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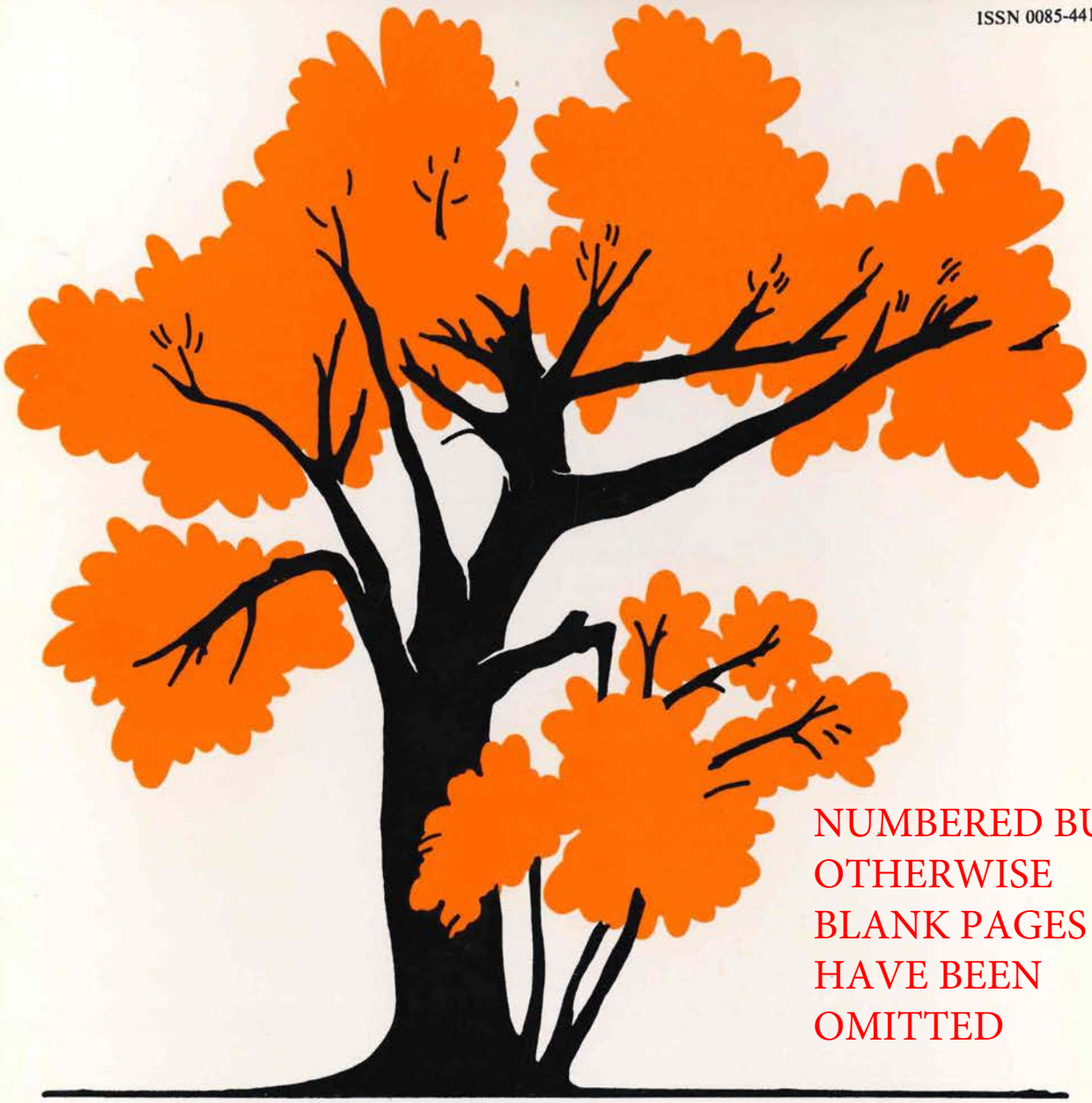

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NUYTSIA

Volume 4 Number 1
1982

WESTERN AUSTRALIAN HERBARIUM—DEPARTMENT OF AGRICULTURE

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Western Australian Herbarium, George St., South Perth,
Western Australia 6151.

An introduction to a series of papers describing new species from the Wongan Hills and surrounding district

Kevin F. Kenneally

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Eight undescribed plant species which have come to light as a result of botanical studies of the Wongan Hills and surrounding district (Kenneally, 1977a), are described and illustrated in a series of papers in the present issue of Nuytsia.

As all of these species are geographically quite restricted (Table 1) and are either vulnerable or endangered (Rye, 1980), they are being published now in order to provide names for the purposes of flora protection.

Table 1. Rare and Geographically Restricted Species occurring within 20 km of Wongan Hills Townsite (modified from Rye, 1980).

Species	Approx. Range (km)	Endemic to Wongan Hills Range	Classification			
			VR	R	VGR	GR
**Acacia botrydion* Maslin	15	+	—	—	+	—
A. denticulosa F. Muell.	150	—	—	—	—	+
A. dura Benth.	30	—	—	—	+	—
A. semicircinalis Maiden and Blakely	9	+	—	+	+	—
A. sp. aff. *obovata* Benth. (*Maslin* 4550)	T	+	+	—	+	—
**A. pharangites* Maslin	T	+	+	—	+	—
Boronia ericifolia Benth.	90	—	—	—	—	+
Calytrix stowardii S. Moore	T	?	+	—	+	—
Clematis sp. aff. *microphylla* DC. (*Kenneally* 5361)	9	+	—	—	+	—
**Conostylis wonganensis* S. D. Hopper	40	—	—	+	+	—
Daviesia euphorbioides Benth.	1	—	+	—	+	—
**D. spiralis* Crisp	5	+	—	?	+	—
Dryandra comosa Meisn.	11	+	—	—	+	—
D. pulchella Meisn.	8	+	—	—	+	—
Eremophila sargentii (S. Moore) Chinnock	70	—	—	—	—	+
**E. ternifolia* Chinnock	T	+	+	—	+	—
**Eriostemon wonganensis* Paul G. Wilson	T	+	+	—	+	—
Eucalyptus caesia Benth.	300	—	—	+	—	—
Gastrolobium glaucum C. A. Gardner	T	—	+	—	+	—
G. hamulosum Meisn.	110	—	—	+	—	+
Melaleuca websteri S. Moore	80	—	—	—	—	+
**Microcorys eremophiloides* Kenneally	7	+	—	+	+	—
**Rhagodia acicularis* Paul G. Wilson	T	+	—	+	+	—
Stylidium coroniforme R. Erickson and Willis	T	+	+	—	+	—
Tetratheca retrorsa J. Thompson	220	—	—	?	⋕	—
Wurmbea humilis Macfarlane	T	—	+	—	+	—

* Species described as new in this issue of Nuytsia
⋕ Species known only from two widely separated areas
T Species known only from type locality (or a single locality)
VR Very Rare—having less than a few hundred reproductively mature plants in natural populations
R Rare—less than a few thousand reproductively mature plants in natural populations
VGR Very Geographically Restricted—having a maximum geographical range of less than 50 km
GR Geographically Restricted—maximum geographical range less than 160 km

Because some of the new species are endemic to the range of hills known as the Wongan Hills it becomes necessary to define what is meant by *The Wongan Hills* and *The Wongan Hills District.*

The Wongan Hills are a range of flat-topped hills lying 12 km to the north-west of the township of Wongan Hills. Located in the Wongan-Ballidu Shire, 143 km (air distance) north-east of Perth, Western Australia, Wongan Hills is the centre of a large wheat and sheep farming district. Since the discovery and naming of the hills by Surveyor-General J. S. Roe in November 1836, only one attempt has been made to define their boundary: in an account of the natural history of the area (Kenneally, 1977b), aerial photographs were used to distinguish the lateritised area associated with the hills. However, a more precise delineation of *The Wongan Hills* and the surrounding area, now termed *The Wongan Hills District,* is presented in this paper.

A method has now been devised for delineating the outcropping lateritised area on the basis of the contour line of best fit. This was aided by the availability of a recent Department of Defence map, completed by the Army in 1977. The Department of Lands and Surveys also provided valuable advice and assistance.

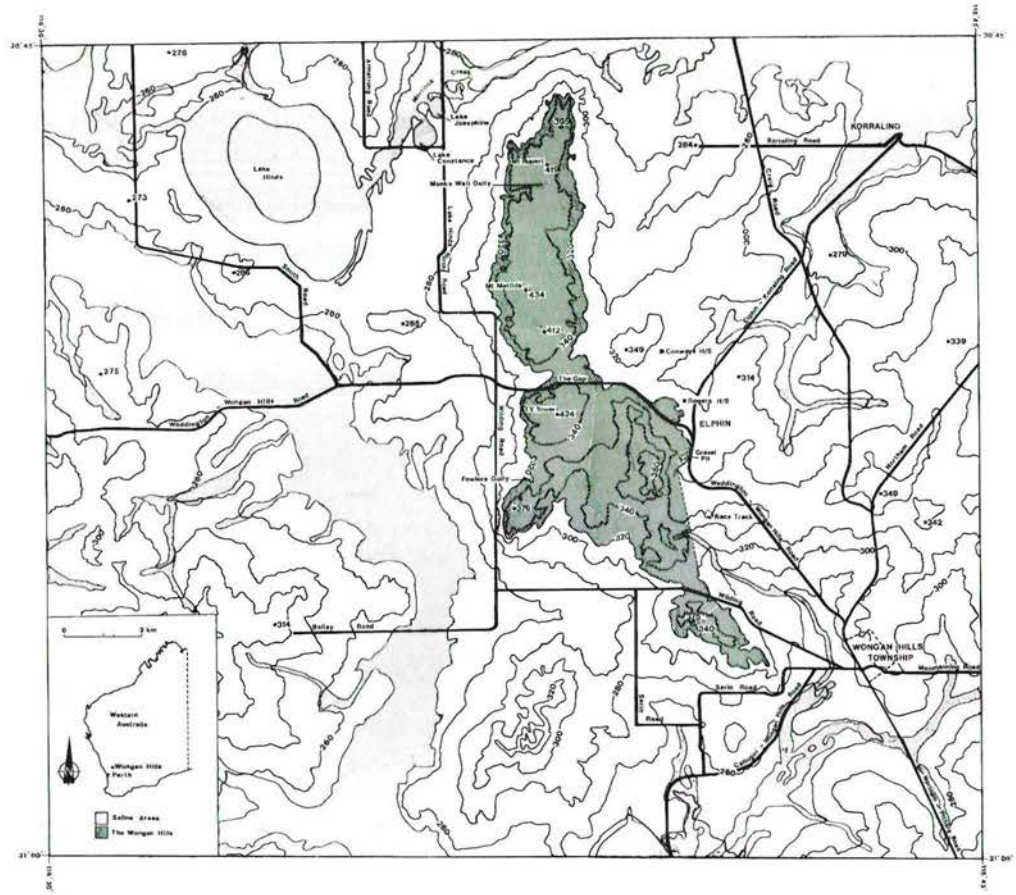

Figure 1. A topographic map delineating the Wongan Hills from the surrounding district.

A 320 m contour line was selected as a line best delineating the outcropping lateritised area from the surrounding sandplain. This accords with Roe's original concept of the Wongan Hills. However on the south-eastern boundary an arbitrary

line joining the 320 m contour line has been incorporated to exclude areas of sandplain which intrude over the laterite. The vegetation in this zone is transitional between sandplain and laterite. *The Wongan Hills* thus defined comprise a series of laterite-capped mesas generally trending north-south, dissected by numerous steep gullies in which exposures of greenstone and granite can be seen (Figure 1). They cover an area of 3 216 ha and are the largest single area of natural vegetation remaining in the northern wheatbelt.

The Wongan Hills District corresponds to the Guangan Vegetation System as defined by Beard (1979, 1980). It occupies all of the area shown in Figure 1 as far west as a line running roughly north and south through Lake Hinds. The District covering some 500 000 ha is characterized to a very large extent by residual sandplain of which yellow sand, often containing gravel, is the most common. The lateritised Wongan Hills support a vegetation system different to that of the Guangan System and thus form an enclave within that System (Beard, 1979).

Acknowledgements

The assistance of Brian Goodchild, Department of Lands and Surveys is gratefully acknowledged. Cheryl Lynch prepared Figure 1 based on topographic detail compiled from Department of Defence (Army) line compilations. Bruce Maslin and John Green read the manuscript and made valuable suggestions.

The continuing interest of the residents of the Wongan-Ballidu Shire and members of the W.A. Naturalists' Club, in supporting the natural history survey of the Wongan Hills, is gratefully acknowledged.

References

Beard, J. S. (1979). 'The vegetation of the Moora and Hill River areas Western Australia.' Map and Explanatory memoir 1:250 000 series. (Vegmap Publications: Perth.)

Beard, J. S. (1980). 'The vegetation of the Bencubbin area Western Australia.' Map and explanatory memoir 1:250 000 series. (Vegmap Publications: Perth.)

Kenneally, K. F. (Co-ordinator) (1977a). 'The Natural History of the Wongan Hills.' Handbook No. 11 (W.A. Naturalists' Club: Perth.)

Kenneally, K. F. (1977b). Narrative and environment of the Wongan Hills survey. In Kenneally (1977a).

Rye, B. L. (1980). Rare and geographically restricted plants of Western Australia. 4. Wongan Hills Species. Department of Fisheries & Wildlife, Perth (Unpub. report.)

A new species of *Eremophila* (Myoporaceae) endemic to the Wongan Hills, Western Australia

R. J. Chinnock

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Abstract

Chinnock, R. J. A new species of *Eremophila* (Myoporaceae) endemic to the Wongan Hills, Western Australia. Nuytsia 4 (1): 5-7 (1982). *Eremophila ternifolia* Chinnock is described and illustrated. This species is characterised by having leaves in whorls of 3 and fruit in which the two carpels are unequal and free in the upper half. The species is considered endangered, although it is established in cultivation.

Eremophila ternifolia Chinnock, sp. nov. (Figure 1)

Frutex humilis *ramis* complanatis in plano uno. *Folia* ternato-verticillata lanceolata vel elliptica acuta raro obtusa. *Sepala* 4 vel 5 linearia vel anguste triangularia. *Corolla* lilacina maculata purpurea pubescentia. *Fructus* manifeste rostratus, duo carpella inaequalia dimidio superiore libero.

Typus: Wongan Hills, SE of Mt Matilda, on Conway's property, 11 Dec. 1980, *B. R. Maslin* 4805, (holo: PERTH; iso: AD, CANB).

Low spreading *shrub* 0.3-0.5 x 0.5-0.7 m. *Branches* opposite, subopposite, or alternate, flattened into one plane, non-tuberculate, hirsute but with numerous shorter glandular hairs. *Leaves* sessile, in whorls of 3, the whorls alternate; lamina green above, often reddish-brown below and on the margins, lanceolate to elliptic, acute, broadly acute or rarely obtuse, entire, 6-11 x 2.7-4 mm, glabrous. *Flowers* solitary, sessile. *Sepals* 4 or 5 sometimes the 5th one vestigial, free almost to the base, linear to narrowly triangular, swollen and corky at the base, green to reddish-brown, becoming prominently veined at fruiting stage and curving over fruit, 3-4.6 x 0.5-1 (-1.3) mm, glandular-pubescent on both surfaces. *Corolla* to 10 mm long, lilac, the tube white below, spotted purple inside, pubescent outside, prominently bearded on the lowermost lobe inside extending down the tube; lobes obtuse. *Stamens* 4, included, but the anthers extending to the throat, glabrous; filaments pale lilac, stamens blue. *Ovary* ovoid, 1.2-1.5 x c. 1 mm, bilobed, bilocular with one ovule per loculus, pubescent; the hairs around the apex short glandular, those below longer, eglandular. *Fruit* dry, indehiscent, prominently beaked, the carpels unequal and free in the upper half, 2.3-3.2 x 2.2-2.8 mm, hirsute. *Seed* small, ovoid, pale yellowish-white, 1.8 x 0.6 mm.

Other specimens examined. WESTERN AUSTRALIA: Conways Farm in the Wongan Hills, *J. S. Beard* 8003 (PERTH); E side of the Wongan Hills behind Conways property "Dunmoor", 8 km N of township Wongan Hills, *K. F. Kenneally* 7532 (PERTH).

Distribution. Known only from the Wongan Hills, 8 km N of the township.

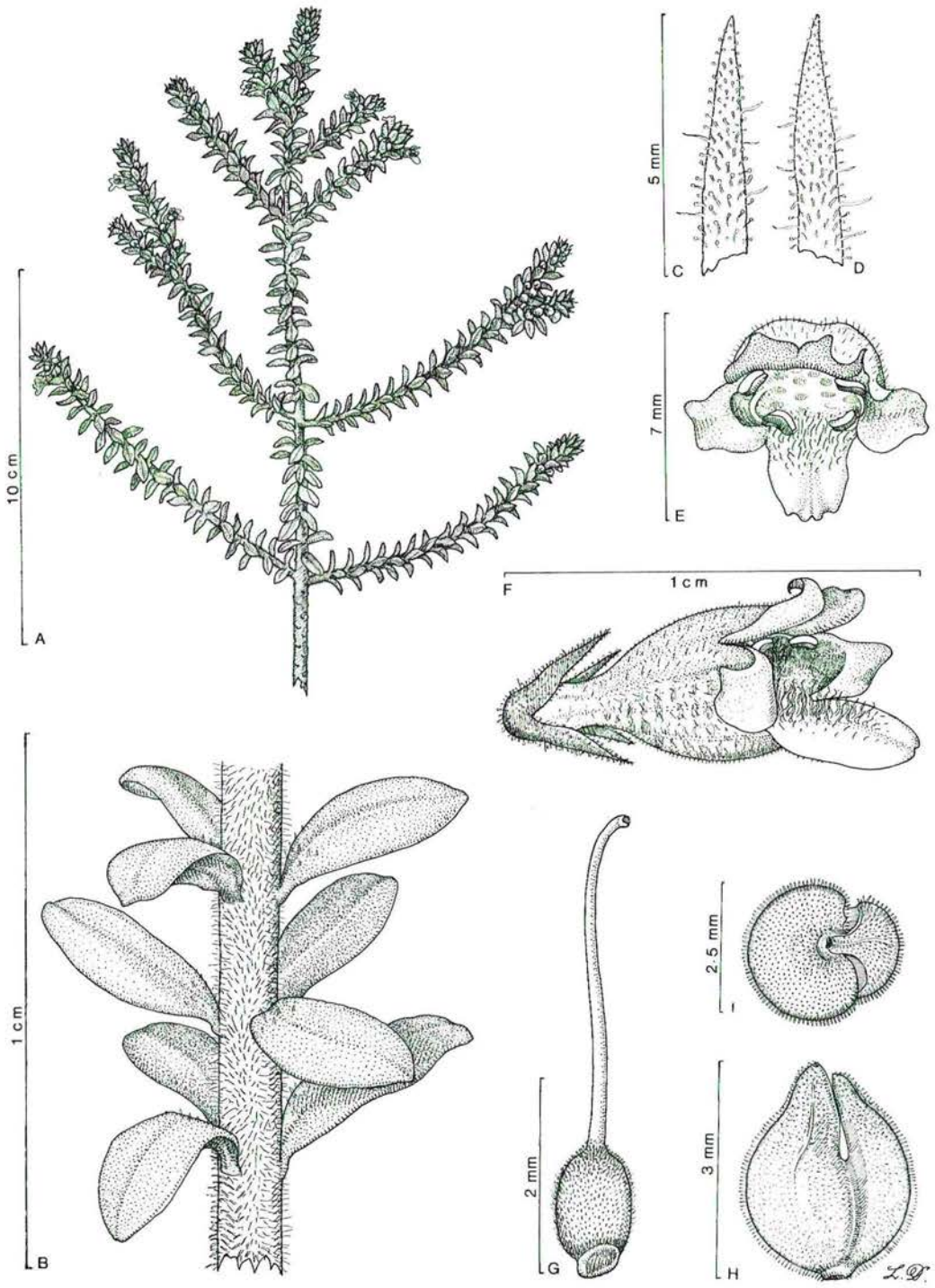

Figure 1. *Eremophila ternifolia*. A—Habit of major branch, branched in one plane. B—Portion of branch showing the ternate leaf arrangement. C and D—Outer and inner surface of sepal. E and F—front and side view of flower. G—Gynoecium. H and I—Side and top view of mature fruit. A—G from *Maslin* 4805 (Holotype); H—I from *Kenneally* 7532.

Ecology. Eremophila ternifolia is the second endemic *Eremophila* to be described from the Wongan Hills and like the other one, *E. sargentii* (S. Moore) Chinnock, it is extremely rare. Mr. K. F. Kenneally, who first found this species estimated that the total population consisted of approximately 70 plants. Both these species have a conservation status of 2V according to the Leigh, Briggs & Hartley (1981) classification for rare or threatened plants.

The species grows in *Eucalyptus longicornis/salubris* woodland with scattered mallees (*E. gracilis*) under a shrub layer of *Santalum acuminatum, Melaleuca adnata* and *Acacia orbifolia* on red clays between breakaways.

Affinities. Eremophila veronica is allied to *E. ternifolia* but differs in having small, densely spiral, linear subterete leaves which are flattened on the upper side and an ovoid fruit which is not split in the upper part.

Cultivation. Eremophila ternifolia has been established in cultivation in Adelaide from live material collected by Bruce Maslin. The species is easily obtained from cuttings and rooted plants can be obtained in 1 to 2 months with a 80-90 per cent success rate using a 1:1 peat/coarse sand medium.

Acknowledgements

I thank Kevin Kenneally and Bruce Maslin for collecting material and Ludwik Dutkiewicz for the illustration.

Reference

Leigh, J., Briggs, J. & Hartley, W. (1981). 'Rare or Threatened Australian Plants.' Australian National Parks and Wildlife Service Special Publication 7.

16559—(2)

Daviesia spiralis and *D. debilior* (Leguminosae:Papilionoideae), two new species occurring in the Wongan Hills, Western Australia

M.D. Crisp

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Abstract

Crisp, M.D. *Daviesia spiralis* and *D. debilior* (Leguminosae:Papilionoideae), two new species occurring in the Wongan Hills, Western Australia. Nuytsia 4 (1): 9-16 (1982). Two new species occurring in the Wongan Hills, Western Australia, are described and illustrated. *Daviesia spiralis* is endemic to the Hills and has twisted leaves which are unique in the genus. *Daviesia debilior* includes two subspecies and extends northward to Eneabba.

Daviesia spiralis Crisp, sp. nov. (Figure 1)

Ab omnibus speciebus *Daviesiae* foliis linearibus in spiram dextrorsum (externe visam) tortis facile dignoscenda. *Frutex* intricatus; *stipulae* adsunt; *racemi* floribus 1-2; *calyx* labio superno truncato emarginato; *carina* subulata inflexa, in dimidio superno supervolutiva.

Typus: 28 km from Piawaning along road to Wongan Hills town, 30°50'S, 116°39'E, 26 Jan. 1979, *M.D. Crisp* 5491, fl., fr., spirit material, photos (holo: CBG; iso: CBG, K, NSW, PERTH, US).

Intricate, rounded *shrub* to 1.5 m tall and broad; *branchlets* ribbed, muriculate. *Phyllodes* alternate, ascending, decurrent, linear, twisted into a right-handed spiral (as viewed externally), apically attenuate and uncinate, to 100 x 3 mm, much reduced towards branchlet apices, muriculate, with a central and two marginal ribs but no visible veins. *Stipules* minute, ≤ 0.5 mm long. *Racemes* 1-few per axil, 1-2-flowered; rhachis 2-8 mm long. *Pedicel* narrowly clavate, 5-18 mm long. *Calyx* campanulate, 4-4.5 mm long; upper two lobes united in a truncate emarginate lip; lower three lobes triangular, 1.5 mm long. *Standard* lamina transverse-broad-elliptic, emarginate, slightly cordate, 6.5-7.5 x 8-10 mm, with two parallel ridge-like callosities on either side of the centre line towards the base, yellow, the centre with a rich yellow, bilobed marking bordered with a red infusion; claw c. 1 mm long; *wings* irregularly obovate, pouched, shortly beaked, auriculate, reddish; claw c. 1.5 mm long; *keel* subulate, inflexed, supervolute in upper half, very acutely beaked, shallowly auriculate, reddish grading to maroon at apex; claw c. 1.5 mm long. *Stamens* almost uniform, inflexed; anthers ovoid, basifixed. *Ovary* subsessile, narrow-oblong; style inflexed; stigma capitate, minute. *Pod* compressed, obliquely half ovate, long acute, 10-13 x 4.5-5 mm; *seed* compressed, ovoid-elliptic, 3-4 x 2-2.5 mm, pale brown speckled with black; hilum lateral; aril conspicuous, c. 1.5 mm long.

