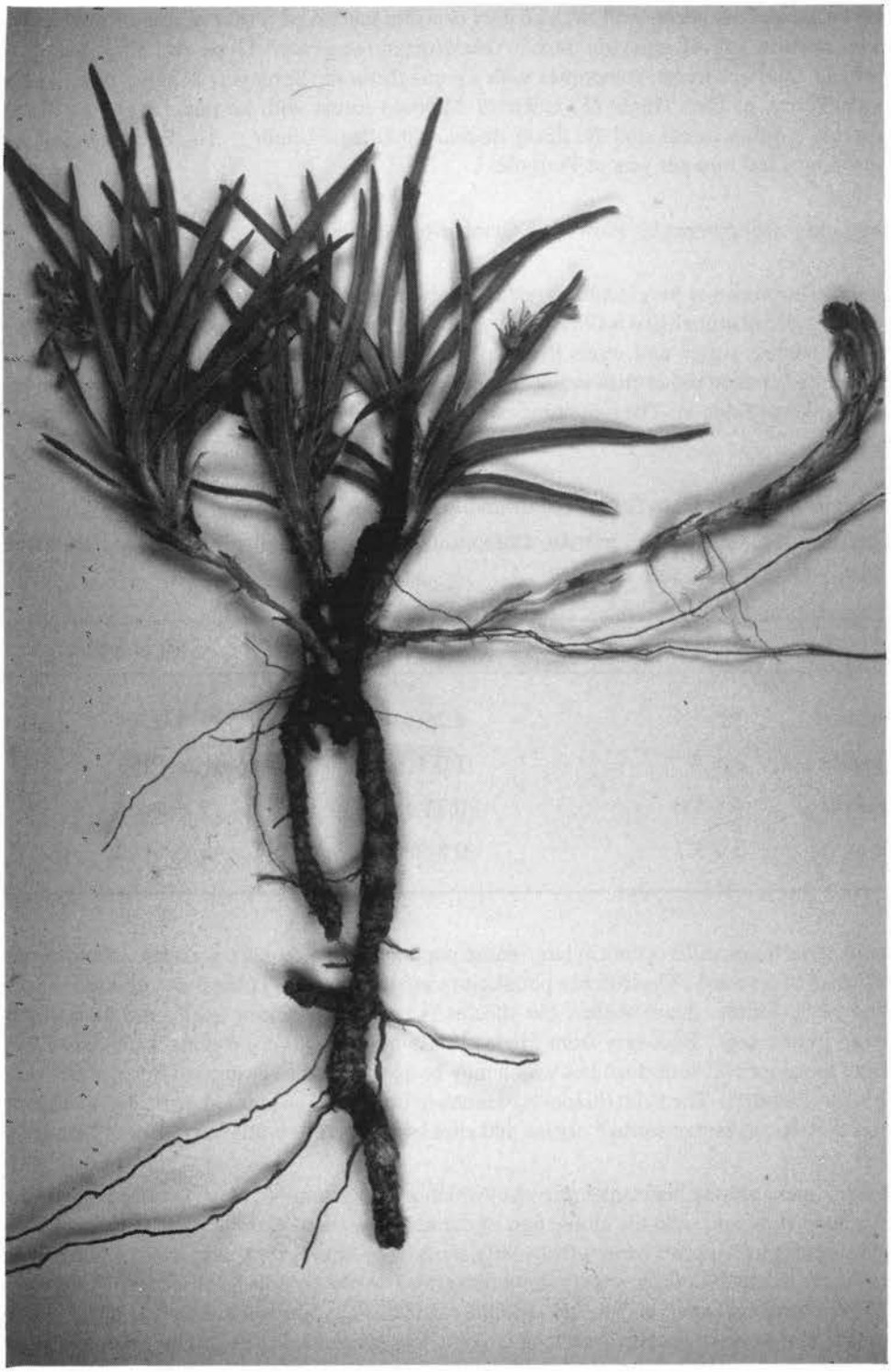

Figure 1. *Chamaexeros longicaulis.* Plant with burnt old stem, thick vertical rhizomes and new shoots arising from the old stem and from new, ascending, slender rhizomes. From *T.D. Macfarlane* 1731.

Habitat. The species occurs on well-drained grey or white sand overlying clay, and brown sandy clay containing lateritic gravel carrying Jarrah (*Eucalyptus marginata* Donn ex Smith) and Marri (*E. calophylla* Lindley) forest, sometimes with *Agonis flexuosa* (Sprengel) Schauer trees, and a tall shrub understorey, or Red Tingle (*E. jacksonii* Maiden) forest with an understorey of the sedge *Lepidosperma effusum* Benth. and the shrub *Acacia pentadenia* Lindley. The rainfall in this area is high, averaging 1369 mm per year at Walpole.

Flowering and fruiting periods. Flowering October-November. Fruiting January.

Discussion. *Chamaexeros longicaulis* is most closely related to *C. serra* (Endl.) Benth., these two species sharing dense umbel-like inflorescences, but *C. longicaulis* differs in having elongated stems, elongated rhizomes, softer and more flexible leaves, an exserted rather than usually concealed peduncle which is naked rather than bracteate, green rather than scarious outer inflorescence bracts, and longer flowers (Table 1). The remaining two species have open paniculate inflorescences (see the key below).

Table 1. Measurements from flowers of *Chamaexeros* species.

Diagnostic measurements shown in bold. Observations made on reconstituted herbarium material; measurements in mm.

Species	Flower length	Anther length	Style length
C. fimbriata	3.3-4.5	**0.25-0.45**	**1-1.75**
C. longicaulis	c. **6.9**	1.0-1.1	c. 3.5
C. macranthera	4.5-5.0	0.75-1.0	3.4-3.5
C. serra	5.0-5.7	0.8-0.9	3.1-3.25

Chamaexeros longicaulis occurs in large dense populations or colonies, sometimes having almost the appearance of a sward. These dense populations are at least partly clonal owing to the vigorous production of rhizomes. Nevertheless the species is capable of setting seed, and presumably of reproducing in this way. Recovery from fire is chiefly by vegetative sprouting from partly burned stems, from the apices of stout rhizomes which may be up to 5 cm below ground level, and from new or old slender rhizomes. The stout rhizomes, which are brittle and appear rather fleshy when broken, appear to function as reserve storage organs and sites of regeneration following fire or damage.

The possession of long horizontal rhizomes which give rise to new stems, the deeply penetrating and fleshy stout rhizomes, and the elongation of the aerial stems of *C. longicaulis* are unique in the genus. The other three species form tufts by very short (0.5 -1 cm) extensions of the woody rhizome which each give rise to a single new leafy shoot that grows up closely adjacent to neighbouring shoots. When long unburnt, *C. fimbriata* (F. Muell.) Benth. can in this way form clumps up to 1 metre diameter, and the individual stems can attain 7 cm long as the apices are gradually buried by accumulating drift soil and leaf litter. Similarly *C. serra* can exhibit stems up to 6 cm long when long unburnt. However the stems of *C. longicaulis* commonly reach 20-30 cm in a comparatively short time after fire.

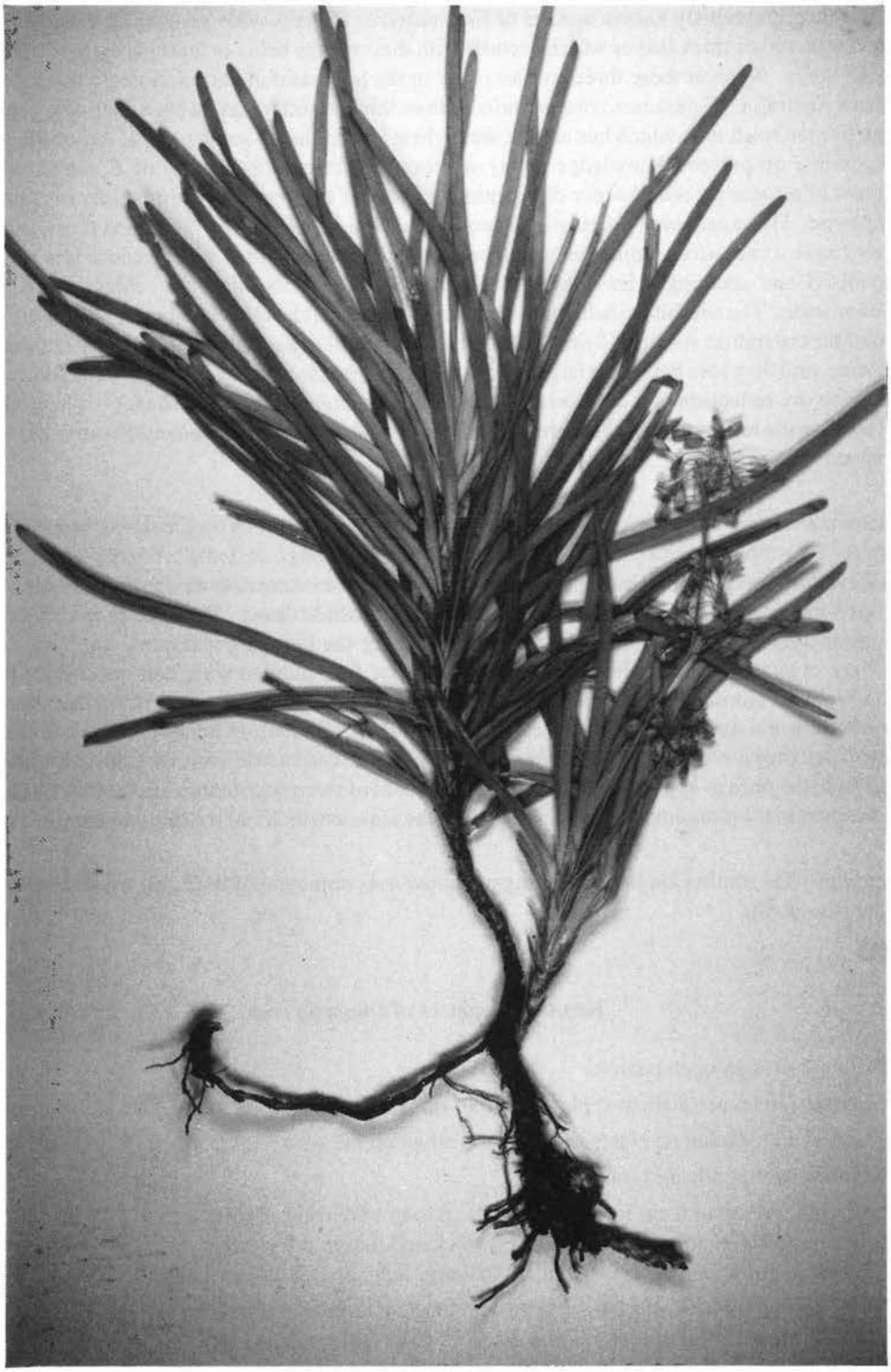

Figure 2. *Chamaexeros longicaulis.* Plant showing the long stem, old horizontal slender rhizome from which the plant arose, a vertical thick rhizome with a short horizontal slender rhizome growing from its tip, and new shoots arising from ascending slender rhizomes. From *T.D. Macfarlane* 1731.

The three previously known species of *Chamaexeros* all have wide geographic ranges. They all have tough, rather thick leaves which accords with their ranges being at least partly in relatively low rainfall areas. None of these three species occur in the high rainfall karri and tingle forests of south western Australia. *Chamaexeros longicaulis*, with its thinner, softer leaves, has a restricted geographic range limited to an area which has almost the highest rainfall in the south west of the continent. It is not possible on present knowledge to say whether the current distribution of *C. longicaulis* is a remnant of a formerly much wider distribution or whether the genus was primitively mesophytic or xerophytic. However some speculations can be made on its evolution. The three more xerophytic species have a caespitose habit, which can be considered the primitive state because it is less highly specialised and seemingly less likely to have arisen from the strongly rhizomatous state of *C. longicaulis*. The caespitose habit is also general in the large, closely related genus *Lomandra* Labill. Two of the caespitose species, *C. fimbriata* and *C. macranthera* Kuchel, occur wholly or largely in the arid zone, and they also both have large open branched inflorescences which seem more likely to have given rise, by reduction and condensation, to the dense umbel-like inflorescences of the other two species than the reverse. Thus there are grounds for considering that *C. longicaulis* is an evolutionarily advanced species.

Conservation status. Chamaexeros longicaulis is currently listed among the Declared Rare and Priority Flora for Western Australia (Atkins 1994) as "*Chamaexeros longicaulis* ms". It has been assigned the Conservation Code 2, which is for poorly known taxa which are known from one or a few populations, at least some of which are not believed to be under immediate threat. The species is very restricted geographically as far as is presently known. However the known populations are large, and the vigorous vegetative reproduction and regeneration after fire, coupled with their occurrence in forest in the Walpole-Nornalup National Park (including the Nuyts Wilderness area) mean that the species, as a whole, is not threatened. Nevertheless, the Rest Point populations are near roads and recreation areas so that they are vulnerable to future developments and road modifications. Consideration should be given to the need to appropriately record the existence of these populations so that they can be taken into account in the planning of human activities in the area, and to the advisability of monitoring them.

Etymology. The epithet *longicaulis* - long-stemmed is a compound of the Latin words *longus* - long and *caulis* - stem.

Key to the species of *Chamaexeros*

1. Inflorescence an open panicle
   2. Leaves terete, not glaucous; plants rooting from base of stem only ..... *C. fimbriata*
   2. Leaves flat, glaucous; plants rooting from all along the stem ..... *C. macranthera*
1. Inflorescence condensed, umbel-like
   3. Stems short, up to 6 cm long; plants lacking long subterranean rhizomes, forming discrete tufts; leaves relatively thick and tough; inflorescence bracts all straw-coloured to white, up to 7 mm long ..... *C. serra*
   3. Stems long, up to 30 cm long; plants with long subterranean rhizomes, often forming colonies; leaves thin and soft; outer inflorescence bracts having green leaf-like blade with white fimbriate margins, 10-20 mm long ..... *C. longicaulis*

General discussion

The new species conforms well to current circumscriptions of *Chamaexeros* (Stevens 1978, George 1986) in possessing such features as bright yellow bisexual flowers, a simple style, two ovules per locule and fimbriate leaf margins. New features for the genus are the long stems and the two types of rhizome, the slender ones which provide vigorous vegetative reproduction, and the stout ones which presumably provide for reserve storage.

Certain generic features of *Chamaexeros* have been described incorrectly in the past or have been based on very few observations. These are discussed and clarified below.

Chamaexeros was long thought to have one ovule per locule (Bentham 1878, Kuchel 1976) but Stevens (1978), George (1986) and Macfarlane (1987) stated that there are two per locule. This latter situation was confirmed for all four species in the present study.

The perianth segments of *Chamaexeros* were stated to be free by Kuchel (1976) and George (1986) and not explicitly described by Bentham (1878). However as mentioned by Macfarlane (1987), they are slightly connate at the base.

Bentham (1878) indicated, without being explicit, that there is a difference in the insertion of the antipetalous and antisepalous stamens. Kuchel (1976) and George (1986) stated that the antipetalous stamens are inserted on the petals while the antisepalous ones are hypogynous. However, careful examination of all four species during the present study has confirmed a previous description (Macfarlane 1987) that all six stamens are adnate to the segments at the base, or more exactly are inserted just above the base of the segments.

Capsules of *Chamaexeros* were unknown to Bentham (1878) but were described for *C. fimbriata* by Kuchel (1976), and George (1986) added information on those of *C. serra*. In addition to the above description of the capsule of *C. longicaulis*, I note that the capsules of *C. macranthera* (*J. Brown* 221, PERTH) resemble those of the other species. Although usually described as spherical or globular, *Chamaexeros* capsules are often beaked or curved when seeds fail to develop in one or two of the locules.

The seeds of *Chamaexeros*, described very briefly by previous authors, are described more fully above for *C. longicaulis*. They are similar in shape, colour, texture and internal structure to those of the related genera *Lomandra* and *Romnalda* P.F. Stevens.

Floral features have not been much emphasised in distinguishing the species of *Chamaexeros*. Kuchel (1976) gave measurements of the flowers of the three species then known, and *C. macranthera* was named for its longer anthers. Measurements made during this study confirm that this species has longer anthers than those of *C. fimbriata*, but also show that the real distinction is between the short anthers of *C. fimbriata* (0.25-0.45 mm long) and the longer ones of the other three species, whose ranges of anther lengths overlap or adjoin (combined range 0.75-1.1 mm long). The anthers of *Chamaexeros longicaulis* are at the upper limit of this range. Among several floral features investigated during this study, two other measurements, flower length and style length, showed a clear disjunction for one species against the other three, with *C. longicaulis* being at the upper end of the range and *C. fimbriata* at the lower end (Table 1). Distinctly longer flowers characterise

C. longicaulis, and *C. fimbriata* stands out by its shorter style. These measurements thus have some utility for identification purposes and could have been used in the above key had there not been sufficient distinctions using more obvious characters.

A note on the distribution of *Chamaexeros serra*

Chamaexeros serra, previously thought to reach its northern limit near Perth and at Tammin (George 1986, Macfarlane 1987), is now known from 220 km further north of Perth near Eneabba (*C. Chapman s.n.*, 17 Aug. 1974, PERTH; *E.A. Griffin* 3143, PERTH).

Acknowledgements

I thank the following for discussion or making collections available: A. P. Brown, G.J. Keighery, S.D. Hopper, G. Wardell-Johnson, A.S. Weston. P.G. Wilson kindly translated the Latin description. H.R. White took the photographs.

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C.R.P. Andrews' species of *Acacia* (Leguminosae: Mimosoideae): typification of the names

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Abstract

Maslin, B R. and Cowan, R.S. C.R.P. Andrews' species of *Acacia* (Leguminosae: Mimosoideae): typification of the names. Nuytsia 9 (3): 383-385 (1994). The type status of the names for the five species of *Acacia* from south-west Western Australia published by C.R.P. Andrews in 1904 has been assessed. We have ascertained that the holotypes of these names are held at the National Herbarium of New South Wales (NSW) and that isotypes are held at the Western Australian Herbarium (PERTH) and the Royal Botanic Gardens, Kew (K).

Introduction

C.R.P. Andrews (1904) described five new species of *Acacia* from south-west Western Australia, namely, *A. ancistrophylla, A. cometes, A. camptoclada, A. eremaea* and *A. lasiocalyx*. Type material of these taxa is held in the National Herbarium of New South Wales (NSW), the Western Australian Herbarium (PERTH) and the Royal Botanic Gardens, Kew (K). NSW has two sets of specimens, one originating from Cecil Andrews' private herbarium and the other from (or assumed to be from) W.V. Fitzgerald's private herbarium. The specimens with "Herb. Cecil Andrews" labels (which are annotated in Andrews' hand) accord well with the protologues and are here regarded as holotypes. These sheets are stamped as having been received by NSW on 27 April 1915 but it is not known why Andrews deposited them there. At that time Andrews was Director of Education in Western Australia and there existed in Perth two, albeit small, institutional herbaria (Green 1990). None of the other specimens (isotypes) at NSW nor those at K and PERTH are annotated by Andrews, nor do any have "Herb. Cecil Andrews" labels. Some of the NSW isotypes have printed labels which clearly show them as originating from W.V. Fitzgerald's private collection. The remaining NSW isotypes have labels which are titled "Herbarium of the Department of Agriculture, W.A."; as these are annotated in Fitzgerald's hand it is assumed here that they too originated from W.V. Fitzgerald's private collection. The Kew specimens were all presented to that institution by W.E. Blackall in Jan. 1936. The PERTH specimens were acquired as donations from NSW, from C.A. Gardner's private herbarium or their origin is unknown. A summary of the typification of Andrews' *Acacia* names follows.

Typification of C.R.P. Andrews' *Acacia* names

Acacia ancistrophylla C.R.P. Andrews, J.W. Austral. Nat. Hist. Soc. 1: 40 (1904). Type citation: "I found this species in flower on red clay, near Dundas, in October, 1903." *Holotype*: red clay, near Dundas, W.A., Oct. 1903, Herb. Cecil Andrews (NSW). *Isotypes*: K (presented by W.E. Blackall in Jan. 1936), NSW (ex herb. W.V. Fitzgerald), PERTH 00739995 (ex herb. C.R.P. Andrews, in Herb. C.A. Gardner no. 1312*a*), PERTH 00740403 (fragment, origin unknown), PERTH 00740411 (ex herb. NSW, in W.E. Blackall Collection).

Note. *Acacia ancistrophylla* is treated in the forthcoming "Flora of Australia" account of *Acacia* as comprising three closely related varieties.

Acacia camptoclada C.R.P. Andrews, J.W. Austral. Nat. Hist. Soc. 1: 39 (May 1904), non E.Pritzel (Dec. 1904). Type citation: "I found this species in flower on red clay, near Dundas, in October, 1903." *Holotype:* red clay, near Dundas, W.A., Oct. 1903, Herb. Cecil Andrews (NSW). *Isotypes:* K (presented by W.E. Blackall in Jan. 1936), NSW (presumably ex herb. W.V. Fitzgerald, on a label with the heading "Herbarium of the Department of Agriculture, W.A." crossed-out), PERTH 00743593 (in Herb. C.A. Gardner No. 1308ß).

Acacia cometes C.R.P. Andrews, J.W. Austral. Nat. Hist. Soc. 1: 39 (1904). Type citation: "I found this species in flower on clay soil near Ravensthorpe on the Phillips River in October, 1903." *Holotype:* clay soil, Ravensthorpe, W.A., Oct. 1903, Herb. Cecil Andrews (NSW). *Isotypes:* K (presented by W.E. Blackall in Jan. 1936), NSW (in herb. W.V. Fitzgerald), PERTH 00745235 (ex herb. NSW), PERTH 00745219 (in herb. C.A. Gardner No. 1310*a*), PERTH 00745227 (? ex herb. W.E. Blackall) and PERTH 00745170 (origin unknown).

Note. *Acacia cometes* is treated as conspecific with *A. lachnophylla* F. Muell. in the forthcoming "Flora of Australia" account of *Acacia.*

Acacia eremaea C.R.P. Andrews, J.W. Austral. Nat. Hist. Soc. 1: 40 (1904). Type citation: "I found this species in flower on dry clay soil near Cue in July, 1903." *Holotype:* clay soil, Cue, W.A., July 1903, Herb. Cecil Andrews (NSW). *Isotypes:* K (presented by W.E. Blackall in Jan. 1936). *?Isotype:* Cue, Aug. 1903, *C.R.P. Andrews* (NSW, label annotated by W.V. Fitzgerald with the heading "Herbarium of the Department of Agriculture, W.A." crossed out; Fitzgerald probably erroneously recorded the date of collection as "Aug." instead of July), PERTH 00750972 (ex NSW), PERTH 00750557 (in Herb. C.A. Gardner No. 1309*a*), PERTH 00750964 (origin unknown).

A. lasiocalyx C.R.P. Andrews, J.W. Austral. Nat. Hist. Soc. 1: 41 (1904). Type citation: "I found this very handsome species in flower on sand plains near the Gairdner and Hammersley Rivers in October, 1903." *Holotype:* sandplains, near Gairdner and Hammersley Rivers, W.A., Oct. 1903, Herb. Cecil Andrews (NSW). *? Isotypes*: Jerramongup, Oct. 1903, *C.R.P. Andrews* (NSW, label annotated by W.V. Fitzgerald with the heading "Herbarium of the Department of Agriculture, W.A." crossed out Fitzgerald probably interpreted the type locality as "Jerramongup" [= Jerramungup]), PERTH 00762598 (ex NSW), PERTH 00762571 (in Herb. C.A. Gardner No. 1304ß).

Acknowledgements

We wish to thank the Directors of the National Herbarium of New South Wales (NSW) and the Royal Botanic Gardens, Kew (K), for allowing us access to their material which is cited in this paper. We are particularly grateful to Phillip Kodela for supplying valuable information on Andrews' specimens at NSW and to Dr Greg Leach (Australian Botanical Liaison Officer at Kew, 1990-91) for supplying photocopies of archival material from Kew. Special thanks are extended to the Australian Biological Resources Study for financial support.