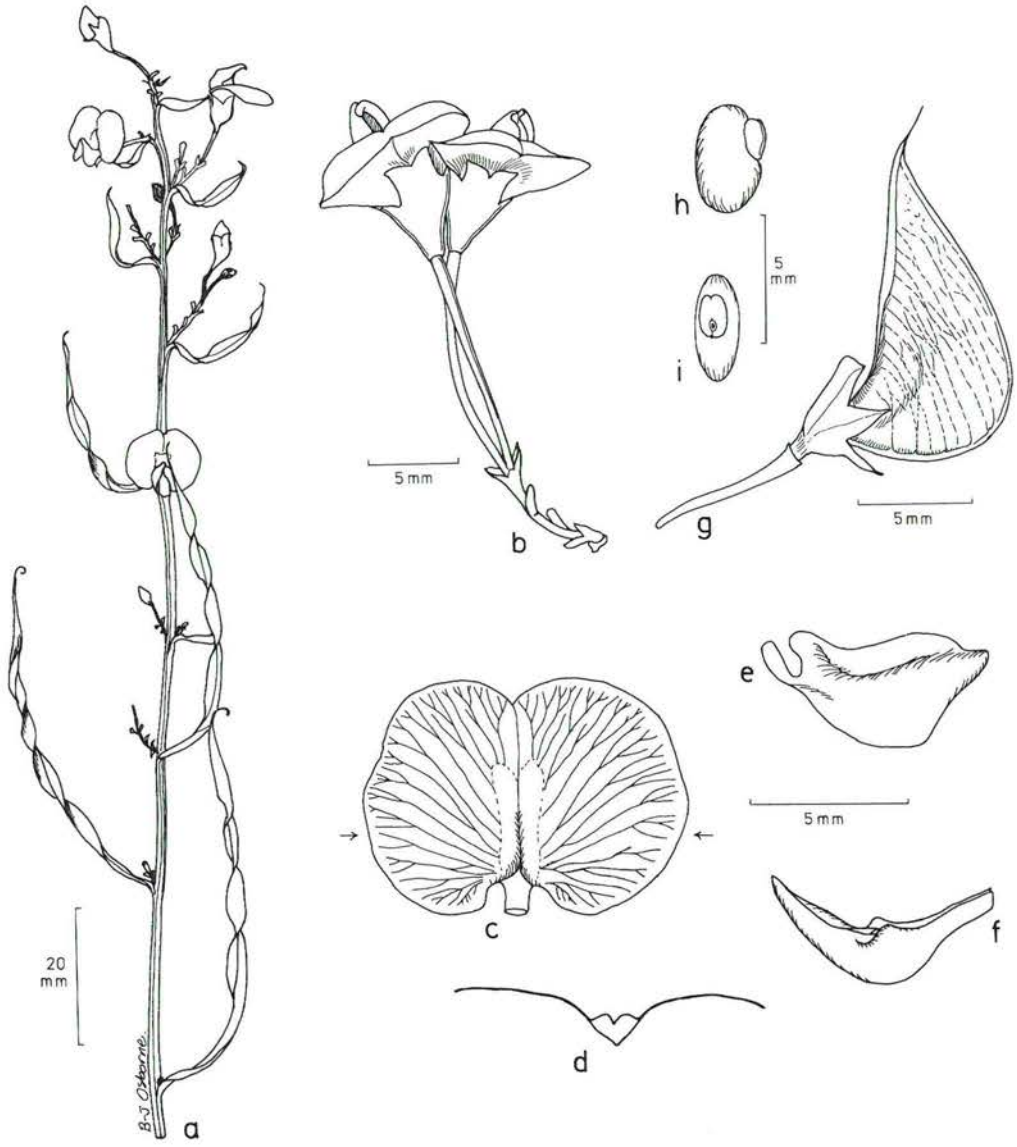

Figure 1. *Daviesia spiralis*. a—branchlet. b—inflorescence. c—standard. d—transection of standard in plane indicated by arrows on c. e—wing, claw at left. f—keel, claw at right. g—pod. h—seed, lateral view, radicular end downwards. i—seed, hilar view.

a from *K. F. Kenneally* 2303; b—i from the type, *M. D. Crisp* 5491. a, b and g drawn by B-J. Osborne.

Additional specimens examined. WESTERN AUSTRALIA: Laterite gully adjacent to Fowlers Gully, S end of Wongan Hills, 194 km N of Perth, *K. F. Kenneally* 2303 (PERTH); "The Gap" between Elphin Railway Siding and T. V. Translator Tower, Wongan Hills, 30°50′S, 116°40′E, *K. F. Kenneally* 7155 (PERTH).

Distribution. Western Australia, Avon district, endemic in the Wongan Hills. Within the Hills there are 500 or more plants scattered in four or more populations over a range of at least 10 km (B. Rye, personal communication).

Habitat. Daviesia spiralis appears to grow exclusively in laterite-derived clay and gravel. It is associated with mallee shrubland dominated by *Eucalyptus eudesmioides, E. ebbanoensis, E. drummondii* and *Casuarina campestris*, with *Dryandra comosa* and *D. pulchella* common. However, like many species of *Daviesia* it tends to be most numerous in openings in the vegetation, especially at the type locality, where it has invaded the road cutting (B. Rye, personal communication, partly). At the type locality, it is associated with the type population of *D. debilior* subsp. *sinuans* (q.v.).

Conservation status. Vulnerable, coded 3V (criteria from Leigh, Briggs & Hartley, 1981).

Flowering period. September to January. *Fruiting period.* December to February.

Affinity. Daviesia spiralis is a most distinctive species, apparently without close relatives within the genus. Apart from the twisting of the leaves, it is vegetatively similar to *D. elongata* Benth. and *D. costata* Cheel, but is quite different in floral morphology and inflorescence. The flowers, fruits, seed and to some extent, the inflorescence of *D. lancifolia* Turcz. resemble those of *D. spiralis*, but there is no similarity in vegetative morphology. Taken together, the spiral leaves, the presence of stipules, the 1-2-flowered racemes, the truncate emarginate upper calyx lip and the subulate inflexed supervolute keel readily distinguish *D. spiralis* from all other *Daviesia* species.

Etymology. The specific epithet is from the Latin word *spira*, for anything coiled, wreathed or twisted, and refers to the spirally twisted leaves.

Daviesia debilior Crisp, sp. nov. (Figure 2)

Frutex caulibus procumbentibus et ramulis ad 0.6 m debile adscendentibus; ramuli phyllodiaque prominenter costati; *phyllodia* in squamas ad nodos supernos vel in planta omni deminuta, angulata compressa vel versus basin caulium complanata, inermia; *bracteae* magnae, conchatae, imbricatae, alabastra includentes; *calyx* lobis supernis binis fere ad apicem connatis; *legumen* oblique transversum-latum-obtriangulare, sutura inferna integra. Ad *D. hakeoidem* Meisn. et *D. junceam* Sm. arte cognata.

Typus: 13 km S of Eneabba-Lake Indoon road, from 7 km SW of Eneabba, 29°57'S, 115°12'E, 19 June 1977, *C. Chapman* (21B)77, fl. (holo: CBG; iso: K, PERTH).

Shrub with procumbent stems and many weakly ascending branchlets, to 0.6 m tall x 1.5 m broad; *branchlets* angular, 1-2 mm diam., prominently ribbed, even when fresh. *Juvenile phyllodes* flat but thick, narrowly spathulate, 20-50 x 4-8 mm, with midrib, thickened margins, and many ascending anastomosing raised veins; *intermediate phyllodes* longer and narrower than juveniles, usually present at base of mature plants. *Adult phyllodes* alternate, decurrent, reduced to minute scales at upper few nodes or over the entire plant, ascending, angular or compressed, linear, mucronate, unarmed, 0-120 x 0.4-2 mm, with several prominent ribs. *Stipules* minute or absent. *Racemes* 1 per axil, 2-4-flowered, very condensed; rhachis to 2 mm long; bracts numerous, shell-shaped, large, imbricate, enclosing buds, striate; bracts subtending pedicels spreading, obovate, tridentate, c. 3 x c. 2 m. *Pedicel* filiform, 1-3 mm long. *Calyx* obconical to campanulate, 1.5-2 mm long; upper two lobes more or less united

or with a very shallow sinus; lower three lobes triangular, acute, 0.2-0.4 mm long. *Standard* transverse-broad-elliptic, emarginate, cordate, deeply centrally grooved, 5-5.5 x 6-6.5 mm on a 1.5 mm claw, yellow infused with purple-black or red towards the centre and with a vertical yellow line towards the base in front, deep orange-pink to purple behind; *wings* obovate, auriculate, clawed, apically incurved, orange-pink; *keel* semicircular, falcate, with a long narrow pouch, acute, slightly auricled, clawed, dark purple-red. *Stamens* with filaments equal, incurved; anthers basifixed, alternately globular and narrow-ovoid. *Ovary* broadly stipitate; style subulate, inflexed. *Pod* strongly compressed, obliquely transverse-broad-obtriangular, shortly acuminate, 14-17 x 9-10 mm; *seed* compressed, ovoid, 3.5 x 2.5 mm, tan with obscure grey markings; hilum lateral; aril thickly lobed, 1.75 mm long.

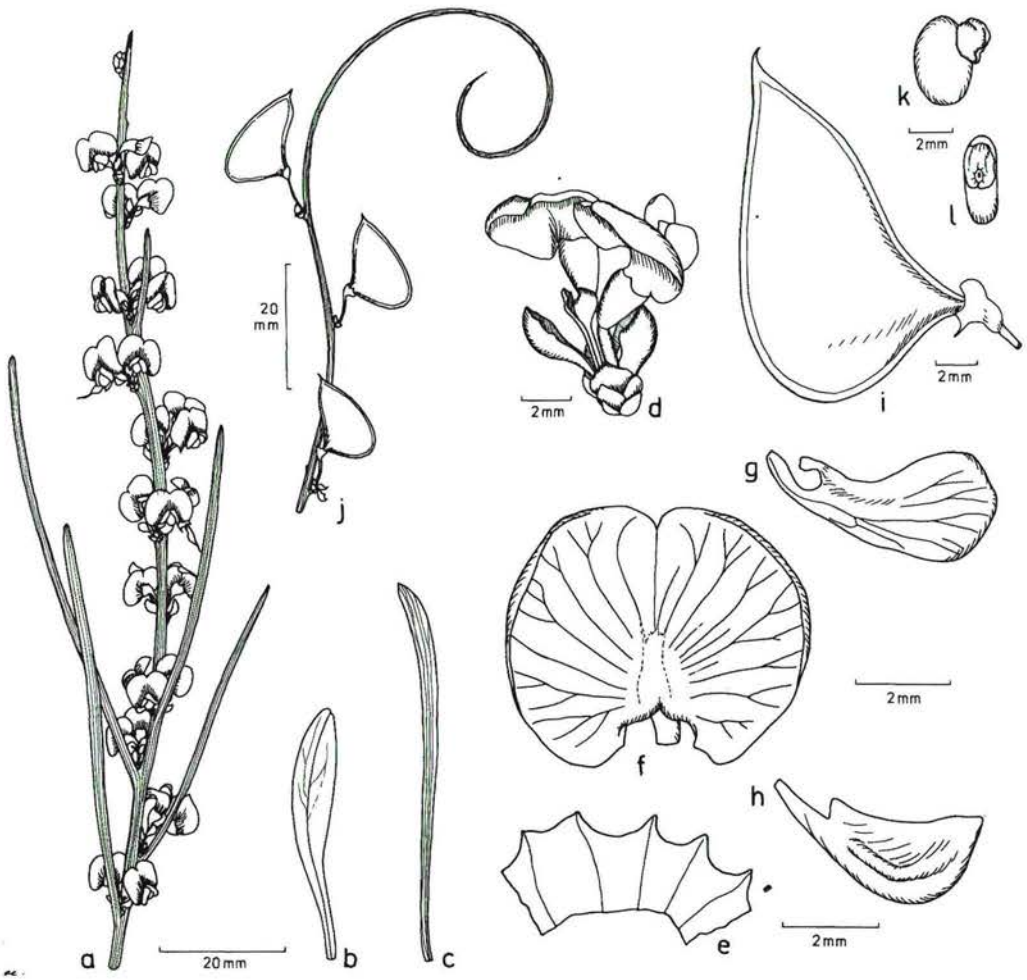

Figure 2. *Daviesia debilior* subsp. *debilior* (a-i). a—branchlet. b—juvenile phyllode. c—intermediate phyllode. d—inflorescence. e—calyx opened out, upper lobes at left. f—standard. g—wing. h—keel. i—pod. *D. debilior* subsp. *sinuans* (j-l). j—branchlet. k—seed, lateral view, radicular end downwards. l—seed, hilar view.

a from the type, *C. Chapman* (21B)77; b—h from *C. Chapman* s.n., 17 May 1979 (CBG 8004030); i from *C. Chapman* (66)77; j from *E. H. Ising* s.n., 10 Sep. 1926 (AD 97622028); k and l from *H. Demarz* 1854 (Kings Park). a-d, i and j drawn by A. Prowse.

Etymology. The epithet is the comparative degree of the Latin adjective *debilis,* meaning weak, and refers to the relatively feeble habit and unarmed phyllodes, which distinguish the new species from its near relative *D. hakeoides.*

Affinity. Daviesia debilior belongs to an endemic Western Australian group with numerous moderately enlarged imbricate bracts and frequently leafless branchlets. This group is not to be confused with *Daviesia* series Involucratae (Endl.) Benth. in which the bracts are few, enormous and leaf-like. There are several undescribed species in the *D. debilior* group but most of these are easily distinguished. All but one of the species in the group have a more erect, stronger habit than *D. debilior. D. hakeoides* Meisn. and *D. juncea* Sm. non (Schrad. et Wendl.) Pers. are the only close relatives of *D. debilior* which have been previously described.

Daviesia hakeoides is easily recognized by its pungent phyllodes. Specimens of *D. hakeoides* var. *subnuda* Benth. may appear leafless, but they always have some pungent phyllodes at least 2-3 mm long, which is immediately obvious when a finger is run down the branchlet. *Daviesia hakeoides* also differs from *D. debilior* in having pods which are prominently beaked because the lower suture is indented near the apex. In *D. debilior* subsp. *debilior* (q.v.) there is an abrupt transition from fully developed phyllodes to minute scale leaves part-way up the branchlet (Figure 2a). By contrast, the phyllodes of *D. hakeoides* var. *hakeoides* reduce gradually all the way up the branchlet, this being the typical condition in the genus.

Daviesia juncea and a closely related undescribed species are leafless like *D. debilior* subsp. *sinuans* (q.v.), but both differ from it in having larger flowers (standard lamina 6.5-8 mm long, calyx 2.5-3 mm long), differently shaped calyces, and branchlets which are more terete and striate than angular and ribbed.

Daviesia debilior includes two morphological variants which, because they have parapatric distributions, are best treated as subspecies.

Key to subspecies

1. Phyllodes present at least on lower parts of branchlets . . . . . subsp. *debilior*
   Phyllodes all reduced to minute scales . . . . . subsp. *sinuans*

subsp. **debilior** (Figure 2 a-i)

Branchlets gently upcurved, not or slightly sinuous, not glaucous; *phyllodes* developed, except towards branchlet apices where they are abruptly reduced to minute scales, angular or compressed, linear, up to 120 x 2 mm, prominently many-ribbed.

Specimens selected from 15 examined. WESTERN AUSTRALIA: **Irwin district**: 60 km from Three Springs on road to Eneabba, c. 2 km E of Eneabba, 29°48′S, 115°18′E, *C. Chapman* (16)77 (CBG, PERTH); 2 km SW of Eneabba, 29°50′S, 115°15′E, *M. D. Crisp* 5451 (CBG, MEL); 13 km S of Eneabba-Lake Indoon road, from 7 km SW of Eneabba, 29°57′S, 115°12′E, *C. Chapman* (21)77 (AD, CBG); ibid., *C. Chapman* (21C)77 (CBG, NSW); ibid., *C. Chapman* (22)77 (CBG, US); ibid., *C. Chapman* (66)77 (CBG, PERTH); 9.2 km N of Coorow-Green Head road along Eneabba south road, 30°00′S, 115°12′E, 17 May 1979, *C. Chapman* s.n. (CBG 8004030, MEL, PERTH). **Darling district**: Wannamal, 31°10′S, 116°03′E, *B. C. Crisp* 483 (CBG); Darlington, Darling Range, 19 July 1902, *A. Morrison* s.n. (E, PERTH).

Distribution (Figure 3). Western Australia, Irwin and Darling districts; mainly localised around Eneabba, also at Wannamal on the Geraldton Highway and at Darlington near Perth.

Habitat. Subspecies *debilior* usually grows in shallow sand overlying lateritic gravel and clay, although one collection was taken from gravelly clay with no sand. The vegetation is heath, and there are usually several other *Daviesia* species present.

Flowering period. May to July. *Fruiting period.* September.

Conservation status. Vulnerable, coded 3V (criteria from Leigh, Briggs & Hartley, 1981). Although the subspecies is locally common in its occurrences around Eneabba, all the sites are mere roadside relicts of the originally extensive heathland. Its extent at the two southern localities is unknown, but is unlikely to be great, because only one specimen has been obtained from each of these well-collected areas.

subsp. **sinuans** Crisp, subsp. nov. (Figure 2 j-l)

Ramuli sinuantes, ad apicem gracillimi (c. 0.5 mm diam.) interdum crispi, aliquando glaucescentes; *phylldia* omnino in squamas redacta.

Branchlets very weakly ascending, becoming sinuous, occasionally glaucescent, the tips usually very slender (c. 0.5 mm diam.) and occasionally curled; *phyllodes* all reduced to scales.

Typus: 9 km from Wongan Hills town along road to Piawaning, 30°49′S, 116°39′E, 17 July 1980, *M. D. Crisp* 6518, fl., fr., spirit material, photos (holo: CBG; iso: AD, K, L, MEL, NSW, PERTH).

Specimens selected from 15 seen. WESTERN AUSTRALIA: **Avon district**: Coorow, 29°53′S, 116°01′E, *B.C. Crisp* 490 (CBG, PERTH); Walebing [*ut* Whalebing], *A.M. Ashby* 5148 (AD, CBG); Lake Hinds [*ut* Hines], Wongan Hills, 10 Sep. 1926, *E.H. Ising* s.n. (AD 97622028). **Darling district**: Mogumber, Moore River, 12 Nov. 1906, *A. Morrison* s.n. (AD, K, MEL); 65 mile peg, Great Northern Highway, *H. Demarz* 1854 (Kings Park Botanic Garden, Perth).

Distribution. (Figure 3) Western Australia, Avon and Darling districts; from Coorow south to the Moore River and east to Wongan Hills. This subspecies occurs farther inland than subsp. *debilior.*

Habitat. Subspecies *sinuans* appears always to grow on gravelly lateritic clay. Its type locality is also the type locality of *D. spiralis* (q.v.), and the site is described under that species.

Flowering period. May to July. *Fruiting period.* October to November.

Conservation status. Vulnerable, coded 3V (criteria from Leigh, Briggs & Hartley, 1981). Of the six known occurrences of *D. debilior* subsp. *sinuans*, I am familiar only with the type locality. There it is locally common, but perhaps less abundant than *D. spiralis.* This subspecies also appears to be restricted to relict roadside vegetation in otherwise cleared wheat-farming country.

Morphological note. The specimen *B. C. Crisp* 483 has been included under *D. debilior* subsp. *debilior*, but shows some tendency towards subsp. *sinuans*. The branchlets have longer leafless terminal portions than is usual for subsp. *debilior*. In fact, one branchlet has the phyllodes reduced to scales along its entire 30 cm length. In addition, this branchlet is strongly upcurved and almost sinuous. The specimen is from Wannamal, close to localities of subsp. *sinuans* and farther inland than the other localities of subsp. *debilior* (Figure 3).

Etymology. The subspecific epithet refers to the tendency of the branchlets to undulate, and is derived from the Latin verb *sinuo*, meaning bend, curve or wind.

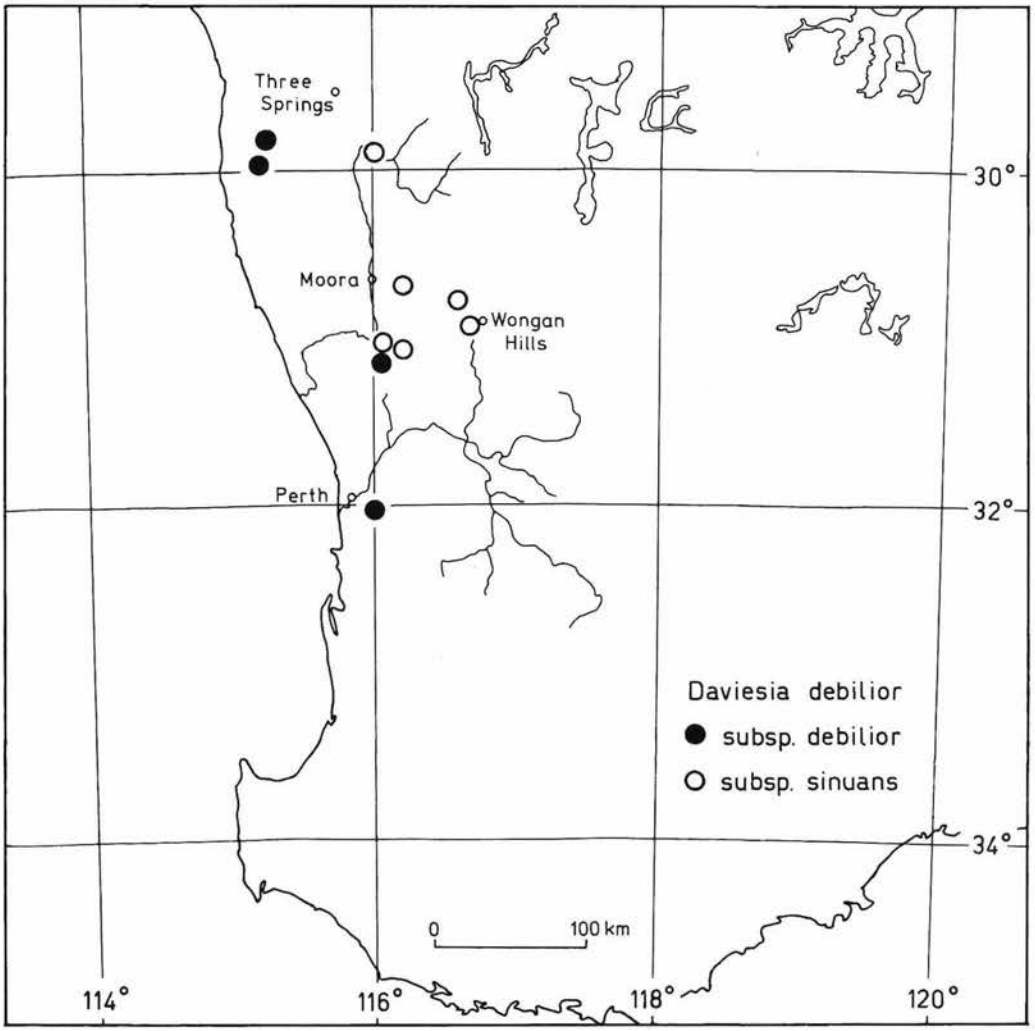

Figure 3. Distribution of *Daviesia debilior* subsp. *debilior* and subsp. *sinuans*.

Acknowledgements

This work forms part of a taxonomic revision of the genus *Daviesia* and was assisted by several staff members of the National Botanic Gardens, Canberra. The field work was supported, in part, by a grant from the World Wildlife Fund,

Australia. The illustrations were partly funded by the Bureau of Flora and Fauna, and I thank Betsy Osborne and Anne Prowse for doing the drawings. I am especially grateful to Mr Charles Chapman for his energetic field work, accurate observations, and for his hospitality.

Reference

Leigh, J. H., Briggs, J. D. & Hartley, W. (1981). 'Rare or Threatened Australian Plants.' Australian National Parks and Wildlife Service Special Publication 7.

A new species of *Conostylis* (Haemodoraceae) from the Wongan Hills district, Western Australia

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Abstract

Hopper, Stephen D. A new species of *Conostylis* (Haemodoraceae) from the Wongan Hills district, Western Australia. Nuytsia 4(1): 17-21 (1982). *Conostylis wonganensis* Hopper is described and illustrated. It is a rare endemic of the Wongan Hills district allied to *C. teretiuscula* F. Muell., *C. dielsii* W. V. Fitzg. and *C. caricina* Lindl.