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William Vincent Fitzgerald's species of *Acacia* (Leguminosae: Mimosoideae): typification of the names

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Abstract

Maslin, B.R. and Cowan, R.S. William Vincent Fitzgerald's species of *Acacia* (Leguminosae: Mimosoideae): typification of the names. Nuytsia 9(3): 387-398 (1994). William Vincent Fitzgerald described 33 new species of *Acacia* in four papers published between 1904 and 1917. Notes on these publications and on the specimens used by Fitzgerald are provided. Lectotypes are selected for 23 names, based on specimens located at BM (4), PERTH (6) and NSW (13).

Introduction

William Vincent Fitzgerald was born on the Mangana goldfield in north-eastern Tasmania on 21 July 1867 and at 16 was training for a career in mining at the School of Mines in that State. About 1890 he began corresponding with, and sending plant specimens to, F. Mueller in Melbourne. In 1903 he was a member of the Western Australian Commission on Forests and the following year became chairman of the Forests Advisory Board of Western Australia. In 1904 Fitzgerald described 23 species of *Acacia*, mostly from the south-west of Western Australia in the inaugural number of "Journal of the West Australian Natural History Society" (Fitzgerald 1904). In April 1905 he was appointed temporarily to the Department of Lands and Surveys as naturalist to the trigonometrical survey expedition to the Kimberley region led by Charles Crossland (Kenneally 1986). Then in 1906 he was sent, at the direction of the Minister of Lands, to survey the potential for arable lands in several river valleys of the Kimberley region (Hall 1978). As a result of these explorations Fitzgerald produced reports for parliament, published initially in the "Western Australian Year Book 1905-1906." These reports included general comments on the flora, fauna, extent of arable land and prospects for gold mining but did not mention specifically any of the new species he stated he had collected. In 1912 he described six new south-west Western Australian species of *Acacia* in "Journal of Botany". It was not until 1917 that three of the new *Acacia* species collected during the 1905 Kimberley expedition were described by Fitzgerald (in Maiden 1917). In a later paper in this same volume Maiden (1917a) published Fitzgerald's south-west Western Australian species, *A. drewiana*.

Because most of the names published by Fitzgerald have not been typified, we have taken the opportunity presented by our work with the "Flora of Australia" to recognise holotypes or to select lectotypes wherever possible. This process is based on a study of Fitzgerald specimens at many herbaria, especially the principal sets at BM, NSW and PERTH.

Methods

The four publications by Fitzgerald in which new species of *Acacia* were described have different histories and deal with species from different geographical areas. We consider here each paper separately, arranged chronologically by date of publication. For each paper we provide information relevant to the typification of the names contained therein. For each new species we provide the taxon name and author citation, the place of publication and a precise quotation of the type citation given in the protologue; this is followed by the type designation in which we give the data on the type sheet, the abbreviation of the herbarium holding the principal type specimen and the abbreviations of the herbaria holding duplicates of the type. A "Note" is generally attached to our consideration of each species and the status of the name is often indicated here (if no indication is given it should be assumed that the name under which the "Note" appears is the accepted name for that taxon).

Fitzgerald's *Acacia* publications

1. Species described in J. W. Austral. Nat. Hist. Soc. 1: 5-17 (1904)

Twenty-three new species of *Acacia* from south-west Western Australia were described in this publication. These names were based on Fitzgerald's own gatherings except for *A. duriuscula* and *A. resinomarginea* (which were based on E. Kelso collections) and *A. andrewsii* (which was based on both C.R.P. Andrews and W.V. Fitzgerald material). Some Fitzgerald collections were made in September 1898 and July 1899, but most were gathered between June and November 1903.

Although many collections from Western Australia had been made earlier, it was not until the end of the 19th century and the beginning of the 20th, when Fitzgerald was collecting, that specimens began to be retained locally, first at the Western Australian Museum with the encouragement of B.H. Woodward, and slightly later at the Bureau (later Department) of Agriculture with the appointment of Alexander Morrison as the first official botanist (Green 1990). Even though these efforts provided focus for the beginning of two small herbaria in Perth many collections continued to leave the State. The collections of W.V. Fitzgerald provide an example of this outward flow of materials. According to Green (1990: 24) "Fitzgerald donated a set of specimens to the Department of Agriculture, of which many duplicates went to J.H. Maiden in NSW." In addition, NSW purchased a set of specimens in about late 1909 (*via* J. Staer, K.F. Kenneally pers. comm.), which, as noted below, we suspect represented Fitzgerald's personal collection. Also, as will be seen from the discussions below, some specimens even found their way to European herbaria such as BM and K.

The best representation of collections on which Fitzgerald based his new *Acacia* names for species published in this 1904 paper are at NSW and PERTH. From our examination of these materials we have discerned what appear to be patterns that reflect the historical flow of specimens referred to above. This information has been used in our deliberations on the typification of Fitzgerald *Acacia* names. The *Acacia* specimens are accompanied by two types of printed labels, both of which are annotated in Fitzgerald's hand:

(1) Labels on pink paper stock. PERTH has the most comprehensive set of specimens with this type of label, both in terms of the number of taxa represented and the data content of the labels. Of the 21 species based on Fitzgerald collections, PERTH has specimens with pink labels on all but one (i.e. *A. acutata*) whereas NSW has only 13. Furthermore, the PERTH labels normally record some of the

habit and/or habitat data which appear in the protologue, but these notes are absent from the NSW specimens. We suspect that this PERTH collection of Fitzgerald specimens with pink labels was part of the set he donated to the W.A. Department of Agriculture (see above). The (incomplete) NSW set seemingly comprises duplicates of this same collection sent by Fitzgerald prior to his May 1904 publication. We reach this conclusion because notes on the NSW sheets of *A. comans* and *A. euphleba* show that Fitzgerald had corresponded with NSW in April 1904 requesting that specimens he had sent earlier be redetermined, the original manuscript names for these taxa to be replaced with new names.

(2) Labels on white stock. NSW has a very comprehensive set of specimens on white paper stock, whereas PERTH has none. Of the 21 species based on Fitzgerald collections, NSW has 19 specimens with these particular white labels. Interestingly, each of these labels is annotated "Type" by Fitzgerald but we consider that he was probably not using the term in today's sense, that is as nomenclatural types, and was not lectotypifying his names. We suspect that these specimens were part of Fitzgerald's personal collection which NSW purchased in late 1909 (see above).

In view of the fact that two annotated sets of Fitzgerald collections exist, lectotypification is regarded as desirable. In designating lectotypes we have given preference to those NSW specimens which we assume originated from Fitzgerald's personal herbarium, i.e. those with the white labels (see 2 above). In general these specimens are the more complete, although their label information is not as comprehensive as that given on competing PERTH specimens with pink labels. Therefore, unless otherwise noted in the following list, it should be assumed that the lectotypes, holotypes and many paralectotypes at NSW (but not commonly the isolectotypes) are accompanied by labels on white stock. We have avoided selecting unmounted NSW specimens as lectotypes when another choice was possible because of the real possibility of the actual content changing over the years or the labels becoming mixed. For PERTH specimens, only those with pink labels have been annotated by Fitzgerald and, unless otherwise noted, it should be assumed that it is these specimens which are cited below.

Acacia acuaria W. Fitzg., J. W. Austral. Nat. Hist. Soc. 1: 7 (1904). Type citation: "Cunderdin, fl. Aug., fr. Nov. 1903; Mingenew, fl. Sept. 1903. - W.V.F." *Lectotype* (here selected): Cunderdin, W.A., Aug. 1903, *W.V. Fitzgerald s.n.* (PERTH 00739359, flowering specimen); *isolectotype:* NSW. *Paralectotype 1* (fruiting specimens): Cunderdin, W.A., Nov. 1903, *W.V. Fitzgerald s.n.* (NSW, PERTH 00739340). *Paralectotype 2* (flowering specimen): Mingenew, W.A., Sept. 1903, *W.V. Fitzgerald s.n.* (NSW).

Note. The NSW specimens from Fitzgerald's presumed personal collection are either unmounted or depauperate, thus the lectotype has been selected from the PERTH material.

Acacia acutata W. Fitzg., J.W. Austral. Nat. Hist. Soc. 1: 6 (1904). Type citation: "Cunderdin, August, 1903. - W.V.F." *Holotype:* Cunderdin, W.A., Aug. 1903, *W.V. Fitzgerald s.n.* (NSW); *isotype:* K (comm. W.E. Blackall 1936).

Note. The Kew isotype does not bear Fitzgerald handwriting.

Acacia andrewsii W. Fitzg., J.W. Austral. Nat. Hist. Soc. 1: 6 (1904). Type citation: "Watheroo, fl. August, 1903. - C.R.P. Andrews; Wurarga, fr. Sept. 1903. - W.V.F." *Lectotype* (here selected): Watheroo, W.A., Aug. 1903, *C.P.R. Andrews s.n.* (PERTH 00740489, flowering specimen); *isolectotypes:* K (comm. W.E. Blackall 1936), NSW, PERTH 00740470. *Paralectotype* (fruiting

specimens): Wurarga, W.A., Sept. 1903, *W.V. Fitzgerald s.n.* (NSW, PERTH 00740497 - presumably ex herb. W.E. Blackall).

Note. In order to apply this name with confidence it is preferable that Andrews' flowering collection be selected as lectotype rather than Fitzgerald's which is in fruit. The Andrews' specimen at NSW from Fitzgerald's presumed personal collection is unmounted and rather depauperate, thus the lectotype has been selected from the PERTH material.

Acacia cliftoniana W. Fitzg., J.W. Austral. Nat. Hist. Soc. 1: 10 (1904). Type citation: "Arrino, Sept. 1903. - W.V.F." *Lectotype* (here selected): Arrino, W.A., Sept. 1903, *W.V. Fitzgerald s.n.* (NSW 167229); *isolectotypes:* NSW 167228, PERTH 00744743, 00744727 (ex herb. C.A. Gardner no. 1311a), 00744735 (fragment of unknown origin).

Note. This name will be treated as a subspecies of *A. congesta* in the "Flora of Australia" account of *Acacia*.

Acacia comans W.V. Fitzgerald, J.W. Austral. Nat. Hist. Soc. 1: 5 (1904). Type citation: "Arrino, Sept. 1903. - W.V.F." *Lectotype* (here selected): Arrino, W.A., Sept. 1903, *W.V. Fitzgerald s.n.* (NSW 216914); *isolectotypes:* NSW, PERTH 00745189.

Acacia dubia W. Fitzg., J.W. Austral. Nat. Hist. Soc. 1: 9 (1904). Type citation: "Boulder, Sept. 1898. - W.V.F." *Lectotype* (here selected): Boulder, W.A., Sept. 1898, *W.V. Fitzgerald s.n.* (NSW 167219); *isolectotypes:* PERTH 00749931 & 00133124 (ex herb. W.E. Blackall).

Note. *Acacia dubia* will be treated as a synonym of *A. merrallii* F. Muell. in the "Flora of Australia" account of *Acacia*.

Acacia duriuscula W. Fitzg., J.W. Austral. Nat. Hist. Soc. 1: 15 (1904). Type citation: "Coolgardie district. - E. Kelso." *Syntype:* Coolgardie district, W.A., *E. Kelso s.n.* (NSW); ? *isosyntypes:* NSW, PERTH 00749974 (not ex herb. W.V. Fitzgerald) & 00749982 (ex Herbarium of the Department of Agriculture, W.A.).

Note. According to the protologue this name was based on "two small specimens". The only material annotated by Fitzgerald that we have seen is at NSW and comprises a small flowering branchlet c. 10 cm long, accompanied by a label with the printed title "Herbarium of the Department of Agriculture, W.A." (but this title has been cancelled by hand). Much larger specimens of *A. duriuscula* collected by Kelso in 1902 are at both NSW and PERTH but none are annotated by Fitzgerald; these are treated here as possible isosyntypes. In the absence of seeing both specimens referred to by Fitzgerald, and given the inadequacy of the authentic NSW material, we have refrained from lectotypifying the name.

Acacia euphleba W. Fitzg., J.W. Austral. Nat. Hist. Soc. 1: 16 (1904). Type citation: "Milly's Soak and Jack's Well, Sept. 1903; Gwalia, Nov. 1903 - W.V.F." *Lectotype:* Near Milly's Soak, W.A., Sept. 1903, *W.V. Fitzgerald s.n.* (NSW), designated by B. Randell, J. Adelaide Bot. Gard. 14(2): 127 (1992); *isolectotypes:* NSW, PERTH 00751561. *Paralectotype:* Gwalia, W.A., Nov. 1903, *W.V. Fitzgerald s.n. (n.v.).*

Note. *Acacia euphleba* is treated as conspecific with *A. craspedocarpa* F. Muell. by Randell (*loc. cit.*).

Acacia exocarpoides W. Fitzg., J.W. Austral. Nat. Hist. Soc. 1: 7 (1904). Type citation: "Between Lennonville and Boogardie, Sept. 1903. - W.V.F." *Lectotype* (here selected): Near Lennonville (between it and Boogardie), W.A., Sept. 1903, *W.V. Fitzgerald s.n.* (NSW); *isolectotypes:* NSW, PERTH 00751006.

Acacia flabellifolia W. Fitzg., J.W. Austral. Nat. Hist. Soc. 1: 11 (1904). Type citation: "Arrino, Sept. 1903. - W.V.F." *Lectotype* (here selected): Arrino, W.A., Sept. 1903, *W.V. Fitzgerald s.n.* (NSW); *isolectotypes:* K (comm. W.E. Blackall 1936), NSW, PERTH 00752126 & 00752134 (fragment of unknown origin).

Acacia linophylla W. Fitzg., J.W. Austral. Nat. Hist. Soc. 1: 16 (1904). Type citation: "Cue, Mt. Magnet, Sept. 1903. - W.V.F." *Lectotype:* Nannine, Cue, Mt Magnet, W.A., Sept. 1903, *W.V. Fitzgerald s.n.* (PERTH 00763640), designated by B. Randell, J. Adelaide Bot. Gard. 14(2): 115 (1992); *isolectotypes:* NSW, PERTH 00763659 (ex herb. C.A. Gardner no. 1283B).

Note. The two specimens that are annotated by Fitzgerald have three localities on their labels: "Nannine, Cue, Mt. Magnet" but only the latter two were cited in the protologue (not all three as stated by Randell, *loc. cit.*). From our examination of the available type material there is no indication that more than a single gathering is involved. The label on the PERTH specimen selected by Randell as lectotype is on pink paper stock. *Acacia linophylla* is treated as conspecific with *A. ramulosa* W. Fitz. by Randell (*loc. cit.*).

Acacia mooreana W. Fitzg., J.W. Austral. Nat. Hist. Soc. 1: 10 (1904). Type citation: "Capel River, June 1903. - W.V.F." *Lectotype* (here selected): Capel River, W.A., June 1903, *W.V. Fitzgerald s.n.* (NSW); *isolectotypes:* K (comm. W.E. Blackall 1936), NSW, PERTH 00764752.

Acacia multilineata W. Fitzg., J.W. Austral. Nat. Hist. Soc. 1: 13 (1904). Type citation: "Arrino, sand plains. September 1903. - W.V.F." *Lectotype* (here selected): Arrino, W.A., Sept. 1903, *W.V. Fitzgerald s.n.* (NSW 216915, left-hand specimen on sheet); *isolectotypes:* NSW 216915, right-hand specimen on sheet, PERTH 00765813, 00765791 (ex herb. C.A. Gardner no. 1306B), 00765805 (fragment, presumably ex herb. W.E. Blackall).

Note. The NSW type sheet supports two specimens of the same taxon, each with a label, the left-hand one on white paper stock and the right-hand one on pink. These specimens were unmounted until recently and we assume that the specimens and labels have been correctly matched. *Acacia multilineata* will be treated as a subspecies of *A. lineolata* in the forthcoming "Flora of Australia" account of *Acacia.*

Acacia neurophylla W. Fitzg., J.W. Austral. Nat. Hist. Soc. 1: 13 (1904). Type citation: "Cunderdin, in fl. Aug. fr. Nov., 1903. - W.V.F." *Lectotype* (here selected): Cunderdin, W.A., Aug. 1903, *W.V. Fitzgerald s.n.* (NSW, flowering specimen); *isolectotypes:* NSW, PERTH 01116673 (ex herb. C.A. Gardner no. 1303B) & 0116762. *Paralectotype* (fruiting specimens): Cunderdin, W.A., Nov. 1903, *W.V. Fitzgerald s.n.* (NSW, PERTH 00765767 & 00765759 - ex herb. C.A. Gardner).

Note. *Acacia neurophylla* will be regarded as comprising two subspecies in the forthcoming "Flora of Australia" account of *Acacia.*

Acacia ramulosa W. Fitzg., J.W. Austral. Nat. Hist. Soc. 1: 15 (1904). Type citation: "Lennonville, Sept. 1903. - W.V.F." *Lectotype:* Lennonville, W.A., Sept. 1903, *W.V. Fitzgerald s.n.* (PERTH 00769975), designated by B.R. Randell, J. Adelaide Bot. Gard.14(2): 115 (1992); *isolectotype:* NSW.

Acacia randelliana W. Fitzg., J.W. Austral. Nat. Hist. Soc. 1: 14 (1904). Type citation: "Mount Malcolm, fl. July, 1899; 12 miles north-east of Kanowna, fr. Nov. 1903. - W.V.F." *Lectotype* (here selected): Mount Malcolm, W.A., July 1899, *W.V. Fitzgerald s.n.* (NSW, flowering specimen); *isolectotype:* PERTH 00769991. *Paralectotype* (fruiting specimens): 12 miles [19 km] north-east of Kanowna, W.A., Nov. 1903, *W.V. Fitzgerald s.n.* (NSW, PERTH 00769983 - not ex herb. W.V. Fitzgerald).

Note. *Acacia randelliana* will be treated as conspecific with a subspecies of *A. acuminata* in the "Flora of Australia" account of *Acacia.*

Acacia resinimarginea W. Fitzg. (as 'resinomarginea'), J.W. Austral. Nat. Hist. Soc. 1: 15 (1904). Type citation: "Coolgardie district. - E. Kelso." *Lectotype* (here selected): Coolgardie district, W.A., without date, *E. Kelso s.n.* (NSW); *isolectotypes* (dated 1902): NSW, PERTH 00770043 (ex Herbarium of the Department of Agriculture, W.A.).

Note. The lectotype is annotated by Fitzgerald on a "Herbarium of the Department of Agriculture, W.A." label (with "the Department of Agriculture W.A." cancelled). Unlike the isolectotypes (which are not annotated by Fitzgerald) the lectotype is without a collection date.

Acacia resinistipulea W. Fitzg. (as 'resinostipulea'), J.W. Austral. Nat. Hist. Soc. 1: 12 (1904). Type citation: "Nine miles north of Bullabulling, Nov. 1903. - W.V.F." *Lectotype* (here selected): 9 miles [14.5 km] N of Bullabulling, W.A., Nov. 1903, *W.V. Fitzgerald s.n.* (NSW); *isolectotypes:* NSW, PERTH 00770078 & 00770051 (ex herb. C.A. Gardner no. 1307B).

Acacia ridleyana W. Fitzg., J.W. Austral. Nat. Hist. Soc. 1: 12 (1904). Type citation: "Mogumber, Nov. 1903. - W.V.F." *Lectotype* (here selected): Mogumber, W.A., Oct. and Nov. 1903, *W.V. Fitzgerald s.n.* (NSW); *isolectotypes* (Nov. 1903): NSW, PERTH 00769460.

Acacia sericocarpa W. Fitzg., J.W. Austral. Nat. Hist. Soc. 1: 9 (1904). Type citation: "Cunderdin, fl. Aug., fr. Nov. 1903. - W.V.F." *Lectotype* (here selected): Cunderdin, Nov. 1903, *W.V. Fitzgerald s.n.* (PERTH 00771589, right-hand fruiting specimen). *Paralectotype:* Cunderdin, Aug. 1903, *W.V. Fitzgerald s.n.* (PERTH 00771589, left-hand flowering specimen; PERTH 00771562, ex herb. C.A. Gardner no. 1315B).

Note. No type material of *A. sericocarpa* has been located at NSW, therefore the lectotype is selected from the PERTH collection. Two Fitzgerald specimens from Cunderdin at BM (ex NSW) are labelled type but this is presumably an error as they are sterile and dated Aug. 1908.

Acacia tratmaniana W. Fitzg., J.W. Austral. Nat. Hist. Soc. 1: 8 (1904). Type citation: "Cunderdin, August 1903. - W.V.F." *Holotype:* Cunderdin, W.A., Aug. 1903, *W.V. Fitzgerald s.n.* (PERTH 00774200); *isotypes:* K (comm. W.E. Blackall 1936), PERTH 00774197 (ex herb. C.A. Gardner no. 1305B).

Note. The only material seen which is annotated by Fitzgerald is the PERTH sheet which we regard as the holotype.

Acacia vernicosa W. Fitzg., J.W. Austral. Nat. Hist. Soc. 1: 11 (1904). Type citation: "Midland Junction and vicinity, fl. July, fr. Oct. 1901. Serpentine, fl. Aug. 1902. - WVF." *Lectotype* (here selected): Midland Junction, W.A., July 1901, *W.V. Fitzgerald s.n.* (PERTH 00775339, flowering specimen); *isolectotypes:* K (*sphalm.* "1903", comm. W.E. Blackall 1936), NSW, PERTH 00775320 (ex herb. C.A. Gardner). *Paralectotype 1* (fruiting specimen): Midland Junction, W.A., Oct. 1901, *W.V. Fitzgerald s.n.* (NSW). *Paralectotype 2* (flowering specimen): Serpentine, W.A., Aug. 1902, *W.V. Fitzgerald s.n.* (NSW).

Note. The NSW sheet presumed to be from Fitzgerald's personal herbarium supports a single label, a number of unmounted specimens and pods in an envelope. The label data is that given in the protologue and it is not possible to determine with certainty what collection(s) are represented. However, as the sheet may contain flowering specimens from both Midland Junction and Serpentine we have selected as lectotype the PERTH specimen which gives only the Midland Junction locality. *Acacia vernicosa* was treated as conspecific with *A. incrassata* Hook. by Maslin (1978).

Acacia xerophila W. Fitzg., J.W. Austral. Nat. Hist. Soc. 1: 8 (1904). Type citation: "Bardoc, July, 1899. - W.V.F." *Lectotype* (here selected): Bardoc, W.A., July 1899, *W.V. Fitzgerald s.n.* (NSW); *isolectotypes:* PERTH 00776386 & 00776408 (fragment ex B).

Note. Fitzgerald's Bardoc collection is also the type of *A. fitzgeraldii* E. Pritzel, Bot. Jahrb. Syst. 35: 291 (Dec. 1904), published just seven months following the publication of *A. xerophila.* We assume that Pritzel used a specimen at B to prepare his account; however, this specimen appears no longer to exist (probably destroyed during the 1939-45 War) although PERTH has a fragment of it.

2. Species described in J. Bot. 50: 18-21 (1912)

This paper includes descriptions of miscellaneous new Western Australian taxa, including six species of *Acacia.* The *Acacia* species were based on material collected by Fitzgerald himself *(A. hynesiana)* and by R. Helms *(A. inaequiloba),* M. Koch *(A. ewartiana, A. eremophila, A. kochii)* and F.H. Vachel *(A. brachyclada).*

A footnote on the first page of the paper states: "Specimens of the plants here described, with the exception of *A. inaequiloba* and *Regelia sparsifolia,* are in the National Herbarium." The authorship of the note raises interesting and perhaps significant questions: if the note was Fitzgerald's, one might assume that the National Herbarium he referred to was that at Melbourne (MEL), but, if it was an editorial note added by the editor, James Britten, to what herbarium was he referring? Although the British Museum (Natural History) is rarely described as the "National Herbarium", we found that at least for Britten it was an accepted term. On page 245 of the same volume in which the paper was published, in an article by Britten, he quotes another author who had written of the "Herb. Mus. Brit.", but in the next paragraph Britten refers to specimens "in the National Herbarium". We therefore conclude that the footnote was probably added by Britten and that the herbarium referred to was BM. This is also in accord with the fact that there are specimens at BM of all but one *(A. inaequiloba)* of the six *Acacia* species published by Fitzgerald in this 1912 paper.