Introduction

The Wongan Hills contain one of the few moderately large vestiges of uncleared land in the central wheatbelt of Western Australia. They have outstanding conservation values (Kenneally, 1977; Rye, 1980), but are potentially threatened by mining and agricultural activities.

The following rare *Conostylis* is described as an addition to several accompanying papers in this issue of Nuytsia that name plants endemic to the Wongan Hills district.

Conostylis wonganensis Hopper, sp. nov. (Figure 1)

Differt a *C. teretiuscula* F. Muell. foliis glabris praeter spinos parvos marginis dense pubescentes, ovula pauca in quoque loculo marginem inferiorem placentae affixa, Differt a *C. dielsii* W. V. Fitzg. foliorum basibus glabris, caulibus florentibus foliis minus quam triplo brevioribus.

Differs from *C. teretiuscula* F. Muell. in the leaves being glabrous except for small densely pubescent marginal spines and in the few ovules per locule that are attached on the lower side of the placenta. Differs from *C. dielsii* W. V. Fitzg. in the glabrous leaf bases and in the flowering stems less than a third the length of the leaves.

Typus: 4.4 km NW of Wongan Hills town on road to Piawaning, 23 August 1976, *S. D. Hopper* 427 per *D. Coates* (holo: PERTH; iso: AD, CANB, NSW).

Perennial herb, caespitose, small (to 20 cm tall by 10 cm basal diameter); rhizome and stems short, bearing numerous crowded leaves and wiry roots 30 cm or more long. *Leaves* to 17 cm long and 0.9 mm in diameter, erect, thin, terete, sulcate, pale green except for their yellow-brown equitant bases, glabrous except for small densely pubescent spines evenly spaced along the margins. *Scape* tomentose, 1-3 cm high, less than a third the length of the leaves, 0.5-1.0 mm in diameter, bearing less than

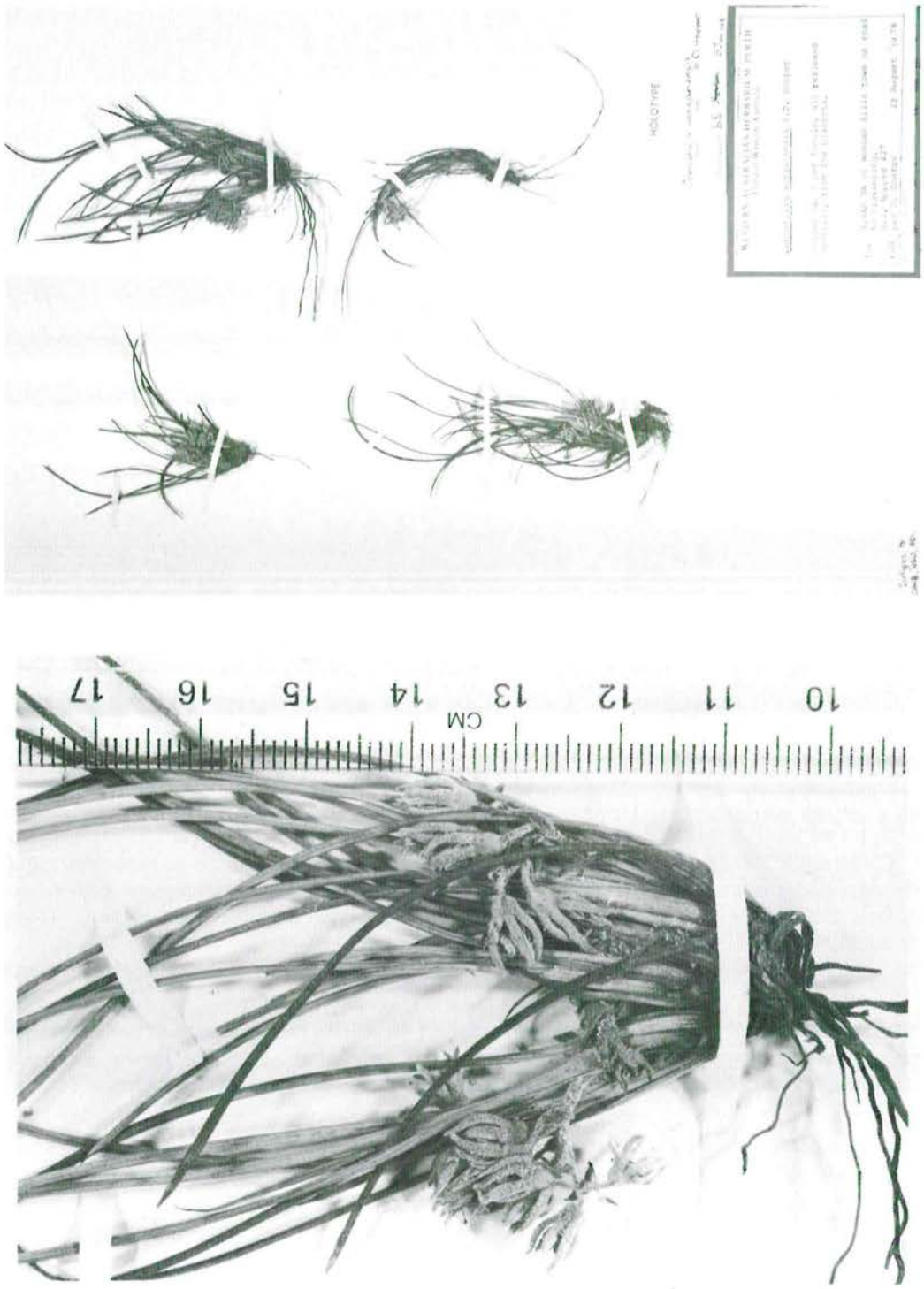

Figure 1. *Conostylis wonganensis*. Top—holotype sheet *(S. D. Hopper* 427 per *D. Coates)*. Bottom—enlargement of upper right hand specimen on the holotype sheet.

10 flowers. *Flowers* creamy yellow, densely tomentose on all surfaces; *perianth* (5-)6(-8) mm long; *perianth lobes* (3-)4.4(-6) mm long, 1.4-2.1 mm broad at the base and splayed at right angles to the tube when fresh; *stamens* uniseriate, inserted 0.6-1.6 mm above the ovary on the perianth wall, filaments 0.5-0.9 mm long, anthers 1.8-3.2 mm long; *style* 3.3-6.9 mm long, the trilobate stigma held 2-3 mm above the anthers; *placenta* with up to 5 ovules per locule, ovules all attached on the lower placental surface. *Seeds* not seen.

Distribution. The south-west of Western Australia; known only from near Wongan Hills and Manmanning.

Habitat. Occurs as scattered plants in species-rich heath with emergent *Eucalyptus pyriformis* mallees and favouring yellow sand over clay or laterite on gradual slopes high in the landscape.

Flowering season. Commences late July, peaks in August and finishes in early September.

Other specimens examined (all housed at PERTH). WESTERN AUSTRALIA: Wongan Hills, July 1963, *Y. Chadwick* 399; 4.2 km (2.6 mi) NW of Wongan Hills towards Piawaning, 30°52'S, 116°41'E, 27 August 1976, *R. Coveny* 7808 and *B. R. Maslin* (duplicate ex NSW); Smith's farm ± 2 km SW of Manmanning, 31 August 1976, *A. S. George s.n.*; about 3 km NW of Wongan Hills township along road to Piawaning, 29 May 1978, *S. D. Hopper* 893; 3.6 km NW of Wongan Hills along road to Piawaning, 30°52'S, 116°41'E, 1 September 1978, *S. D. Hopper* 1108.

Etymology. The species is named after the Wongan Hills district to which it is endemic. It has the most restricted geographical distribution of any named *Conostylis*. Hence a geographical reference in the specific epithet seems appropriate.

The affinities of this species are with *Conostylis teretiuscula* F. Muell., *C. dielsii* W. V. Fitzg. and *C. caricina* Lindl. (cf Green 1961). The four species now recognised in this group all have distinctive creamy-yellow or cream flowers. Qualitative and quantitative differences between these species are given in Table 1. The terete leaves with glabrous bases and very small pubescent spines scattered along the margins are diagnostic features of *C. wonganensis* easiest to perceive. It also has flowers that are noticeably smaller than those of its relatives.

The oldest known specimen of *C. wonganensis* was collected by Y. Chadwick in July 1963. The species was not collected again until 1976, when specimens were obtained in the same month independently by D. J. Coates (23 August—holotype), R. Coveny and B. R. Maslin (27 August), and A. S. George (31 August). The distribution represented by these collections has not been extended subsequently, despite fairly intensive field work in the area undertaken by the author since 1978. Further surveys for *C. wonganensis* are needed before a sound understanding of its conservation status is at hand, but it seems probable that the species is, indeed, a very rare endemic of the Wongan Hills-Manmanning area. One of the known populations extends partly into a Nature Reserve, while the other occurs in uncleared tall heath surrounding a farm house on private land.

TABLE 1. A comparison of qualitative and quantitative character differences between *Conostylis wonganensis* and related species.

Character*	*C. wonganensis*	*C. teretiuscula*	*C. dielsii*	*C. caricina*
1. Ovule position	lower placenta	lower and lateral placenta	lower placenta	entire placenta
2. No. ovules/locule	5	15-20	5	20
3. Leaf shape	terete	terete, occasionally flat	flat-terete	flat
4. Leaf bases	glabrous	glabrous	densely tomentose	glabrous
5. Leaf indumentum	minute pubescent marginal spines	densely to sparsely tomentose with elongate hairs	sparsely tomentose with elongate hairs	glabrous
6. Maximum leaf length (mm) mean ± SE (N) range	112.5 ± 12.3 (8) 75-140	17.9 ± 14.8 (20) 98-380	114.2 ± 5.9 (16) 72-155	158.2 ± 8.5 (20) 76-215
7. Leaf width (mm) mean ± SE (N) range	0.7 ± 0.04 (8) 0.6.-0.9	1.0 ± 0.06 (20) 0.5-1.6	1.2 ± 0.7 (16) 0.8-1.8	2.5 ± 0.2 (20) 0.9-5.3
8. Leaf thickness (mm) mean ± SE (N) range	0.6 ± 0.03 (8) 0.5-0.7	0.6 ± 0.04 (20) 0.3-0.9	0.4 ± 0.03 (16) 0.2-0.7	0.9 ± 0.1 (13) 0.4-1.2
9. Stem length (mm) mean ± SE (N) range	11.3 ± 2.0 (8) 6-25	56.9 ± 4.3 (20) 28-98	69.0 ± 5.9 (16) 22-103	50.5 ± 6.0 (20) 18-123
10. Perianth length (mm) mean ± SE (N) range	6.0 ± 0.3 (13) 4.7-7.8	9.5 ± 0.2 (30) 7.4-11.4	8.5 ± 0.2 (10) 7.5-10.0	12.1 ± 0.3 (10) 10.5-13.4
11. Style length (mm) mean ± SE (N) range	4.3 ± 0.2 (13) 3.3-6.9	7.1 ± 0.1 (30) 5.9-8.5	7.4 ± 0.2 (10) 6.2-8.6	8.2 ± 0.3 (10) 7.2-9.5
12. Anther length (mm) mean ± SE (N) range	2.4 ± 0.1 (13) 1.8-3.2	3.7 ± 0.1 (30) 2.8-4.7	3.3 ± 0.0 (10) 2.8-3.7	5.0 ± 0.2 (10) 4.3-5.7
13. Filament length (mm) mean ± SE (N) range	0.6 ± 0.1 (13) 0.2-1.1	0.9 ± 0.1 (30) 0.5-1.5	0.1 ± 0.2 (10) 0.0-0.7	3.1 ± 0.1 (10) 0.1-0.9
14. Height above ovary to filaments (mm) mean ± SE (N) range	1.1 ± 0.0 (13) 0.6-1.6	1.6 ± 0.0 (30) 0.9-2.3	2.6 ± 0.1 (10) 2.0-4.3	3.7 ± 0.2 (10) 2.7-4.7
15. Perianth lobe length (mm) mean ± SE (N) range	4.4 ± 0.2 (13) 3.1-5.7	7.5 ± 0.1 (30) 5.8-8.9	5.0 ± 0.1 (10) 4.0-5.9	7.9 ± 0.2 (10) 6.6-9.0
16. Lobe basal width (mm) mean ± SE (N) range	1.7 ± 0.0 (13) 1.4-2.1	1.9 ± 0.0 (30) 1.6-2.2	1.8 ± 0.0 (10) 1.4-2.2	2.8 ± 0.2 (10) 2.1-3.2

*Characters 1-9 were measured on the following specimens at PERTH (SE = standard error, N = sample size):

C. wonganensis—*Chadwick, Y.* 399; *Coveny, R.* 7808; *George, A. S.* s.n.; *Hopper, S. D.* 427, 1108.

C. teretiuscula—*Beard, J. S.* 1640; *Blackall, W. E.* 3613, 4423; *George, A. S.* 7842; *Hartley, G.* 13941; *Hopper, S. D.* 441, 442, 443, 628, 638, 639, 641, 643, 644, 645, 647, 653; *Morrison,* s.n.; *Salisbury,* s.n.

C. dielsii—*Ashby, A. M.* 3279; *Diels, L.* B122, s.n.; *Hopper, S. D.* 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440.

C. caricina—*Blackall, W. E.* s.n.; *Canning, E.* 3732; *Cranfield, R.* s.n.; *Fairall, A.* 316; *George, A.* 14338; *Green, J. W.* 486, 489, 587; *Hopper, S. D.* 370, 371, 372, 373, 888, s.n.; *Koch, M.* 1698; *Paust, S.* 1002; *Roster, S.* 328; *Royce, R.* 3834, 4316; *Scrymgeour, E.* 2083.

Characters 10-16 were measured on fresh flowers preserved in F.A.A. from the following localities:

C. wonganensis—Wongan Hills, voucher *S. D. Hopper* 427 (PERTH); *C. teretiuscula*—Mimegarra, voucher *S. D. Hopper* (PERTH); *C. dielsii*—W of Arrino, voucher *S. D. Hopper* 436 (PERTH); *C. caricina*—Parkerville, voucher *S. D. Hopper* 373 (PERTH).

There is no information yet available on the reproductive biology of *C. wonganensis,* other than its flowering period which extends from late July to early September. Further work in this area, particularly in relation to fire responses, may facilitate successful management of the species on the Nature Reserve at Wongan Hills.

Acknowledgements

I am grateful to Dr D. J. Coates for drawing my attention to the new species, to Mr B. R. Maslin for commenting on the manuscript and to Mr P. G. Wilson for providing the latin diagnosis. Dr J. W. Green kindly made available facilities at the Western Australian Herbarium. The project was funded by the Western Australian Department of Fisheries and Wildlife. Mr T. J. Fetherstonhaugh measured specimens for the data in Table 1.

References

Green, J. W. (1961). The genus *Conostylis* R. Br. II. Taxonomy. Proc. Linn. Soc. N.S.W. 85: 334-373.

Kenneally K. F. (Co-ordinator) (1977). 'The Natural History of the Wongan Hills.' Handbook No. 11 (W.A. Naturalists' Club: Perth.)

Rye, B. L. (1980). Wongan Hills species. Rare and Geographically Restricted Plants of Western Australia. 4. West. Aust. Dept Fish. Wildl. Unpublished Rept.

A new species of *Microcorys* (Lamiaceae) from the Wongan Hills, Western Australia

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Abstract

Kenneally, Kevin F. A new species of *Microcorys* (Lamiaceae) from the Wongan Hills, Western Australia. Nuytsia 4(1): 23-27 (1982). A new species *Microcorys eremophiloides* Kenneally (Lamiaceae), is described and illustrated from the Wongan Hills, Western Australia where it appears to be endemic. It was formerly incorrectly referred to *M. longifolia* (Bebtg.) Benth,

Introduction

The genus *Microcorys* R.Br. (Lamiaceae) is endemic to the south-west of Western Australia. Two species, *M. ericifolia* Benth. and *M. longifolia* (Benth.) Benth., are recorded for the Wongan Hills (Kenneally, 1977). An examination of type material at the Royal Botanic Gardens, Kew, England, has revealed that the species from the Wongan Hills, formerly referred to *M. longifolia,* is a distinct taxon. It requires describing in order to provide a name for the purpose of flora protection and to validate its inclusion in an updated flora list for the Hills.

Taxonomy

Microcorys eremophiloides Kenneally, sp. nov. (Figures 1 and 2)

M. longifolia (Benth.) Benth. affinis sed floribus duplo longioribus, corollae labio superiore labio inferiore multo longiore etiam lobis labii inferioris acutis (haud obtusis).

Typus: Eastern Edge of the Wongan Hills (c. 30°50′S 116°40′E), W of Conway's property "Dunmoor", approx. 15 km N of township of Wongan Hills, Western Australia, 27 October 1980, *K. F. Kenneally* 7497 (holo: PERTH; iso: AD, CANB, K, MEL, NSW, NY, PERTH).

Erect, openly-branched *shrub* to 2 m high. *Stems* with slightly fissured bark when young, becoming deeply fissured and corky with age. *Branches* and young shoots hoary with a minute tomentum. *Leaves* opposite, often crowded towards the ends of the terminal branchlets, linear, 30-60 x 1-3 mm, sessile, obtuse, with revolute margins, minutely scabrous above becoming glabrous with age, hoary or white tomentose underneath. *Flowers* axillary. *Pedicels* slender, sigmoid, 1 cm long, with a pair of linear-subulate bracteoles 3 mm long, 3 mm below the calyx. *Calyx* narrow-cylindrical, ca 10-15 mm long, puberulous with a mixture of glandular and simple hairs; *teeth* lanceolate, equal to or shorter than the tube, the uppermost tooth usually larger than the others. *Corolla* 4 cm long, deep pink to red, slightly glandular-pubescent; *tube* exserted, cylindrical, somewhat dilated upward; *upper lip* narrow,

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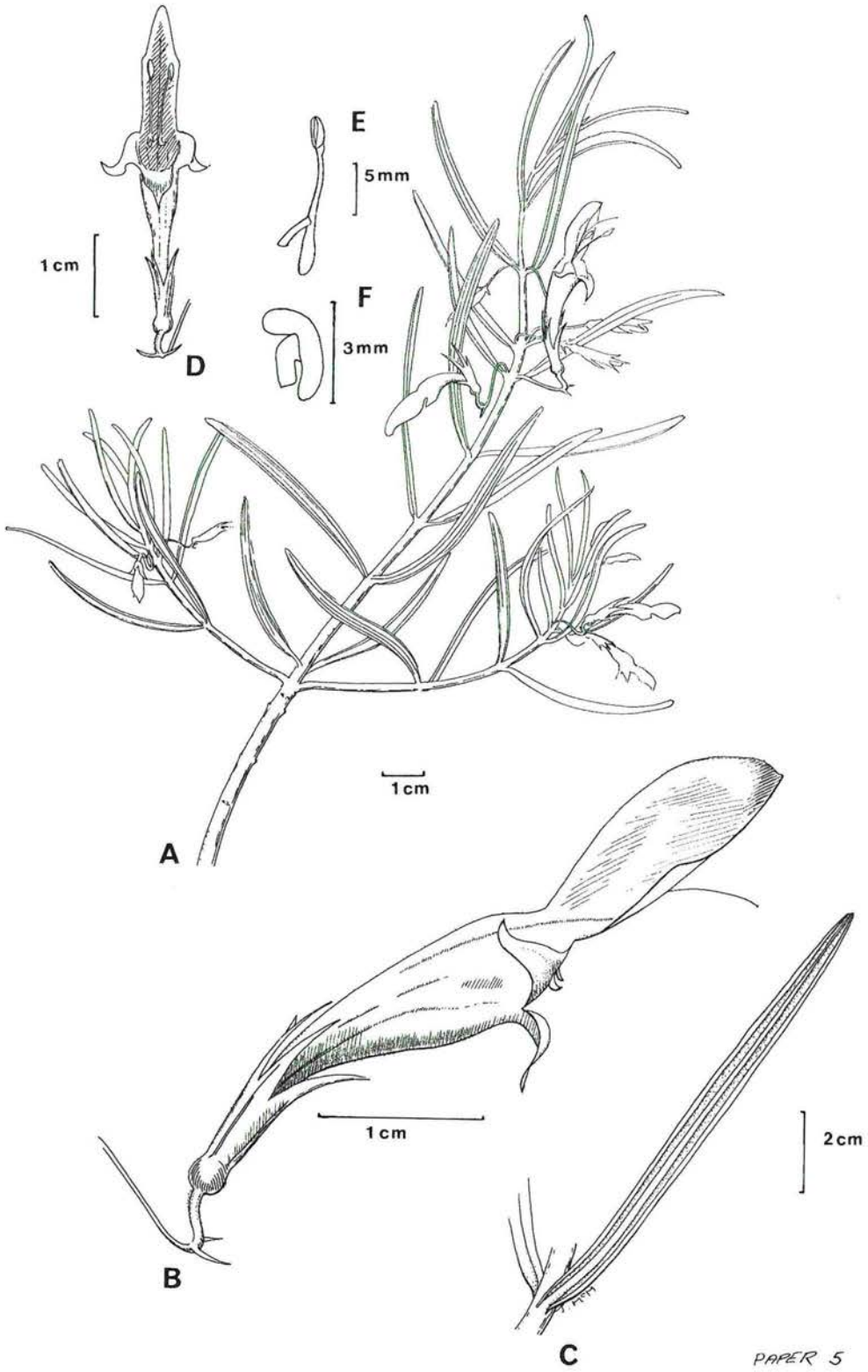

Figure 1. *Microcorys eremophiloides*. A—habit. B—flower. C—leaf (abaxial view). D—flower (abaxial view). E—upper stamen. F—lower stamen. From the holotype *(Kenneally* 7497).

concave, slightly emarginate, somewhat shorter than the tube; *lower lip* much shorter than the upper lip, spreading, with three acute, entire lobes. *Stamens* four, included; *upper stamens* with one large fertile cell, lower end of connective 5 mm long and dilated at the end but scarcely bearded; *lower stamens* with two linear sterile lobes. *Nutlets* dry, cylindrical, 3-4 mm long, irregularly ribbed, dark brown.

Other specimens examined. WESTERN AUSTRALIA: *J. Drummond* s.n. (K); Wongan Hills, 7 Oct. 1903, *A. Morrison* s.n. (PERTH); 8 km NW Wongan Hills township, 17 Sept. 1963, *J. H. Willis* s.n. (PERTH); Monks Well Gully in the Wongan Hills, *K. F. Kenneally* 2281 (PERTH); PMG site (TV translator tower) in the Wongan Hills, *J. S. Beard* 8017 (PERTH).

Distribution. South-west Western Australia (Avon District, South-west Botanical Province—Beard, 1980); known only from the Wongan Hills, c. 140 km NE Perth.

Habitat. Favouring shallow soil over massive laterite where it occurs as scattered plants in closed heath of *Casuarina campestris* and *Dryandra* spp. with emergent *Eucalyptus drummondii* and *E. ebbanoensis* mallees.

Flowering season. Commences early September, peaks in October and finishes in early November.

Fruiting season. The four nutlets remain attached, surrounded by the calyx, until late February.

Etymology. The species is named from the resemblance of the flowers to those of the genus *Eremophila.*

Microcorys eremophiloides superficially resembles *M. longifolia* and was formerly incorrectly referred to this species. The type of *M. longifolia* is a specimen collected by Karl von Huegel from the "Swan River" (Bentham, 1837). Huegel visited Western Australia in 1833 and in the period 27 November-19 December collected in the vicinity of Perth and Fremantle (Napier, 1975). On 5 December, in company with J. S. Roe the Surveyor General, he made a collecting expedition through Ellens Valley—the present Helena Valley on the edge of the Darling Scarp. This is most likely the type locality for *M. longifolia* as it is known to occur in the Helena Valley and appears to be restricted to the Scarp.

Bentham (1837) originally placed *M. longifolia* in *Hemigenia.* When in 1848 he transferred it to *Microcorys* he amended his description to include characters found in a specimen collected by *James Drummond* (coll. 2, no. 214). Amongst the Kew material is an additional unnumbered Drummond collection, not cited by Bentham, but determined by him as *M. longifolia*, which is in fact *M. eremophiloides.*

Drummond's second collection, sent to Hooker at Kew in August 1844, consisted of four hundred specimens and included material from the Darling Scarp. However in January 1843 Drummond had already sent to Hooker a collection of one hundred and thirty specimens collected from the Wongan Hills and Moore River (Erickson, 1969). It is very probable that the specimen of *M. eremophiloides* collected by Drummond came from the Wongan Hills and that Bentham (1848, 1870) included this entity when preparing his description of *M. longifolia* for de Candolle's Prodromus and his own Flora Australiensis.