The labels accompanying the BM specimens are in Fitzgerald's hand and are from what we presume was his personal herbarium. At NSW the specimens of the same collections (except *A. hynesiana* and *A. kochii*) are annotated by Fitzgerald with the published name but unlike those at BM the rest of the label is not in his hand and the specimens are not from his personal herbarium. Except where otherwise noted below, specimens that we have seen of these same collections at K, MEL and PERTH are not annotated by Fitzgerald. Since there are annotated sets of Fitzgerald specimens at both BM and NSW, lectotypification is regarded as desirable. In designating lectotypes we have, except for *A. inaequiloba*, given preference to the BM specimens.

Publication of this paper was delayed for some considerable time, apparently for lack of funds for printing. On page 286 of the volume in which Fitzgerald's new species were published, the editor, James Britten, commented "We note with regret that the publication of several plants described by Mr. W.V. Fitzgerald on pp. 18-23 has been anticipated by Dr. Ewart and Dr. Jean White in their 'Contribution to the Flora of Australia' [Ewart, White and Wood 1911]... It is right to say that the author is not to blame for this, at any rate in the majority of cases, as his paper had been in our possession some time before its publication ...." He goes on to say that because Ewart and White had failed to include Latin diagnoses, their names could not be regarded as validly published. While he was correct at the time he wrote the note, the "International Code of Botanical Nomenclature" (Greuter *et al.* 1988) has required Latin diagnoses for valid publication only since 1935. Of the six species of *Acacia* described in this 1912 paper three had been published earlier by Ewart and White (1911), namely, *A. ewartiana* W. Fitzg. ex J. White (= *A. dielsii* E. Pritzel), *A. leptoneura* Benth. var. *eremophila* W. Fitzg. ex Ewart & J. White (=*A. eremophila* W. Fitzg.) and *A. kochii* W. Fitzg. ex Ewart & J. White. Both Fitzgerald and Ewart & White based their names on the same Max Koch collections, although we know (or presume) that they used different specimens. A similar situation was encountered by Short (1992): MEL specimens were used by Ewart and White to describe *Trichinium eriotrichum* W. Fitzg. ex Ewart & White (1910) and, quite independently, Fitzgerald described *Ptilotus eriotrichus* (1912) on the basis of different specimens of the same collection at NSW.

Because three of the species in this 1912 paper were based on Max Koch collections, it must be recalled that Koch's numbers are taxon numbers, not collecting numbers, thus one often encounters specimens with the same number but with different dates. This unfortunate situation often leads to difficulties when typifying names based on Koch collections. Therefore, in order to specify unambiguously a particular gathering one must associate the taxon number with a date of collection. At NSW the problem is sometimes compounded by the earlier policy of not mounting specimens; as a consequence there is the potential for labels and their associated specimens to become separated and mixed.

Acacia brachyclada W. Fitzg., J. Bot. 50: 20 (1912). Type citation: "Kellerberin; F.H. Vachel". *Lectotype* (here selected): Kellerberrin, W.A., Dec. 1903, *F.H. Vachell s.n.* (BM); *isolectotypes:* MEL (ex NSW), NSW (two sheets), PERTH 00742600 (fragment ex MEL).

Acacia eremophila W. Fitzg., J. Bot. 50: 19 (1912). Type citation: "Apud planities arenosa, Cowcowing; Max Koch (nos. 1024, 1024a)." *Lectotype* (here selected): Cowcowing sandplain, W.A., Aug. 1904, *M. Koch* 1024a (BM); *isolectotypes:* NSW, PERTH 00763136, 00838292 & 01505246. *Paralectotype:* Cowcowing, Sept. 1904, *M. Koch* 1024a (NSW, PERTH 00750980).

Note. Although the protologue lists *Koch* 1024 and 1024a as the basis for *A. eremophila*, this is clearly an error; Koch's own notes in archives of the Western Australian Herbarium lists a *Grevillea* species

for 1024 and *A. eremophila* for 1024a. The only herbarium where the number 1024 appears is at NSW on a scrap of newsprint attached to a sheet annotated by Fitzgerald.

Koch 1024a comprises a mixed collection of both flowering and young fruiting specimens which were gathered in July and August 1904 (judging from Koch's own labels on specimens at BM, NSW and PERTH) and presumably also September (judging from NSW 216932, which bears a "National Herbarium of New South Wales" label). However, as far as we are aware, Fitzgerald has annotated only the August and September collections as to the published name, thus the July collection is not regarded as a type. *Acacia leptoneura* var. *eremophila* Ewart & White was also based on *Koch* 1024a but we have not examined the type material which we assume would be at MEL but only the original drawings for figures 1-4 of the protologue have been located there (Short pers. comm.).

Acacia ewartiana W. Fitz., J. Bot. 50: 19 (1912). Type citation: "Cowcowing; Max Koch (no. 998)." *Lectotype* (here selected): Cowcowing, W.A., Aug. 1904, *M. Koch* 998 (BM); *isolectotypes:* K, MEL (*n.v.*, 2 sheets), NSW, PERTH 00751618. *Paralectotype:* Cowcowing, W.A., *M. Koch* 998, Sept. 1904 (MEL *n.v.*, NSW, PERTH 00751596).

Note. We have seen specimens of *Koch* 998 dated July, August and September 1904; however, as far as we are aware, Fitzgerald annotated only the August and September collections as to the published name. *Acacia ewartiana* W. Fitz. ex J. White in Ewart, White & Wood (1911) was also based on *Koch* 998 and there are syntypes at MEL (which we have not seen), also collected in August and September 1904. The name *A. ewartiana* will be treated as a synonym of *A. dielsii* E. Pritzel in the "Flora of Australia" account of *Acacia*.

Acacia hynesiana W. Fitzg., J. Bot. 50: 20 (1912). Type citation: "Planities arenosa prope Kellerberrin; leg. W.V.F." *Holotype:* Kellerberrin, W.A., Nov. 1907, *W.V. Fitzgerald s.n.* (BM); *isotypes:* MEL (fragment), NSW, PERTH 00760536 (ex NSW).

Note. As far as we are aware only the BM specimen is annotated by Fitzgerald and we therefore regard it as the holotype. The name *A. hynesiana* will be treated as a synonym of *A. merinthophora* E. Pritzel in the "Flora of Australia" account of *Acacia*.

Acacia inaequiloba W. Fitzg., J. Bot. 50: 18 (1912). Type citation: "Victoria Desert, Castra 56; R. Helms (Elder Exploring Expedition)." *Holotype:* Victoria Desert, Camp 56 [c. 95 km NE of Streich Mound, W.A.], 19 Sept. 1891, *R. Helms* 15 (NSW 180591); *isotypes:* AD, NSW (specimen ex Linn. Soc. N.S.W.), PERTH 02741059 (fragment ex herb. C.A. Gardner).

Note. The protologue clearly stated that the material used to describe this species is at NSW. This comprises two small (unmounted) flowering specimens which we regard as representing the holotype. A note by Fitzgerald accompanying these specimens is substantively the same as the discussion given in the protologue. There is no indication that the holotype specimen was ever part of Fitzgerald's personal herbarium.

Acacia kochii W. Fitzg., J. Bot. 50: 20 (1912). Type citation: "Rabbit-proof fence east of Watheroo; Max Koch". *Lectotype* (here selected): Watheroo Rabbit Fence, W.A., Aug. 1905, *M. Koch* 1616 (BM, left-hand specimen on sheet); *paralectotypes*: BM (dated Aug. 1905), MEL (*n.v.*, dated Sept. 1905), NSW (two sheets, one dated Sept. 1905, one dated Aug.-Sept. 1904), PERTH 00762067 (dated Sept. 1905).

Note. As evidenced by sheets at BM, MEL, NSW and PERTH there is variation in the date of collection of *Koch* 1616. Koch's own labels give the date as August and September of both 1904 and 1905. The BM sheet of 1616 supports two specimens and two labels (one annotated August 1905 by Koch, the other September 1904 by Fitzgerald). The left-hand specimen on the sheet (which we have chosen as the lectotype) is the more informative and we asume that the Fitzgerald label with the September 1904 date belongs to this specimen. The single MEL specimen of *Koch* 1616 (which is dated by Koch as September 1905) is the holotype of *A. kochii* W. Fitzg. ex Ewart & White (1911).

3. Species described in Maiden, J. & Proc. Roy. Soc. New South Wales 51: 71-124 (1917)

In this paper three new Kimberley *Acacia* species were described, namely, *A. curvicarpa*, *A. kimberleyensis* and *A. pachyphloia.* Although Maiden provided the Latin descriptions and added some observations of his own he clearly attributed these taxa to Fitzgerald (see protologues, also footnote on title page of paper). Thus, as with Short (1993), we regard the author citations to be W. Fitzg. in Maiden, not W. Fitzg. ex Maiden & W. Fitzg. as is given by Chapman (1991).

A knowledge of the history of the publication of these three names bears on the typification of them. Initially Fitzgerald prepared the descriptions as part of a large manuscript entitled "Notes on the Flora of North-West Australia with descriptions of some new genera and species". As discussed by Short (1993) this manuscript was completed by, at the very least, early 1912. A copy was submitted to J. Britten (BM) around this time with the request that it be published, but this never happened. The manuscript indicates by symbols that Fitzgerald specimens of a number of the species, including *A. curvicarpa* and *A. kimberleyensis*, were deposited at BM. In 1916 Fitzgerald submitted another copy of the manuscript to J.H. Maiden (NSW), along "with some herbarium specimens" (Maiden in Fitzgerald 1918). Maiden subsequently communicated this to the Royal Society of Western Australia where it was published in 1918. In the previous year, however, Maiden had published for Fitzgerald the three new *Acacia* species; this was done in the context of a review of *Acacia* species "Mr Fitzgerald has recorded as new for the tropical west" (Maiden 1917). In his own publication Fitzgerald (1918) merely listed these three names, noting that they had already been published in Maiden's paper. As a matter of interest, in 1906 Fitzgerald had published photographs and habitat notes, but no descriptions, of *A. curvicarpa* and *A. kimberleyensis* in "The Western Mail" (Perth).

Fitzgerald collected the material of his three new *Acacia* species when he was a member of Charles Crossland's expedition to the Kimberley in 1905. With reference to Fitzgerald's Kimberley collections Maiden (1917: 108) stated that some "have been very much dispersed, and no complete set of them exists;". He further noted that he had received Fitzgerald specimens from two sources: (1) "Some of Mr. Fitzgerald's specimens came into my care through purchase from a person into whose hands they had passed...." [i.e. *via* J. Staer in about late 1909, K.F. Kenneally pers. comm.]; (2) "Some of Mr. Fitzgerald's Acacias from the herbarium of the W.A. Department of Agriculture (received by me from Dr. F. Stoward) are published in the present paper." The following year (1918) in a series of notes prefacing Fitzgerald's most important publication on the Kimberley, Maiden stated that "In April, 1917, I received from Dr. Stoward, specimens of 53 species now described in this paper. These are in the National Herbarium of Sydney, and the original set is with Dr. Stoward at Perth." Although there were no *Acacia* species described in this work, Maiden's comment shows that he considered the first set of Fitzgerald's Kimberley specimens to be in Perth and the duplicate set at NSW. In our typification of *A. curvicarpa* and *A. kimberleyensis* (below) we have adopted that point of view in regarding the PERTH specimens as the primary set.

Because the relevant specimens at BM, NSW and PERTH are annotated by Fitzgerald, implying they all were used in preparing the protologue, we consider lectotypification desirable, even though for *A. curvicarpa* and *A. kimberleyensis* only a single collection is cited. Except where otherwise noted, the PERTH labels of all three species (i.e. the two above plus *A. pachyphloia*) are annotated by Fitzgerald on a printed label titled "Herbarium of the Department of Agriculture, W.A." This label does not occur on specimens at BM or NSW. Unlike specimens elsewhere, those at PERTH have Fitzgerald collecting numbers.

Acacia curvicarpa W. Fitzg. in Maiden, J. & Proc. Roy. Soc. New South Wales 51: 114 (1917). Type citation: "Near the junction of the Hann and Barnett Rivers (W.V.F.). On quartzite hills." *Lectotype* (here selected): Near Junction of Hann & Barnett Rivers, W.A., June 1905, *W.V. Fitzgerald* 1123 (PERTH 00746762); *isolectotypes:* BM (one specimen ex NSW, the other ex herb. W.V. Fitzgerald - the latter with a label on pink paper stock, see above), K (ex NSW), NSW (ex herb. W.V. Fitzgerald, the label on white paper stock, see above), PERTH 00746754 (on a "State Herbarium, Western Australia" label, not annotated by Fitzgerald).

Note. *Acacia curvicarpa* is regarded as synonymous with *A. acradenia* F. Muell. in the "Flora of Australia" account of *Acacia*.

Acacia kimberleyensis W. Fitzg. in Maiden, J. & Proc. Roy. Soc. New South Wales 51: 112 (1917). Type citation: "Packhorse Range, Kimberley district. Amongst sandstone. (W.V.F.)" *Lectotype* (here selected): Packhorse Range, W.A., July 1905, *W.V. Fitzgerald* 1222 (PERTH 00761621); *isolectotypes:* BM (one specimen ex NSW, the other ex herb. W.V. Fitzgerald - the latter with a label on pink paper stock, see above), NSW (ex herb. W.V. Fitzgerald, the label on white paper stock, see above).

Acacia pachyphloia W. Fitzg. in Maiden, J. & Proc. Roy. Soc. N.S.W. 51: 116 (1917). Type citation: "Slopes of Bold Bluff; hills near C.92, in proximity to the Synnott Range; hills by the Charnley and Calder Rivers (W.V.F.)." *Syntype:* near C92, Synnott Range, W.A., July 1905, *W.V. Fitzgerald* 1267 (NSW 65871, PERTH 00765864).

Note. As we have seen only the one syntype of this name, and as the species will be prepared for the "Flora of Australia" by M.D. Tindale (NSW), we do not wish to pre-empt taxonomic decisions by lectotypifying this name here.

4. Species described in Maiden, J. & Proc. Roy. Soc. New South Wales 51: 238-274 (1917)

Included in this paper was the description of *A. drewiana*, a new species which Maiden clearly attributed to Fitzgerald. As far as we are aware, the only specimen annotated by Fitzgerald is at NSW and this is therefore regarded as the holotype. The label on this specimen is on white paper stock and titled "FLORA OF AUSTRALASIA" (this sort of label is not commonly found on Fitzgerald *Acacia* specimens at NSW).

Acacia drewiana W. Fitzg. in Maiden, J. & Proc. Roy. Soc. New South Wales 51: 273 (1917). Type citation: "Type from Cannington (W.V.F.)" *Holotype:* Cannington, W.A., Feb. 1905, *W.V. Fitzgerald s.n.* (NSW 133030); *isotype:* PERTH 00749451, ex NSW.

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C.F. Meissner's species of *Acacia* (Leguminosae: Mimosoideae): typification of the names

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Abstract

Maslin, B.R. and Cowan, R.S. C.F. Meissner's species of *Acacia* (Leguminosae: Mimosoideae): typification of the names. Nuytsia 9 (3): 399-414 (1994). The type status of names for all 56 taxa described by Meissner in Lehmann's "Plantae Preissianae" (1844 and 1848) and in a subsequent paper in "Botanisches Zeitung" (1855) has been carefully assessed. Consequently, we have fixed the application of these names by choosing lectotypes wherever possible from among the syntypes, particularly those at BM, LD and NY. Of the lectotypes selected here 19 are at LD, 10 are at NY and 2 at BM.

Introduction

Johann August Ludwig Preiss, a private scholar and landowner in Herzberg am Harz in north-eastern Germany, journeyed to Western Australia in 1838 and spent more than three years (December 1838-January 1842) collecting plants, approximately 2800 species of both cryptogams and phanerogams (Marchant 1990). Several recent papers have described his itinerary and the fate of his collections, namely McGillivray (1975), Wilson (1983), Crisp (1983), Lander (1988), Short & Sinkora (1988) and Marchant (1990), but the account is still incomplete. Crisp noted that when Preiss returned to Europe, he turned over his collections to J.G.C. Lehmann, still unsorted even to family, although McGillivray (1975) records that some were sold earlier to William Hooker by Preiss while he was in London in mid-1842. Lehmann then enlisted the assistance of specialists to prepare an account of the various taxa that were subsequently published in "Plantae Preissianae" vols. 1 and 2 in 1844 and 1848 respectively. In the preface to these volumes, Lehmann made it clear that the sorting of the material was under his supervision and that it was sorted into families before specimens were sent to the 19 specialists who contributed treatments of the taxa (Short & Sinkora 1988). Unfortunately we do not know precisely how much of each of the collections the authors worked with, whether they had access to all the material or only the material which became part of Lehmann's and their own herbaria. Lehmann's herbarium went to the herbarium of the Botanical Museum, Lund, Sweden (LD) and each contributing author was allowed to take specimens of varying proportions for their own herbarium (Crisp 1983). It is possible, of course, that Lehmann distributed duplicates of the Preiss collections before specimens were sent to the specialists. This appears to have been the case, at least with specimens of Asteraceae, for Lander (1988) noted that there are Preiss specimens at the Conservatoire

Botanique de Geneve (G) which were received as early as June 1842, just six months after Preiss' departure from Western Australia. Short & Sinkora (1988) stated that all the Preiss Australian specimens received by J. Steetz, who contributed the Compositae, were in his hands by 1843. McGillivray (1975) suggested that some Preiss collection numbers, specifically those between 2621 and 2644, might well have been represented by one or very few specimens. The only collection number in this range representing *Acacia* type material was the type number Meissner cited for *A. myrtifolia* var. *major* (2641) and no example of that number has been seen by us.

Typification of Meissner's *Acacia* names

In the course of preparing the account of *Acacia* for the "Flora of Australia" the status of all 56 taxa described by Meissner in the "Plantae Preissianae" (1844 and 1848) and in a subsequent paper in "Botanisches Zeitung" (1855) has been carefully assessed and the names typified where possible. The new taxa were divided between species (of which 12 are now synonyms of other taxa) and varieties (of which 18 are now considered synonyms); this means that more than half the novelties he described have been synonymised, a rather surprising statistic given the fact that in the 1840s, relatively few taxa from Western Australia had been described, and those mostly by Robert Brown (1813) and George Bentham (1842). Many of Meissner's varieties represented minor variants in the populations, which may explain in part the very high number of synonyms at that level.

The new taxa of *Acacia* described by Meissner are mostly from south-west Western Australia, the exceptions being *A. falcinella* and *A. latrobei* which were based on Latrobe collections from eastern Australia, and *A. glaucifolia* which was based on a European-grown garden plant. The new taxa were based principally on Preiss collections but included a substantial number of J. Drummond collections. Two south-west Australian taxa were based on other than Preiss or Drummond collections - *A. denudata* var. *spinossissima* (based on a European-grown garden plant) and *A. gilbertii* (based on *Gilbert* 50).

The primary sets of Preiss collections of *Acacia* are at the Herbarium, Botanical Museum, Lund, Sweden (LD) and The New York Botanical Garden (NY); the latter set is Meissner's personal herbarium which was purchased by Columbia University in New York City and later transferred to NY. The Preiss specimens at LD were annotated by Meissner in most cases but the remainder of the label is often in Lehmann's hand. As to Meissner's personal herbarium at NY, the conclusion seems inescapable that Meissner annotated the specimens after the publication of "Plantae Preissianae", for he included in many cases, as part of the labels, the page number in "Plantae Preissianae", as well as reference to subsequent use of the name in other works, chiefly Bentham's account of the genus in the "Flora Australiensis".

Both Crisp (1983) and Wilson (1983) concluded that, taken as a whole, the best set of Preiss collections is at LD. Our analysis of the type specimens of Meissner *Acacia* taxa based on Preiss collections demonstrates that one cannot make the assumption that the LD specimen best qualifies as lectotype. We found that nearly as many specimens were better represented and/or better authenticated in Meissner's own herbarium at NY. For example, *A. restiacea* var. *scoparia* at NY is completely annotated to the varietal level by Meissner but the LD specimen lacks either a species or varietal epithet. Similarly, there are several other examples of Preiss specimens at LD not annotated by the author with the name published by him, namely, *A. acuminata* var. *ciliata*, *A. denudata*, *A. meissneri* and *A. obovata* var. *minor*. As noted above, the annotations by Meissner on the NY specimens were likely to have been added after the publication of "Plantae Preissianae".

Even if the "International Code of Botanical Nomenclature" did not condemn mechanical selection of lectotypes, to choose the LD specimen as the lectotype of a Meissner species without careful assessment of all the relevant data would be equally undesirable. We have studied each taxon thoroughly with all the relevant materials at hand before choosing lectotypes, a procedure most likely to lead to typifications that contribute to the stability of plant names.

Meissner also used Drummond specimens in his three accounts involving *Acacia*. Crisp (1983) noted that, with respect to the "Plantae Preissianae" treatments, Meissner saw Drummond specimens in the Shuttleworth herbarium which was purchased by BM in 1877. Except for *A. pulchella* var. *glaberrima* we have seen the relevant BM *Acacia* material (many in the form of photocopies provided by Dr P. Weston). These specimens are marked as being part of Shuttleworth's herbarium and, in most cases, are annotated by Meissner (however, see "Notes" under *A. ligustrina, A. meissneri* var. *angustifolia, A. myriobotrya* and *A. trigonophylla*). There are also Drummond type specimens at BM of five of the species described in the "Botanisches Zeitung" publication; however, these are not annotated by the author and are not marked as part of the Shuttleworth herbarium. Except for the NY Drummond specimens of *A. cochlocarpa* and *A. scirpifolia* (which are treated as holotypes) none of the NY or LD specimens of these five species is annotated by Meissner. As it is not known what material Meissner used to describe the other three species we have treated specimens bearing the type numbers as syntypes.

There are duplicates of Preiss and Drummond *Acacia* collections in many herbaria worldwide. Indeed, in the course of several lengthy visits to many European, American and Australian herbaria, Maslin located collections, mainly of Preiss and Drummond, relevant to the present study at the following institutions: A, BM, C, CGE, E, FI, G, G-DC, GOET, HBG, K, L, LD, M, MEL, MO, NAP, NSW, NY, OXF, P, PERTH, RO, STR, TCD, US and W.

We have taken the opportunity, provided by our work on the genus for the "Flora of Australia" to fix the application of Meissner's names by choosing lectotypes wherever possible from among the syntypes. This was possible because we had available Maslin's photographs and detailed notes concerning all Preiss and Drummond specimens at both LD and NY. This work was also greatly facilitated by having photocopies of many of the Drummond syntypes at BM; these were provided by the 1992-93 Australian Botanical Liaison Officer at Kew, Dr Peter Weston.

Of the 56 names introduced by Meissner, we here lectotypify 29 of them, about half the total, of which 19 are based on specimens at LD, 10 at NY, and 2 at BM. Two names, *A. endlicheri* and *A. horridula*, had been lectotypified previously, based on specimens at MEL and NY respectively. Holotypes are recognised for ten names, eight are based on specimens at BM and two at NY, and these are primarily based on Drummond specimens which originated from Shuttleworth's herbarium.

Methods

(1) Where an equally complete, annotated Preiss specimen was present at NY and LD, we chose, arbitrarily if necessary, the NY specimen from Meissner's own herbarium.

(2) We have refrained from typifying names in the absence of all the relevant information (this applies mostly to names based on Drummond collections published in "Botanisches Zeitung").

The format in the following list is that each entry includes the taxon name and author citation, the place of publication and a precise quotation of the type citation given in the protologue; bracketed geographic information in the type citations is the present-day equivalent of the Preiss locality as interpreted by Marchant (1990). This is followed by the type designation in which we give the data on the type sheet, the abbreviation of the herbarium holding the type specimen and the abbreviations of the herbaria holding duplicates of the type. In the list presented the following assumptions may be made:

(1) The specimen selected as lectotype conforms with the protologue and is annotated by the author in his own hand, unless specifically stated otherwise.

(2) We believe that we have examined all relevant Preiss and Drummond specimens at BM, LD and NY that pertain to *Acacia* names published by Meissner (the Drummond syntype of *A. pulchella* var. *glaberrima* excepted).

(3) Meissner has annotated the types that are listed for BM, LD and NY unless we indicate otherwise.

(4) In the case of entries lacking an appended "Note", one should assume that the name in question is accepted as published by Meissner.

List of Meissner's *Acacia* Names

Acacia acuminata var. **ciliata** Meissner in J.G.C. Lehmann, Pl. Preiss. 1: 19 (1844). Type citation: "In solo sublimoso-arenoso sylvae circa oppidum York. Herb. Preiss. No. 934." *Lectotype* (here selected): In solo sublimoso-arenoso sylvae circa urbiculam York (York), legit. *L. Preiss* No. 934 (NY); *isolectotypes*: A, G, GOET, HBG, L, LD, MEL, MO, P, PERTH 02482827 (fragment ex MEL), STR.

Note. The LD specimen of *Preiss* 934 is not annotated by Meissner but the NY one is. This name is treated as a synonym of *A. acuminata* Benth. subsp. *acuminata* in the forthcoming "Flora of Australia" account of *Acacia*.

Acacia apiculata Meissner in J.G.C. Lehmann, Pl. Preiss. 1: 17 (1844). Type citation: "In glareosis sterilibus porrectis promont. Cape Riche, d. 20. Nov. 1840. Herb. Preiss No. 919." *Lectotype* (here selected): In glareosis sterilibus porrectis promontorii 'Cape Riche', 20. Nov. 1840, legit. *L. Preiss* 919 (LD); *isolectotypes:* G, NY.

Note. This name will be treated as a synonym of *A. subcaerulea* Lindley in the forthcoming "Flora of Australia" account of *Acacia*.

Acacia benthamii Meissner in J.G.C. Lehmann, Pl. Preiss. 1: 11 (1844). Type citation: "In regionibus interioribus Australiae meridionali-occidentalis m. Nov. 1840. Herb. Preiss. florens No. 949. (*Drummond* n. 284!)". *Lectotype* (here selected): Ad fluv. Cygnorum [Swan River, W.A.], *Drummond* 284 (BM, sheet labelled "HERB. R.J. SHUTTLEWORTH.-Recd. 1877."); *isolectotype*: G; *? isolectotypes:* K, OXF, W (specimens numbered '289' apparently in error). *Paralectotype:* In regionib. interioribus Austr. merid.-occid., Nov. 1840, legit. *L. Preiss* 949 (LD).

Acacia bidentata var. **pubescens** Meissner in J.G.C. Lehmann, Pl. Preiss. 1: 10 (1844). Type citation: "In arenosis planitiei ad fluv. Avon, 9 mill. ab oppido York, d. 10 Sept. 1839. Herb. Preiss. No. 958, florif. et in sterilibus sylvae ad montem prope praedium rusticum Dom. Barker [between York and Toodyay], d. 11. Apr. 1840. sterilis No. 969." *Lectotype* (here selected): In arenosis planitiei ad fluvium 'Avon', 9 millium ab urbicula 'York' (York), 10 Sept. 1839, legit. *L. Preiss* 958 (LD); *isolectotypes*: C, CGE (*sphalm.* '445'), FI, K, M, MEL, MO, P, PERTH 00806927, TCD (*sphalm.* '445'). *Paralectotypes:* In sterilibus illustribus sylvae ad montem prope praedium rusticum D. Barker, 11 Apr. 1840, legit. *L. Preiss* 969 (LD, NY).

Note. This name will be treated as a synonym of *A. bidentata* Benth. in the forthcoming "Flora of Australia" account of *Acacia*.

Acacia biglandulosa Meissner in J.G.C. Lehmann, Pl. Preiss. 2: 205 (1848). Type citation: "Swan River, Drummond coll. II. No. 97." *Holotype:* Ad fluv. Cygnorum [Swan River, W.A.] *Drummond* 97 (BM, sheet labelled "HERB. R.J. SHUTTLEWORTH.-Recd. 1877."); *isotypes:* K, MEL, NSW, OXF, P, PERTH 00742090.

Note. The holotype is the only specimen seen that has been annotated by Meissner. This name was treated as a synonym of *A. pentadenia* Lindley in Maslin (1975).

Acacia candolleana Meissner in J.G.C. Lehmann, Pl. Preiss. 2: 206 (1848). Type citation: "Swan River, Drummond. coll. II. No. 152." *Holotype:* Ad fluv. Cygnorum [Swan River, W.A.], *Drummond* 152 (BM, sheet labelled "HERB. R.J. SHUTTLEWORTH.-Recd. 1877."); *isotypes:* CGE, K, G-DC, LD, MEL, OXF, P, PERTH 01012762 - fragment ex MEL.

Note. The BM specimen of *Drummond* 152 is annotated by Meissner but the LD specimen is not. The name *A. candolleana* was treated as the basionym of *A. drummondii* subsp. *candolleana* (Meissner) Maslin in Maslin (1975).

Acacia cochlocarpa Meissner, Bot. Zeitung (Berlin) 13: 10 (1855). Type citation: "Drumm. Coll. VI. n. 6." *Holotype:* Nov. Holl. Australi - occid. inter flum. Moore et Murchison [between Moore R. and Murchison R., W.A.], *Drummond* coll. 6, n. 6, comm. Shuttleworth 1854 (NY); *isotypes:* BM, CGE, LD (*sphalm.* 'coll. 3'), OXF, P, PERTH 00976008 (fragment, origin unknown).

Note. The only specimen we have seen of *Drummond* 6: 6 annotated by Meissner is at NY and it is therefore regarded as the holotype. *Acacia cochlocarpa* will be treated as comprising two subspecies in the forthcoming "Flora of Australia" account of *Acacia*.

Acacia cuneata var. **glabra** Meissner in J.G.C. Lehmann, Pl. Preiss. 1: 9 (1844). Type citation: "Cum praecedente [i.e. *A. cuneata*, "In clivulis calcareis juxta oppidum Freemantle"] d. 15. Aug. 1839. No. 956.; et in arenosis inter frutices vix penetrabiles insulae Rotenest d. 19. Aug. 1839. florens No. 954." *Lectotype* (here selected): In clivulis calcareis haud longe ab urbicula 'Freemantle', 15 Aug. 1839, legit. *L. Preiss* 956 (LD); *isolectotypes:* K, NY (also K, MEL, P & PERTH 01504711 - fragment ex MEL) but all incorrectly labelled *L. Preiss* 954). *Paralectotype:* Rottnest Island, 19 Aug. 1839, *L. Preiss* 954 (C, FI, L, M, MO, NAP, NY, P, STR & W, also K, MEL, PERTH 01507893 - fragment ex MEL, W but all incorrectly labelled *L. Preiss* 956).

Note. The name *A. cuneata* var. *glabra* was based on two Preiss collections, namely, 954 from Rottnest Island (this represents *A. littorea* Maslin) and 956 from the adjacent mainland near Fremantle (this represents a very close relative, *A. truncata* (Burm. f.) Hort. ex Hoffmannsegg). Judging from specimens examined in numerous herbaria it appears that specimens of 956 have commonly been erroneously labelled as 954, and *vice versa;* we have attempted to elucidate this confusion above. The type sheet of *A. cuneata* var. *glabra* at LD supports what appears to be two identical specimens of *A. truncata.* It would therefore be expected that these would both be labelled as *Preiss* 956; however, only the left hand specimen is thus labelled (we have selected this as the lectotype), the right hand specimen is (evidently erroneously) labelled as *Preiss* 954.

Acacia cycnorum var. **minutifolia** Meissner in J.G.C. Lehmann (as *'cygnorum'*), Pl. Preiss. 1: 22 (1844). Type citation: "In region. interior. Australiae merid.-occid., d. 7. Mart. 1840. Herb. Preiss. No. 912." *Lectotype* (here selected): In regionibus interioribus Austr. merid.-occid., 7 March 1840, legit. *L. Preiss* 912 (LD); *isolectotypes:* MEL, NY, PERTH 01825615 (fragment ex MEL).

Note. The lectotype is the right hand specimen on the LD sheet; the left hand specimen is *Preiss* 886 (= *A. lasiocarpa* Benth. ? var. *lasiocarpa*). The name *A. cycnorum* var. *minutifolia* was treated as a synonym of *A. lasiocarpa* var. *sedifolia* (Meissner) Maslin in Maslin (1975).

Acacia cycnorum var. **sedifolia** Meissner in J.G.C. Lehmann (as *'cygnorum'*), Pl. Preiss. 1: 22 (1844). Type citation: "In sublimoso-glareosis sylvae district. Hay [between Balgarup and Lake Matilda], d. 7. Nov. 1840. Herb. Preiss. No. 911." *Lectotype* (here selected): In sublimoso-glareosis silvae districtus 'Hay', 7 Nov. 1840, legit. *L. Preiss* 911 (LD); *isolectotypes:* MEL, PERTH 01014293 (fragment ex MEL).

Note. The lectotype is the right hand specimen on the LD sheet; the left hand specimen is *Preiss* 892 (= *A. lasiocarpa* Benth. ? var. *sedifolia*). The name *A. cycnorum* var. *sedifolia* was treated as the basionym of *A. lasiocarpa* var. *sedifolia* (Meissner) Maslin in Maslin (1975).

Acacia daphnifolia Meissner, Bot. Zeitung (Berlin) 13: 11 (1855). Type citation: "Drumm. Coll. VI. n. 2." *Syntypes:* between Moore and Murchison rivers, W.A., *J. Drummond* 6: 2 (BM, K, LD - *sphalm.* 'coll. 3', MEL, OXF, P, PERTH 02786303 - fragment ex MEL, TDC, W).

Note. Because the BM specimen of *Drummond* 6: 2 has been annotated by Meissner and because we did not record who annotated all the other specimens cited above, we have refrained from selecting a lectotype for *A. daphnifolia.* All syntypes examined to date represent *A. microbotrya* Benth. under which name *A. daphnifolia* will be treated in the forthcoming "Flora of Australia" account of *Acacia.*

Acacia denudata Lehm. ex Meissner in J.G.C. Lehmann, Pl. Preiss. 1: 21 (1844). Type citation: "In depressis umbrosis prope Woodman's-point, d. 15. Aug. 1839. Herb. Preiss. No. 893. (*Drummond* n. 312!)". *Lectotype* (here selected): Ad fluv. Cygnorum [Swan River, W.A.], *Drummond* 312 (BM, sheet labelled "HERB. R.J. SHUTTLEWORTH.-Recd. 1877."); *isolectotypes:* G-DC, K, MEL, P, PERTH 01105582 (fragment ex MEL), W. *Paralectotype:* In depressis umbrosis prope 'Woodman's point' [Woodman Point, 32° 08'S, 115° 44'E], 15 Aug. 1839. legit. *L. Preiss* 893 (LD, MEL, PERTH 00748366 - fragment ex MEL, RO & TCD, the last two *sphalm.* '298').

Note. The BM lectotype is annotated by Meissner. This name was treated as a synonym of *A. pulchella* var. *glaberrima* Meissner in Maslin (1975).

Acacia denudata var. **gracilis** Meissner in J.G.C. Lehmann, Pl. Preiss. 1: 21 (1844). Type citation: "In umbrosis ad ripam fluvii Preston (Wellington) m. Dec. 1839. Herb. Preiss. No. 904." *Lectotype* (here selected): In umbrosis ad ripam fluvii 'Preston' (Wellington), Dec. 1839, legit. *L. Preiss* 904 (LD); *isolectotype:* US.

Note. Both the LD and US specimens are annotated by Meissner. This name was treated as a synonym of *A. pulchella* var. *glaberrima* Meissner in Maslin (1975).

Acacia denudata var. **spinosissima** Meissner in J.G.C. Lehmann, Pl. Preiss. 1: 21 (1844). Type citation: "Colitur in Horto Baumanniano Mulhusiae Alsatorum, ubi florentem vidi vere 1843." ?*Holotype:* cultivated in Hort. Baumann, Bollwiller (US: writing on label needs confirming as Meissner's).

Note. This name will be treated as a synonym of *A. pulchella* R. Br. var. *pulchella* in the forthcoming "Flora of Australia" account of *Acacia*; in the absence of having seen the type, Maslin (1975) erroneously referred this name to *A. pulchella* var. *glaberrima* Meissner.

Acacia diptera var. **angustior** Meissner in J.G.C. Lehmann, Pl. Preiss. 1: 5 (1844). Type citation: "In glareosis ad jugum montium Darling's-range prope cataractam [i.e. Susannah Brook], d. 3. Aug. 1839. - Herb. Preiss. No. 393 [sphalm. 993]. in asperis ad latus occidentale montis Wuljenup (Plantagenet) [i.e. Willyung Hill, near Albany] d. 14. Oct. 1840 (No. 394.[sphalm. 994]) et hinc inde in arenosis subumbrosis sylvae ad fluv. Cygnorum [Swan River], d. 23. Jul. 1839. (sine No.)". *Lectotype* (here selected): In glareosis ad jugum montium Darling's-range, haud procul a cataracta, 3 Aug. 1839, legit. *L. Preiss* 993 (*sphalm.* '393' in protologue) (NY); *isolectotypes:* HBG, K, FI, G, GOET, L, LD, P, STR. *Paralectotype 1:* In asperis ad latus occidentale montis 'Wuljenup' (Plantagenet), W.A., 14 Oct. 1840, legit. *L. Preiss* 994 (*sphalm.* '394' in protologue) (G, LD, NY). *Paralectotype 2:* In arenosis subumbrosis silvae ad fluvium Cygnorum hinc inde, W.A., 23 July 1839, legit. *L. Preiss s.n.* (LD).

Note. This name will be treated as a synonym of *A. applanata* Maslin (ms name) in the forthcoming "Flora of Australia" account of *Acacia.*

Acacia diptera var. **latior** Meissner in J.G.C. Lehmann, Pl. Preiss. 1: 4 (1844). Type citation: "In arenosis sylvae prope Perth, d. 8. Maj. Herb. Preiss. No. 995, et in limoso calculosis inter frutices sylvae prope Halfwayhouse (Darling's-range) [i.e. Halfway House, 31° 54'S, 116° 20'E] d. 12. Sept. 1839. No. 996 cum fl. et fr." *Lectotype* (here selected): In limoso-calculosis inter frutices sylvae prope Halfwayhouse (Darling's-range), W.A., 12 Sept. 1839, legit. *L. Preiss* 996 (*sphalm.* '596' on specimen label, but '996' on slip-on tag attached to specimen) (NY); *isolectotypes:* G, GOET, HBG, L, LD, STR. *Paralectotypes:* In arenosis sylvae haud prope urbiculam Perth, W.A., 8 May 1839, legit. *L. Preiss* 995 (B, FI, G, GOET, HBG, K, L, LD, NY - *sphalm.* '595', P, STR)

Note. The LD specimens of *Preiss* 995 & 996 are not annotated by Meissner as to variety. This name will be treated as a synonym of *A. willdenowiana* H.L. Wendl. in the forthcoming "Flora of Australia" account of *Acacia.*

Acacia endlicheri Meissner in J.G.C. Lehmann, Pl. Preiss. 1: 21 (1844). Type citation: "In districtu Plantagenet [i.e. between Lake Matilda, Albany and Two Peoples Bay] m. Dec. 1840. Herb. Preiss. No. 888 et 905." *Lectotype* (*fide* Maslin, Nuytsia 1: 431, 1975): without details, *L. Preiss* 905 (MEL); *isolectotypes:* PERTH 01036874 (fragment ex MEL). *Paralectotypes:* In districtu 'Plantagenet', Dec. 1840, legit. *L. Preiss* 888 (LD, NY).

Note. In order to apply the name *Acacia endlicheri* unequivocally, the taxon was lectotypified by Maslin (1975) by the only type material which was then known to him. Subsequently it has been discovered that more appropriate candidates for lectotypification exist at LD and NY (these are annotated by Meissner and have label details corresponding to the protologue). However, as the original lectotypification is not invalid under the International Code of Botanical Nomenclature it is retained here. The name *A. endlicheri* was treated as the basionym of *A. browniana* var. *endlicheri* (Meissner) Maslin in Maslin (1975).

Acacia falcinella Meissner, Bot. Zeitung (Berlin) 13: 11 (1855). Type citation: "Circa Victoria (Port Lincoln) Novae Holl. austral. legit cl. Latrobe!"

Note. This type has not been located as yet. Following Bentham (1864), this name will be treated as a synonym of *A. pycnantha* Benth. in the forthcoming "Flora of Australia" account of *Acacia.*

Acacia gilbertii Meissner in J.G.C. Lehmann, Pl. Preiss. 2: 204 (1848). Type citation: "Swan River, 'Vasse and Augusta road', m. Dec. 1842. *Gilbert* No. 50. 'White blossomed Acacia.'" *Holotype:* Augusta, W.A., 1842, *Gilbert* 50 (BM, sheet labelled "HERB. R.J. SHUTTLEWORTH.-Recd. 1877."); *isotypes:* K, FI, PERTH 00709093 (ex BM), TCD.

Note. The BM holotype is the only specimen we have seen annotated by Meissner.

Acacia glaucifolia A.& N. Baumann ex Meissner in J.G.C. Lehmann, Pl. Preiss 1: 14 (1844). Type citation: "Colitur in hortis Baumannianis Mulhusiae et Bollwiller, Alsatiae, ubi vivam florentemque vidi." ?*Holotype:* cultivated, April 1842, *A. & N. Baumann* (STR: writing on label not in Meissner's hand).

Note. This name will be treated as a synonym of *A. cultriformis* Cunn. ex Don in the forthcoming "Flora of Australia" account of *Acacia.*

Acacia graminea Lehm. ex Meissner in J.G.C. Lehmann, Pl. Preiss. 1: 5 (1844). Type citation: "In solo humoso vallis prope Mahogany creek (Darling's-range) [i.e. 31° 54'S, 116° 08'E] d. 25. Apr. 1840. Herb. Preiss., No. 984 (Drummond n. 304)". *Lectotype* (here selected): In solo humoso vallis prope 'Mahogany creek' (Darling's-range), 25 Apr. 1840, legit. *L. Preiss* 984 (LD); *isolectotypes:* A, G & NY. *Paralectotypes:* Swan River, *J. Drummond* 304 (BM, OXF, P).

Note. This name will be treated as a synonym of *A. extensa* Lindley in the forthcoming "Flora of Australia" account of *Acacia.*

Acacia heteroclita Meissner in J.G.C. Lehmann, Pl. Preiss. 1: 18 (1844). Type citation: "Ad promont. Cape Riche, d. 19. Nov. 1840. Herb. Preiss. No. 938." *Lectotype* (here selected): Ad promontorium 'Cape Riche', 19 Nov. 1840, legit. *L. Preiss* 938 (LD); *isolectotypes:* G, NY, PERTH 01170996 (fragments ex G and NY).

Note. *Acacia heteroclita* will be treated as comprising two subspecies in the forthcoming "Flora of Australia" account of *Acacia.*

Acacia hookeri Meissner in J.G.C. Lehmann, Pl. Preiss. 1: 12 (1844). Type citation: "In solo sublimoso prope villam Cl. Mitchell [property of W.Mitchell, Upper Swan, 31° 46'S, 116° 01'E] ad

fluv. Cygnorum [Swan River], d. 29. Jun. 1839. florens Herb. Preiss. No. 981. (Drummond n. 300!)". *Lectotype* (here selected): In solo sublimoso prope villam Cl. Mitchell ad fluvium Cygnorum, 29 June 1839, legit. *L. Preiss* 981 (LD); *isolectotype:* C, FI, G, GOET, HBG, K, L, M, MEL, MO, NAP, NY, P, PERTH 00947989 (fragment ex MEL, RO-*sphalm.* '464', STR, TCD-*sphalm.* '464'). *Paralectotype:* Ad fluv. Cygnorum, *Drummond* 300 (BM - sheet labelled "HERB. R.J. SHUTTLEWORTH.-Recd. 1877.", G, G-DC, MEL, OXF, P, PERTH 00947555 - fragment ex MEL).

Note. The *Preiss* lectotype at LD and isolectotype at NY, and the *Drummond* paralectotype at BM are all annotated by Meissner. This name was treated as a synonym of *A. ericifolia* Benth. in Maslin (1978a).

Acacia horridula Meissner in J.G.C. Lehmann, Pl. Preiss. 1: 9 (1844). Type citation: "In regionibus interioribus Australiae meridionali-occidentalis, m. Nov. 1840. Herb. Preiss. No. 965, cum fruct. jun. et in arenosis ad fluv. Canning (Perth) d. 4. Dec. 1839. florescens No. 1151." *Lectotype (fide* Maslin, Nuytsia 2: 277. 1978): In arenosis ad fl. Canning (Perth), 4. Dec. 1839, legit. *L. Preiss* 1151 (NY); *isolectotypes:* G, LD, MEL, P, PERTH 00896195 (fragment ex MEL), W. *Paralectotypes:* In regionib. interioribus Austr. merid.-occid., Nov. 1840, legit. *L. Preiss* 965 (LD, NY).

Note. *Acacia horridula* was based on discordant elements, namely, *Preiss* 1151 (= *A. horridula* Meissner *sensu lectotypico*) and *Preiss* 965 (= *A. pycnocephala* Maslin), *fide* Maslin (1978). At the time of typifying this name the author was unaware of the existence of the LD collections. We now know that both syntypes are at LD and NY and both are annotated by Meissner.

Acacia laricina Meissner in J.G.C. Lehmann, Pl. Preiss. 1: 6 (1844). Type citation: "In regionibus interioribus Australiae meridionali-occidentalis m. Oct. 1840. Herb. Preiss. No. 973." *Lectotype* (here selected): In regionib. interiorib. Australiae meridionali-occidentalis, Oct. 1840. legit. *L. Preiss* 973 (NY); *isolectotypes:* C, FI, G, GOET, HBG, L, LD, M, MEL, P, PERTH 01504207 (fragment ex MEL), STR.

Acacia latipes var. **pubescens** Meissner in J.G.C. Lehmann, Pl. Preiss. 1: 10 (1844). Type citation: "In planitie arenosa Quangen (Victoria) [i.e. near Wongamine, E of Toodyay, 31° 29'S, 116° 37'E] d. 20. Mart. 1840. sterilis Herb. Preiss. No. 989." *Lectotype* (here selected): In planitie arenosa Quangen (Victoria), 20 March 1840, legit. *L. Preiss* 989 (NY); *isolectotype:* LD.

Note. This name will be treated as a synonym of *A. latipes* Benth. subsp. *latipes* in the forthcoming "Flora of Australia" account of *Acacia.*

Acacia latrobei Meissner in J.G.C. Lehmann, Pl. Preiss. 1: 10 (1844). Type citation: "In colonia ad 'Port Philipp' Australiae meridionali-occidentalis legit cl. Latrobe, coloniae praefectus (v.s. in Herb. Musei Neocomensis.[Como, Italy])". *Lectotype* (here selected): Victoria, legit. *Latrobe*, comm. D. Sam. Studer 1852. (NY, sheet stamped herb. Meissner); *isolectotype:* G.

Note. There is no herbarium listed in "Index Herbariorum" for Como, Italy (see location of dried specimen in type citation). However, type material of *A. latrobei* has been seen at both herb. NY and G and it is therefore desirable to lectotypify this name. The specimen selected as lectotype has been annotated by Meissner; the material at G may also have been annotated by Meissner but we do not know whether this is the case. The name *A. latrobei* was treated as a synonym of *A. acinacea* Lindley in Maslin (1987).