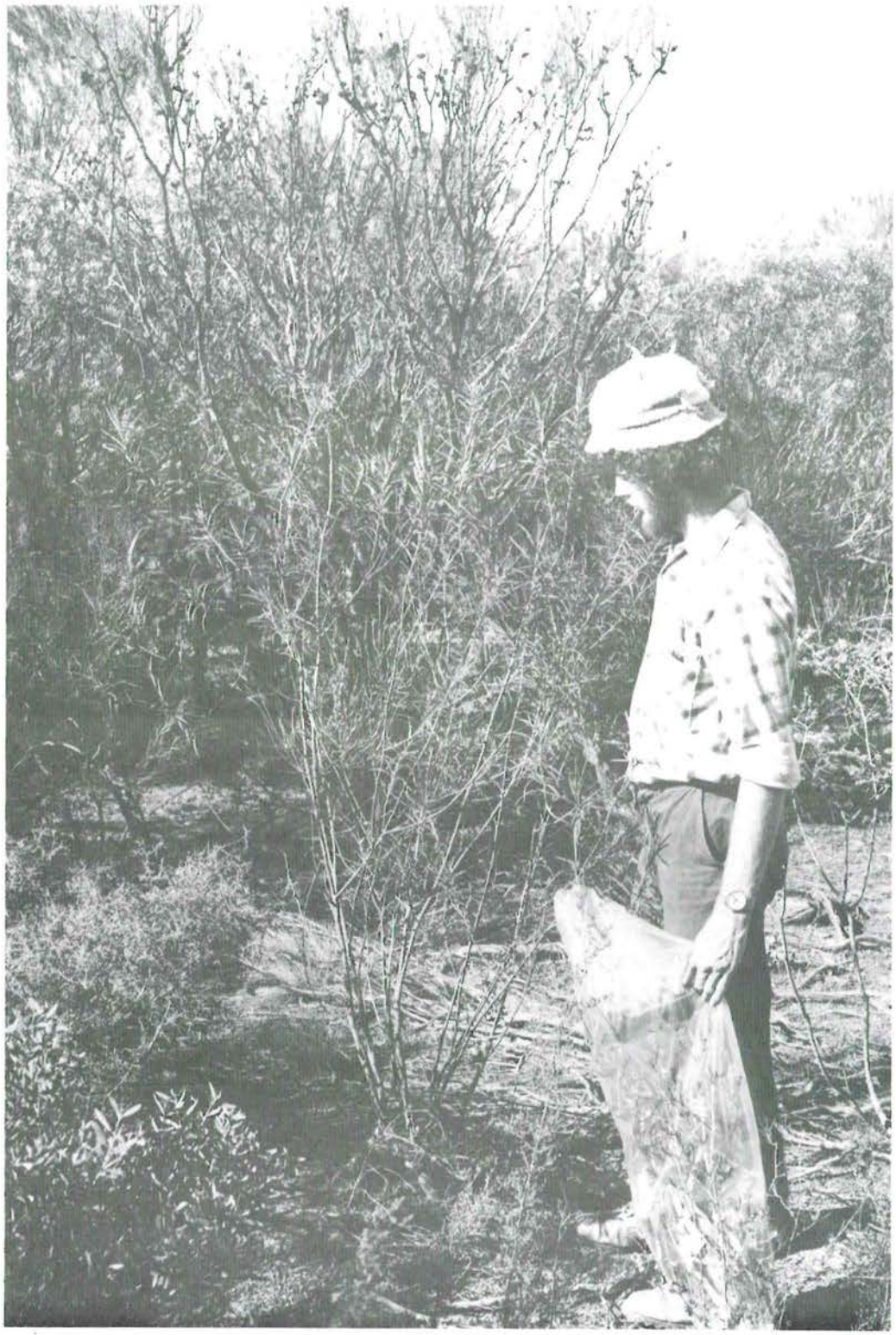

Figure 2. *Microcorys eremophiloides*. Occurrence in shallow soil over massive laterite, Wongan Hills, Western Australia.

Microcorys eremophiloides is the largest-flowered species so far described in the genus and belongs to Bentham's section Hemigenioides. Its closest relative is *Microcorys longifolia* from which it can be distinguished by its flowers which are twice as large, and by the upper lip of the corolla being much longer than the lower lip. The three lobes of the lower lip of the corolla are acute in *M. eremophiloides* and obtuse in *M. longifolia*. The leaves of *M. eremophiloides* tend to be crowded towards the ends of the terminal branchlets whereas young branches of *M. longifolia* are leafy throughout.

Microcorys eremophiloides is endemic to the Wongan Hills where only five populations, comprising approximately 200 mature plants, are known. About half of the plants occur on privately owned uncleared farming land and half on a Class A flora and fauna reserve (No. 33530) vested with the W.A. Wildlife Authority (B. Rye—pers. comm.). The conservation status of *M. eremophiloides* must therefore be considered as very rare (Hartley and Leigh, 1979).

Acknowledgements

The opportunity to examine *Microcorys* type material at the Royal Botanic Gardens, Kew, England was made possible by a Churchill Fellowship. The Winston Churchill Memorial Trust is gratefully acknowledged. The author also extends his thanks to the Director and staff of the Royal Botanic Gardens, Kew, England for their advice and assistance.

Mr P. G. Wilson kindly provided the latin diagnosis and made many helpful suggestions during the preparation of this paper.

The illustration was prepared by Joyce McMahon.

References

Beard, J. S. (1980). A new phytogeographic map of Western Australia. Western Australian Herbarium Research Notes No. 3: 37-58.

Bentham, G. (1837). Labiatae. In S. L. Endlicher, E. Fenzl, G. Bentham and H. W. Schott 'Enumeratio plantarum quas in Novae Hollandiae . . . Huegel.' (Fr. Beck: Wien.)

Bentham, G. (1848). Labiatae. In A.P. de Candolle, Prodromus systematis naturalis regni vegetabilis 12: 568. (Treuttel & Wurtz: Paris.)

Bentham, G. (1870). Labiatae. Flora Australiensis 5: 70-137. (Reeve: London.)

Erickson, R. (1969). 'The Drummonds of Hawthornden.' (Lamb Paterson Pty. Ltd.: Osborne Park, Western Australia.)

Hartley, W. and Leigh, J. (1979). 'Plants at risk in Australia.' Australian National Parks and Wildlife Service. Occasional Paper No. 3.

Kenneally, K. F. (Co-ordinator) (1977). 'The natural history of the Wongan Hills.' Handbook No. 11 (W.A. Naturalists' Club: Perth.)

Napier, K. D. (1975). New Holland in Europe. Early Days Journal VII (VII): 55-68.

Studies in the genus *Acacia* (Leguminosae: Mimosoideae)—10. *Acacia* species of the Wongan Hills, Western Australia

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Abstract

Maslin, B. R. Studies in the genus *Acacia* (Leguminosae: Mimosoideae)—10. *Acacia* species of the Wongan Hills, Western Australia. Nuytsia 4(1): 29-46 (1982). Two new *Acacia* species endemic to the Wongan Hills, *A. botrydion* sp. nov. (section Phyllodineae) and *A. pharangites* sp. nov. (section Plurinerves) are described and illustrated. An emended description of *A. semicircinalis* Maiden et Blakely is provided as this species and *A. botrydion* were formerly confounded. Notes are provided on a morphological variant of *A. acuaria* W. V. Fitzg. (section Phyllodineae) and also on a taxon allied to *A. obovata* Benth. (section Phyllodineae). Both these taxa are confined to the Hills. A checklist to the 28 *Acacia* species recorded for the Wongan Hills is provided. Analysis of the distributions of Wongan Hills Acacias showed that all Western Australian extra-tropical sections of the genus were represented there. Section Phyllodineae comprised 14 species, section Plurinerves seven species, section Juliflorae five species, section Alatae two species and section Pulchellae one species. A majority of the Wongan Hills Acacia species were confined to, and widespread within, the South-West Botanical Province. The south-western geographical affinities were supported from an examination of the taxonomically closest relatives of Wongan Hills Acacias where these affinities could be determined. Most Wongan Hills species appeared to be of recent origin, very few relict taxa being present. Endemism in the area proved to be relatively low. The Wongan Hills emerged as an important conservation site in the central wheatbelt.

Taxonomy of some Wongan Hills *Acacia* species

The following notes and descriptions apply to those Wongan Hills *Acacia* species which are currently recognized as being in need of taxonomic clarification. Two new species, *A. botrydion* and *A. pharangites,* are described and illustrated, an emended description of *A. semicircinalis* is given, and notes on two variants, *A. acuaria*-variant and *A.* aff. *obovata,* are provided. The taxa are numbered and arranged alphabetically and a list of all collections seen is given at the end of the paper.

1. **Acacia acuaria** W. V. Fitzg.—variant.

This taxon is obviously related to *A. acuaria* (which also occurs in the Wongan Hills) but differs in its smaller legumes and its sparsely puberulous phyllodes which are slightly broader and which have recurved apices. In the absence of a detailed taxonomic investigation, formal rank is not here given to this variant. However, present indications are that at best it will be afforded infraspecific rank.

Distribution and habitat. Known only from the Wongan Hills near Mount Rupert on a lateritic plateau in open scrub dominated by mallee eucalypts.

Flowering and fruiting period. Judging from the very few specimens seen, flowering occurs around August-September and legumes mature in December-January.

Specimens seen. WESTERN AUSTRALIA: West side of Mount Rupert homestead, Wongan Hills, 30°49'S, 116°38'E, *K. F. Kenneally* 5875 (PERTH); South side of old Mount Rupert homestead, 6 km north of the Wongan Hills-Piawaning Road, *K. F. Kenneally* 6896 (CANB, PERTH).

2. **Acacia botrydion** Maslin, sp. nov. (Figures 1, 3A and 3B)

Acacia semicircinalis Maiden et Blakely, J.Roy.Soc.W.Austral. 13:11 (1928), pro parte, not as to lectotype, as to Wongan Hills, 7 Oct. 1903, *A. Morrison* s.n. (NSW—lectoparatype) and pl.8, f.6.

Frutex rigidus, diffusus, intricatus, 0.5-1.3 altus. *Cortex* cineraceus. *Rami* et ramuli spinescentes, hispiduli; *ramuli* abbreviati, divaricati. *Phyllodia* asymmetrice elliptica a late-elliptica, 9-15 mm longa, 4-12 mm lata, aliquantum undulata, hispidula, 1-nervata. *Inflorescentia* racemosus vel interdum ad apices ramulorum paniculata ob phyllodia reducta; *pedunculi* c. 10 mm longi, didymi; *capitula* globulosa, c. 40 floribus. *Florae* 5-merae. *Sepala* lineari-spathulata. *Petala* glabra. *Legumina* circinata, submoniliformia, ad 4 cm longa ubi extensa, c. 4 mm lata. *Semina* (aliquot visa) in legumine longitudinalia, 3.5-4.5 mm longa, 2.5-3 mm lata, nigra.

Typus: About 12.5 km NW of Wongan Hills townsite towards Piawaning, Western Australia. "Harsh shrub to 1.3 m tall; branches smooth, light grey; branchlets spinescent; heads golden yellow; inflorescences not prolific, terminal on branchlets, axes red; phyllodes dull green, margins and tips orange to red. Laterite." 9 Sept. 1975, *B. R. Maslin* 3805 (holo: PERTH; iso: BRI, CANB, G, K, MEL, NSW, NY, PERTH).

Harsh, craggy, diffuse, intricately branched *shrubs* 0.5-1.3 m tall, domed and spreading to c. 3 m diam. in exposed areas, main stems sparingly branched near base. *Bark* light grey, smooth. *Branches* slightly flexuose, terete, obscurely nerved, hispidulous (hairs minutely tubercule-based), the apices together with the short divaricate branchlets are ± spinescent and frequently devoid of phyllodes. *Stipules* triangular, 0.5-1 mm long, dark brown. *Phyllodes* asymmetrically elliptic to widely so, 9-15 mm long, 4-12 mm wide, length to width ratio 1-2, somewhat undulate, patent to slightly ascending, hispidulous, dark green to subglaucous, margins yellowish to orange-red; apex acutely mucronulate (mucro hooked or sometimes straight); *midrib* and *marginal nerves* evident, lateral nerves very obscure; *pulvinus* very reduced; *gland* not prominent, often apparently absent, when present situated on adaxial margin of phyllode 3-5 mm above the pulvinus. *Inflorescences* dense, showy, 1-2 per node, racemose or sometimes appearing paniculate towards the ends of the branchlets due to phyllode reduction; *raceme axis* 5-20 mm long, red-brown, sparsely hispidulous, supporting up to 5 pairs of pedunculate flower-heads; *basal peduncular bracts* solitary, triangular, c. 0.5 mm long; *peduncles* twinned, c. 10 mm long, red-brown, sparsely hispidulous. *Flower-heads* globular, light golden, c. 40-flowered; *bracteoles* linear-spathulate, c. 1.5 mm long, glabrous, claw pale, lamina brown. *Flowers* 5-merous, 2.5 mm long, glabrous; *calyx* 2/3 length of corolla, divided to base into narrow linear-spathulate sepals; *petals* nerveless and glabrous. *Legumes* circinate, submoniliform, to 4 cm long (expanded length), c. 4 mm wide, slightly resinous, red-brown, glabrous, very finely longitudinally wrinkled when dry, margins barely thickened. *Seeds* (few seen) longitudinal in legume, irregularly ellipsoid, turgid but sometimes slightly compressed, 3.5-4.5 mm long, 2.5-3 mm wide, dull, black; *pleurogram* very obscure, 'u'-shaped, open towards the hilum; *areole* minute, c. 0.5 x 0.6 mm; *funicle* filiform, minute, abruptly expanded into quite a large fleshy yellowish *aril* situated on top of the seed and folded once near the hilar end.

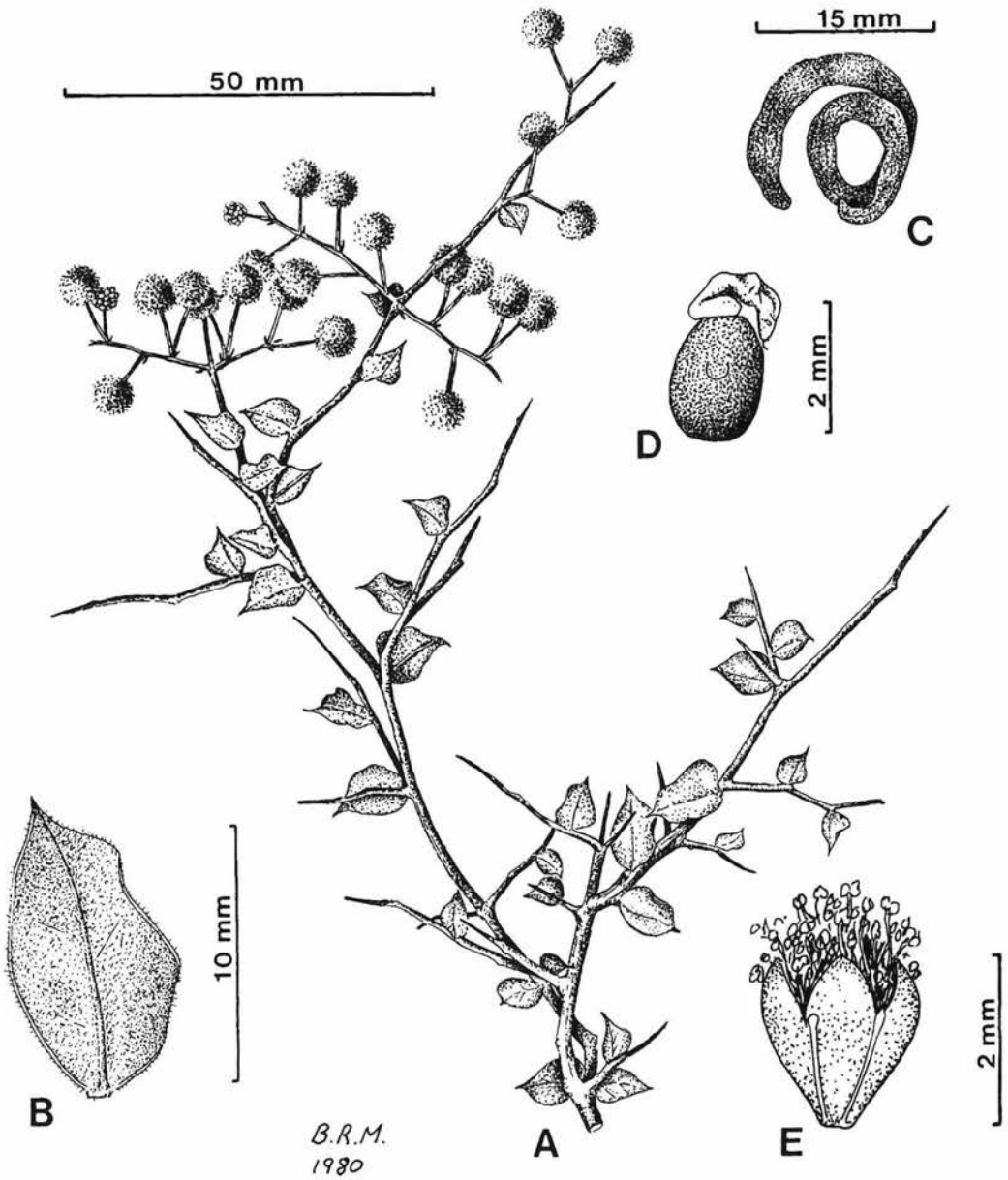

Figure 1. *Acacia botrydion.* A—Portion of branch showing the short, divaricate, spinescent branchlets and the clustering of inflorescences towards the end of the branch. B—Undulate phyllode. C—Legume. D—Seed. E—Flower showing linear-spathulate sepals.

A, B and E from *B. R. Maslin* 3382; C and D from *B. R. Maslin* 4429.

Distribution and habitat. Known only from the Wongan Hills where it is relatively common on lateritic hills and often associated with species such as *Eucalyptus ebbanoensis, Melaleuca undulata* and *Phebalium brachycalyx.*

Flowering and fruiting period. Flowers from July to September. Legumes with mature seeds have been collected in December and January.

Other specimens seen. WESTERN AUSTRALIA: The Wongan Hills, top of Fowlers Gully on laterite cap, 21 July 1974, *K. F. Kenneally* s.n. (PERTH); 9 km NE of the township Wongan Hills on the Piawaning Road, 1 Sept. 1980, *K. F. Kenneally* s.n. (PERTH); 12.5 km from Wongan Hills township towards Piawaning, *B. R. Maslin* 3382 (AD, B, PERTH); The Wongan Hills, *B. R. Maslin* 4206 and 4429 (both PERTH); Northern end of the Wongan Hills, Mt. Rupert Station, *B. R. Maslin* 4547 (AD, PERTH); 7 mi (11.3 km) NW of Wongan Hills on the road to Piawaning, *M. D. Tindale* 2794 (NSW, PERTH).

Acacia botrydion is placed in section Phyllodineae and appears to be most closely allied to *A. semicircinalis* (see below) with which it is sympatric and with which it has frequently been confused. Indeed, Maiden and Blakely's (1928) description of *A. semicircinalis* was based on elements of both taxa necessitating lectotypification and an emended description in the present work (see p. 34 below). Besides being sympatric in the Wongan Hills, *A. botrydion* and *A. semicircinalis* possess globular flower-heads and 1-nerved, undulate phyllodes which are very similar in shape and size. It is these features which seem to have led to the past confusion between the two. *Acacia botrydion*, however, is readily distinguished from *A. semicircinalis* in the following ways. It is a harsher, more craggy and intricately branched shrub which forms bushes to 1.3 m tall. It has light grey bark and numerous short, divaricate, coarsely spinescent lateral branches which are frequently devoid of phyllodes. *Acacia semicircinalis* on the other hand is a more wiry, sprawling, diffuse, open shrub often with long prostrate branches which are sparsely divided and which lack the short, coarsely spinescent branchlets of *A. botrydion*, its bark is reddish brown. Additionally *A. botrydion* has terminal clusters of racemes or panicles which form brilliant bright golden floral aggregates at flowering which occurs between July and September. *Acacia semicircinalis* on the other hand has inflorescences which are less conspicuous and more scattered along the branches. Its principal flowering period is from September to January, however, a few flowers can usually be found throughout most of the year. *Acacia botrydion* has distinctly circinate legumes while those of *A. semicircinalis*, besides being broader and not moniliform, are only gently curved. The phyllodes and branch apices in *A. botrydion* are always minutely hispidulous while in *A. semicircinalis* they may be either glabrous or minutely hispidulous.

The specific epithet alludes to the inflorescences which are bunched at the ends of the branches.

3. **Acacia** aff. **obovata** Benth.

Glabrous *sub-shrubs* to 0.4 (0.7) m tall. *Phyllodes* elliptic-obovate, 1.5-3 cm long, 0.7-2 cm wide, bright green, apiculate, midrib obvious, frequently a minor second longitudinal nerve is present; *gland* small and insignificant. *Inflorescences* simple and axillary. *Flower-heads* white, c. 3-flowered. *Flowers* 4-merous; ovary one per flower, stipitate. *Legumes* narrow-oblong, 2-3 cm long, c. 5 mm wide, rather woody, flat, margins thickened.

Distribution and habitat. Known only from a single locality in the Wongan Hills where it grows in crevices of laterite conglomerate on a hill south-east of Mount Matilda. The vegetation at this locality is dense and dominated by *Casuarina campestris, Dryandra comosa, D. hewardiana, D. pulchella, Eucalyptus ebbanoensis* and *Isopogon divergens.*

Flowering and fruiting period. Judging from the specimens at hand the main flowering period is from about March to May. Legumes with near-mature seeds have been collected in late October.

Specimens seen. WESTERN AUSTRALIA: (All from the same population and all housed at PERTH.) *K. F. Kenneally* 5891, 7194 and 7496; *B. R. Maslin* 4550, 4550A and 4804.

The affinities of this taxon are clearly with *A. myrtifolia* and its allies, e.g. *A. celastrifolia, A. obovata, A. nervosa,* and a number of undescribed taxa from Western Australia. A treatment of this group will be the subject of a forthcoming paper and in this work the taxonomic status of this variant will be further considered. Present indications are that it may well constitute a distinct species.

4. **Acacia pharangites** Maslin, sp. nov. (Figures 2, 3C and 3D)

Frutex ad 3(4) alta, aliquantum gracilis. *Rami* glabri. *Stipulae* deciduae. *Phyllodia* linearia-teretia, 1.5-4 cm longa, c. 1 mm lata, ascendentia, aliquantum rigida, ± glaucescentia, glabra, 7-nervata, aliquantum pungentia. *Inflorescentia* racemus brevissimus; *pedunculi* c. 10 mm longi; *bracteae basales pedunculi,* 1.5-2.5 mm longae; *capitula* obloidea, 7-10 mm longa, 5-6 mm lata, c. 25 floribus; *bracteolis* in capitala juveni conspicuis. *Florae* 5-merae. *Calyx* irregulariter lobatus. *Petala* glabra. *Legumina* anguste-oblonga, ad 6.5 cm longa, c. 4 mm lata, leviter undulata, glaucescentia, glabra. *Semina* in legumine longitudinalia, 3-3.5 x c. 2.5 x c. 2 mm, nigra, nitentia; *arillus* clavatus.

Typus: In the Wongan Hills, 18.5 km NW of Wongan Hills townsite towards Piawaning, 30° 50'S, 116° 39'E, Western Australia. "A somewhat spindly, open shrub to 4 m tall; phyllodes smooth, terete, ascending, subglaucous; heads golden; bark grey, slightly roughened. In red-brown clay in a gully". 28 Aug. 1976, *B. R. Maslin* 4205 (holo: PERTH; iso: CANB, K, MEL, NY).