Acacia leiophylla var. **microcephala** Meissner in J.G.C. Lehmann, Pl. Preiss. 1: 15 (1844). Type citation: "In regionibus interior. Australiae meridionali-occidentalis m. Oct. 1840. Herb. Preiss. No. 921." *Lectotype* (here selected): In regionibus interioribus Australiae meridionali-occidentalis, Oct. 1840, legit. *L. Preiss* 921 (NY); *isolectotypes:* G-DC, LD, MEL, NAP, PERTH 02484625 (fragment ex MEL), W.

Note. The lectotype is the left hand specimen on the NY sheet; the right hand (flowering) specimen is unlabelled but judging from the type sheet at LD this is probably *Preiss* 922 (= *A. microbotrya* Benth.). We are not absolutely sure of the identity of *Preiss* 921 but it appears to represent the oblanceolate phyllode form of *A. chamaeleon* Maslin (ms name) under which it will be included in the forthcoming "Flora of Australia" account of *Acacia* as a presumed synonym.

Acacia leptoneura var. **pungens** Meissner in J.G.C. Lehmann, Pl. Preiss. 1: 12 (1844). Type citation: "In regionibus interior. Australiae merid.-occid. m. Oct. 1840. sterilis Herb. Preiss. No. 976." *Lectotype* (here selected): In regionibus interioribus Austr. merid.-occid., Oct. 1840, legit. *L. Preiss* 976 (LD); *isolectotypes:* NY, P, PERTH 00985937 (fragment ex B).

Note. Extant collections of *Preiss* 976 are sterile or with very young fruit thus making it difficult to name with certainty. However, it appears to be *A. acellerata* Maiden & Blakely under which name it will be placed as a presumed synonym in the forthcoming "Flora of Australia" account of *Acacia.*

Acacia ligustrina Meissner in J.G.C. Lehmann, Pl. Preiss. 2: 203 (1848). Type citation: "Swan River, Drummond. coll. II. No. 150." *Syntypes:* Swan River, W.A., *J. Drummond* 2: 150 (BM, G, K, LD, MEL, NSW, OXF, P, PERTH 00763233 - fragment ex MEL, W).

Note. Although the BM specimen of this collection was examined by Maslin some years ago, no record was made as to who provided the annotations on the sheet and therefore we have refrained from selecting a lectotype for *A. ligustrina.* This does not affect the application of the name because all syntypes examined to date represent the same taxon.

Acacia lindleyi Meissner in J.G.C. Lehmann, Pl. Preiss. 1: 14 (1844). Type citation: "In regionibus interioribus Australiae meridionali-occidentalis m. Nov. 1840. Herb. Preiss. No. 947." *Lectotype* (here selected): In regionibus interioribus Austr. merid.-occid., Nov. 1840, legit. *L. Preiss* 947 (LD); *isolectotype:* NY.

Note. This name will be treated as a synonym of *A. saligna* (Labill.) H. Wendl. in the forthcoming "Flora of Australia" account of *Acacia.*

Acacia marginata var. **angustata** Meissner in J.G.C. Lehmann, Pl. Preiss. 1: 14 (1844). Type citation: "Herb. Preiss. No. 927 ex parte." *Lectotype* (here selected): In glareosis illustribus sylvae ad latus merid. montis 'Clarence', [Mount Clarence, Albany, W.A.], 30 Sept. 1840, legit. *L. Preiss* 927 [ex parte] (LD); *isolectotypes:* A, C, FI, G, GOET, HBG, K, M, MEL, NY, P, STR, W.

Note. This name will be treated as a synonym of *A. myrtifolia* (Sm.) Willd. in the forthcoming "Flora of Australia" account of *Acacia.*

Acacia meisneri Lehm. ex Meissner in J.G.C. Lehmann, Pl. Preiss. 1: 13 (1844). Type citation: "In limoso-arenosis sylvae prope oppidum York [near York], d. 4. Sept. 1839. Herb. Preiss. No. 930."

Lectotype (here selected): In limoso-arenosis illustribus sylvae prope urbiculam 'York' (York), 4 Sept. 1839, legit. *L. Preiss* 930 (LD); *isolectotypes:* G, GOET, K, MEL, NY, P, PERTH 02482940 (fragment ex MEL), STR.

Note. At first, Meissner applied the ms name *'pruinosa'* to this taxon but later changed it to *'raccinioides'*, presumably because the former name had previously been used by Bentham in 1842. Both the LD and NY sheets are annotated with these two ms names; however, *'raccinioides'* was subsequently changed to *'Meissneri'* (annotated on the LD sheet by Lehmann) or *'Meisneri'* (annotated on the NY sheet by Meissner). Because the LD material is the more complete we have selected this as the lectotype even though Meissner did not annotate the sheet with the published name. Nevertheless, it is clear that he examined the LD material prior to publication of *A. meisneri.*

Acacia meisneri var. **angustifolia** Meissner in J.G.C. Lehmann, Pl. Preiss. 1: 13 (1844). Type citation: "In colonia Swan River legit Jac. Drummond, n. 292!". *Syntypes:* Swan River, W.A., *J. Drummond* 292 (BM, G, K, MEL, OXF, P, PERTH 00765252, W).

Note. Although the BM specimen of this collection was examined by Maslin some years ago, no record was made as to who provided the annotations on the sheet. We have therefore refrained from selecting a lectotype. This, however, does not affect the application of the name because all syntypes examined represent the same taxon. The name *A. meisneri* var. *angustifolia* will therefore be treated as a synonym of *A. meisneri* Lehm. ex Meissner in the forthcoming "Flora of Australia" account of *Acacia.*

Acacia microneura Meissner in J.G.C. Lehmann, Pl. Preiss. 1: 19 (1844). Type citation: "In region. interior. Australiae merid.-occid. m. Febr. 1841. Herb. Preiss. 942." *Lectotype* (here selected): In regionibus interioribus Austr. merid.-occid., Feb. 1841, legit. *L. Preiss* 942 (LD); *isolectotypes:* MEL, NY, PERTH 01007211 (fragment ex MEL).

Acacia myriobotrya Meissner in J.G.C. Lehmann, Pl. Preiss. 1: 15 (1844). Type citation: "Swan River (Drummond n. 286!)". *Syntypes:* Swan River, W.A., *J. Drummond* 286 (A, BM, E, G, K, NY, OXF, P, W).

Note. The NY syntype of *A. myriobotrya* is annotated by Meissner and, although the BM specimen of this collection was examined by Maslin some years ago, no record was made as to who provided the annotations on the sheet. We therefore have refrained from selecting a lectotype for *A. myriobotrya.* All syntypes examined to date represent *A. microbotrya* Benth. under which name *A. daphnifolia* will be treated in the forthcoming "Flora of Australia" account of *Acacia.*

Acacia myrtifolia var. **major** Meissner in J.G.C. Lehmann, Pl. Preiss. 2: 203 (1848). Type citation: "In rupestribus promontorii Cape Riche. Herb. Preiss. No. 2641." *Type:* not seen.

Note. Although this type has not been located, the name will be treated as a synonym of *A. myrtifolia* (Sm.) Willd. in the forthcoming "Flora of Australia" account of *Acacia.*

Acacia neurocarpa var. **glabrata** Meissner in J.G.C. Lehmann, Pl. Preiss. 2: 204 (1848). Type citation: "In rupestribus promontorii Cape Riche et montis Baldhead [Cape Riche and Bald Head, the latter near Albany] Nov. 1840. cum fl. et fr. Herb. Preiss. No. 2642." *Type:* not seen.

Note. This type has not been located at B, FI, G, LD, NY, PR or W, and as the original description is very brief and uninformative the application of this name is uncertain. It therefore will be treated as a Doubtful Name in the forthcoming "Flora of Australia" account of *Acacia.*

Acacia nigricans var. **subracemosa** Meissner in J.G.C. Lehmann, Pl. Preiss. 2: 204 (1848). Type citation: "Swan River, Drummond. coll. II. No. 157." *Holotype:* Ad fluv. Cygnorum [Swan River, W.A.], *J. Drummond* 97 (BM, sheet labelled "HERB. R.J. SHUTTLEWORTH.-Recd. 1877."); *isotypes:* G, G-DC, K, LD, MEL, OXF, P.

Note. The BM holotype is annotated by Meissner but the LD isotype is not. This name was treated as a synonym of *A. gilbertii* Meissner in Maslin (1975).

Acacia obovata var. **minor** Meissner in J.G.C. Lehmann, Pl. Preiss. 1: 8 (1844). Type citation: "In glareosis inter frutices montis Greenmountain (York) [Greenmount, E of Guildford, 31° 54'S, 116° 03'E] d. 26. Apr. 1840. florens, Herb. Preiss. No. 931." *Lectotype* (here selected): In glareosis inter frutices montis Greenmountain (York), 26 Apr. 1840, legit. *L. Preiss* 931 (NY); *isolectotypes:* C, LD, M, MEL, MO, NAP, P, RO.

Note. Although Meissner has annotated both the NY and LD sheets as *'obovata',* only on the former has he included the varietal name. The name *A. obovata* var. *minor* will be treated as a synonym of *A. obovata* Benth. in the forthcoming "Flora of Australia" account of *Acacia.*

Acacia obscura var. **canescens** Meissner in J.G.C. Lehmann, Pl. Preiss. 1: 20 (1844). Type citation: "Ad sinum Regis Georgii III [Albany]. absque florib. Herb. Preiss. No. 910." *Lectotype* (here selected): Ad sinum regis Georgii III, legit. *L. Preiss* 910 (LD); *isolectotype:* NY.

Note. This name will be treated as a synonym of *A. luteola* Maslin in Maslin (1975).

Acacia obscura var. **preissiana** Meissner in J.G.C. Lehmann, Pl. Preiss. 1: 20 (1844). Type citation: "In region. interior. Australiae merid.-occid. m. Oct. 1840. Herb. Preiss. No. 885." *Lectotype* (here selected): In regionibus interioribus Australiae meridionali-occid., Oct. 1840, legit. *L. Preiss* 885 (NY); *isolectotypes:* G-DC, K, LD, MEL, P, PERTH 01041096 (fragment ex MEL).

Note. Although the NY specimen is less complete than the one at LD, there is no direct evidence that Meissner examined the latter; thus we have selected the NY specimen, which was annotated by him, as the lectotype. The name *A. obscura* var. *preissiana* was treated as the basionym of *A. preissiana* (Meissner) Maslin in Maslin (1975).

Acacia pulchella var. **glaberrima** Meissner in J.G.C. Lehmann, Pl. Preiss. 1: 22 (1844). Type citation: "In arenosis sylvae ad fl. Cygnorum [Swan R.], Herb. Preiss. No. 884 et 907. (Drummond n. 310.)" *Lectotype* (see note below): In arenosis sylvae ad fluvium Cygnorum, without date, legit. *L. Preiss* 884 (NY); *isolectotypes:* C, FI, G-DC, GOET, HBG, K, LD, M, MEL, MO, NAP, P, PERTH 01066536 (fragment ex MEL), STR, W. *Paralectotype 1:* Swan R., *J. Drummond* 310 (G, G-DC, K, MEL, OXF, W). *Paralectotype 2:* In Australia occidentali, without date, legit. *L. Preiss* 907 (LD).

Note. Because *A. pulchella* var. *glaberrima* was based on three collections representing two taxa, Maslin (1975) restricted the application of the name to the entity represented by *Preiss* 884, but no single specimen was nominated as the lectotype. We therefore select the *Preiss* 884 specimen at NY

as the lectotype; this collection is represented by duplicates in many herbaria. Although Meissner has annotated both the NY and LD sheets of *Preiss* 884 as *'pulchella'*, neither bears the varietal epithet. *Preiss* 907, the second paralectotype, represents *A. pulchella* var. *goadbyi* (Domin) Maslin.

Acacia pulchella var. **hispidula** Meissner in J.G.C. Lehmann, Pl. Preiss. 1: 22 (1844). Type citation: "In limoso-calculosis sylvae inter Mahogany creek [i.e. Mahogany Creek, 31° 54'S, 116° 08'E] et Halfwayhouse [i.e. Halfway House, 31° 54'S, 116° 20'E] (Darling's-range) d. 13. Sept. 1839. Herb. Preiss. No. 908 [number incorrect, should be 890] (Drummond n. 309, 311!)." *Lectotype* (here selected): In limoso-calculosis sylvae inter 'Mahoganicreek' et 'Halfwayhouse' (Darling's-range), 13 Sept. 1839, legit. *L. Preiss* 890 (LD); *isolectotypes:* C, GOET, G-DC, L, M, MEL, MO, P, RO (*sphalm.* '594'), STR, TCD (*sphalm.* '594'), W. *Paralectotype 1:* Ad fluv. Cygnorum [Swan River, W.A.], *Drummond* 309 (BM - sheet labelled "HERB. R.J. SHUTTLEWORTH.-Recd. 1877.", G, G-DC, K, MEL, OXF, P, W). *Paralectotype 2:* Ad fluv. Cygnorum [Swan River, W.A.], *Drummond* 311 (BM - sheet labelled "HERB. R.J. SHUTTLEWORTH.-Recd. 1877.", E, G-DC, K, MEL, OXF, P, PERTH 01111388 - fragment ex MEL, W).

Note. The *Preiss* lectotype at LD and the *Drummond* paralectotypes at BM are all annotated by Meissner. Variety *hispidula* was treated as a synonym of *A. pulchella* R. Br. var. *pulchella* in Maslin (1975).

Acacia restiacea var. **scoparia** Meissner in J.G.C. Lehmann, Pl. Preiss. 1: 3 (1844). Type citation: "In rupestribus ad latus occidentale montis Currie (York) d. 10 Apr. 1840, fructifer Herb. Preiss. No. 972." *Lectotype* (here selected): In rupestribus ad latus occid. M^{tis} 'Currie' [an unknown locality, probably on the property once owned by M.Currie], (York), 10 Apr. 1840, legit. *L. Preiss* 972 (NY); *isolectotypes:* G, LD, MEL, P.

Note. This name will be treated as a synonym of *A. restiacea* Benth. in the forthcoming "Flora of Australia" account of *Acacia.*

Acacia retrorsa Meissner, Bot. Zeitung (Berlin) 13: 10 (1855). Type citation: "Drumm. Coll. VI. n. 4." *Syntypes:* between Moore and Murchison Rivers, W.A., *J. Drummond* coll. 6, no. 4 (BM, CGE, K, LD -*sphalm.* 'coll. 3', OXF, P, PERTH 02786338 - fragment but origin unknown, W).

Note. Because the BM specimen of *Drummond* 6: 4 has not been annotated by Meissner and because we did not record who annotated all the other specimens cited above, we have refrained from selecting a lectotype for *A. retrorsa.* This does not affect the application of the name because all syntypes examined represent the same taxon.

Acacia scalpelliformis Meissner in J.G.C. Lehmann, Pl. Preiss. 2: 200 (1848). Type citation: "In colonia ad flum. Cygnorum [Swan River, W.A.] legit Drummond. coll. II. No. 161." *Holotype:* Ad fluv. Cygnorum, *Drummond* 161 (BM, sheet labelled "HERB. R.J. SHUTTLEWORTH.-Recd. 1877."); *isotypes:* G, NSW, OXF, P, PERTH 00771627 (fragment ex MEL), W.

Note. The herb. Shuttleworth specimen is accepted as the holotype because it is the only specimen we have seen that has been annotated by Meissner.

Acacia scirpifolia Meissner, Bot. Zeitung (Berlin) 13: 10 (1855). Type citation: "Drumm. Coll. VI. n. 5." *Holotype:* Nov. Holl. australi - occid. inter flum. Moore et Murchison [between Moore and

Murchison Rivers, W.A.], *J. Drummond* coll. VI, n. 5, comm. Shuttleworth (NY); *isotypes:* BM, CGE, G, K, LD (*sphalm.* 'coll. 3'), MEL, OXF, P, PERTH 02786354, W.

Note. The only specimen we have seen of *Drummond* 6: 5 annotated by Meissner is at NY and it is therefore regarded as the holotype.

Acacia shuttleworthii Meissner in J.G.C. Lehmann, Pl. Preiss. 1: 7 (1844). Type citation: "Swan River. (Drummond n. 294! in Herb. Shuttleworth.)" *Holotype:* Ad fluv. Cygnorum [Swan River, W.A.], *Drummond* 294 (BM - sheet labelled "HERB. R.J. SHUTTLEWORTH.-Recd. 1877."; *isotypes:* G, K, NSW, OXF, P, PERTH 00731269 (fragment ex MEL), W.

Note. There were no specimens of *Drummond* 294 located at herb. NY.

Acacia stereophylla Meissner in J.G.C. Lehmann, Pl. Preiss. 2: 203 (1848). Type citation: "Swan River, Drummond. coll. II. No. 100." *Holotype:* Ad fluv. Cygnorum [Swan River, W.A.], *Drummond* 100 (BM, sheet labelled "HERB. R.J. SHUTTLEWORTH.-Recd. 1877."); *isotypes:* CGE, MEL, OXF, P, PERTH 00772674 (fragment ex MEL), W.

Note. The holotype is the only specimen seen which has been annotated by Meissner. *Acacia stereophylla* will be treated as comprising two subspecies in the forthcoming "Flora of Australia" account of *Acacia.*

Acacia strigosa var. **brevifolia** Meissner in J.G.C. Lehmann, Pl. Preiss. 1: 20 (1844). Type citation: "In solo turfaceo-arenoso ad Stirling's-terrace [i.e. Albany townsite] (Plantagenet) d. 22. Nov. 1840. Herb. Preiss. No. 902." *Syntypes:* ad Stirling's terrace, W.A., 22 Nov. 1840, *L. Preiss* 902 (C, FI, G-DC, GOET, HBG, K, L, LD, M, MEL, NAP, P, PERTH 01036920 - fragment ex MEL, STR, W).

Note. The LD syntype of this name is not annotated by Meissner and we have no record of a syntype at herb. NY. Although *Preiss* 902 has been seen in numerous herbaria, no record was made as to who provided the annotations on these sheets. As the application of this name is not in doubt (all syntypes represent the same taxon, namely, *A. browniana* H. Wendl. var. *browniana, fide* Maslin 1975) we have refrained from selecting a lectotype pending a search for material annotated by Meissner.

Acacia subbinervia Meissner in J.G.C. Lehmann, Pl. Preiss. 1: 16 (1844). Type citation: "In colliculis arenosis insulae Rotenest, d. 20. Aug. 1839. Herb. Preiss. No. 924. (Drummond n. 285!)". *Lectotype* (here selected): Rotenest [Rottnest] Is., W.A., 20 Aug. 1839, *L. Preiss* 924 (LD); *isolectotypes:* C, G, GOET, HBG, L, M, NAP, NSW, P, STR, W). *Paralectotype:* Ad fluv. Cygnorum [Swan River, W.A.], *Drummond* 285 (BM - sheet labelled "HERB. R.J. SHUTTLEWORTH.-Recd. 1877.", G, K, P, W.

Note. The name *A. subbinervia* was treated as a synonym of *A. rostellifera* Benth. in Chapman & Maslin (1992).

Acacia subfalcata Meissner, Bot. Zeitung (Berlin) 13: 11 (1855). Type citation: "Drumm. Coll. VI. n. 1." *Syntypes:* between Moore and Murchison rivers W.A., *J. Drummond* 6: 1 (BM, CGE, K, LD - *sphalm.* 'coll. 3', MEL, OXF, P, PERTH 02786311 - fragment ex MEL, W).

Note. Because the BM specimen of *Drummond* 6: 1 has not been annotated by Meissner and because we did not record who annotated all the other specimens cited above, we have refrained from selecting

a lectotype for *A. subfalcata.* All syntypes examined to date represent *A. microbotrya* Benth. under which name *A. daphnifolia* will be treated in the forthcoming "Flora of Australia" account of *Acacia.*

Acacia tetragonocarpa Meissner in J.G.C. Lehmann, Pl. Preiss. 1: 4 (1844). Type citation: "In solo subturfoso-arenoso prope villam b. Spencer [i.e. Strawberry Hill farm, Albany] (Plantagenet) d. 8. Dec. 1840. Herb. Preiss. No. 866." *Lectotype* (here selected): In solo subtorfoso-arenoso prope villam b. Spencer (Plantagenet), 8 Dec. 1840, legit. *L. Preiss* 866 (LD); *isolectotypes:* G, NY, P, W.

Acacia trigonophylla Meissner in J.G.C. Lehmann, Pl. Preiss. 2: 199 (1848). Type citation: "Swan River, Drummond. coll. II. No. 144." *Syntypes:* Swan River, W.A., *J. Drummond* 2: 144 (BM, CGE, E, G, G-DC, LD, MEL, NSW, P, PERTH 01116657, W).

Note. A number of syntypes of this name have been examined, including the one at BM; however, no record was made as to who provided the annotations on the BM sheet. We have therefore refrained from selecting a lectotype for *A. trigonophylla.* This does not affect the application of the name because all syntypes examined represent the one taxon.

Acacia ulicina Meissner in J.G.C. Lehmann, Pl. Preiss. 2: 202 (1848). Type citation: "Swan River, Drummond. coll. II. No. 147." *Holotype:* Ad fluv. Cygnorum [Swan River, W.A.], *Drummond* 147 (BM, sheet labelled "HERB. R.J. SHUTTLEWORTH.-Recd. 1877."); *isotypes:* G, K, LD, MEL, OXF, P, PERTH 02484498.

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A contribution to the taxonomy of the Tiliaceae of Western Australia

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Abstract

Rye, B.L. A contribution to the taxonomy of the Tiliaceae of Western Australia. Nuytsia 9 (3): 415-420 (1994). A new species, *Corchorus laniflorus* Rye, is described and the new combination *Triumfetta clementii* (Domin) Rye is made. Lectotypes are designated for *C. elachocarpus* F.Muell. and *C. parviflorus* (Benth.) Domin. Corrections are also given for the treatment of Tiliaceae in "Flora of the Kimberley Region".

Introduction

In Western Australia, members of the family Tiliaceae occur mainly in the Kimberley and Pilbara, with surprisingly few species shared by the two regions. The family also occurs in the northern arid zone and Gascoyne region, extending south to the Wiluna area and the southern part of Gibson Desert. Of the three Western Australian genera, *Grewia* is restricted to the Kimberley region, whereas *Corchorus* and *Triumfetta* are widespread in the northern half of Western Australia. Keys and descriptions for the Kimberley taxa have been published in "Flora of the Kimberley Region" (Rye 1992). This paper gives corrections to the Kimberley treatment.

A study of the species of Tiliaceae in the Pilbara and adjacent regions was commenced in 1991, with the aim of sorting out the taxonomic problems of the group sufficiently to determine which taxa should be placed on the priority lists for conservation. This paper presents the formal taxonomic results of that study, while an unpublished report (Rye 1994) provides data on all the taxa in the study area, including keys, distribution maps, habitat descriptions, flowering times, synonyms and notes. Many of the taxa included in the unpublished report and the Kimberley flora lack formal names, but these are presently being studied by D. Halford (Queensland Herbarium), who is preparing a treatment of the family for "Flora of Australia".

New species or combinations

Corchorus laniflorus Rye, sp. nov. (Figure 1)

Corchoro parvifloro affinis a quo indumento longiore sepalis et fructis grandioribus differt.

Typus: Red Hill, Western Australia, 20 October 1941, *C.A. Gardner* 6384 (holo: PERTH 01526316; iso: CANB).

Related to *C. parviflorus* but with a longer indumentum, larger sepals and larger fruit.