Somewhat spindly, open, erect *shrubs* to 3(4) m tall, with main stems sparingly branched near base and phyllodes concentrated towards ends of branches. *Bark* grey, slightly roughened. *Branches* marked with raised scars of fallen phyllodes, terete, finely nerved, glabrous. *New shoots* arising at distal end of a very reduced raceme axis and subtended by a few scarious light-brown striate glabrous but marginally white-fimbriate early deciduous bracts. *Stipules* imbricate in vegetative bud, very early deciduous, connate, light brown, striate, glabrous but apically fimbriate, margins slightly revolute, apex cleft. *Phyllodes* linear-terete, slightly narrowed towards the base, 1.5-4 cm long, c. 1 mm wide, straight to slightly curved, ascending, rather rigid, smooth and turgid when fresh but finely wrinkled upon drying, ± glaucescent, glabrous; *nerves* seven (three abaxial with only the central one extending wholly from the apex to the pulvinus, two lateral and two adaxial), neither prominent nor raised when fresh, yellowish upon drying; *apex* mucronulate, mucro yellowish or brown and somewhat pungent; *pulvinus* yellowish when fresh, brown and finely transversely wrinkled when dry; *gland* situated on adaxial surface (between the two adaxial nerves) above the middle of the phyllode, not prominent. *Inflorescences* extremely reduced axillary racemes of 1(2) pedunculate flower-heads, the axis c. 0.5 mm long and terminated by a young vegetative shoot; *basal peduncular bract* relatively large (1.5-2.5 mm long), deciduous, scarious, brown, striate, auriculate at base, cleft at apex; *peduncles* c. 10 mm long, glabrous. *Flower-heads* obloid, 7-10 mm long, 5-6 mm wide, golden, c. 25-flowered; *bracteoles* conspicuously overtopping flowers in inflorescence bud, the claw less than 0.5 mm long, the lamina ovate 1.5-2 mm long c. 1 mm wide concave scarious finely striate brown white-fimbriate and sparsely puberulous abaxially near the base. *Flowers* 5-merous; *calyx* irregularly lobed, (1)2 lobes triangular and very reduced, the remaining lobes longer oblong dissected for 1/2-3/4 their length and sparsely ciliolate

at the apex; *petals* glabrous, obscurely 1-nerved. *Legumes* pendulous, narrowly oblong, to 6.5 cm long, c. 4 mm wide, slightly undulate, dark brown, glaucescent, glabrous, abruptly narrowed at both ends, prominently raised over the seeds with the umbo rounded and alternately more pronounced on one side of the legume than on the other; *margins* very slightly thickened, slightly but variably constricted between seeds. *Seeds* longitudinal in legume, irregularly ellipsoid but truncate along edge adjacent to aril, turgid, 3-3.5 mm long, c. 2.5 mm wide, c. 2 mm thick, black, shiny; *pleurogram* obscure, with a narrow opening towards the hilum; *areole* minute, c. 0.5 x 0.3 mm; *funicle* minute, abruptly expanded into a clavate yellowish ± straight *aril* which is c. 3 mm long and which extends 1/3-1/2 down one side of the seed.

Distribution and habitat. Known only from the Wongan Hills where it grows along two or three sheltered gullies in rocky (greenstone) red-brown clay flanking seasonally dry creeks and also in grey sand of the creek beds themselves. The species is not common on the high ridges associated with these watercourses. Normally *A. pharangites* is of scattered occurrence and only rarely does it form dense stands. It occurs in dense scrub 3-4 m tall, dominated by *Calothamnus asper, Casuarina acutivalvis* and *Melaleuca radula* with sparse ground cover.

Flowering and fruiting period. Flowers in August; legumes with mature seed have been collected from mid-December to mid-January.

Other specimens seen. WESTERN AUSTRALIA: 18.5 km NW of Wongan Hills towards Piawaning, *R. Conveny* 7847 and *B. R. Maslin* (CANB, K, MEL, NSW, PERTH, UC, US); Base of T.V. Translator Tower, Wongan Hills, 30° 50′S, 116° 38′E, *K. F. Kenneally* 7161 (PERTH); The Wongan Hills, *B. L. Rye* 8001 (AD, BM, BRI, G, PERTH); The Wongan Hills, *B. R. Maslin* 4427 (K, PERTH).

Acacia pharangites is difficult to place in the existing classifications of the genus. Its obloid flower-heads suggest inclusion in section Juliflorae, however, it is apparently not closely related to any other member of this group. Its general phyllode and legume morphology is similar to that of the south coastal species *A. tetanophylla* (section Plurinerves) but the two species are not particularly closely related. *Acacia pharangites* differs in its taller habit, reduced racemose inflorescences, obloid flower-heads, larger bracteoles and irregularly divided calyx. Additionally, the arrangement of the phyllode nervature in the two species is different. Although both species have 7-nerved phyllodes the two adaxial nerves in *A. tetanophylla* unite immediately above the gland. This does not occur in *A. pharangites* (compare Figure 2 here with Figure 6 in Maslin, 1977). Upon drying the phyllodes of *A. pharangites* are less sulcate than those of *A. tetanophylla*. Its lack of no close relatives indicates that *A. pharangites* should be considered a relict species.

Only about 400 individuals of *A. pharangites* are known to exist (Barbara Rye, pers. comm.). Considering also that the species has a very restricted range and appears to be very habitat-specific the existing populations must be afforded suitable protection in order to prevent the possible extinction of this unusual taxon.

The specific epithet alludes to the species gully habitat.

5. **Acacia semicircinalis** Maiden et Blakely, J. Roy. Soc. W. Austral. 13:11 pl. 8 (1928). Lectotype: Wongan Hills, 3 Oct. 1903, *A. Morrison* s.n. (NSW; iso: K), *lecto. nov.* (Lectoparatype: Wongan Hills, 7 Oct. 1903, *A. Morrison* s.n.—see *A. botrydion* sp. nov. above.)

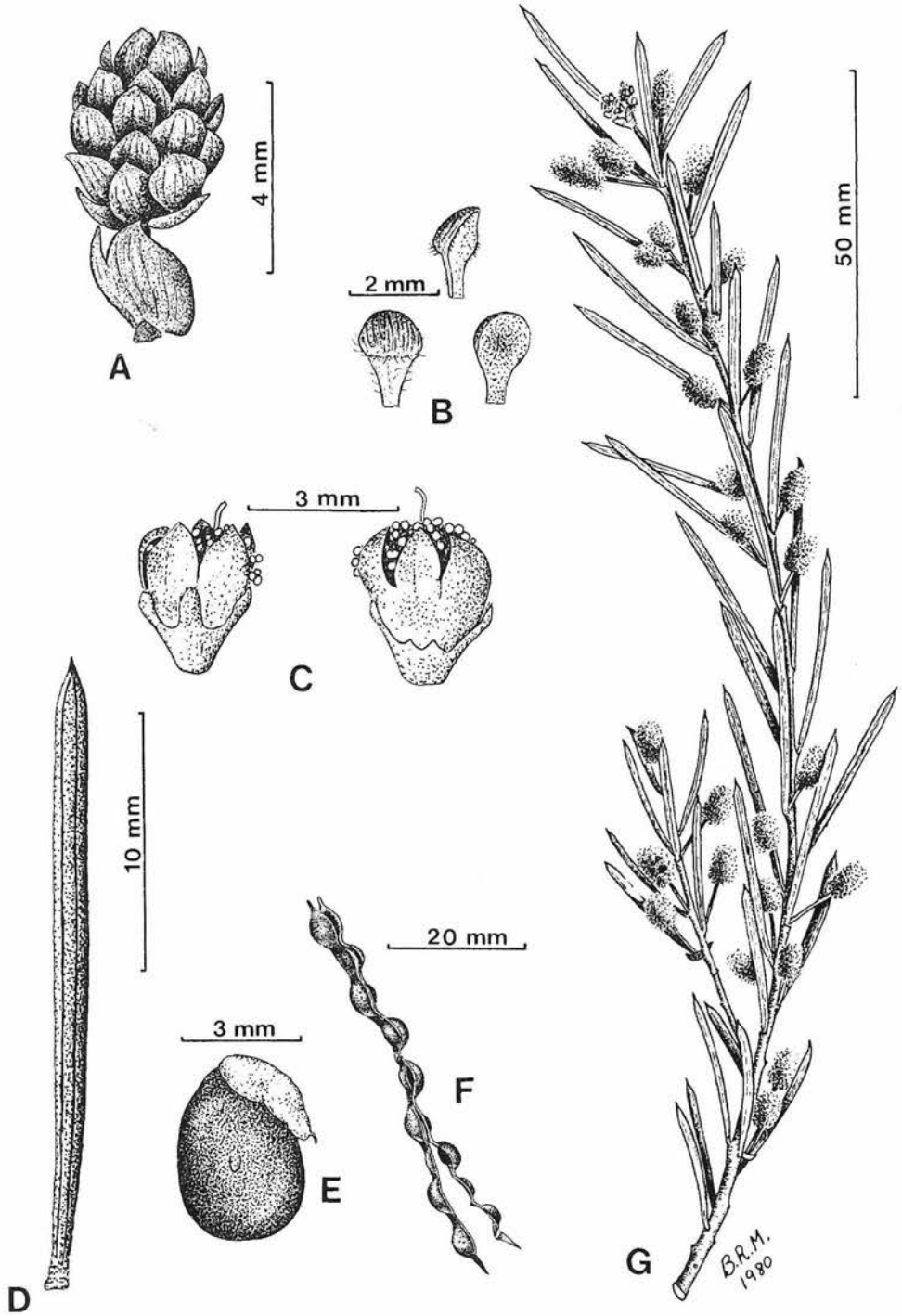

Figure 2. *Acacia pharangites.* A—Inflorescence bud showing the conspicuous bracteoles overtopping the flowers and the large, cleft basal bract. B—Bracteoles. C—Flowers (back and front views) showing the irregular lobing of the calyx. D—Phyllode (reconstituted) showing the two adaxial nerves. E—Seed. F—Legumes. G—Portion of branch showing obloid flower-heads.

A, B, C, D and G from *B. R. Maslin* 4205 (the Type); E and F from *B. R. Maslin* 4427.

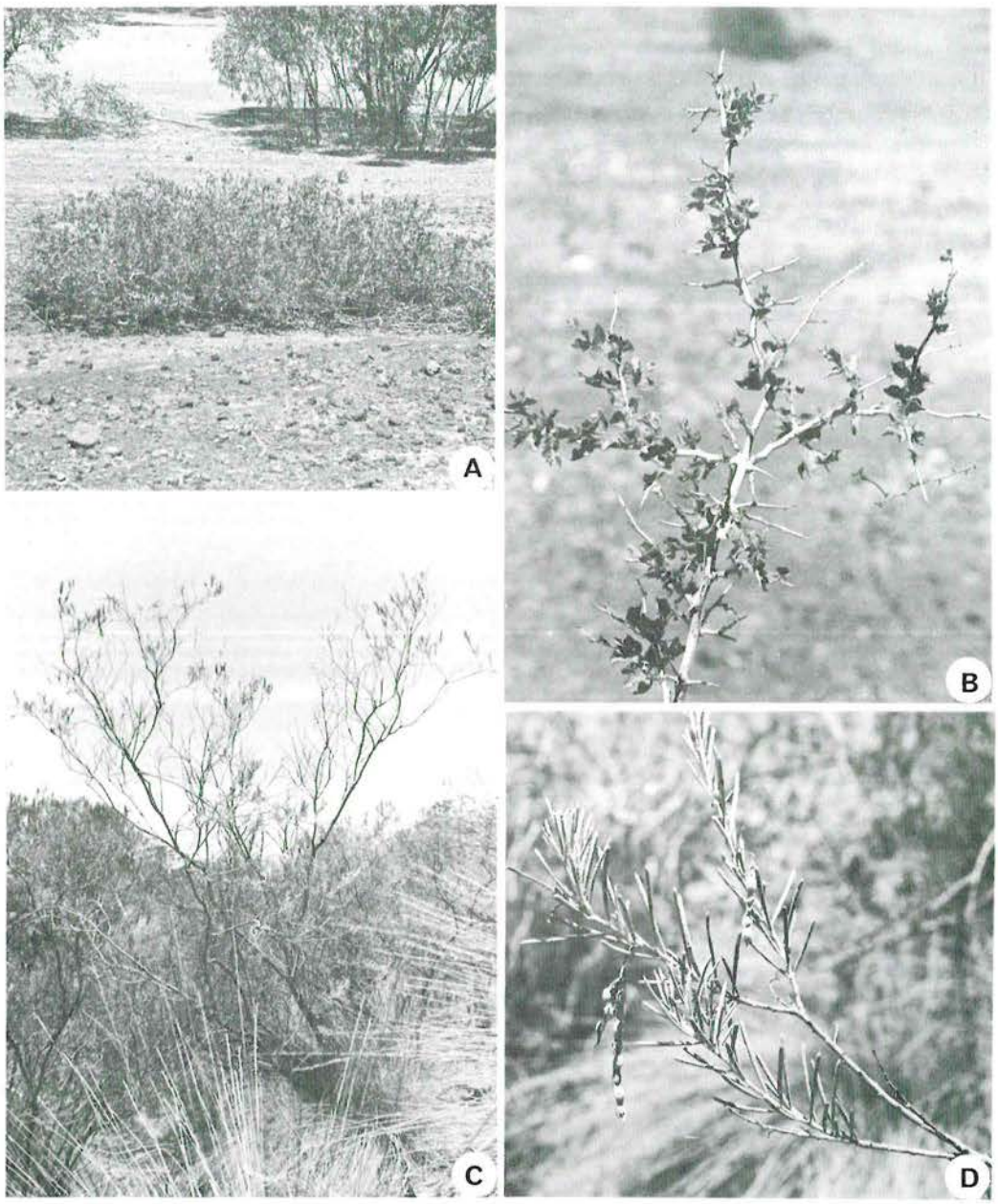

Figure 3. A and B: *A. botrydion* (A—habit; B—branch showing short, divaricate, spinescent branchlets). C and D: *A pharangites*. All photographed *in situ* in the Wongan Hills.

Wiry, open, diffuse *shrubs* to c. 1 m tall, often with sprawling prostrate branches. *Branches* ± straight, terete, finely nerved, reddish brown to light brown, slightly shiny, sometimes sparsely verriculose, glabrous or sparsely hispidulous, terminally coarsely pungent but lacking the short divaricate ± spinescent branchlets of *A. botrydion*. *Phyllodes* asymmetrically oblong-elliptic, 10-20 mm long, 5-9 mm wide, length to width ratio 1.5-3, slightly to obviously undulate, ascending at c. 45° from the branch, glabrous to hispidulous, light olive green to subglaucous, margins

yellowish; *base* unequal; *apex* obtuse or acute, mucronulate, the mucro minute acute indurate often slightly laterally positioned and straight or slightly hooked; *midrib* evident (raised when dry), centrally situated or slightly excentric, frequently yellowish, lateral veins few and obscure; *gland* very obscure, 0.5-2 mm above the base. *Inflorescences* scattered, 1(2) per node, either arising within axil of immature phyllodes at the ends of the branchlets, or alternatively, arising within the axil of mature phyllodes then consisting of a minute raceme of 1(2) pedunculate flower-heads borne on an extremely minute raceme axis terminated by a vegetative shoot, at anthesis this axis grows out and further peduncles may arise and reach anthesis before maturation of their subtending phyllode, this structure then resembles a short raceme 1-2 cm long; *basal peduncular bract* solitary; *peduncles* 5-13 mm long, glabrous or sparsely hispidulous, a small deciduous triangular bract normally occurs near or above the middle of the peduncle. *Flower-heads* globular, bright golden, c. 25-flowered. *Flowers* c. 2 mm long; *calyx* divided to base into 5 (rarely 4 or 7 in a few flowers) linear-spathulate sepals which are sparsely puberulous at the apex; *petals* 5, glabrous, nerveless. *Legumes* gently curved (not circinate), raised over but not (or barely) constricted between seeds, to 6 cm long and 6 mm wide, not resinous, reddish-brown, glabrous, finely longitudinally wrinkled when dry, at base narrowed into a stipe c. 5 mm long, at apex abruptly contracted; *margins* barely thickened. *Seeds* (seen only from near-mature spirit material) longitudinal in legume, obloid-ellipsoid, c. 6 mm long and 3.5-4 mm wide, turgid; pleurogram obscure, continuous; *areole* circular, 0.5-1 mm diam.; *funicle* minute (c. 1 mm long) and filiform, abruptly expanded into a large white to yellowish fleshy *aril* situated on top of the seed and with a short fold near the hilar end.

Distribution and habitat. Known only from the region of Wongan Hills where it is seemingly confined to lateritic hills. It has been recorded from about 3 km north-west of the Wongan Hills township west to the Wongan Hills themselves.

Flowering and fruiting period. Flowers principally from September to January but a few flowers can usually be found throughout most of the year. Legumes containing near-mature seeds have been collected in late November and in January.

Other specimens seen. WESTERN AUSTRALIA: 18.5 km (11.5 mi) NW of Wongan Hills towards Piawaning, 30° 50′S, 116° 39′E, *R. Coveny* 7841 and *B. R. Maslin* (CANB, K, NSW, PERTH) and 7842 (K, NSW, PERTH); Gully adjacent to Fowlers Gully, Wongan Hills, 30° 49′S, 116° 38′E, *K. F. Kenneally* 2413 (K, MEL, NSW, PERTH); Wongan Hills, 2 km S Wongan Hills-Piawaning Road, *K. F. Kenneally* 7160 (PERTH); 2 mi (3.4 km) out of Wongan Hills towards Piawaning, *F. Lullfitz* L1653 (PERTH); 4.5 mi (7 km) NW of Wongan Hills township towards Elphin, *B. R. Maslin* 134 and 1635 (both PERTH); About 12.5 km NW of Wongan Hills township towards Piawaning, *B. R. Maslin* 3804 (CANB, PERTH); The Wongan Hills, *B. R. Maslin* 4428 (C.N.R.S.*, PERTH); The Wongan Hills, south-east of Mount Matilda on Conway's property, *B. R. Maslin* 4806 (PERTH).

The original description of *A. semicircinalis* was based on two un-numbered Morrison collections from the Wongan Hills, one in flower (here selected as the lectotype), the other in fruit (see *A. botrydion* above). The epithet 'semicircinalis' is not altogether appropriate for the legumes of either species (see descriptions above) therefore a rather arbitrary choice of the flowering specimen as the lectotype was made. *Acacia semicircinalis* is illustrated in Maiden and Blakely (1928) plate VIII, ff. 1-5. The fruiting specimen illustrated in this plate (f.6) is *A. botrydion.*

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Phytogeography of *Acacia* in the Wongan Hills.

The Wongan Hills are situated in a region termed the transitional-rainfall zone of south-west Western Australia (Hopper, 1979). This zone lies between the dry arid zone and the more temperate areas bordering the south-west coast of Western Australia. Rainfall in the area is from 300-800 mm p.a. The landform is of low relief but of diverse topography characterized by laterite-capped divides separated by broad valleys, by plains of considerable edaphic complexity, by saltlakes and by emergent granite monadnocks. The transitional-rainfall zone is very rich in species and among the historical factors listed by Hopper as contributing to this richness are recurrent climatic stresses and erosional dynamism in the Quaternary associated with weathering of the laterites of the area.

The laterite-dominated Wongan Hills, with their expanse of relatively undisturbed vegetation, provide an excellent site for examining a specific habitat within the edaphically complex transitional-rainfall zone. *Acacia* is well-suited for such an analysis because it is well represented in species and their taxonomy is relatively well understood.

Results and discussion. With its 28 species (Table 1), *Acacia* is the largest plant genus in the Wongan Hills, although in terms of abundance it is eclipsed by genera such as *Eucalyptus, Casuarina* and *Melaleuca*. The five *Acacia* species recorded by Kenneally (1977) from the adjacent, non-lateritic Mortlock Creek area or which occur as roadside invaders within the Hills are not included in the present study. The Hills are located on the National Mapping 1:250 000 'Moora' sheet which covers c. 1.5 million ha and which has the highest concentration of *Acacia* species for the State and probably also for Australia (94 described species—Hnatiuk and Maslin, 1980b). With about 30 per cent of *Acacia* species on this sheet occurring in the Hills, the importance of this small area (c. 1 750 ha) is readily appreciated.

Except for the entirely tropical/desert sections Acacia and Lycopodiifoliae (which together comprise 13 species within Western Australia) all infrageneric groups of the genus occurring in this State are represented in the Hills. Half the species are contained in section Phyllodineae (14 species) while the closely related sections Plurinerves and Juliflorae have seven and five species respectively and sections Alatae and Pulchellae have only two and one species each (Table 1).

Nineteen species, or about 2/3 of the Wongan Hills *Acacia* species, are restricted to the South-West Botanical Province (Table 1). Those species extending beyond the Province are mostly confined to the western margins of the adjacent Eremaean and South-West Interzone regions. *Acacia acanthoclada* just reaches the Desert region while this species and *A. erinacea* are the only taxa extending into eastern Australia. No Wongan Hills species occur in the northern tropical/subtropical areas of Australia.

Sixteen Wongan Hills *Acacia* species are widespread within south-west Western Australia (ranges exceeding 500 km). Of the remaining species nine have more restricted south-western distributions (ranges to c. 500 km), while only three taxa, *A. botrydion, A.* aff. *obovata* and *A. pharangites*, are strictly endemic to the Hills. Apart from *A. dura* and *A. semicircinalis* which grow in the general region of the Hills but not entirely confined within their boundary, those species with restricted ranges occur in the central and northern part of the wheatbelt from about Southern Cross to the Murchison River.

Table 1. Results of geographical analysis of *Acacia* sections occurring in the Wongan Hills.

Section (Pedley, 1978)	Number of spp. in the Wongan Hills	No. of WH spp. endemic to SWBP/WH	Distribution of WH outside SWBP						
			NBP	EBP					Extra-WA
				pr	dr	er	np	swi	
Pulchellae	1	1/0	—	—	—	—	—	—	—
Alatae	2	1/0	—	—	—	—	—	—	—
Phyllodineae	14	10/2	—	—	1	3	1	3	2
Plurinerves	6	5/1	—	—	—	1	—	2	—
Juliflorae	5	2/0	—	—	—	2	1	3	—
TOTALS	28	19/3	—	—	1	6	2	8	2

Abbreviations for botanical Provinces and Regions are adapted from Hopper and Maslin (1978): EBP—Eremaean Botanical Province (dr—Desert Region; er—Eremaean Region; np—Nullarbor Plain; pr—Pilbara Region; swi—South-West Interzone Region); NBP—Northern Botanical Province. SWBP—South-West Botanical Province. WA—Western Australia. WH—Wongan Hills.

The south-western geographical affinities of the Wongan Hills *Acacia* species are supported by examining the distributions of their taxonomically closest relatives. Of the 24 species for which close relatives can be determined, all but *A. shuttleworthii* have their closest relative within the South-West Botanical Province and 14 of these are entirely confined to the Province itself (Table 2). Ten of these close relatives are widespread throughout the Province and have ranges exceeding 500 km. Another 12 are generally less widespread and are restricted to the central or southern parts of the Province in areas south of about Moora. Only one close relative, *A. leptospermoides* subsp. *obovata*, is confined to the northern part of the Province, while only *A. gregorii*, the possible closest relative of *A. shuttleworthii*, occurs entirely in the Eremaean Province to the north.

As 24 Wongan Hills Acacias appear to have at least one close relative it suggests that the majority of the *Acacia* species in this region are of recent origin. Relict taxa (i.e. ones not possessing even a single close relative) are difficult to detect with certainty, although, *A. denticulosa* and *A. pharangites* seem to fall into this category. *Acacia dura, A. erinacea* and *A. restiacea* are also possible relicts but further work is required to assess the true taxonomic position of these species.

Hopper (1979) observed that within the transitional rainfall zone there existed a large number of recently evolved species and relatively few relict taxa. He also noted that within the wheatbelt area of the zone there existed few local endemic taxa relative to the two main heathland centres. To a large extent the Wongan Hills *Acacia* data presented here support these observations.

From the above discussion it is seen that the Wongan Hills offer a habitat not only for endemic taxa but also for species with relatively restricted ranges in the central and northern parts of the Western Australian wheatbelt. The wheatbelt is under considerable pressure from agricultural activity (Kitchener, 1976; Kenneally, 1977) and only a few relatively undisturbed stands of native vegetation remain. Most uncleared wheatbelt land is probably privately owned farmland (Kitchener et al.,

1980). Thus, areas such as the Wongan Hills are invaluable conservation sites for species such as these restricted *Acacia* species which, in the course of time, will most probably become even scarcer. Additionally, as noted above, two taxa endemic to the Wongan Hills, *A.* aff. *obovata* and *A. pharangites*, are exceedingly rare there. Both appear to have very narrow habitat preferences and are represented by very low numbers of individuals. In the former case by fewer than 50 plants and in the latter by no more than a few hundred. Undue site disturbance in either case may well lead to their extinction.

Acknowledgements

The author is grateful to Dr Stephen Hopper for his helpful comments on the phytogeographic aspects of this paper. Mr Alex George is thanked for checking my Latin diagnoses. Dr Barbara Rye and Mr Kevin Kenneally are thanked for making special collections and providing field observations on a number of the included taxa. Financial assistance was provided under an Australian Biological Resources Study grant from the Bureau of Flora and Fauna.

References

Hnatiuk, R. J. and Maslin, B. R. (1980a). The distribution of *Acacia* (Leguminosae: Mimosoideae) in Western Australia. 1. Individual species distributions. W. Austral. Herb. Res. Notes No. 4:1-103.

Hnatiuk, R. J. and Maslin, B. R. (1980b). The distribution of *Acacia* (Leguminosae: Mimosoideae) in Western Australia. 2. Lists of species occurring in 1° x 1.5° grid cells. W. Austral. Herb. Res. Notes. No. 4: 105-144.

Hopper, S. D. (1979). Biogeographical aspects of speciation in the south-west Australian flora. Ann. Rev. Ecol. Syst. 10:399-422.

Hopper, S. D. and Maslin, B. R. (1978). Phytogeography of *Acacia* in Western Australia. Austral. J. Bot. 26:63-78.

Kenneally, K. F. (Co-ordinator) (1977). 'The Natural History of the Wongan Hills.' Handbook No. 11. (W.A. Naturalists' Club: Perth.)

Kitchener, D. J. (1976). Preface to the series. In: Biological survey of the Western Australian wheatbelt. Part 1. Rec. W. Austral. Mus. Suppl. 2:3-10.

Kitchener, D. J., Chapman, A., Dell, J. and Muir, B. J. (1980). Lizard assemblage and reserve size and structure in the Western Australian wheatbelt—some implications for conservation. Biol. Conserv. 17:25-62.

Maiden, J. H. and Blakely, W. F. (1928). Descriptions of fifty new species and six varieties of Western and Northern Australian *Acacias*, and notes on four other species. J. Roy. Soc. W. Austral. 13:1-36.

Maslin, B. R. (1975). Studies in the genus *Acacia* (Mimosaceae)-4. A revision of the series Pulchellae. Nuytsia 1:388-494.

Maslin, B. R. (1977). Studies in the genus *Acacia* (Mimosaceae)-6. Miscellany. Nuytsia 2:145-161.

Maslin, B. R. (1978). Studies in the genus *Acacia* (Mimosaceae)-7. The taxonomy of some diaphyllodinous species. Nuytsia 2:200-219.

Pedley, L. (1978). A revision of *Acacia* Mill. in Queensland. Part 1. Austrobaileya 1(2):75-234.

Index to specimens examined for the taxonomic treatment in this work

This index is arranged alphabetically according to the name of the collector. Number in parentheses refer to the corresponding numbered taxon in the text. Unless otherwise stated, the specimens are housed at the Western Australian Herbarium (PERTH).

Coveny, R. and *Maslin, B. R.* 7841 (5-CANB, K, NSW, PERTH), 7842 (5-K, NSW, PERTH), 7847 (4-CANB, K, MEL, NSW, PERTH, UC, US)—numbers are Coveny collecting numbers.

Kenneally, K. F. 2413 (5-K, MEL, NSW, PERTH); 5875(1); 5891(3); 6896 (1-CANB, PERTH); 7160(5); 7161(4); 7194(3); 7496(3); s.n., 21 July 1974 (2); s.n., 1 Sept. 1980 (2).

Lullfitz, F. L1653(5).

Maslin, B. R. 134(5); 1635(5); 3804 (5-CANB, PERTH); 3805 (2-holo: PERTH; iso: BRI, CANB, G, K, MEL, NSW, NY, PERTH); 3382 (2-AD, B, PERTH); 4205 (4-holo: PERTH; iso: CANB, K, MEL, NY); 4206(2); 4427(4-K, PERTH); 4428(5-Montpellier, PERTH); 4429(2); 4547(2); 4550 and 4550A; 4806(5).

Morrison, A. s.n., 3 Oct. 1903 (5-lecto: NSW; iso: K); s.n., 7 Oct. 1903 (2-lectoparatype of *A. semicircinalis:* NSW).

Rye, B. L. 80001 (4-AD, BM, BRI, G, PERTH).

Tindale, M. D. 2794 (2-NSW, PERTH).

Table 2. List of Wongan Hills *Acacia* species giving their salient features, distributions and closest relative with its distribution.

Section (Pedley, 1978)	Taxon	Salient features[A]	Distribution[B]	Closest relative		Notes
				Taxon	Distribution[B]	
Pulchellae (Benth.) Taub. (Leaves bipinnate; flower-heads globular)	*A. pulchella* var. *glaberrima* Meisn.	Harsh, diffuse shrub 1 m tall with numerous axillary spines.	WA: SWBP. (Northampton-Ravensthorpe)	*A. pulchella* R.Br. var. *pulchella*	WA: SWBP (Moora-Albany: Jarrah forest)	Wongan Hills populations represent the 'inland' variant of var. *glaberrima* referred to in Maslin (1975:403).
Alatae (Benth.) Pedley (Phyllodes decurrent or absent; flower-heads globular)	*A. stenoptera* Benth.	Shrub c. 1 m tall, with winged stems produced into decurrent, recurved, ± pungent phyllodes; flower-heads cream; legumes winged.	WA: SWBP (Geraldton-Ravensthorpe)	*A. tetragonocarpa* Meisn.	WA: SWBP. (Moora-Esperance: scattered, not common)	
	A. restiacea Benth.	Fastigiate shrub with slender, leafless branches to 0.8 cm long; racemes enclosed by conspicuous brown bracts when young.	WA: SWBP. (Murchison River-Kellerberrin)	Unknown		Due to the lack of phyllodes the species is difficult to place in existing classifications.
Phyllodineae DC. (Phyllodes flat, with one ± central nerve on each face; flower-heads globular or slightly obloid)	*A. acanthoclada* F. Muell.	Harsh, diffuse shrub with short spinescent branchlets; phyllodes 3-7 mm long, asymmetrically cuneate with rounded apices.	WA: SWBP; EBP-swi, dr; S.A.; Vict. (Dry areas of southern Australia)	*A. bidentata* Benth.	WA: SWBP. (Murchison River-Ravensthorpe)	
	A. acuaria W.V. Fitzg.	Dense, much-branched shrub 1.5 m tall; phyllodes spreading, needle-like; legumes dark brown, moniliform.	WA: SWBP; EBP-er. (Murchison River-Southern Cross)	*A. benthamii* Meisn.	WA: SWBP. (Known only from the Perth region)	Together with the typical form, a variant of this species occurs in the Wongan Hills—see p. 29 above.

Table 2. List of Wongan Hills *Acacia* species giving their salient features, distributions and closest relative with its distribution—*continued.*

Section (Pedley 1978)	Taxon	Salient features[A]	Distribution[B]	Closest relative		Notes
				Taxon	Distribution[B]	
Phyllodineae DC. (Phyllodes flat, with one ± central nerve on each face; flower-heads globular or slightly obloid)	*A. bidentata* Benth.	Harsh, diffuse sub-scrub 0.2 m tall; phyllodes c. 3 mm long, with rounded and obliquely mucronulate apices.	WA: SWBP. (Murchison River-Ravensthorpe)	*A. orbifolia* Maiden et Blakely	WA: SWBP. (Moora-Southern Cross)	A widespread, variable species in need of taxonomic revision.
	A. botrydion Maslin	Craggy, intricate shrub to 1.3 m tall, with short coarsely spinescent branchlets; phyllodes undulate, 9-15 x 4-12 mm; inflorescence clustered in bunches at ends of branches; legumes coiled.	WA: SWBP. (Restricted to the Wongan Hills)	*A. semicircinalis* Maiden et Blakely	WA: SWBP. (Wongan Hills area)	A full description of these species is given on p. 30 above.
	A. cliftoniana W.V. Fitzg.	Harsh, diffuse shrub to 2 m tall; stipules spinose; phyllodes c. 10 x 4 mm, asymmetric, tip spinose; flower-heads very slightly obloid; legumes strongly curved.	WA: SWBP (Arrino-Wongan Hills)	*A. congesta* Benth.	WA: SWBP. (Geraldton-Mt. Barker)	
	A. erinacea Benth.	Intricate sub-shrub c. 0.5 m tall, with short spinescent branchlets; phyllodes 5-10 x 2-3 mm; legumes oblong, ± flat, not constricted between seeds.	WA: SWBP; EBP-swi, er, np; S.A. (Murchison River-Dumbleyung, then east to S.A. near Eucla)	Unknown		The absence of recognisable close relatives suggests that this may be a relict species.

Phyllodineae DC. (Phyllode flat, with one ± central nerve on each face; flower-heads globular or slightly obloid).	*A. hemiteles* Benth. (syn. *A. graffiana* F. Muell.)	Shrub 2 m tall, phyllodes c. 7 cm x 7 mm, rigid, often gently curved, acute, midrib prominent; inflorescences racemose; pods papery, often coiled.	WA: SWBP; EBP-swi, er. (Murchison River-Dumbleyung, then east to near Cundeelee)	*A. prainii* Maiden et Blakely	WA: SWBP; EBP-dr; N.T.; S.A. (Perenjori east to Central Australia)	
	A. ligustrina Meisn.	Shrub or tree to 3 m tall, canopy dense; phyllodes 2-4 cm x c. 5 mm, spreading, greyish green, 1-2 glands raised along upper margin; aril orange, almost completely enclosing seed.	WA: SWBP. (Murchison River-Kellerberrin)	*A. merrallii* F. Muell.	WA: SWBP; EBP-swi, np; S.A. (Perenjori east to S.A.)	
	A. microbotrya Benth.	Bushy tree 2-3 m tall; phyllodes falcate, c. 10 x 1 cm; racemes prolific; legumes long, moniliform, dark brown; flowering in autumn.	WA: SWBP. (Murchison River-Bremer Bay)	*A. jennerae* Maiden	WA: SWBP; EBP-swi, er, dr; N.T.; N.S.W. (Merredin, east to Central Australia in arid/semi-arid areas)	
	A. aff. *obovata* Benth.	Sub-shrub c. 0.4 m tall; phyllodes elliptic-obovate, 1.5-3 x 0.7-2 cm; flowers white.	WA: SWBP, (Known only from the Wongan Hills)	*A. obovata* Benth.	WA: SWBP. (Mt. Lesueur to Augusta)	This taxon is discussed on p. 32 above.
	A. orbifolia Maiden et Blakely	Dense spreading shrub 1.5 m tall; branchlets white; phyllodes rounded, c. 1 cm diam., dark green; flower-heads creamy white.	WA: SWBP. (Moora-Southern Cross)	*A. bidentata* Benth.	WA: SWBP. (Murchison River-Ravensthorpe)	
	A. semicircinalis Maiden et Blakely	Sprawling shrub, branches often prostrate; phyllodes 1-2 cm x 5-9 mm, undulate; legumes curved.	WA: SWBP. (Restricted to the general region of the Wongan Hills)	*A. botrydion* Maslin	WA: SWBP. (Restricted to the Wongan Hills)	This species is discussed on p. 34 above.

Table 2. List of Wongan Hills *Acacia* species giving their salient features, distributions and closest relative with its distribution—*continued*.

Section (Pedley 1978)	Taxon	Salient features[A]	Distribution[B]	Closest relative		Notes
				Taxon	Distribution[B]	
Phyllodineae DC. (Phyllodes flat, with one ± central nerve on each face; flower-heads globular or slightly obloid)	*A. shuttleworthii* Meisn.	Compact, hairy sub-shrub to c. 0.5 m tall; phyllodes c. 10 x 6 mm, very undulate, apices acute; flower-heads cream; flowering in summer.	WA: SWBP. (Mogumber-Cunderdin; Nyabing. Apparently a disjunct distribution)	Perhaps *A. gregorii* F. Muell.	WA: EBP-er. (Carnarvon-Onslow)	Further study required to establish the true affinities of this species.
	A. ulicina Meisn.	Harsh, intricate sub-shrub c. 0.5 m tall; branches glaucescent, striate, with numerous short divaricate spinescent branchlets; phyllodes c. 5 x 1 mm.	WA: SWBP. (Murchison River-Kellerberrin)	*A. spinosissima* Benth.	WA: SWBP; EBP-swi. (York-Norseman area)	
Plurinerves (Benth.) Maiden et Betche (Phyllodes flat or terete, nerves numerous; flower-heads globular or rarely obloid)	*A. assimilis* S. Moore	Dense shrub to 3 m tall; phyllodes filiform, terete, more than 8-nerved, bright green, with white plumose tips.	WA: SWBP; EBP-swi. (Yalgoo-Bremer Bay and Norseman)	*A. triptycha* F. Muell. ex Benth.	WA: SWBP. (Busselton-Cape Arid)	
	A. dura Benth.	Obconic shrub 1 m tall, canopy dense; phyllodes ascending, c. 3-5 cm x 2 mm, broad-linear, slightly curved, prominently 2-nerved on each face.	WA: SWBP. (Restricted to the general region of Wongan Hills)	Unknown		The absence of readily detectable close relatives suggests that this may be a relict species.
	A. fragilis Maiden et Blakely	Dense shrub to 2 m tall; phyllodes filiform, terete, 8-nerved, dark green, with white plumose tips.	WA: SWBP; EBP-swi. (Geraldton-Esperance)	*A. uncinella* Benth. (Taxonomy in need of review)	WA: SWBP; EBP-swi, er. (Corrigin-Esperance; Sandstone area)	

Plurinerves (Benth.) Maiden et Betche (Phyllodes flat or terete, nerves numerous; flower-heads globular or rarely obloid)	*A. latipes* Benth.	Harsh, diffuse shrub c. 1 m tall; phyllodes rigid, patent, strongly 3-nerved, c. 1.5 cm long and tapered to sharp apices.	WA: SWBP. (Shark Bay-Esperance)	*A. cochlearis* (Labill.) H. Wendl.	WA: SWBP: EBP-np. (Coastal dunes)	
	A. leptospermoides Benth. subsp. *leptospermoides*	Obconic shrub 1 m tall; phyllodes c. 10 x 4 mm, narrowly obovate, glaucescent; legumes light brown, distinctly curved.	WA: SWBP. (Shark Bay-Cranbrook)	*A. leptospermoides* subsp. *obovata* Maslin	WA: SWBP. (Murchison River)	The broad, flat phyllode form referred to in Maslin (1978) occurs in the Wongan Hills.
	A. pharangites Maslin	Spindly, open shrub to 3(4) m tall; phyllodes linear-terete, to 4 cm long, glaucescent; flower-heads obloid.	WA: SWBP. (Restricted to gullies in the Wongan Hills)	Distantly related to *A. tetanophylla* Maslin	WA: SWBP. (Stirling Range-Ravensthorpe area)	Presumably a relict species (see p. 33 above.
Juliflorae (Benth.) Maiden et Betche (Phyllodes flat or terete, nerves numerous; flower-heads in cylindrical spikes)	*A. acuminata* Benth.	Tree to 4 m tall; phyllodes flat, marginally white-fimbriate on upper 1/3.	WA: SWBP; EBP-swi, er, np. (Shark Bay-Albany then east to about Norseman)	*A. burkittii* F. Muell. ex Benth.	W.A.: SWBP; EBP-er, dr, np; S.A.; N.S.W. (Southern semi-arid areas of Australia)	
	A. denticulosa F. Muell.	Open shrub to 3.5 m tall; phyllodes c. 6-7 x 4-5 cm, coriaceous, asperulate, reticulate-veined; spikes dense.	WA: SWBP. (Wongan Hills-Nungarin, favours granite rocks)	Unknown		Perhaps a relict species.

Table 2. List of Wongan Hills *Acacia* species giving their salient features, distributions and closest relative with its distribution—*continued.*

Section (Pedley 1978)	Taxon	Salient features[A]	Distribution[B]	Closest relative		Notes
				Taxon	Distribution[B]	
Juliflorae (Benth.) Maiden et Betche (Phyllodes flat or terete, nerves numerous; flower-heads in cylindrical spikes)	*A. lasiocalyx* C. Andrews	Tree to 4 m tall; branchlets pruinose; phyllodes long (to 25 cm), broad-linear, lax, falcate, glabrous.	WA: SWBP; EBP-swi. (Perenjori-Cape Arid)	*A. signata* F. Muell.	WA: SWBP; EBP-er. (Murchison River-Esperance)	
	A. multispicata Benth.	Dense shrub 1-2 m tall; phyllodes linear-terete, 3-4 cm long, slightly curved, with a small hooked apical mucro; spikes sessile.	WA: SWBP. (Murchison River-Ravensthorpe)	*A. sessilispica* Maiden et Blakely	WA: SWBP. (Morawa-Newdegate)	
	A. neurophylla W.V. Fitzg.	Dense shrub to 2 m tall; phyllodes c. 8 x 0.5 cm, strongly veined with distant nerves, rather straight and rigid.	WA: SWBP; EBP—swi, er. (Murchison River area—Norseman)	*A. cochlocarpa* Meisn.	WA: SWBP. (Moora-Kellerberrin)	

[A]The features given here refer only to the Wongan Hills populations. No account is taken of variation encountered outside this region.
[B]Abbreviations for Western Australian botanical Provinces and Regions are adapted from Hopper and Maslin (1978): EBP=Eremaean Botanical Province (dr—Desert Region; er—Eremaean Region; np—Nullarbor Plain; swi—South-West Interzone Region). SWBP—South-West Botanical Province. Australian State abbreviations are given in capitals. Distribution maps for all species listed here are given in Hnatiuk and Maslin (1980a).

Eriostemon wonganensis (Rutaceae), a new species from the Wongan Hills, Western Australia

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Abstract

Paul G. Wilson, *Eriostemon wonganensis* (Rutaceae), a new species from the Wongan Hills, Western Australia. Nuytsia 4 (1): 47-50 (1982). A new species, *Eriostemon wonganensis*, from the Wongan Hills, Western Australia, is described and illustrated. It belongs to sect. Nigrostipulae and differs from all other members of that section in being completely glabrous.

Since a revision of *Eriostemon* Smith was published (Wilson, 1970) several new members of the genus have been found, but in most cases in areas difficult of access from where it has not been possible to obtain suitable material for the provision of adequate descriptions. The species which is here described is found in the Wongan Hills, a low range of laterite-capped hills about 140 km north-east of Perth. It was discovered in September 1980 during a continuing survey of the plants and animals of the area (Kenneally, 1977). It is clearly distinct from all other members of the genus.

Eriostemon wonganensis Paul G. Wilson, sp. nov. (Figures 1 and 2)

Fruticulus glaber c. 1 m altus. *Ramuli* graciles, vittis viridibus glandulosis e foliis decurrentibus. *Folia* estipulata, aciculares, supra plana et sulcata. *Flores* axillares, solitarii, glabri; *stamina* pyramidales; *discus* pulvinatus planus; *ovarium* pyramidale. *Semen* oblongo-reniforme, c. 2.5 mm longum; *testa* minute verrucosa (fere laevis).

Typus: Wongan Hills, 13.5 km NE of Wongan Hills township, Western Australia, 1 Sept. 1980, *K. F. Kenneally* 7466 (holo: PERTH; iso: CANB, K).

Erect glabrous *shrub* c. 1 m high, with a number of erect branches arising from the base. *Branches* slender, when young with green glandular-verrucose decurrencies arising from leaf bases and separated by corky strips. *Leaves* scattered, estipulate, ± erect, subsessile, slender and subterete, 5-10 mm long, glandular verrucose, sulcate and somewhat flattened above. *Flowers* solitary, axillary, glabrous; *pedicel* slender clavate, c. 5 mm long, with a few small basal bracteoles c. 0.5 mm long; *sepals* fleshy, ovate, obtuse, c. 1 mm long; *petals* oblong-elliptic, c. 5 mm long, white except for pink outer medial strip; *stamens* pyramidally arranged, c. 3 mm long with the antipetalous slightly shorter than the antisepalous; *filaments* very narrowly triangular, flattened; *anthers* quadrate, c. 1 mm long with a small white apiculum c. 0.2 mm long, pollen orange; *disc* cushion-shaped, flat; *ovary* pyramidal c. 1.5 mm high; *style* slender-terete c. 1 mm long; *stigma* small, subcapitate. *Cocci* slightly spreading in fruit, quadrate, c. 3 mm high, glandular verrucose, shortly apiculate. *Seeds* oblong-reniform, c. 2.5 mm long and 1.8 mm broad; *testa* brittle; faintly verrucose (almost smooth), black; *hilum* circular, central on abaxial face; *placental endocarp* thin.

Figure 1. *Eriostemon wonganensis*. Growing in the Wongan Hills. Photo of type plant by K. F. Kenneally.

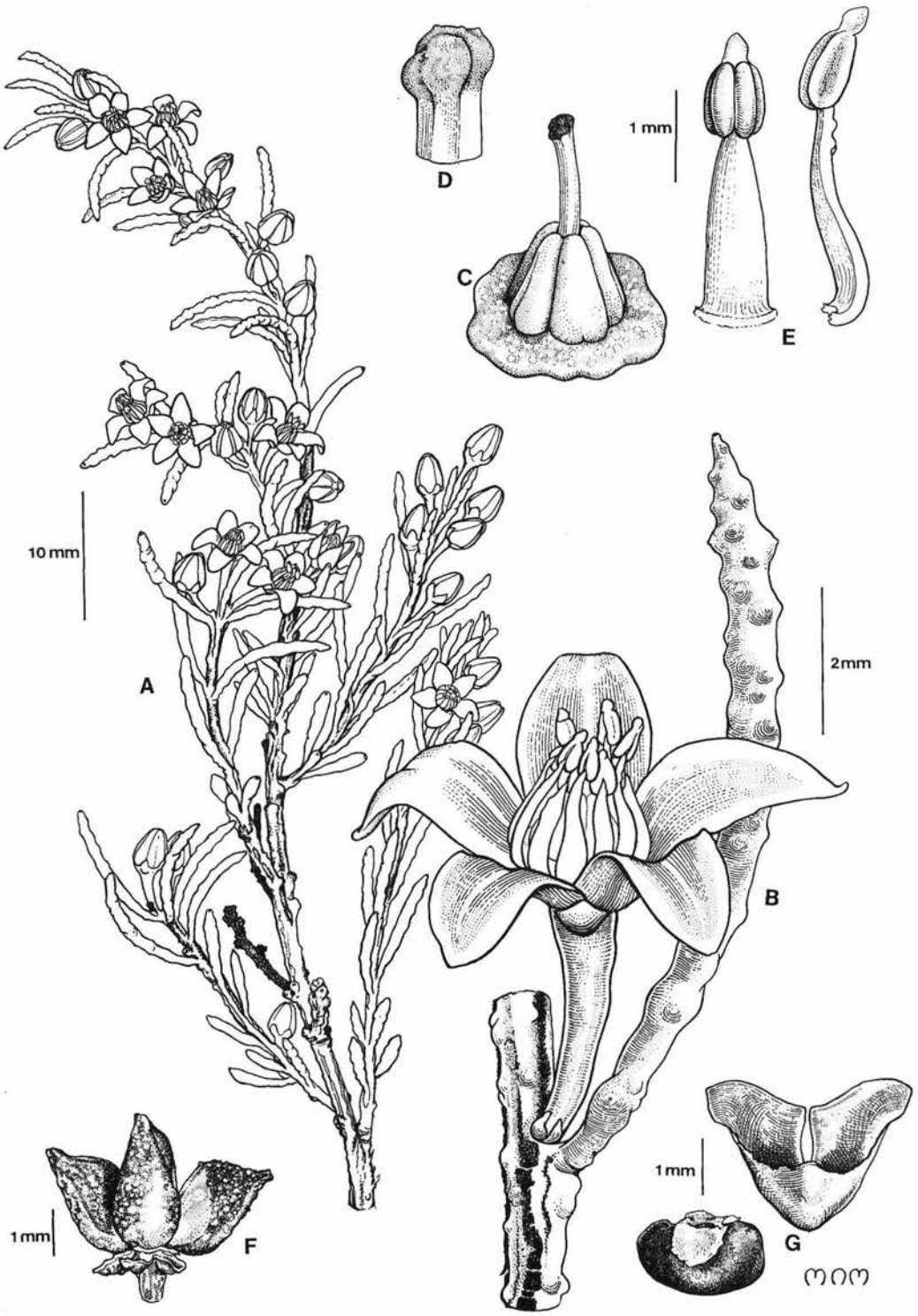

Figure 2. *Eriostemon wonganensis*. A—habit. B—flower. C—gynoecium and disc. D—stigma. E—stamens. F—fruit. G—elastic endocarp and seed with attached placental endocarp.

A-E from *K. F. Kenneally* 7466 F. and G from *K. F. Kenneally* 7493.

Additional specimen examined. WESTERN AUSTRALIA: Wongan Hills 13.5 km NE of Wongan Hills township, *K. F. Kenneally* 7493 (Perth).

Distribution. Only known from the Wongan Hills, c. 30°50'S 116°38'E, Western Australia.