Spreading or compact *shrub*, commonly 0.3-0.7 m but up to 1.2 m high, densely stellate-hairy on the young stems and leaves, usually also with simple glandular hairs at least on the young stems and petioles; stellate hairs whitish, soft, the largest ones 1.5-2.5 mm long including the 0.2-0.6 mm long stalk; glandular hairs yellowish to dark red-brown, 1-2 mm long. *Stipules* subulate, usually 3.5-6.5 mm long, stellate-hairy. *Leaves* spreading; petiole 8-26 mm long; lamina concolorous or slightly discolorous, usually pale grey-green, ovate or broadly ovate, 17-42 x 25-53 mm, rather prominently veined, with undulate dentate margins, usually obtuse, sometimes becoming glabrous near the margins with age; marginal teeth usually 1-2 mm long. *Umbels* usually with c. 5 flowers; peduncle 5-16 mm long; pedicels 2-9 mm long. *Flower-buds* spherical with protruding sepal points. *Sepals* narrowly ovate to ovate, 9-15 mm long, prominently acuminate, densely stellate-hairy outside with long dendritic-stellate hairs on the body and shorter hairs on both surfaces of the point, often also with simple glandular hairs, largely glabrous inside on the body but with short hairs on the base; dendritic-stellate hairs 2-6 mm long; acuminate point usually slightly incurved or slightly recurved, 3-7 mm long. *Petals* broadly spathulate, 6-11 mm long, stellate-hairy on margins of the short claw, sometimes also ciliate at base of lamina, glabrous elsewhere. *Stamens* numerous, usually 70-100, 3-5 mm long. *Annular disc* usually glabrous, rarely slightly to distinctly ciliate. *Capsule* 3-celled, narrowly ovoid or ovoid, 10-18 mm long, c. 6 mm wide including the indumentum, beaked, densely stellate-hairy, usually 1- or few-seeded but sometimes with several seeds per cell, if 1-seeded then the 2 empty cells displaced and difficult to see; indumentum sometimes or usually including some dendritic-stellate hairs and simple glandular hairs, the largest hairs c. 1.5 mm long, the beak with indumentum similar to or slightly shorter than that on body of capsule.

Specimens examined. WESTERN AUSTRALIA (all PERTH): Roy Hill, *J.S. Beard* 2801; Uaroo Station, *J.S. Beard* 3605; Red Hill Station, *J.S. Beard* 6166; Nullagine road, *N.T. Burbidge* 1183; Abydos-Woodstock road, *N.T. Burbidge* 5881; Woodstock Station, *N.T. Burbidge* 5961; Towera Station, *R.J. Cranfield* 1760; Mt Stewart-Duck Creek track, *A.A. Mitchell* 76/118; Nanutarra, *A. Morrison*, 5 Oct. 1905; Mt York, *K.[R.] Newbey* 10002; Lyndon Station, *J.Z. Weber* 4850; Cranks Well, *J.Z. Weber* 4873.

Distribution. Extends from Red Hill and Tabba Tabba Stations in the north to Lyndon Station in the south-west and to near Roy Hill in the south-east.

Habitat. Recorded on spinifex plains and in sandstone areas or other rocky sites.

Flowering and fruiting period. April-October.

Derivation of name. Derived from the Latin *lani* - wool, *flos/floris* - flower, referring to the woolly appearance of the flowers.

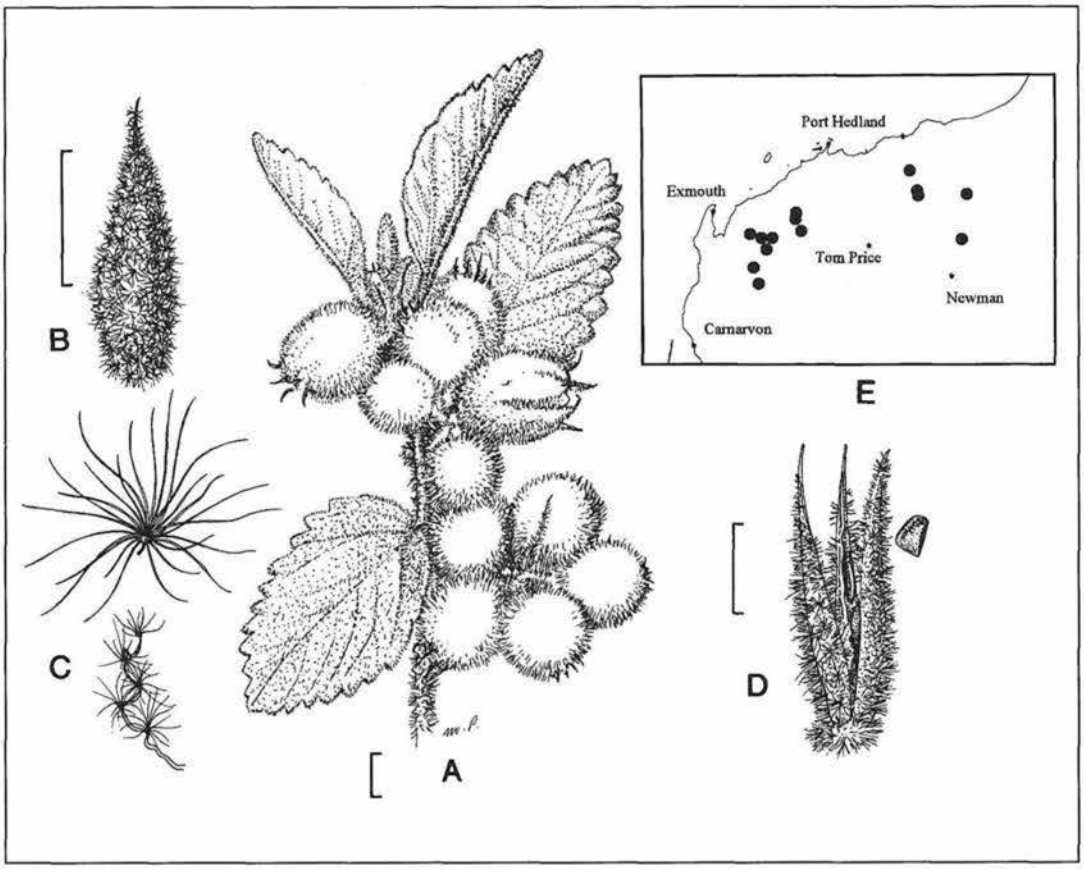

Figure 1. *Corchorus laniflorus* A - flowering stem, B - sepal, C - stellate and dendritic-stellate hairs from sepal, much enlarged, D - capsule, E - geographic distribution. A-C drawn from *J.Z. Weber* 4850 and D from *J.S. Beard* 3605. Scale bars = 5 mm.

Notes. All measurements were taken from dry material. The description of the capsule was based on only one, possibly atypical, specimen in mature fruit and a number of specimens with immature fruits.

Two specimens from the Woodstock Station area (*N.T. Burbidge* 5881, 5961) are very unusual in that they have all of the following atypical characters: glandular hairs absent, leaves up to 2.5 times as long as wide and a distinctly ciliate annular disc. Each of these characters is found separately in at least one other specimen (except that none is so obviously ciliate on the disc), suggesting that the Woodstock specimens are not sufficiently distinct to recognise as a separate taxon. However, *Corchorus laniflorus* is extremely variable as presently recognised and needs further study, particularly of specimens in mature fruit.

Triumfetta clementii (Domin) Rye comb. nov.

Triumfetta bartramia var. *clementii* Domin (Domin 1928: 933). Type: between Ashburton River and De Grey River, *E. Clement s.n.* (K - photo examined).

Lectotypifications

Lectotypification was essential to clarify the application of names for *Corchorus walcottii* var. (?) *parviflorus* Benth. and *C. elachocarpus* F. Muell. In each case the two cited type collections are of different species, with a total of three species represented by the four type collections. Both Mueller (1872: 6) and Domin (1928: 937) evidently regarded the types of these taxa to be conspecific, Mueller choosing a new epithet to replace that of Bentham (1863: 279) and Domin publishing the new combination *C. parviflorus* (Benth.) Domin. One of Mueller's types is from the same locality, Nickol Bay, as one of Bentham's types, but even these are of distinct taxa.

It would have been possible to choose lectotypes in such a way as to make the taxa equivalent, but that did not appear to be the best option. The type collections that appeared to be most appropriate to use in terms of the quality of the specimens, the descriptions provided by these authors and their apparent application of the names, fortunately also corresponded to the way the names have generally been applied in Western Australia. The lectotypifications given here have therefore maintained the current usage of the names.

Corchorus elachocarpus F. Muell. (Mueller 1872: 6). Type: Nickol Bay, *P. Walcott* (lecto, here designated: MEL 223670).

The other collection cited by Mueller (1872), i.e. Dampier Archipelago, *A. Hughan* (syn: MEL 223668), is of a different species, *C. parviflorus*.

Corchorus parviflorus (Benth.) Domin (Domin 1928: 937). - *Corchorus walcottii* var. (?)*parviflorus* Benth. (Bentham 1863: 279). Type: Nickol Bay, *F. Gregory* (lecto, here designated: MEL 223669; isolecto: K - *n.v.*, photo examined).

The other collection cited by Bentham (1863), i.e. NW Coast, *Bynoe* (syn: K -*n.v.*, photo examined), is a different species but its exact identity is not certain from the photograph.

Corrections to "Flora of the Kimberley Region"

Many inaccuracies and new data have come to light since the flora treatment for the Kimberley Region was finalised, partly through advice from D. Halford and M. Cheek and partly through further examination of the specimens, including some types and additional collections. In *Grewia*, the species tentatively called *G. multiflora* A.L. Juss. in Rye (1992) should probably be known as *G. glabra* Blume, and *G. xanthopetala* Benth. should be added to the treatment as a synonym of *G. brevifolia* Benth. (D. Halford pers. comm.).

Corchorus capsularis L. appears to be the correct name for *Corchorus* sp. *A*, rather than just a related species. The species included in Rye (1992) as *C. sericeus* Ewart & O.B. Davies, based on a doubtful vague record from that region, is now regarded as an unnamed species confined to the Pilbara. True *C. sericeus*, which occurs in the Northern Territory, might extend into the Kimberley but there are no records to date. Another species, referred to in the Kimberley treatment as *Corchorus walcottii* F. Muell., is an unnamed Western Australian endemic extending from Broome south-west to Pardoo Station and Shellborough. True *C. walcottii* is restricted to the Pilbara region.

Some specimens with 20-25 stamens that were included in *Corchorus sidoides* probably belong instead to *C. vermicularis* (D. Halford pers. comm.), the stamen number in *C. sidoides* being 30-40. *C. leptocarpus* A. Cunn. ex Benth. has now been recorded from Koolama Bay and King George River in Central Gardner (CGa) District and sometimes has smaller sepals than previously indicated.

In *Triumfetta*, all the published names used have been confirmed except for *T. rhomboidea* Jacq., which was misapplied to a taxon now thought to be a new species endemic to the Kimberley Region. *T. rhomboidea* is not known from Western Australia but has been collected from other parts of Australia. The name *Triumfetta pentandra* A. Rich. has been confirmed to apply to *Triumfetta* sp. *C* (M. Cheek pers. comm.), and this species occurs in Queensland as well as in the Northern Territory. There are some inaccuracies in the description given for *Triumfetta micracantha*, which actually has sepals c. 5 mm long, petals c. 3 mm long and only c. 10 stamens. *Triumfetta* sp. *J* is no longer considered to include the variant with long-ciliate stamens and therefore does not occur in the Eremaean Botanical Province.

A major error in the treatment has been the omission of two species related to *T. plumigera* in the key and descriptions, the only mention of them being in a note under *T. plumigera*. The start of the key to species in the Kimberley flora needs to be altered as follows:

1. Sepal appendage subulate to narrowly triangular, 0.2-1.3 mm long, entire. Fruit body 1.5-2.5 mm long; bristles rather slender or very slender, about half to more than twice as long as fruit body, the apical hair stellate.
   - A. Sepals (3)4-7.5 mm long. Stamens c. 10. Fruit body 2-2.5 mm long; bristles covering body uniformly, very slender, 4.5-8 mm long ..... **T. plumigera**
   - A. Sepals (2)2.5-4(5) mm long. Stamens 3-6. Fruit body 1.5-2 mm long; bristles often in a terminal tuft or in distinct longitudinal rows, rather slender, 1-2 mm long.
     - B. Fruit body c. 1.5 x 1.5 mm, with a terminal tuft of bristles c. 2 mm long and a few bristles below ..... **T. sp.**(*L. Vernon* 39)
     - B. Fruit body 1.5-2 x 1.3-1.5 mm, with distinct longitudinal rows of bristles or rarely appearing to be more uniformly covered, the larger bristles 1-2 mm long ..... **T. triandra**
1. Sepal appendage narrowly ovate to depressed obovate (except in *T. pentandra*), (0.1)0.5-7 mm long, tending to be toothed or lobed in many species. Fruit body 3-25 mm long; bristles slender to very stout or apparently absent, less than half as long as fruit body, the apical hair (except in *T. bradshawii* and sometimes *T.* sp. *F*) simple and uncinate.

Triumfetta plumigera F. Muell.

Description as in Rye (1992: 172).

Occurs in sandy plains and associated with sandstone, extending from Beverley Springs Station, Drysdale River National Park and near Wyndham southwards to Edgar Range and Mary River: WGa, CGa, EGa, Fi, Da, Ha. Extends south to Wolf Creek Crater. Also occurs in N.T. and Qld.

Flowers February-July; fruits April-August.

Triumfetta triandra Sprague & Hutch.

Sepals (2)2.5-4(5) mm long; appendage 0.2-0.8 mm long. Stamens 3-5. Fruit 1.5-2 x 1.3-1.5 mm; bristles usually in distinct longitudinal rows, often with prominent pairs of rows alternating with areas largely lacking bristles but with a few hairs at the middle, however sometimes appearing to cover the surface of the fruit body, rather slender, stellate-hairy including the apex, the larger bristles 1-2 mm long.

Widespread in the north west, from Kalumburu to the northern tip of Dampier Peninsula, and extending east to Osmond Valley Station: WGa, CGa, Fi, Da, Ha. Also occurs in N.T.

Flowers & fruits mainly April-August.

Triumfetta sp. (*L. Vernon* 39)

Sepals 2.7-3 mm long; appendage c. 0.3 mm long. Stamens 5. Fruit c. 1.5 x 1.5 mm, with a terminal tuft of bristles c. 2 mm long and a few bristles below.

Apparently endemic to the Kimberley Region, recorded from Koolan Island, near the junction of Charnley and Calder Rivers and from near Pentecost Range: WGa, Fi.

Flowers & fruits March-June.

Acknowledgements

I would like to thank Gill Perry and Paul Wilson for advice on taxonomic nomenclature, David Halford for advice on the Kimberley species of Tiliaceae, Malcolm Trudgen for advice on the Pilbara species and Nicholas Lander and Judy Wheeler for constructive comments on the manuscript. Paul Wilson provided the Latin diagnosis and Margaret Pieroni drew the line illustration.

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A new species of *Nicotiana* (Solanaceae) from near Broome, Western Australia

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Abstract

Symon, D.E. and Kenneally, Kevin F. A new species of *Nicotiana* (Solanaceae) from near Broome, Western Australia. Nuytsia 9 (3): 421-425 (1994). *Nicotiana heterantha* Symon & Kenneally is described from near Broome, Western Australia. The new species is known from only two populations, both of which are under threat from grazing. It appears most closely related to *N. rosulata* subsp. *rosulata.*

Introduction

A new species of *Nicotiana*, namely *N. heterantha*, a Kimberley endemic is described in order to validate the name for use in a forthcoming book on the plants of Broome and the Dampier Peninsula.

There have been three accounts of *Nicotiana* in Australia in recent times. A pioneering account by Burbidge (1960) brought together records up to that date and described five new species and two new subspecies. This was followed by Horton (1981) who described two new subspecies and reduced one of Burbidge's species *(N. hesperis)* to the rank of subspecies. The acount of *Nicotiana* in the Flora of Australia, Purdie *et al.* (1982) was based on Horton. Since then Symon (1984) has described a new species, *N. burbidgei* from near Dalhousie Springs in the far north-east of South Australia, and Clarkson & Symon (1991) described *N. wuttkei* from north-eastern Queensland.

Taxonomy

Nicotiana heterantha Symon & Kenneally, sp. nov. (Figure 1)

Herba annua decumbens, pilis simplicibus et glandulosis. Folia radicalia petiolata; laminae ellipticae vel obovatae ad basim attenuatae; apices obtusi. Folia caulina ex axillis caespitosa. Inflorescentia racemosa, filo metallico similis; bractis parvis; flores interdum cleistogamae. Calyx 7-9 mm longus, lobis subaequalibus, apicibus triangularibus. Corolla minute pubescens; tubus 2.5 cm

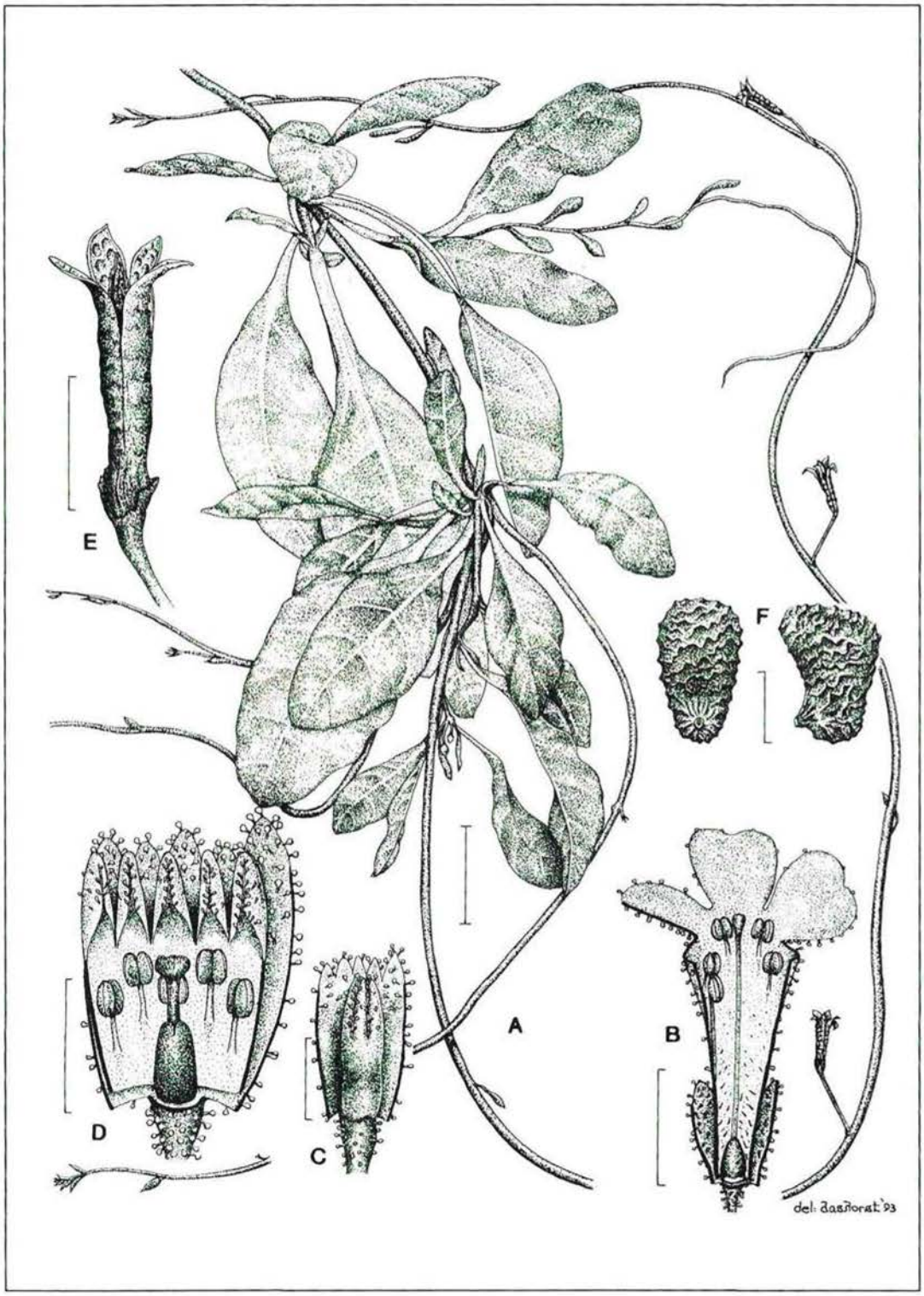

Figure 1. *Nicotiana heterantha* A - flowering plant (scale bar = 4 cm), B - corolla of chasmogamous flower (scale bar = 1.75 cm), C - bud of cleistogamous flower, D - corolla of cleistogamous flower, (C and D scale bar = 4 mm), E - capsule (scale bar = 4.5 mm), F - seeds (scale bar = 0.5 mm). Drawn from a pot plant grown from seed of *Kenneally* 11338.

longus; limbus 0.7-1 cm longus; lobi limbi emarginati. Stamina quattor subdidynama in fauci, quintum brevi filamento semiadnatum. Capsula ellipsoidea 8-10 mm longa. Semina angularia reniformia brunnea reticulata.

Typus: Buckleys Bore, 11 km N of Broome, Dampier Peninsula, 17° 51'S, 122° 13'E, Western Australia, *J.B. Martin* 225, 8 Mar. 1992 (holo: PERTH 2169819; iso: AD, CANB, K).

Annual or short-lived *perennial* herb, branching near the base. Decumbent *stems* develop tufts of leaves at the lower nodes. *Leaves* at first basal, 2-10 x 1-4.5 cm, commonly c. 7 x 2.5 cm, petiolate, elliptic to obovate, apex obtuse, base attenuate, margin entire, petiole 2-2.5 cm, narrowly winged, attachment to stem simple. Leaves at first basal and cauline, these in time replaced by tufts of leaves at the stem nodes and in the lower parts of the inflorescence. *Indumentum* of simple and minute globular-headed glandular hairs, more common on young parts and calyces but never conspicuous, leaves and wiry stems glabrescent. *Inflorescence* a simple or sparsely branched raceme, the axis relatively slender and wiry, to 1 m long, decumbent. Stem leaves soon reduced to linear-triangular *bracts* 3-5 mm long, tufts of leaves develop at the lower nodes (see above), from these axillary tufts of leaves short flowering axes 1-5 cm long with 2-5 flowers may develop; *pedicel* c. 7 mm long. *Chasmogamous flowers* (*Kenneally* 11338): *calyx* 7-9 mm long, the lobes joined by membrane 2-3 mm, the lobes free for 2 mm, lobe apex triangular, all minutely glandular pubescent within the lower half, limb 0.7-1 cm long, divided about halfway, lobe apex emarginate. Four upper anthers on filaments 1.5-2 mm long, the lower fifth anther on filament 6-7 mm long. *Anthers* 1 mm long; *style* 2.8 cm long; stigma capitate, exserted just beyond the four anthers. *Ovary* 2 mm, conical, sparsely minutely glandular pubescent, base surrounded by circular fleshy disc. *Cleistogamous flowers*: *calyx* as above but corolla tube and lobes c. 5 mm long, not expanding. *Capsule* c. 8-10 mm long, apex acute, equal to or exceeding the calyx, dividing to four valves when mature, the calyx tube and capsule often slightly constricted at about one-quarter of their length, the lower quarter somewhat thicker and hardened. *Seeds* to 1 mm long, bluntly triangular to angularly reniform, reticulate with sharp-edged wavy ridges, the cells deeply concave, brown.

Other specimens examined. WESTERN AUSTRALIA: Coconut Well, 15 km N of Broome, 10 May 1985, *Foulkes* 237 (AD, CANB, K, PERTH); Coconut Well, 15 km N of Broome, 17 June 1984, *K.F. Kenneally* 9031 (CANB, PERTH); Buckleys Plain, 10 km N of Broome, behind O.T.C. station, 1 Sept. 1992, *Kenneally* 11338 (PERTH); Buckleys Plain O.T.C. side, 7 km N of Broome, Dampier Peninsula, 17°54'S, 122°15'E, 24 April 1992, *Martin* 226 (PERTH).