Habitat. Red soil over fractured or schistose greenstone in open *Eucalyptus ebbanoensis* woodland (fide K. F. Kenneally in sched.).

Eriostemon wonganensis clearly belongs to the section Nigrostipulae Wilson (1970) as is evident from the flower and seed structure, yet, unlike other members of the section, it is completely glabrous. The only other species of *Eriostemon* which is both glabrous and axillary-flowered is *E. deserti* Pritzel of section Gymnanthos but in that species the staminal filaments are terete and spreading whereas in *E. wonganensis* they are flat and pyramidally arranged.

Conservation status (Hartley and Leigh, 1979). Vulnerable. *Eriostemon wonganensis* is only known from an area of a few hectares of privately owned land in the Wongan Hills where there appears to be about 100 plants present (B. Rye pers. comm.). Owing to the unusual nature of the habitat and the isolated position of the Hills, it is unlikely that this plant occurs elsewhere.

Acknowledgement

I am grateful to Margaret A. Menadue for preparing the illustration.

References

Hartley, W. and Leigh, J. (1979). 'Plants at risk in Australia.' (Australian National Parks and Wildlife Service: Canberra.)

Kenneally, K. F. (Co-ordinator) (1977). 'The natural history of the Wongan Hills.' Handbook No. 11. (W.A. Naturalists' Club: Perth.)

Wilson, P. G. (1970). A taxonomic revision of the genera *Crowea, Eriostemon* and *Phebalium* (Rutaceae). Nuytsia 1:2-155.

Rhagodia acicularis (Chenopodiaceae), a new species from the Wongan Hills, Western Australia

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Abstract

Paul G. Wilson, *Rhagodia acicularis* (Chenopodiaceae) a new species from the Wongan Hills, Western Australia. Nuytsia 4(1): 51-54 (1982). A new species, *Rhagodia acicularis,* is described; it is endemic to the Wongan Hills, Western Australia. A new combination is effected for a close relative *R. ulicina* (Gand.) Paul G. Wilson (*Chenopodium ulicinum* Gand.).

Recent collecting activity in the Wongan Hills, Western Australia, had brought to light an undescribed *Rhagodia* which closely resembles *R. ulicina* (Gand.) Paul G. Wilson. The latter had been placed in the genus *Chenopodium* but both it and the newly described species clearly belong in *Rhagodia.*

Rhagodia acicularis Paul G. Wilson, sp. nov. (Figures 1 and 2)

Frutex compactus c. 0.5 m altus, furfuraceus. *Folia* alterna, parva, angusti elliptica, 2-5 mm longa, aliquantum carnosa, vesiculariter furfuracea. *Inflorescentia* spicata (vel breviter paniculata), c. 10 mm longa; flores pauci, parvi, sessiles, minute bracteati. *Flores* masculi late turbinati c. 1 mm longi; *tepala* 5; *stamina* 5, filamentis anguste teretibus versus basim lanatis; *pistillodium* minutum. *Flores* feminei spheroidei c. 1.2 mm diam.; *staminodia* absentia; *ovarium* glabrum; *stigmata* tenuia, papillosa, c. 0.3 mm longa. *Fructus* baccatus, depresso sphericus, c. 3 mm diam.; pericarpium succulentum, roseum. *Semen* lenticulare 1.5 mm diam., radialiter verruculosum, nigrum, margine rotundato.

Typus: Monk's Well Gully, Wongan Hills, 30°46'S, 116°38'E, Western Australia, 15 Feb. 1980, *P. G. Wilson* 11713 (holo: PERTH; iso: CANB).

Compact intricately branched rounded *shrub* c. 0.5 m high, scurfy due to a close covering of minute vesicular hairs which although collapsing retain their circular shape with age, dioecious. *Branchlets* spinescent. *Leaves* alternate, small, somewhat fleshy, narrowly elliptic, 2-5 mm long, glabrescent above, closely vesicular puberulous below. *Inflorescence* spicate (or shortly paniculate) with a spinescent axis c. 10 mm long; *flowers* few, sessile, subtended by a minute bract. *Male flowers* broadly turbinate, c. 1 mm long; *tepals* 5, free to base, narrowly obovate, incurved, closely vesicular hairy outside, glabrous within; *stamens* 5, filaments slender-terete, lanate towards base, united into a thick cup-shaped disc; *anthers* shortly exserted, c. 0.5 mm long; *pistillode* minute. *Female flowers* spheroidal, c. 1.2 mm diam.; *tepals* narrowly obovate not enlarging in fruit; *staminodes* absent; *ovary* glabrous; *style* minute; *stigmas* slender, papillose, c. 0.3 mm long. *Terminal flower* on female inflorescence sterile, densely filled with woolly hairs arising from staminodes;

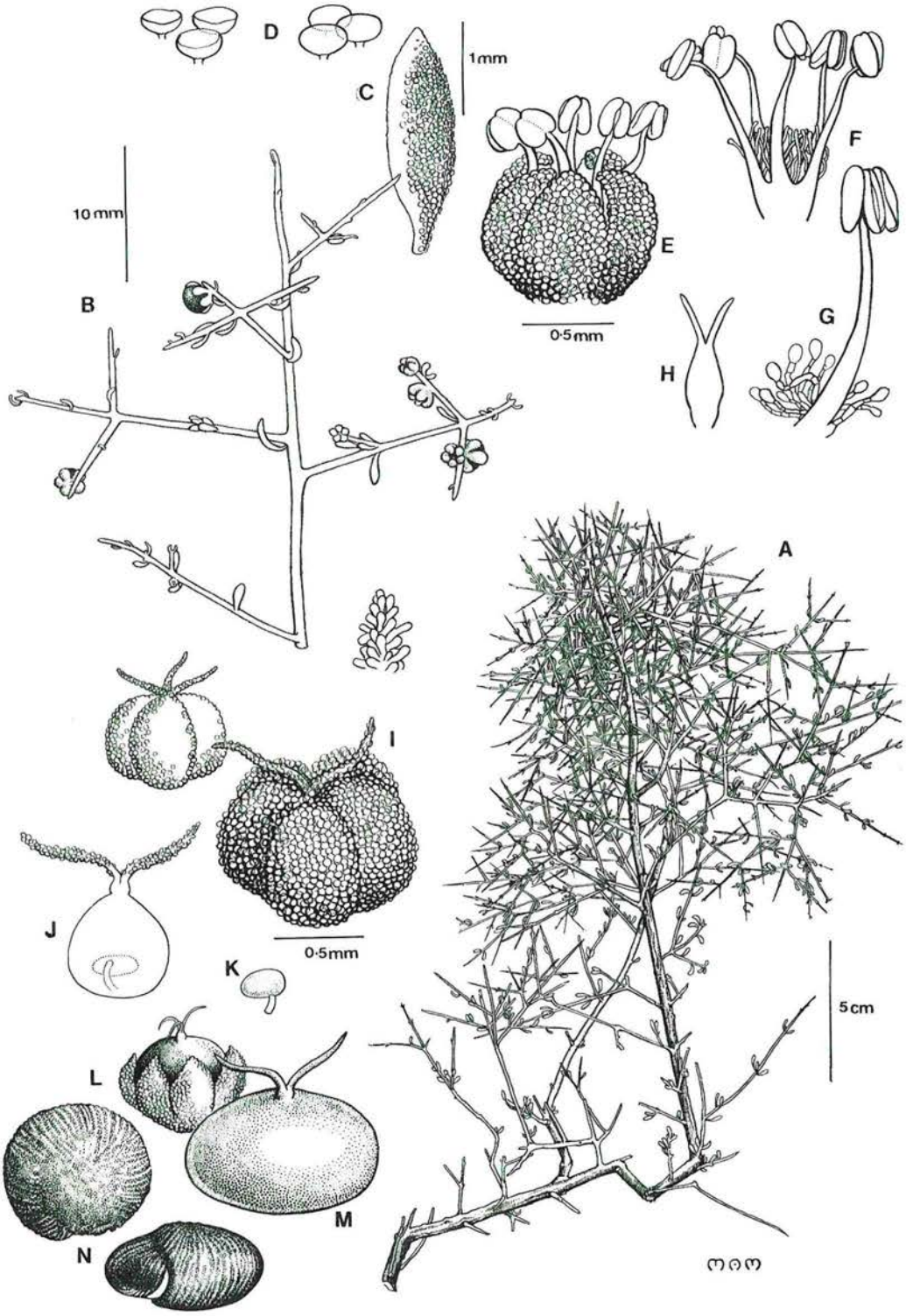

Figure 1. *Rhagodia acicularis*. A—habit. B—female branch. C—young leaf. D—vesicular hairs, inflated (right) and collapsed (left). E—male flower. F—androecium. G—stamen. H—pistillode. I—female flower. J—ovary. K—ovule. L—perianth with fruit. M—berry. N—seed, from above and side.

From *K. F. Kenneally* 2384 (male) and *P. G. Wilson* 11713 (female).

pistillode minute with 2-3 erect glabrous stigmas. *Fruit* baccate, depressed spherical, c. 3 mm diameter, pale red, clasped around margin by tepals but exposed at apex and towards base in inter-tepalar spaces; *pericarp* succulent, adherent to seed. *Seed* lenticular with rounded margin, 1.5 mm diam., radially verruculose, black.

Additional specimens examined. WESTERN AUSTRALIA: Wongan Hills, *K. F. Kenneally* 2384 and 6448 (PERTH); ibid., *P. G. Wilson* 11712 (PERTH).

Distribution. Endemic to the Wongan Hills, c. 30°50′S, 116°40′E, south-west Western Australia.

Habitat. Red soil on gravelly lateritic slope in eucalypt woodland.

The specific epithet 'acicularis' refers to the needle-like branchlets of this species.

Rhagodia ulicina (Gand.) Paul G. Wilson, comb. nov.

Chenopodium ulicinum Gand., Bull. Soc. Bot. France 66:224 (1919). *Type*: Mt. Lyndhurst, April 1900, *M. Koch* 366 (holo: LY; iso: PERTH).

Rhagodia acicularis resembles *R. ulicina*, to which it is evidently closely related, but differs in the following characters: 1) Terminal flower of female inflorescence sterile (not large and fertile), 2) Seed radially verruculose (not smooth or minutely granular), 3) Male flower with woolly stamens united into a cup-shaped disc (not glabrous and without a disc). It is a typical member of the genus and evidently related to such other typical members as *R. spinescens* R.Br. and *R. drummondii* Moq.

When Gandoger described *Chenopodium ulicinum* he was evidently unaware that the plant was dioecious and that it had baccate fruits for these two characters, and it being a shrub, firmly establish it as a member of the genus *Rhagodia*. This species is widely distributed in semi-arid areas of southern Australia from eastern New South Wales to northern Eyre Peninsula westwards to south-east Western Australia (near Cocklebiddy). It frequently grows on limestone.

Acknowledgement

The illustration was kindly prepared by Margaret A. Menadue.

Figure 2. *Rhagodia acicularis*. Growing in the Wongan Hills. Photo of type plant by K. F. Kenneally.

A new species of *Conostylis* R.Br. (Haemodoraceae) from the Fitzgerald River area, Western Australia

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Abstract

Green, J. W. A new species of *Conostylis* R.Br. (Haemodoraceae) from the Fitzgerald River area, Western Australia. Nuytsia 4(1): 55-59 (1982). *Conostylis deplexa* J. W. Green, belonging to section Catospora Benth., is described. It is distinguished from all other species in the genus by having marginal setae embracing the otherwise glabrous leaf blades.

Conostylis deplexa J. W. Green, sp. nov. (Figures 1-3)

Planta perennis. *Folia* linearia, plana, glabra, praeter setas marginales distichos amplectentes. *Scapus* foliis breviorus. *Perianthium* parte libra ovario superanti, lobis tubo paulo longioribus. *Antherae* connectivum longum, decurrens. *Placentae* peltatae, ovulis pluribus reflexis ornatis. *Semina* in quoque loculo 1 vel 2, curva, longitudinaliter sulcata.

Typus: 6 km E of Fitzgerald River on Ravensthorpe-Jerramungup road, 31 Oct. 1975, *J. W. Green* 4619. (holo: PERTH; iso: CANB).

Perennial in small tufts or solitary. *Stem* short. *Leaves* linear, 15-20 cm long, 1.5-3 mm broad, flat, longitudinally striate, glabrous except for marginal setae; *setae* in 2 alternate ranks on each margin, stiff, simple (though sometimes themselves minutely spinulose), enclasping the leaf blade often across its entire breadth, white or tinged reddish-brown at the base. *Scape* 2-5 cm long, shorter than the leaves, bearing near the middle a brown, scarious, broadly lanceolate bract 2-3 cm long which sometimes becomes leaf-like; *indumentum* of the scape softly tomentose, of branched or simple trichomes. *Inflorescence* excluding the scape congested, 2.5-3.5 cm across, subtended by 1 or 2 brown, scarious, lanceolate bracts 1.5-2 cm long and abaxially tomentose on their midrib. *Flowers* in clusters of 10-20, each subtended by a linear, ± tomentose, brown bracteole 3-7 mm long; pedicel 1-2 mm long. *Perianth* campanulate, 1-1.5 cm long, yellow; *lobes* ± equal, 4-7 mm long, exceeding the free part of the tube; *outer surface of the perianth* bearing a woolly tomentum of short, branched trichomes mixed with longer, simple, minutely spinulose ones; *inner surface of the lobes* pubescent, trichomes simple; *inner surface of the tube* glabrous. *Stamens* erect, uniseriate, 3.5 mm long. *Anther* 2.5 mm long, bisporangiate and bilocular (Green, 1980); *connective* decurrent, 2/3 as long as the anther; *filament* slender. *Style* exceeding the stamens, ± reaching the tips of the perianth lobes. *Ovary* 3-locular; placentas axile, peltate, each with several ovules dependent from near the margin. *Fruiting perianth* enlarged to 3.5 mm diameter near the base. *Seeds* 1-2 in each loculus, curved-cylindrical, 1.8 mm long and 0.4 mm diameter, orange, longitudinally grooved.

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Figure 1. *Conostylis deplexa*. Holotype: 6 km E of Fitzgerald River on Ravensthorpe to Jerramungup road. *Green* 4619.

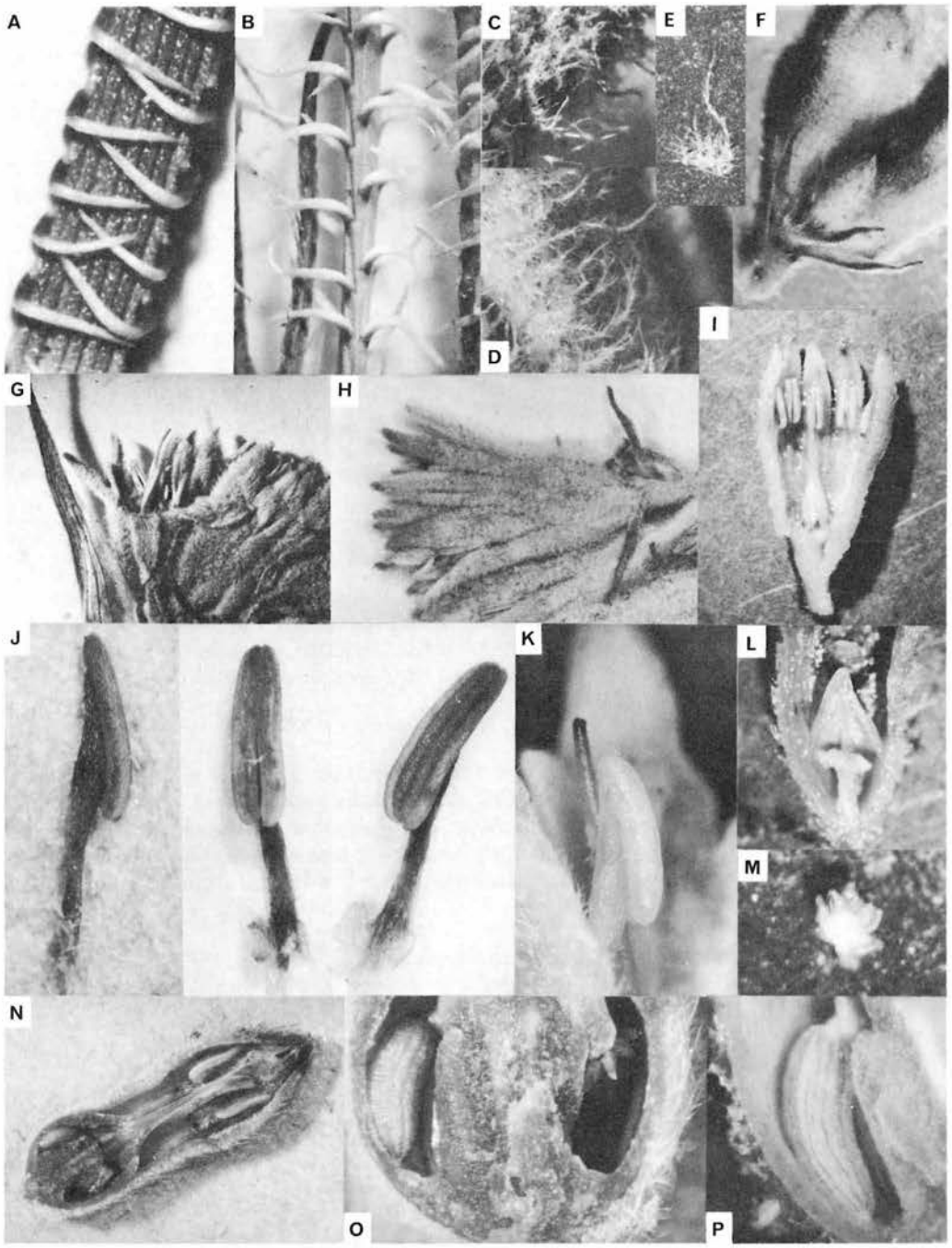

Figure 2. *Conostylis deplexa*. A—B: Leaf showing marginal setae x15. C—E: Indumentum of inflorescence x15. C—scape. D—outer perianth. E—dissection of branched and simple trichomes. F—portion of flower cluster, showing bracteoles x3. G—I: Flower x3. G and H—external view showing stamens and tube. I—ovary showing placentation. J—stamens showing sporangia and connective x10. K—stamens and style x10. L—longitudinal section of ovary x4. M—placenta and ovules dissected out x15. N—fruiting perianth, longitudinal half x3. O—P: Fruit, longitudinal half, showing seeds and unfertilised ovules O x10, P x15. All from *Green* 4819 (holotype, PERTH) except C, D and K from *Hopper* 1142 (PERTH) and G from *Newbey* 3865 (PERTH).

Habitat. According to specimen label data, the species occurs among open shrub mallee, low closed heath or low open woodland containing a low closed heath understorey. Associated species include *Eucalyptus tetragona, E. falcata, E. redunca,* perhaps other mallees and, in one case, "emergent hakeas 1.5 m". The soil is commonly pale grey sand, or sandy loam, mostly over laterite, on rolling hilltops or winter-wet flats.

Flowering and fruiting period. Flowering has been recorded between early September and late October; fruiting has been recorded in October.

Other specimens examined. WESTERN AUSTRALIA: 6 km S of the S end of Lake Magenta, *S. D. Hopper* 1806 (PERTH); 38.5 miles (61.9 km) W of Ravensthorpe on road to Ongerup, *A. S. George* 7043 (CANB, K, MEL, NSW, PERTH); 6.1 km ENE of Fitzgerald River bridge, *S. D. Hopper* 550 (PERTH); 6 km ENE of Fitzgerald River, *S. D. Hopper* 1142 (PERTH); 17.1 km ENE of Fitzgerald River bridge, *S. D. Hopper* 1144 (PERTH); 1.3 km W of Fitzgerald School, *S. D. Hopper* 1151 (CANB, K, NSW, PERTH); 1 km NE of Roe's Rock, *K. Newbey* 3865 (PERTH).

The new species belongs to section Catospora (Bentham, 1873), judging by the placentation of the ovary. Geerinck (1969) has amended Bentham's sectional description ("perianth often hairy or woolly inside") to "tube . . . velue a l'interieur". This modification, which might seem to exclude *C. deplexa* from section Catospora, is, however, an oversimplification since some of the species included in the section by both Bentham and Geerinck have the inside of the perianth, especially the tube, only sparsely pubescent or quite glabrous. In *C. deplexa* the inside of the lobes is pubescent and the tube glabrous.

Conostylis deplexa is the fourth species to be described since the revision of Green (1961); *C. pauciflora* S. D. Hopper (1978) and *C. neocymosa* S. D. Hopper (1980) both fall into section Conostylis Geerinck (= Euconostylis Bentham) while *C. wonganensis* S. D. Hopper (1982) is said to have affinities with *C. dielsii* W.V. Fitzg. (section Catospora, fide Geerinck) and *C. teretiuscula* F. Muell. (section Conostylis).

Conservation status. The species is said to be rare by K. Newbey, (pers. comm.) and, since only one recorded locality occurs in a reserve (the Fitzgerald River National Park), the species may be endangered.

The epithet (Lat. *deplexus*, embracing or clasping) refers to the unique character of the leaf setae which distinguishes the species.

Acknowledgements

I am grateful to a number of my colleagues for discussion and other assistance. In particular I wish to thank Mr Paul Wilson and Mr Bruce Maslin for critically reading the manuscript and making valuable suggestions for improvement. I also wish to thank Mrs Wendy Lee-Frampton for drawing the map and for other technical help and Miss Vicki Hamley for typing the manuscript.

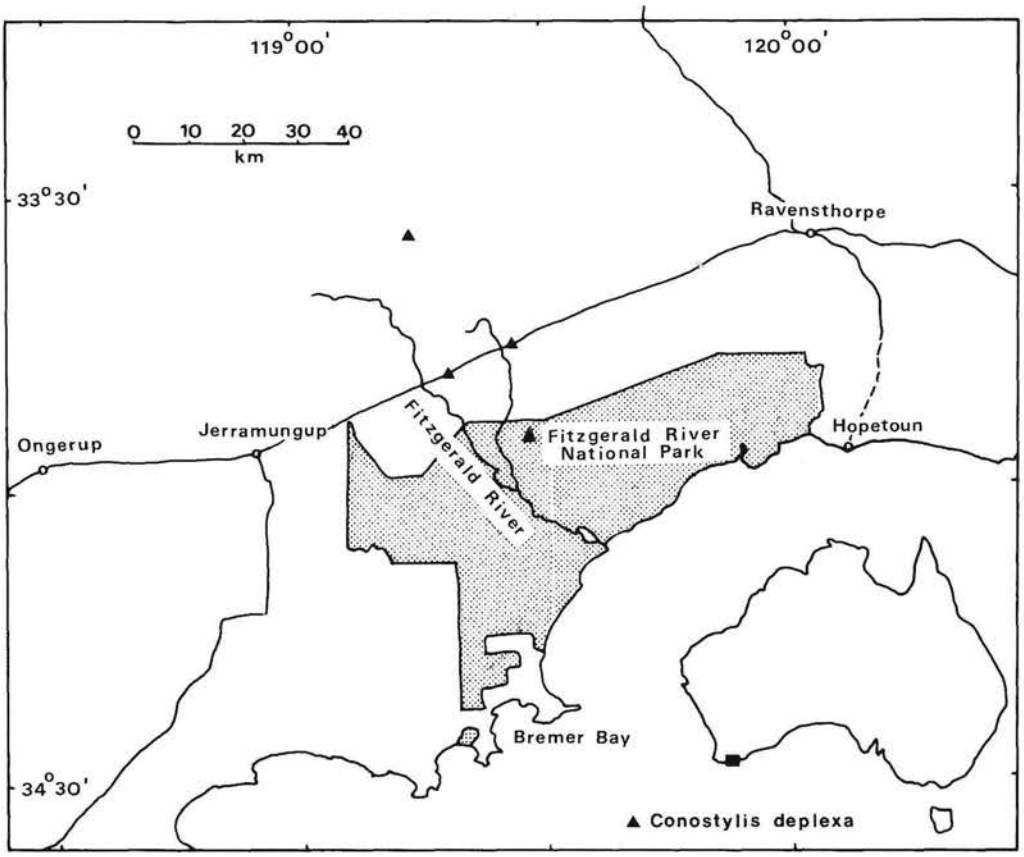

Figure 3. Distribution of *Conostylis deplexa*.

References

Bentham, G. (1873). Flora Australiensis, vol. 6. (Reeve: London.)

Geerinck, D. (1969). Le genre *Conostylis* R.Br. (Haemodoraceae d'Australie). Bull. Jard. Bot. Nat. Belg. 39: 167-177.

Green, J. W. (1961). The genus *Conostylis* R.Br. II. Taxonomy. Proc. Linn. Soc. N.S. Wales 85: 334-373.