Distribution. This is the only *Nicotiana* so far collected from near Broome. It forms low spreading colonies in and out of *Melaleuca* thickets on seasonally wet black clay in an area known as Buckleys Plain north of Broome to about Coconut Well. (Figure 2)

Flowering period. May-June. The species is facultatively cleistogamous. Some specimens collected in the field clearly have well developed and open corollas, others have reduced corollas. Several plants cultivated in Adelaide during the summers were cleistogamous and signs of the corolla were scarcely visible. The cause of these variations is not known.

Affinities. The new species appears most closely related to *Nicotiana rosulata* subsp. *rosulata*, this has more erect, stouter inflorescences which are more branched above and hence the flowers are more concentrated on the terminal parts of the stems. However, there are a few specimens of *N. rosulata* subsp. *rosulata* at AD and PERTH with flowering axes equally slender to the new species. The nearest

Figure 2. *Nicotiana heterantha* forming low spreading colonies on black clay on the edge of a *Melaleuca acacioides* thicket on Buckleys Plain north of Broome.

collection of *N. rosulata* to the new species is one from Pardoo about 400 km to the southwest. *N. heterantha* differs from all other Australian species except *N. debneyi* in its chromosome number (see below). In addition the mostly cleistogamous flowers, tufted growth, and slender wiry stems distinguish it from all other Australian species.

Notes. The axillary tufts of leaves developing at the lower nodes of the inflorescences and their short racemes of flowers are unusual features distinguishing this species.

Chromosome number. 2n = 48 (from *Kenneally* 11338). Root tips counted by Dr D.L. Hayman, Genetics Department, University of Adelaide. Dr Hayman comments that the presence of only one pair of chromosomes with obvious nucleolar organising regions suggests that it is an allopolyploid.

The base chromosome number for the genus *Nicotiana* is x = 12 and all American species have this or multiples of it (Goodspeed 1954). The only previous Australian species with multiple of x = 12 were the two subspecies of *N. debneyi* , n = 24, 2n = 48 and hence a tetraploid (Horton 1981). *N. debneyi* occurs in eastern Australia and is the only Australian species to extend to New Caledonia and Lord Howe Island. Although the ecology of *N. heterantha* is similar to that of *N. debneyi* subsp. *monoschizocarpa*, the plants differ in many characters. All other Australian species have a long series of aneuploid numbers ranging from *N. cavicola* n = 23 to *N. wuttkei* n = 14.

This number 2n = 48 separates *N. heterantha* from *N. rosulata* 2n = 40 in addition to morphological differences.

Conservation status. CALM Conservation Codes for Western Australian Flora: Priority One - Poorly Known Taxa. This species is known from only two populations in the same area, both of which are under threat from grazing.

Etymology. From the Greek *hetero* - different and *anthos* - flower, in reference to the two distinct types of flowers found in this species.

Acknowledgements

The assistance of Brome Botanical Society members Brian Carter, Paul Foulkes, John Martin and Tim Willing in obtaining material and making field observations of *Nicotiana heterantha* is gratefully acknowledged.

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New species of *Hibbertia* (Dilleniaceae) from the northern wheatbelt area of Western Australia

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Abstract

Wheeler, J.R. New species of *Hibbertia* (Dilleniaceae) from the northern wheatbelt area of Western Australia. Nuytsia 9 (3): 427-439 (1994). *H. lividula, H. glabriuscula, H. graniticola* and *H. arcuata* from the northern wheatbelt area of Western Australia are described and illustrated. The placement of *H. lividula* in section *Hibbertia* subsection *Bracteatae* and *H. glabriuscula* in section *Hibbertia* subsection *Ochrolasiae* is discussed. The relationship between *H. graniticola* and *H. arcuata* is also examined.

Introduction

The genus *Hibbertia* Andr. contains several as yet undescribed species in Western Australia. In 1983 and 1984, Phil Roberts, who was then CALM District Wildlife Officer for Wongan Hills, brought *H. lividula* to my attention with his collections of this species from Dalgouring, Beacon and Wialki in the northern wheatbelt area of Western Australia. Further studies confirmed that this was a new species related to *H. commutata* Steudel. Shortly afterwards a further new species from the Carrabin area, *H. glabriuscula,* which is clearly related to *H. drummondii* and also two other new species, *H. graniticola* and *H. arcuata,* came to my attention. The latter three are also taxa of the northern wheatbelt area of Western Australia.

Descriptions

1. Hibbertia lividula J.R. Wheeler, sp. nov. (Figure 1)

Frutex plerumque multi-caulis foliis lividis. Stamina 30-40, libra, ovaria aequaliter circumdantia, post deum in fasciculis quinque aequalibus carpellis alternantibus disposita. Carpella quinque, glabra.

Typus: 8 km east of Beacon, Western Australia, 19 July 1989, *J.R. Wheeler* 2624 (holo: PERTH 03453626; iso: AD, CANB, K, MEL, NSW).

Erect or sprawling *shrub* to 0.6 m high, usually multi-stemmed, with an indumentum of curled or twisted hairs and usually also some straight hairs. Young *branchlets* thinly hairy. *Leaves* alternate, subsessile, bluish grey, narrowly elliptic to narrowly oblong or narrowly obovate, (5)7-15 x 1.5-3.5 mm, sparsely hairy above and below, gradually tapered to the base, margins slightly to distinctly recurved, apex obtuse. *Flowers* solitary, terminal and terminating short branchlets, sessile, 12-25 mm in diameter. *Bracts* imbricate, dark brown and scarious, 1.5-3 mm long; outermost bracts with short appressed hairs at least in the upper half, acuminate or less often terminating in a small leaf-like projection; innermost bracts sparsely hairy, obtuse to obtusely acuminate. *Sepals* 5, more or less equal in length, connate only at the extreme base, 5-9 x 3-5 mm, the hairs somewhat appressed; outer sepals ovate-elliptic, moderately to densely hairy, apex obtuse to subacute; inner sepals elliptic, sparsely to moderately hairy except for a glabrous submarginal band, margin ciliolate, apex obtuse. *Petals* 5, free, golden yellow, obovate to obcordate, 6-15 x 4-9 mm, emarginate. *Stamens* 30-40, free, evenly distributed but the filament apices and anthers falling into 5 groups between the carpels; filaments slender, 1.5-2.5 mm long; anthers obovate and truncate apically, 0.7-1.2 mm long, opening by subterminal oblique pores; staminodes absent, although occasional unusually small stamens may be present. *Carpels* 5, glabrous; ovules usually 2, rarely 3; style 1.5-3 mm long, arising from the adaxial side of the carpel and radiating outwards; stigma minutely 2-lobed. *Fruit* not seen.

Other specimens examined (all PERTH). WESTERN AUSTRALIA: North of Watheroo and east of Bryant Park, 23 July 1965, *J.C. Anway* 159; 8 miles north of Wialki, 16 July 1967, *J.S. Beard* 4727; Seymour Rd, east of Miling, 12 August 1972, *S. Paust* 1108A; East Beacon, 11 May 1984, *P. Roberts s.n.*; Dalgouring Townsite reserve, 31 May 1983, *P. Roberts s.n.*; Wialki West, 19 July 1984, *P. Roberts s.n.*; Dalgouring, 30° 30'S, 118° 13'E, 8 June 1984, *B.H. Smith* 366; 0.6 miles east of Dalgouring, 8 June 1984, *B.H. Smith* 367; 11 km east of Beacon, 19 July 1989, *J.R. Wheeler* 2625; 11 km east of Beacon, 19 July 1989, *J.R. Wheeler* 2626; 3 km north of Beacon-Wialki Rd along Dalgouring Rd, 19 July 1989, *J.R. Wheeler* 2627; 3.5 km north of Beacon-Wialki Rd along Dalgouring Rd, 19 July 1989, *J.R. Wheeler* 2628; 10 km south east of Beacon (31 km north of Mandiga Rd, along Mandiga-Marindo Rd), 20 July 1989, *J.R. Wheeler* 2630; 15 km west of Mollerin on Burakin-Wialki Rd, 20 July 1989, *J.R. Wheeler* 2633; 5 km west of Kulja on Burakin-Wialki Rd, 20 July 1989, *J.R. Wheeler* 2635.

Distribution. South-west Australia, Avon District between Watheroo and Wialki.

Habitat. Occurs on sand, loam or lateritic sand, in *Eucalyptus wandoo* woodland, mallee woodland with *Acacia* and *Allocasuarina* species or *Acacia* shrubland.

Flowering period. Flowers May to September.

Affinities. *Hibbertia lividula* with its free stamens arranged around glabrous carpels clearly belongs to the section *Hibbertia*, subsection *Bracteatae* (Bentham 1863). Members of subsection *Bracteatae* typically have broad dark brown scarious bracts, free stamens which although evenly distributed around glabrous carpels fall into groups alternating with the carpels. *H. lividula* is related to and has many attributes in common with *H. commutata* Steudel and *H. serrata* Hotchk. (Wheeler 1984). However it differs from all known species of this subsection in having 5 rather than 3 carpels.

Conservation status. The populations have not been fully surveyed but this species does not appear to be under threat.

Etymology. The specific epithet refers to the bluish grey colour of the foliage.

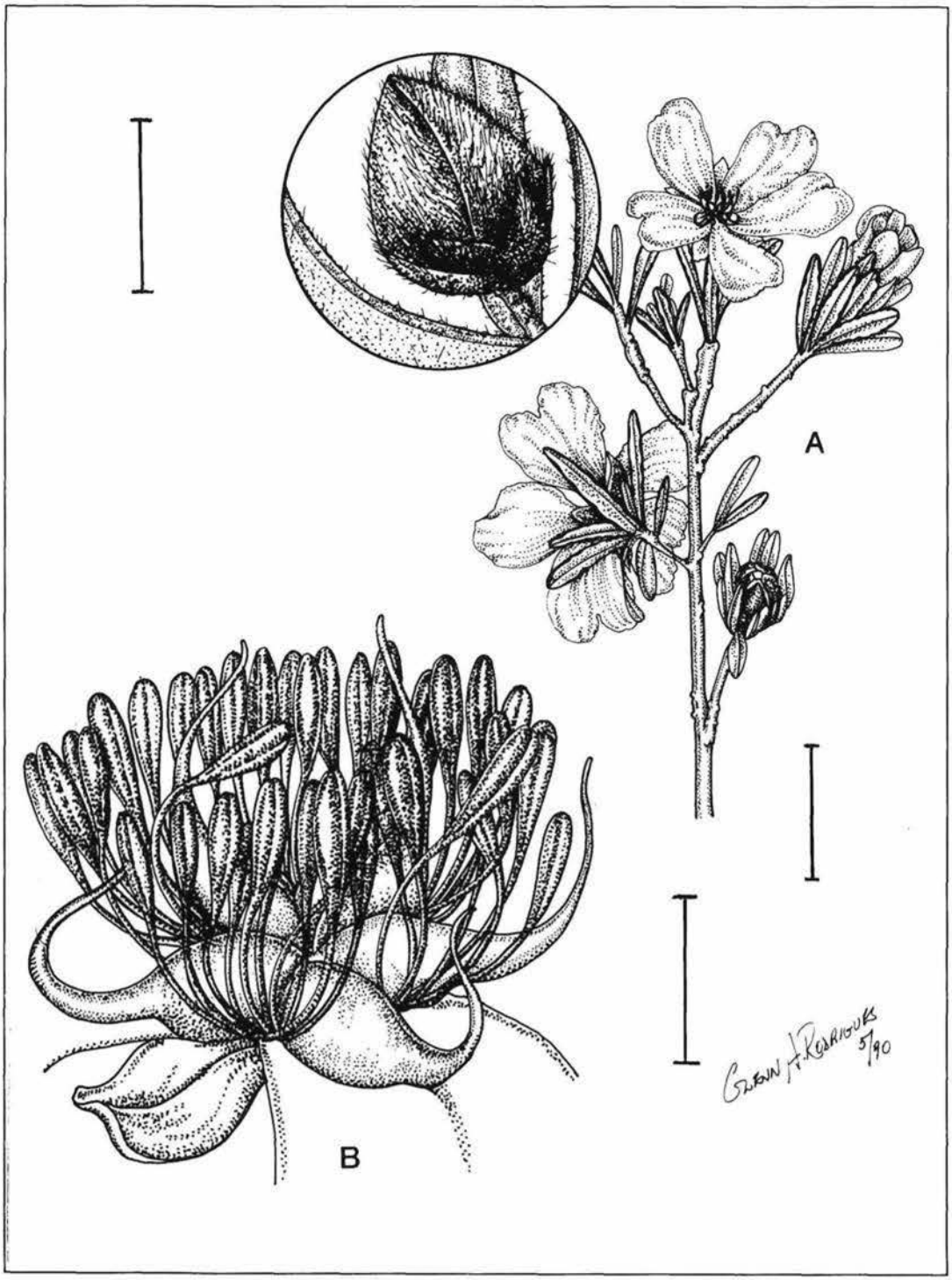

Figure 1. *Hibbertia lividula* A - flowering branch (scale bar = 10 mm), with enlargement of bud and bracts (scale bar = 5 mm), B - stamens and carpels (scale bar = 1 mm).

2. Hibbertia glabriuscula J.R. Wheeler, sp. nov. (Figure 2)

Ex affinitate *H. drummondii* sed sepalis et bracteis sine pilis villosis aureo-fuscis.

Typus: c. 24 km south of Carrabin, Hackling Rd, 14 km east of junction with Burracoppin South Rd, Western Australia, 26 September 1989, *J.R. Wheeler* 2638 (holo: PERTH 03453588; iso: AD, CANB, K, MEL).

Small erect *shrub* to 0.5 m high. Young *branchlets* glabrous. *Leaves* alternate, subsessile or with a very short hairy petiole to 0.3 mm long, oblong to oblong-elliptic and thick, 2-5.5 x 1-1.3 mm, glabrous or sparsely scabrous with simple forward-projecting hairs arising from slight protuberances, margin recurved and connate to the thick broad midrib completely hiding the lower surface, apex obtuse. *Flowers* solitary, terminal, 10-20 mm in diameter; peduncle 1-3 mm long, with short simple hairs; bracts several on the peduncle, narrowly elliptic, 1-3.5 mm long, sepal-like in texture and indumentum. *Sepals* 5, connate only basally, elliptic to broadly elliptic, 4-7 x 2-5 mm, more or less equal in size although the outermost sometimes slightly narrower and more acute, glabrous to thinly hairy with simple hairs outside, appressed hairy at least apically inside, margin ciliolate, apex obtuse or subacute. *Petals* 5, obovate, 6-10 x 4-7 mm, emarginate. *Stamens* 6-12, free, arranged all around the carpels; filaments slender, 1-1.7 mm long; anthers oblong, 1-1.7 mm long, opening by longitudinal slits; staminodes absent. *Carpels* 2, ellipsoid, 1.2-1.5 x c. 1 mm, glabrous; ovules 4 or 6; style at length radiating outwards, 2.5-3.5 mm long. *Fruit* not seen.

Other specimens examined (all PERTH). WESTERN AUSTRALIA: no locality given, no date given *J.S. Beard* 6213; 24 km SSE Carrabin, flora and fauna reserve on land survey blocks nos. 969 and 975, 15-17 September 1982, *A. Strid* 20307; c. 24 km south of Carrabin, Hackling Rd, 14 km east of junction with Burracoppin South Rd, 26 September 1989, *J.R. Wheeler* 2639; c. 24 km south of Carrabin, Hackling Rd, 14 km east of junction with Burracoppin South Rd, 26 September 1989, *J.R. Wheeler* 2640; c. 24 km south of Carrabin, Hackling Rd, 14 km east of junction with Burracoppin South Rd, 26 September 1989, *J.R. Wheeler* 2641; c. 24 km south of Carrabin, Hackling Rd, 14 km east of junction with Burracoppin South Rd, 26 September 1989, *J.R. Wheeler* 2642; c. 25 km south of Carrabin, Pink Rd, c. 1 km south of junction with Hackling Rd, 26 September 1989, *J.R. Wheeler* 2645; c. 25 km south of Carrabin, Pink Rd, c. 1 km south of junction with Hackling Rd, 26 September 1989, *J.R. Wheeler* 2646; c. 23 km south of Carrabin, Hackling Rd, 8 km east of junction with Burracoppin South Rd, 26 September 1989, *J.R. Wheeler* 2647; c. 20 km SSE of Carrabin, Della Rd, c. 1 km north of junction with Hackling Rd, 26 September 1989, *J.R. Wheeler* 2649.

Distribution. South west Australia, Avon District, recorded only from south of Carrabin.

Habitat. Occurs on yellow sand in heath or shrubland.

Flowering period. Flowers recorded for September.

Affinities. *Hibbertia glabriuscula* seems most closely related to *H. drummondii* and clearly belongs with that species in section *Hibbertia*, subsection *Ochrolasiae*. *H. glabriuscula* differs markedly from *H. drummondii* in the absence of the conspicuous long golden brown hairs which characteristically clothe the sepals and bracts of the latter species. The sepals and bracts of *H. glabriuscula* are glabrous to thinly hairy outside and with appressed hairs towards the apex of the inner surface. *H. drummondii* also differs in its usually glabrous and smooth leaves, slightly larger flowers with more numerous (15-18) stamens and larger carpels each with 6-8 ovules.

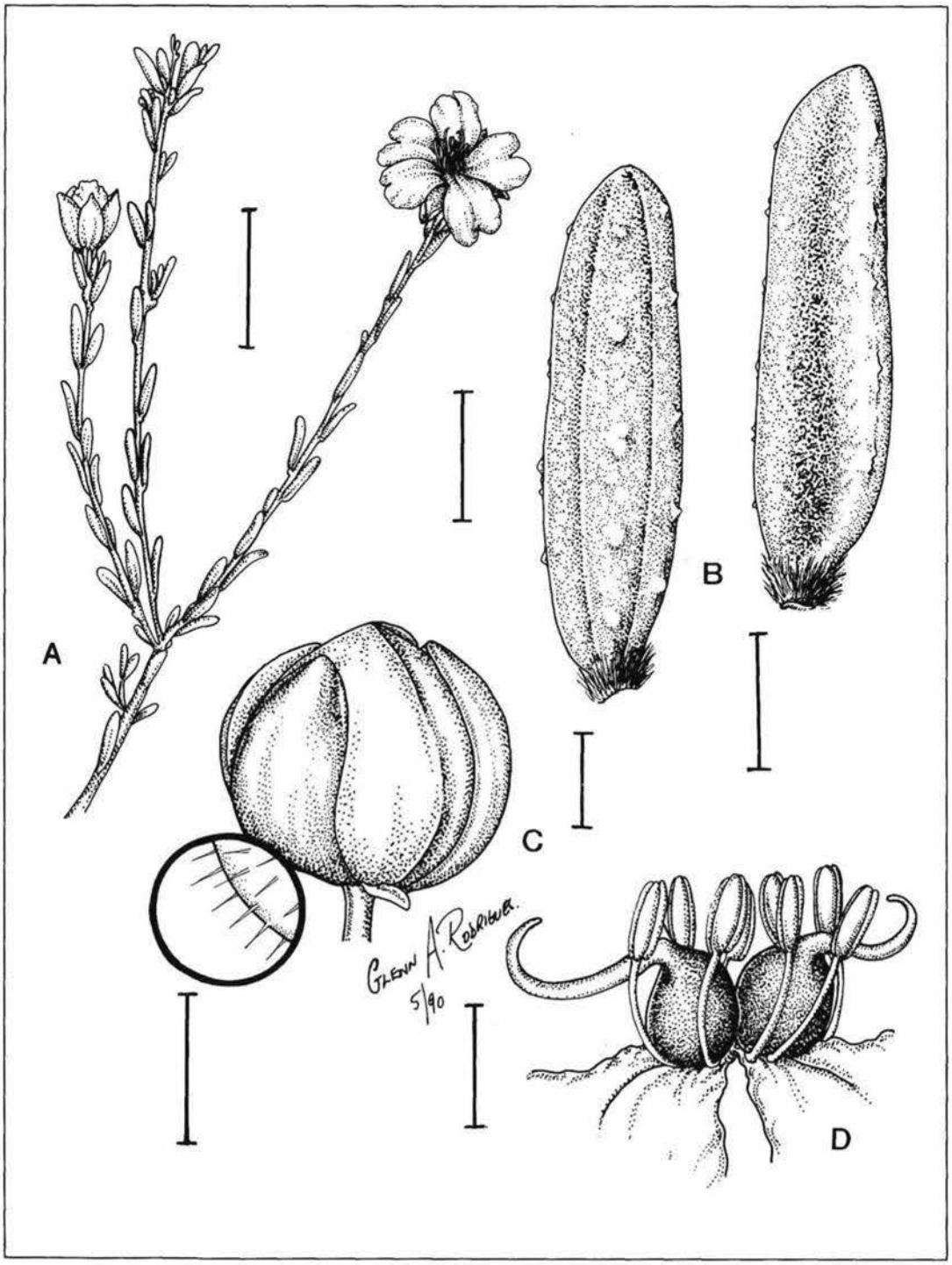

Figure 2. *Hibbertia glabriuscula* A - flowering branch (scale bar = 10 mm), B - leaf, abaxial and adaxial views (scale bar = 1 mm), C - bud (scale bar = 2 mm), with enlargement to show minute hairs sometimes present on sepals (scale bar = 1 mm), D - stamens and carpels (scale bar = 1 mm).

Conservation status. CALM Conservation Codes for Western Australian Flora: Priority Two - Poorly Known Taxa. Survey work is necessary to search for further populations before a complete statement can be made on its conservation status.

Etymology. The specific epithet refers to the absence of long conspicuous hairs on the sepals and bracts; these hairs are present on the sepals and bracts of its closest relative, *Hibbertia drummondii.* Although there are frequently minute hairs present in *H. glabriuscula* it is, in comparison to *H. drummondii,* almost glabrous.

3. Hibbertia graniticola J.R. Wheeler, sp. nov. (Figure 3)

Frutex; pili indumenti breviter stellati. Folia recta, pungentia. Stamina 17-30 carpella circumdantia, versus basim irregulariter connata. Carpella (2)3, dense stellato-pilosa; ovula (8)10 in unoquoque carpello posita.

Typus: Rock NW of Warralakin, 3.5 km along English Rd from junction with Echo Valley Rd, Western Australia, 21 September 1988, *J.R. Wheeler* 2599 (holo: PERTH 03453618; iso: AD, CANB, K, MEL).

Shrub to 1.5 m high, with a minute but dense indumentum on young branchlets, petioles, bracts and sepals of short stellate hairs in which the centre of the hair is slightly fused. *Leaves* spirally arranged and crowded especially towards the tips of the branchlets; petiole 1-1.5 mm long; blade straight, linear but thick with the true margins recurved and fused to the midrib, 10-20 x 1.2-1.5 mm; upper surface flat or slightly concave, glabrous; lower surface convex with a prominently raised midrib, glabrous; edges coarsely scabrous with forward pointing simple hairs; apex a long pungent mucro 1-1.5 mm long. *Flowers* solitary, terminating short branchlets, sessile, 20-35 mm in diameter. *Bracts* inconspicuous, leaf-like, 9-12 mm long. *Sepals* 5, connate basally, densely and shortly stellate-hairy, the margin ciliolate with somewhat curled hairs, apex pungent with a mucro 0.5-2 mm long; outermost sepals elliptic, 12-16 x 4-8 mm; innermost sepals broadly elliptic, 12-16 x 7-11 mm and with a minutely hairy to glabrous submarginal band. *Petals* 5, golden yellow, obovate, 14-20 x 4-8 mm, emarginate. *Stamens* 17-30, arranged all around the carpels, irregularly connate towards the base for the basal 0.5-1 mm; filaments slender, 4-6 mm long; anthers very slender, narrowly elliptic, 3-4 mm long, opening by longitudinal slits; staminodes usually absent. *Carpels* usually 3 but sometimes 2, ovoid, densely stellate-hairy; ovules (8)10 per carpel, placentation marginal; style slender, 4-5 mm long, arising from the abaxial side of the carpel. *Fruits* dry, splitting apically and adaxially to release the seeds. *Seeds* orange-brown, shiny, transversely ellipsoid, 2.5-3 x 1.5-2.5 mm, with a white waxy aril.

Other specimens examined (all PERTH). WESTERN AUSTRALIA: Chutawalakin Hill, (southern edge) 3 September 1989, *R. Cranfield & P. Spencer* 7694A; 1.5 km W of southern boundary of Chiddarcooping Nature Reserve, 11 September 1989, *R. Cranfield & P. Spencer* 7801; NW section Chiddarcooping Nature Reserve, September 1989, *R. Cranfield & P. Spencer* 7820; Chiddarcooping Nature Reserve, 2.55 km WNW of Chiddarcooping Hill, 7 November 1990, *F.H. & M.P. Mollemans* 3784; Warralakin Rock, 14 August 1970, *E. Parkin s.n.*, Chiddarcooping Nature Reserve, site 38, 1 October 1984, *A.S. Weston* 14162; Chiddarcooping Nature Reserve, 5 November 1984, *A.S. Weston* 14493; Rock NW of Warralakin, 3.5 km along English Rd from junction with Echo Valley Rd, 21 September 1988, *J.R. Wheeler 2598.*

Distribution. South-west Australia, Avon District, in the northern wheatbelt near Warralakin.

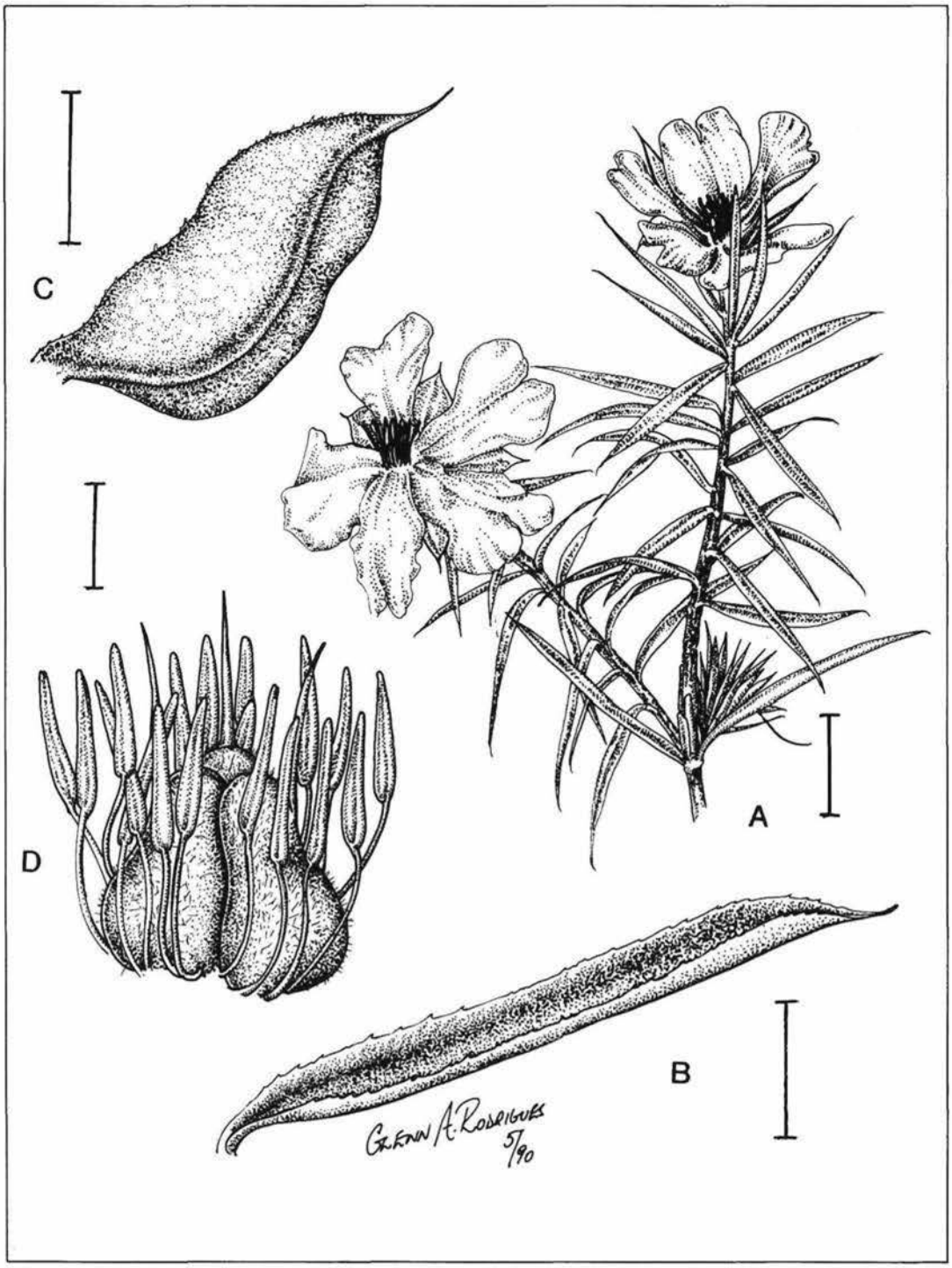

Figure 3. *Hibbertia graniticola* A - flowering branch (scale bar = 10 mm), B - leaf, C - sepal (B & C scale bars = 5 mm), D - stamens and carpels (scale bar = 2.5 mm).

Habitat. Restricted to sand pockets on granitic outcrops or surrounding the base of granite outcrops, usually in shrubland.

Flowering period. Flowers August to September. Fruits recorded for November.

Affinities. *Hibbertia graniticola* is closely related to *H. arcuata* differing primarily in its longer straight leaves, larger flowers and (2)3 carpels with (8)10 ovules per carpel. See under *H. arcuata*.

Conservation status. This is a taxon known from one or a few (generally less than 5) populations, at least some of which are not believed to be under immediate threat (i.e. not currently endangered) and designated as a Priority Two taxon of CALM. This taxon has previously been referred to as *Hibbertia* sp. *Chiddarcooping* (*R.J. Cranfield* 7820).

Etymology. The specific epithet refers to the fact that the species is apparently restricted to granite rocks.

4. Hibbertia arcuata J.R. Wheeler, sp. nov. (Figure 4)

Frutex; pili indumenti breviter stellati. Folia recurva, pungentia. Stamina 15-28 carpella circumdantia, omnio vel fere libera. Carpella 2, dense stellato-pilosa; ovula 6-8 in unoquoque carpello posita.

Typus: 13.4 km E of Kalannie on Kulja road, Western Australia, 19 September 1988, *J.R. Wheeler* 2579 (holo: PERTH 03453596; iso: AD, CANB, K, MEL).

Shrub to 1.3 m high, with a minute indumentum on young branchlets, petioles, bracts and sepals of short stellate hairs in which the centre of the hair is slightly fused and scale-like. *Leaves* spirally arranged, not usually crowded; petiole 0.3-0.8 mm long; blade distinctly to slightly recurved, narrowly oblong-elliptic to narrowly ovate-elliptic, thick with the true margins recurved and fused to the midrib, 4-8 x 1-1.5 mm, upper surface minutely scabrous with forward pointing simple hairs, lower surface glabrous with a prominently raised midrib, apex a long pungent mucro 1-1.5 mm long. *Flowers* solitary, terminating short branchlets, sessile, 12-20 mm in diameter. *Bracts* inconspicuous, leaf-like, 4-6 mm long. *Sepals* 5, connate basally, stellate-hairy, margin ciliolate with somewhat curled hairs; outermost sepals elliptic to broadly elliptic, 5-8 x 3-4 mm including a mucro 1-1.3 mm long; innermost sepals broadly elliptic, 6-9 x 4-6 mm including a mucro 0.5-1 mm long, with a glabrous or very sparsely hairy submarginal band. *Petals* 5, golden yellow, obovate, 5-11 x 5-9 mm, emarginate. *Stamens* 15-28, arranged all around the carpels, free or connate only basally; filaments 1-2.5 mm long; anthers elliptic to ovate-elliptic, 1.5-2.5 mm long, opening by longitudinal slits; staminodes absent or sometimes a few stamens reduced in size and perhaps non-functional. *Carpels* 2, ovoid, densely stellate-hairy; ovules 6 or 8 per carpel, placentation marginal; style slender, 3-4.5 mm long, arising from the abaxial side of the carpel. *Fruits* dry, splitting apically and adaxially to release the seeds. Immature seeds orange-brown, shiny, transversely ellipsoid, with a white waxy aril.

Other specimens examined (all PERTH). WESTERN AUSTRALIA: Halfway between Paynes Find and Perenjori, 31 August 1975, *A.M. Ashby* 5221; Emu fence N of Cleary, 16 July 1967, *J.S. Beard* 4714; Pindar, E of Mullewa, 16 September 1931, *W.E. Blackall* 667; Between Mt Churchman and Beacon, 13 October 1937, *W.E. Blackall* 3453; Dromedaries, near Mt Churchman, October 1937, *W.E. Blackall s.n.*, Between Mullewa and Morowa, August 1959, *A.M. Baird s.n.*, 216 km from Mt Magnet on Geraldton Rd, 22 August 1963, *Y. Chadwick* 1671; 73 miles from Paynes Find to Wubin,

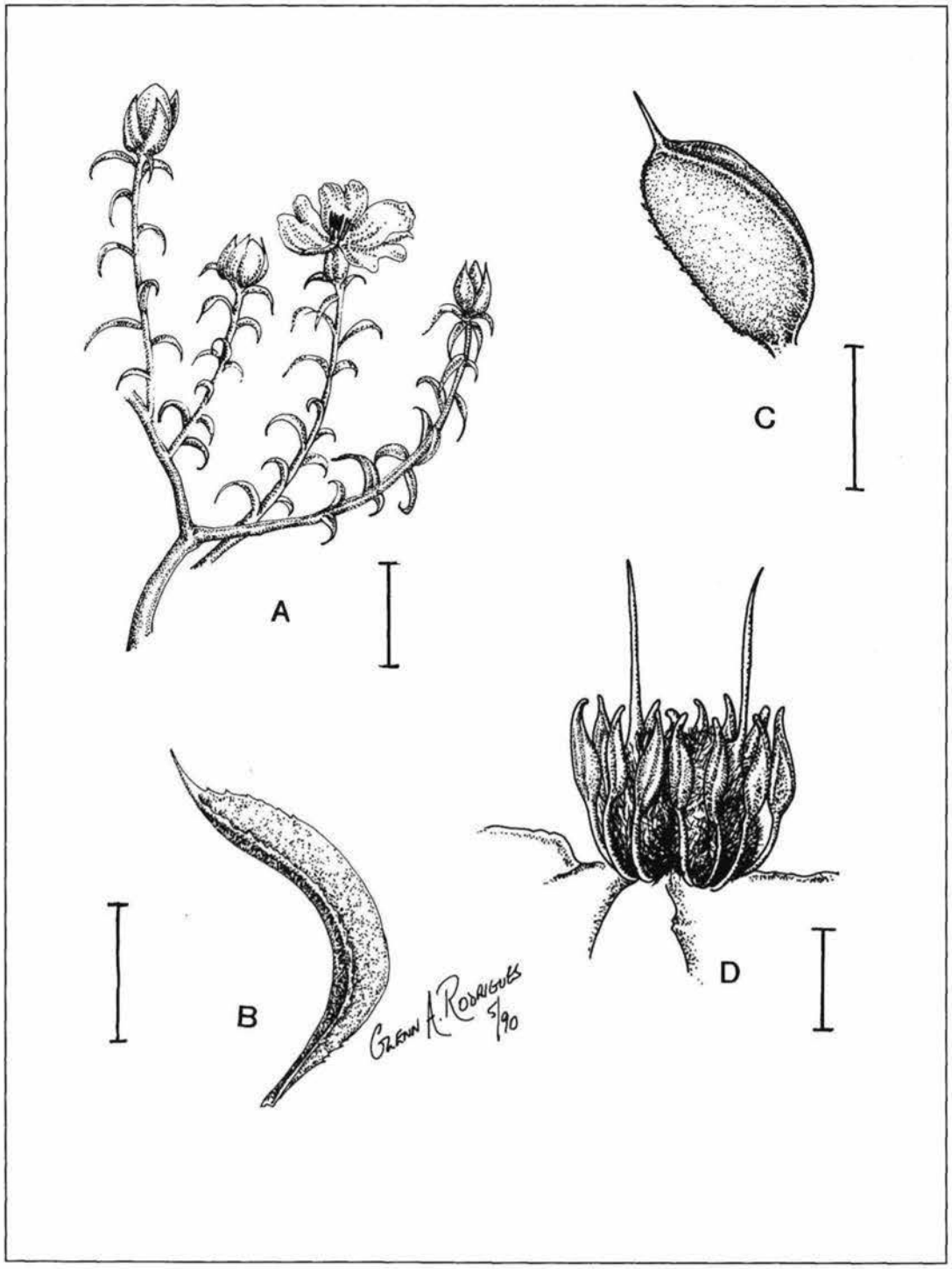

Figure 4. *Hibbertia arcuata* A - flowering branch (scale bar = 10 mm), B - leaf, C - sepal (B & C scale bars = 5 mm), D - stamens and carpels (scale bar = 2.5 mm).

October 1965, *J.R. Knox* 651038; 52.4 km from Wubin towards Mt Magnet, 28 July 1974, *B.R. Maslin* 3538; Wilroy Reserve 29196, 16 km SSE of Mullewa, 4 June 1977, *B.G. Muir* 544; ?Wyalkatchem area, 17 September 1965, *S.B. Rosier* 336; 13.4 km E of Kalannie on Kulja road, 19 September 1988, *J.R. Wheeler* 2579; North west of Beacon, 21.6 km north along Bimbijy Rd towards Mt Churchman, 20 September 1988, *J.R. Wheeler* 2589; South east of Beacon, Gillet road 6 km south from junction with Faulkner road, 19 July 1989, *J.R. Wheeler* 2622.

Distribution. South-west Australia, Avon District, in the northern wheatbelt from Mullewa and Pindar east towards Paynes Find and south to near Beacon, and possibly the Wyalkatchem area.

Habitat. Acacia shrubland, *Allocasuarina* shrubland or *Eucalyptus* woodland, on yellow to brown sand or loam.

Flowering period. Flowers July to October. Fruits recorded for October.

Affinities. Hibbertia arcuata is closely related to *H. graniticola*, differing primarily in its shorter recurved leaves, smaller flowers and presence of only 2 carpels each with 6 or 8 ovules. However *H. graniticola* and *H. arcuata* clearly have many features in common. Their leaves are similar in form and both have long pungent apices. The flowers are solitary terminating short shoots and subtended by inconspicuous leaf-like bracts which grade into the leaves. The sepals are similar in shape with similar indumentum and similar pungent apices. The stamens are similar in shape and type, are arranged all around the carpels and have the same form of dehiscence. Staminodes are usually absent, although occasionally some smaller and possibly non-functional stamens may be found. The carpels are similar in shape and indumentum. Ovules although usually different in number are similar in placentation.

The morphological differences between the closely related *H. graniticola* and *H. arcuata* are summarised in the table below.

	Hibbertia graniticola	**Hibbertia arcuata**
Leaves	Straight, 10-20 mm long	Recurved, 4-8 mm long
Flower size	20-35 mm in diameter	12-20 mm in diameter
Sepal length	12-16 mm long	5-9 mm long
Sepal apex	Mucro not or scarcely longer in outer sepals	Mucro of outer sepals distinctly longer than that of inner sepals
Petals	13-20 mm long	5-11 mm long
Stamens	Irregularly fused for basal 0.5-1 mm	Free or almost so
Staminal filaments	4-6 mm long	1-2.5 mm long
Anthers	Narrowly elliptic and 3-4 mm long	Elliptic to ovate-elliptic and 1.5-2.5 mm long
Carpel number	3, less often 2	2
Ovule number	10, more rarely 8 per carpel	6 or 8 per carpel

As well as being morphologically different, the two species differ markedly in their habitat preferences, with *H. graniticola* being restricted to granite outcrops and *H. arcuata* being more widespread on sandy or loamy soils.

It seems that these two species should be placed in section *Hibbertia,* in which the stamens are characteristically arranged all around the carpels (Bentham 1863 and Gilg & Werdermann 1925). The two are clearly closely related, but do not appear to have any other close relatives. It is therefore not clear in which subsection of section *Hibbertia* they belong. Initially they seem to belong to a subsection of their own, however instead of creating a new subsection for *H. graniticola* and *H. arcuata* it seems sensible to leave this until the whole of the genus is studied Australia-wide for a forthcoming volume of "Flora of Australia".

Conservation status. The populations have not been fully surveyed, but the species is not considered to be under threat.

Etymology. The specific epithet refers to the recurved bow-like nature of the leaves.

Acknowledgements

I should like to thank Phil Roberts for first bringing *H. lividula* to my attention and also Ray Cranfield and Phil Spencer for providing material of *H. graniticola* and surveying populations prior to its inclusion on the Priority Flora List. I thank also Glen Rodrigues for preparing the illustrations of all species, Neville Marchant for his comments on an earlier draft and Paul Wilson for preparing the brief Latin descriptions.

References

Bentham, G. (1863). "Flora Australiensis" vol. 1. (Reeve: London.)

Gilg, E. & Werdermann, E. (1925). In: A. Engler's "Die natürlichen Pflanzenfamilien" ed 2, 21: 21-30 (Duncker & Humblot: Berlin.)

Wheeler, J.R. (1984). "Taxonomic notes on some Western Australian species of *Hibbertia* (Dilleniaceae)" Nuytsia 5: 31-42.

CORRECTION

Correction to **"New species and taxonomic changes in *Grevillea* (Proteaceae: Grevilleoideae) from south-west Western Australia"** By Peter M. Olde and Neil R. Marriott, Nuytsia 9 (2): 237- 304 (1993).

In the above paper a new name, *Grevillea althoferi* was published. However, as Olde and Marriott state that their new species was named in honour of Mr and Mrs Althofer, the epithet must be corrected to *'althoferorum'* (see Greuter *et al.* (1988). International Code of Botanical Nomenclature, Arts. 32.5, 73.1 and 73.10).

In the same paper the name *Grevillea crowleyi* was also published. This name must be corrected to *Grevillea crowleyae* as the epithet honours Mrs Valma Crowley. - **Editor.**

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CONSERVATION CODES FOR WESTERN AUSTRALIAN FLORA

R: Declared Rare Flora - Extant Taxa (= Threatened Flora = Endangered + Vulnerable)

Taxa which have been adequately searched for, and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such, following approval by the Minister for the Environment, after recommendation by the State's Endangered Flora Consultative Committee.

X: Declared Rare Flora - Presumed Extinct Taxa

Taxa which have not been collected, or otherwise verified, over the past 50 years despite thorough searching, or of which all known wild populations have been destroyed more recently, and have been gazetted as such, following approval by the Minister for the Environment, after recommendation by the State's Endangered Flora Consultative Committee.

1: Priority One - Poorly Known Taxa

Taxa which are known from one or a few (generally <5) populations which are under threat, either due to small population size, or being on lands under immediate threat, e.g. road verges, urban areas, farmland, active mineral leases, etc., or the plants are under threat, e.g. from disease, grazing by feral animals, etc. May include taxa with threatened populations on protected lands. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.

2: Priority Two - Poorly Known Taxa

Taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under immediate threat (i.e. not currently endangered). Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.

3: Priority Three - Poorly Known Taxa

Taxa which are known from several populations, at least some of which are not believed to be under immediate threat (i.e. not currently endangered). Such taxa are under consideration for declaration as 'rare flora', but are in need of further survey.

4: Priority Four - Rare Taxa

Taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5-10 years.

Notes for Authors

The aim of **Nuytsia** is to publish original papers on systematic botany with preference given to papers relating to the flora of Western Australia. Descriptions and keys using manuscript or phrase names will not generally be accepted. All papers are refereed and the Editorial Advisory Committee reserves the right to reject papers. Opinions expressed by authors are their own and do not necessarily represent the policies or views of the Department of Conservation and Land Management.

Manuscripts must be submitted in duplicate, typewritten and double spaced. Printing is now done using a desktop publishing system. After final acceptance of papers, authors are requested to provide discs readable directly by IBM computer. Wherever possible, the MS-WORD software should be used. Alternatives should be discussed with the editor before preparing manuscripts.

Great care with layout, spacing and typography must be exercised in the preparation of electronic manuscripts. In particular, note the following. Text is not to be right-justified. Where manuscripts are compiled with software other than MS-WORD all headings and paragraphs are to be left-justified. Within a paragraph two spaces are required between sentences; after colons, semicolons, commas and dashes a single space is required. Where MS-WORD is used, text should be italicised or emboldened where appropriate.

Original figures should not be lettered but accompanied by copies indicating lettering. Page proofs will be forwarded to authors for checking. Twenty reprints of each paper will be provided free of charge; no additional copies may be ordered. Style and layout should follow recent numbers of **Nuytsia**, noting particularly the following.

Title. Should include the family name of genera or species treated, but not authorities. New taxa should be named if not numerous. The geographic area of study should be given where appropriate.

Abstract. The paragraph (or paragraphs) should be indented and commence with bibliographic information. New taxa, combinations and names should be listed. The major contents of the paper should be summarised but no additional material given.

Headings. All headings should be in capitals and lower case, major headings being centred and minor ones left-justified.

Keys. May be either indented (e.g. Nuytsia 5: 277) or bracketed (e.g. Nuytsia 5: 84). Indented keys involving more than nine levels of indentation should be avoided.

Species treatments. Use of certain named paragraphs, or sets of paragraphs, for matter following the descriptions is encouraged. The desired sequence and examples of commonly used headings are shown below. Recommended headings which are italicised below, should be left-justified, followed by text on the same line.

(1) Taxon name, synonymy (if any), significant manuscript or phrase names currently in use and type details (for previously published taxa).
(2) Latin (for new taxa - indented).
(3) *Typus:* (for new taxa - not indented).
(4) English description (indented).
(5) *Other specimens examined* or *Selected specimens examined* as appropriate.
(6) *Distribution.*
(7) *Habitat.*
(8) *Flowering period.*
(9) *Fruiting period.*
(10) *Typification* (discussion).
(11) *Affinities* or *Relationships.*
(12) *Discussion* or *Comments* or *Notes.*
(13) *Conservation status.* (Department of Conservation and Land Management conservation codes for rare and threatened (Declared Rare Flora) WA taxa are given in each issue).
(14) *Etymology.*

Threatened species. It is the policy of CALM not to publish precise locality data for threatened species. Authors are therefore requested not to cite precise locality data when describing threatened species. Generalised localities should be given accompanied by the statement - [precise locality withheld].

Synonymy. The desired format is that used by P.G. Wilson, Nuytsia 4: 135-262.

Standard abbreviations. It is suggested that where possible the following standards be followed.

(1) Author abbreviations - Brummitt, R.K. & Powell, C.E. (1992). Authors of Plant Names. (Royal Botanic Gardens: Kew.)

(2) Book titles in literature citations - Stafleu, F.A. & Cowan, R.S. (1976-83). Taxonomic Literature. Edn 2. (I.A.P.T.: Utrecht) (but with capital initial letters.) - Green, J.W. (1985). Census of the Vascular Plants of Western Australia. Edn 2. Pp. 20-24. (Department of Agriculture: Perth.)

(3) Journal titles in literature citations and reference lists - Lawrence, G.H.M. *et al.* (1968). B-P-H (Botanico-Periodicum-Huntianum). - Green *loc. cit.*

Figures. Numbers should follow a single sequence including maps.

Structure of papers. Authors are encouraged to use the conventional structure of scientific papers when a complete study is being reported (e.g. a revision). A *Methods* section should include the method of drawing up the descriptions from specimens, extent of search for types, and discussion of concepts for choice of taxonomic categories. A *Discussion* section should be considered, which would include some or all of the following: a summary of the findings, emphasising the most significant; interpretation of the results in the light of other relevant work; statement of new problems which have arisen; advising of aspects which are to be followed up; suggestion of topics which others might usefully pursue; prediction and speculation.

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