Green, J. W. (1980). A revised terminology for the spore-containing parts of anthers. New Phytol. 84: 401-406.

Hopper, S. D. (1978). Nomenclatural notes and new taxa in the *Conostylis aculeata* group (Haemodoraceae). Nuytsia 2: 254-264.

Hopper, S. D. (1980). *Conostylis neocymosa* sp. nov. (Haemodoraceae) from south-western Australia. Bot. Notiser 133: 223-226.

Hopper, S. D. (1982). A new species of *Conostylis* (Haemodoraceae) from the Wongan Hills district, Western Australia. Nuytsia 4: 17-21.

Studies in the genus *Acacia* (Leguminosae:Mimosoideae)—11. *Acacia* species of the Hamersley Range area, Western Australia

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Abstract

Maslin, B. R. Studies in the genus *Acacia* (Leguminosae:Mimosoideae)—11. *Acacia* species of the Hamersley Range area, Western Australia. Nuytsia 4(1): 61-103 (1982). Eight new *Acacia* species from the Hamersley Range area belonging to sections Phyllodineae *(A. cuspidifolia, A. marramamba)*, Plurinerves *(A. arrecta)* and Juliflorae *(A. atkinsiana, A. daweana, A. effusa, A. exilis, A. hamersleyensis)* are described and illustrated. A brief discussion is given on the Hamersley Range populations of the taxonomically complex species, *A. bivenosa* DC. and also on certain members of the *A. stowardii* species-group i.e. *A. adsurgens* Maiden et Blakely, *A. kempeana* F. Muell., *A. rhodophloia* Maslin and *A. stowardii* Maiden. A lectotype is selected for both *A. trachycarpa* E. Pritzel and *A. xiphophylla* E. Pritzel. *Acacia clementii* Maiden et Blakely is relegated to synonymy under *A. xiphophylla, A. clementii* Domin under *A. pyrifolia* DC. while *A. gonocarpa* var. *lasiocalyx* F. Muell. is provisionally referred to *A. trachycarpa.* A key is given to the 46 *Acacia* species recorded for the Hamersley Range area. Distribution analyses of these species shows the *Acacia* flora as comprising mainly a mixture of wide-ranging arid zone and subtropical species principally from sections Juliflorae (25 species) and Phyllodineae (14 species). Only 4 species are endemic to the area. The Hamersley Range area emerges as a region with a preponderance of recently-evolved species.

Introduction

Due to increased botanical activity in the Pilbara over recent years, a number of taxonomic matters relating to *Acacia* have been brought to my attention. In this paper 8 new species occurring in, but not necessarily restricted to, the Hamersley Range area are described and the taxonomy of a number of other taxa is discussed. In addition, a key to the 46 *Acacia* species currently recorded for the area is provided. Because of current interest in the phytogeography of the Western Australian flora, a distribution analysis of the Hamersley Range *Acacia* species is included.

The area covered by the present study comprises the Hamersley Plateau as defined by Beard (1975) and includes both the Hamersley and Ophthalmia ranges. This area lies within the Fortescue Botanical District (Beard, 1980) and is situated in the north-west of Western Australia in a region known generally as the Pilbara.

Although 46 species of *Acacia* are here recorded for the Hamersley Range area (Table 1), it is likely that future sampling will increase this number. This is because many areas are very rugged, difficult of access and consequently poorly-collected botanically.

The majority of specimens used in this account are housed at the Western Australian Herbarium (PERTH). A list of specimens examined in the preparation of new species descriptions is given at the end of the paper. All illustrations were made from dried herbarium material.

The species are arranged alphabetically except for *A. adsurgens, A. kempeana* and *A. rhodophloia* which are discussed under *A. stowardii*. The distribution of each species is indicated with respect to its occurrence within Beard's (1980) Botanical Districts. The 1:250 000 map references are also given so that distributions can be correlated with those listed in Hnatiuk and Maslin (1980) and Maslin and Pedley (in press).

The environment. A detailed description of the Pilbara region is given in Beard (1975) and summarized in Beard (1980). The brief notes on climate, geology/geomorphology and vegetation which follow, are largely taken from these two accounts.

The Hamersley Plateau has an arid-tropical climate with an annual precipitation of 250-300 mm. The climate is largely dominated by tropical cyclones which occur predominantly from January to March. Average temperatures for Wittenoom, situated on the north of the Plateau, range from about 18°C in June and July to about 33°C in the November-March period.

The Hamersley Plateau is a mountainous region lying between the Fortescue and Ashburton Rivers. It comprises massive deposits of Lower Proterozoic sediments (mainly jasperlite and dolomite) and volcanics overlying Archean granite and volcanics. On its northern flank the Plateau is bounded by an abrupt escarpment fronting the Fortescue Valley. Around Wittenoom, short rivers have cut deep, narrow gorges into the Plateau. When present, soils on the ranges are rocky and skeletal. Further south and east the topography is different and comprises broken country of impressive ranges separated by broad alluvial plains of deep, earthy loams. The highest eminence in Western Australia, Mt Meharry (1 235 m), occurs in this area.

The vegetation of the jasperlite and dolomite ranges is characteristically a tree steppe dominated by *Eucalyptus leucophloia* (snappy gum) with a *Triodia wiseana* (spinifex) ground cover. On basaltic hills, as in the Tom Price-Paraburdoo area, a vegetation mosaic of *Acacia aneura* (mulga) low woodland and *A. inaequilatera-Triodia* shrub steppe is found. Most of the valleys carry *A. aneura* low woodland.

Phytogeography of *Acacia* in the Hamersley Range area

Distribution maps of all species mentioned in this discussion are given in Maslin and Pedley (1982).

As discussed by Hopper and Maslin (1978) the Pilbara is one of the secondary centres of species richness for *Acacia* in Western Australia. Of the 54 species recorded for the Pilbara (Maslin and Hnatiuk, unpublished) 46 occur in the Hamersley Range area (Table 1). Only 4 species, *A. daweana, A. effusa, A. exilis* and *A. hamersleyensis* are endemic.

The *Acacia* flora of the Hamersley Range area is dominated by sections Juliflorae (25 species) and Phyllodineae (14 species) which together comprise 84 per cent of the total. The remaining seven species are contained in sections Acacia, Lycopodiifoliae and Plurinerves (Table 2).

The main geographical affinities of the Hamersley Range area *Acacia* species are with arid zone and subtropical regions. This is evident from Tables 1 and 2 where it is seen that 33 species (72%) and 32 species (70%) are shared with the adjacent Central Eremaean and South Kimberley Areas respectively (see Figure 1 for

Table 1. Alphabetic listing of *Acacia* species recorded for the Hamersley Range area showing the taxonomic section to which each belongs as well as their distribution. The distribution data is taken from Maslin and Pedley (1982.)

Species	Section (Pedley, 1978)	Distribution within the Hamersley Range area[A]	Distribution outside the Hamersley Range area										
			W.A.[B]										Extra W.A.[C]
			nk	sk	nwe	we	ne	ce	swe	se	cnw	swc	
A. acradenia F. Muell.	Juliflorae	146,157		x	x			x					NT,Q
A. adoxa Pedley	Lycopodiifoliae	146,157,158,169	x	x	x		x	x					NT
A. adsurgens Maiden et Blakely	Juliflorae	157,158,169			x		x	x					NT,Q
A. ampliceps Maslin	Phyllodineae	145,146,157,158, 168	x	x	x	x							NT
A. ancistrocarpa Maiden et Blakely	Juliflorae	145,146,156,157, 158,169	x	x	x	x	x	x					NT,Q
A. aneura F. Muell. ex Benth.	Juliflorae	145,156,157,158, 168			x	x	x	x	x	x			NT,SA,Q, NSW
A. arida Benth.	Juliflorae	156,157,169	x	x	x								
A. arrecta Maslin	Plurinerves	145,146,157, 158		x	x								
A. atkinsiana Maslin	Juliflorae	145,146,156,157, 169			x			x					
A. bivenosa DC.	Phyllodineae	145,146,156,157, 158,168,169		x	x	x		x					
A. citrinoviridis Tindale et Maslin	Juliflorae	145,146,156,157, 158,168,169		x	x	x	x	x	x				
A. coriacea DC.	Plurinerves	157,158,168,169			x			x					
A. cowleana Tate	Juliflorae	145,146,157,169		x	x			x					NT,Q
A. cuspidifolia Maslin	Phyllodineae	168			x	x	x	x					
A. cuthbertsonii Luehm.	Juliflorae	157		x	x	x	x	x	x				NT
A. daweana Maslin	Juliflorae	157			x								
**A. dictyophleba* F. Muell.	Phyllodineae	156,157,158,169		x	x		x	x	x	x			NT,SA,Q
A. effusa Maslin	Juliflorae	157			x								
A. exilis Maslin	Juliflorae	157			x								
A. farnesiana (L.) Willd.	Acacia	146,156,157, 168,169	x	x	x	x		x	x				NT,SA,Q,NSW
A. hamersleyensis Maslin	Juliflorae	157,158,169			x			x					
A. hilliana Maiden	Juliflorae	157,158,169		x	x		x	x					NT,Q
A. holosericea A. Cunn. ex G. Don	Juliflorae	145,146,157,158	x	x	x			x					NT,Q
A. inaequilatera Domin	Phyllodineae	146,156,157,158, 168,169		x	x	x	x						NT
A. kempeana F. Muell.	Juliflorae	156,157,158,168		x	x	x		x	x	x	x		NT,SA,Q
A. maitlandii F. Muell.	Phyllodineae	146,157,158,168, 169		x	x		x	x	x				NT,SA,Q,NSW
A. marramamba Maslin	Phyllodineae	157,168,169			x			x					

Table 1. Alphabetic listing of *Acacia* species recorded for the Hamersley Range area showing the taxonomic section to which each belongs as well as their distribution. The distribution data is taken from Maslin and Pedley (1982.)—Continued.

Species	Section (Pedley, 1978)	Distribution within the Hamersley Range area.[A]	Distribution outside the Hamersley Range area										
			W.A.[B]										Extra W.A.[C]
			nk	sk	nwe	we	ne	ce	swe	se	cnw	swc	
A. monticola J. M. Black	Plurinerves	157,158,169		x	x		x	x					NT,Q
A. orthocarpa F. Muell.	Juliflorae	145,146,157	x	x	x								NT,Q
A. pachyacra Maiden et Blakely	Phyllodineae	156,157,158,169			x			x	x	x			NT,SA
A. pruinocarpa Tindale	Phyllodineae	157,158,168,169			x			x	x				NT,SA
A. ptychophylla F. Muell.	Juliflorae	157		x	x		x						
A. pyrifolia DC.	Phyllodineae	145,146,156,157, 158,168,169	x	x	x	x	x	x					
A. retivenia F. Muell.	Plurinerves	157	x	x	x								NT,Q
A. rhodophloia Maslin	Juliflorae	157,158,168,169		x	x	x	x	x	x		x		NT
A. sclerosperma F. Muell.	Phyllodineae	145,146,156,157, 158,168,169		x	x	x		x	x		x		
A. spondylophylla F. Muell.	Lycopodiifoliae	157,158,169		x	x		x	x					NT,Q
A. stowardii Maiden	Juliflorae	157,168,169			x			x	x	x	x		NT,SA,Q,NSW
A. tenuissima F. Muell. Juliflorae	145,146,157,158, 169		x	x			x						NT,Q
A. tetragonophylla F. Muell.	Phyllodineae	157,158,168,169		x	x	x	x	x	x	x	x		NT,SA,Q,NSW
A. trachycarpa E. Pritzel	Juliflorae	145,146,156,157, 158		x	x		x						
A. tumida F. Muell. ex Benth.	Juliflorae	145,146,157,158	x	x	x		x						NT
A. validinervia Maiden et Blakely	Phyllodineae	157,158			x			x		x			NT,SA
A. victoriae Benth.	Phyllodineae	145,146,156,157, 158,168,169		x	x	x		x	x	x			NSW,V
A. wanyu Tindale	Juliflorae	145,156,168,169		x	x			x					
A. xiphophylla E. Pritzel	Juliflorae	145,146,156,157, 168			x	x			x				

*Although possessing 2-3-nerved phyllodes, I feel this species is better placed in section Phyllodineae than in section Plurinerves.
A The numbers appearing in this column refer to 1°x1.5° grid cells as shown in Hnatiuk and Maslin (1980).
B Abbreviations used here are for Western Australian *Acacia* Areas as explained in Figure 1.
C Australian State abbreviations are as follows: NT—Northern Territory, NSW—New South Wales, Q—Queensland, SA—South Australia, V—Victoria.

Table 2. Results of geographical analysis of *Acacia* sections occurring in the Hamersley Range area. Distribution abbreviations refer to the *Acacia* Regions and Areas given in Figure 1.

Section (Pedley, 1978)	Number of *Acacia* species in the Hamersley Range area		Distribution of Hamersley Range *Acacia* species										
			KR		ER						SWR		Extra-W.A.
	Total No.	Endemic	nk	sk	new	ne	ce	we	swe	se	swc	cnw	
Juliflorae	25	4	5	16	25	10	16	7	7	3	0	3	14
Plurinerves	4	0	1	4	4	2	2	1	0	0	0	0	3
Phyllodineae	14	0	2	9	14	6	12	8	8	5	0	2	9
Lycopodiifoliae	2	0	1	2	2	2	2	0	0	0	0	0	2
Acacia	1	0	1	1	1	0	1	1	1	0	0	0	1
TOTALS	46	4	10	32	46	20	33	17	16	8	0	5	29

definition of *Acacia* Areas referred to herein). Wide-ranging taxa from all sections of the genus contribute to these arid zone/subtropical affinities but most species are contained in the sections Juliflorae and Phyllodineae. For example, *A. aneura, A. cuthbertsonii, A. kempeana,* and *A. stowardii* (all section Juliflorae) and *A. dictyophleba, A. inaequilatera, A. maitlandii, A. pruinocarpa* and *A. tetragonophylla* (all section Phyllodineae) are common in the central and southern parts of the Australian arid zone. Most of these species find their western or north-western limit of distribution in the region of the Hamersley Range. The subtropical affinities are attributed mainly to species distributed in both the northern arid zone and in subtropical parts of northern Australia, e.g. *A. acradenia, A. ancistrocarpa, A. hilliana, A. tenuissima, A. tumida* (all section Juliflorae), *A. coriacea, A. monticola, A. retivenia* (all section Plurinerves) and *A. victoriae* (section Phyllodineae).

Based on current taxonomic knowledge, 44 of the 46 Hamersley Range area *Acacia* species have at least one known close relative and are therefore classified as being of recent origin according to the criteria adopted by Stebbins and Major (1965). Only *A. daweana* and *A. tetragonophylla* seem to qualify as possible relict taxa because neither is known to have taxonomically close relatives. The species richness of the Hamersley *Acacia* flora is therefore the result of an accumulation of recently derived taxa rather than through the persistence of numerous relict taxa. This accords with results shown for other areas of Western Australia (Hopper and Maslin, 1978).

Of the recently derived species, six are either restricted to the Hamersley Range area or extend only to nearby regions. These six species are listed here together with their closest relative(s) and it is to be noted that in every case, at least one of the close relatives also occurs within the Hamersley Range area.

1. *A. arrecta/A. abbreviata, A. arida, A. hilliana, A. minutifolia, A. orthocarpa;*
2. *A. atkinsiana/A. adsurgens, A. duriuscula, A. kempeana, A. nelsonii, A. rhodophloia, A. stowardii;*
3. *A. effusa/A. chisholmii, A. gracillima, A. lysiphloia, A. trachycarpa;*
4. *A. exilis/A. tenuissima;*
5. *A. hamersleyensis/A. citrinoviridis, A. tumida, A. xiphophylla;*
6. *A. marramamba/A. inaequilatera, A. pyrifolia, A. strongylophylla.*

Bowler (in press) proposed that areas peripheral to the central arid zone were climatically the most unpredictable regions of Australia during the Quaternary. According to Maslin and Hopper (in press), the resultant stresses placed on sedentary organisms in such regions created situations ideal for localized speciation. From the data given above it is evident that the Hamersley Range area has been one such region of speciation. It is intriguing to speculate why a number of the recently-evolved Hamersley Range species are confined to the nearby area. Perhaps, as suggested by Randell and Symon (1977), the formation of extensive sand dune systems some 30 000 years B.P. have played an important role as an isolating mechanism. Certainly the Hamersleys are "isolated" in the sense that they are bounded to the north and east by the Great Sandy Desert and the Little Sandy Desert and to the south by the Ashburton River sedimentary basin.

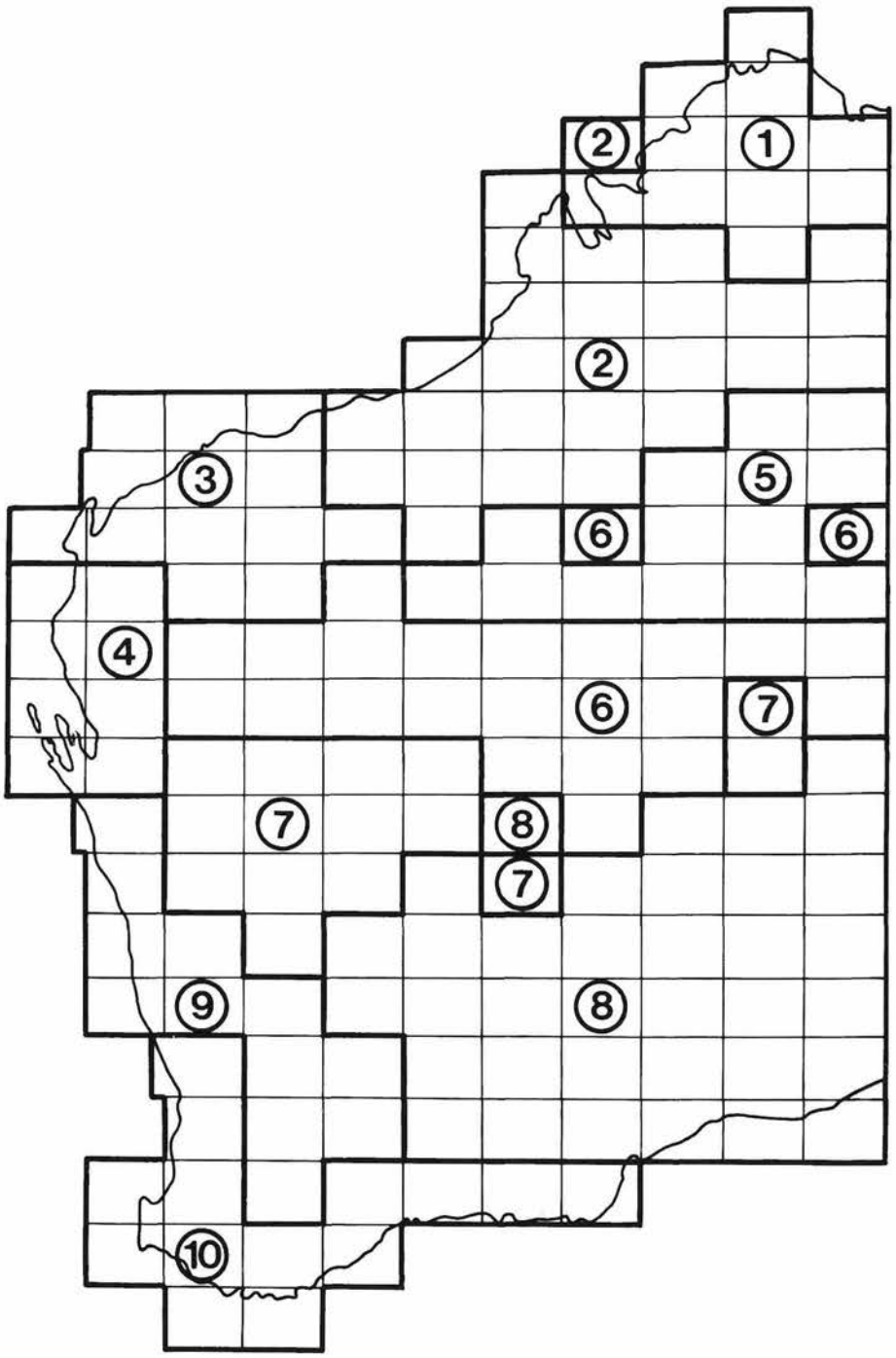

Figure 1. Map of Western Australia showing the ten *Acacia* Areas defined by Hnatiuk and Maslin (unpublished) based on 1° x 1.5° grid cells.

1-2: Kimberley Region (KR) showing 1. North (nk) and 2. South (sk) Kimberley areas. 3-8: Eremaean Region (ER) showing 3. North-West (nwe), 4. West (we), 5. North (ne), 6. Central (ce), 7. South-West (swe) and 8. South (se) Eremaean areas. 9-10: South-West Region (SWR) showing 9. South and West Coastal (swc) and 10. Central and North Wheatbelt (cnw) areas.

Taxonomy

Key to the *Acacia* species of the Hamersley Range area

(Numbered species are described and/or discussed in the text. Descriptions for species marked with an asterisk (*) are in Maslin (1981)).

1. Foliage bipinnate; stipules spiny ..... **A. farnesiana*
   Foliage reduced to phyllodes 2
2. Phyllodes with very sharp, spiny, needle-like tips; flower-heads globular 3
   Phyllodes not sharp and spiny (although sometimes the tips may be coarsely pungent, especially on terete phyllodes); flower-heads globular to cylindrical ... 8
3. Phyllodes 1-4 cm wide, elliptic but often asymmetrically so; stipules spiny, sometimes deciduous; inflorescences racemose or paniculate 4
   Phyllodes less than 1 cm wide, linear to narrowly oblong-elliptic or narrowly obovate; inflorescences simple and axillary (neither racemose nor paniculate) .. 6
4. Phyllodes symmetric with the midrib centrally situated, often glaucous; inflorescence axes yellowish or with a pale purplish tinge ..... 10. *A. pyrifolia*
   Phyllodes asymmetric with the midrib situated near the lower margin 5
5. Branchlet apices white-pruinose; phyllodes 2.5-7 cm long, 1.5-3.5 cm wide, often grey-green, reticulum prominent; inflorescence axes purple; bark corky; gnarled trees to c. 5 m tall ..... **A. inaequilatera*
   Branchlet apices not pruinose; phyllodes 2-4 cm long, 1-2 cm wide, pale green, reticulum obscure; inflorescence axes red-brown; bark fibrous; shrubby trees to 3(5) m tall ..... 9. *A. marramamba*
6. Phyllodes fasciculate (solitary on new shoots), acicular, c. 1 mm wide; diffuse shrubs or trees to 5 m tall ..... **A. tetragonophylla*
   Phyllodes scattered (not fasciculate), more than 1 mm wide 7
7. Stipules spiny (although absent from some nodes); phyllodes normally 3-6 cm long; flower-heads pale yellow; bushy, non-resinous shrubs or trees 3-7 m tall ..... 4. *A. cuspidifolia*
   Stipules not spiny, persistent, c. 1 mm long; phyllodes 0.8-2.5 cm long; flower-heads golden yellow; resinous, rather spindly and open shrubs 2-3 m tall ..... **A. maitlandii*
8. Phyllodes whorled, to c. 1 cm long, ± terete; legumes sticky; shrubs dense, spreading, to 1 m tall 9
   Phyllodes scattered, normally more than 1 cm long 10
9. Phyllodes less than 5 mm long, ascending, grey; branchlets densely white-pilose; petals striate ..... **A. adoxa* var. *adoxa*
   Phyllodes more than 5 mm long, spreading (at maturity), bright green; Branchlets not conspicuously hairy; petals obscurely 1-nerved **A. spondylophylla*
10. Phyllodes minutely punctulate i.e. with minute, circular, whitish dots which are observable at x10 mag., nerveless or very obscurely nerved; flower-heads cylindrical; legumes woody, basally narrowed; seeds oblique with straight, narrowly turbinate funicle/arils 11
    Phyllodes not punctulate, nerves often conspicuous; flower-heads globular to cylindrical 12
11. Phyllodes flat ..... *A. arida*
    Phyllodes terete (very closely allied to the above) ..... **A. orthocarpa*
12. Phyllodes terete, subterete or quadrangular 13
    Phyllodes distinctly flattened (although occasionally only 1-2 mm wide) 21
13. Longest phyllode less than 7 cm 14
    Longest phyllode more than 7 cm 16

14. Flower-heads globular, on peduncles 1.5-4 cm long; legumes woody, vernicose when young, basally narrowed, 4-6 mm wide, margins not thickened; phyllodes to 4 cm long, curved upwards; slightly viscid, spreading shrubs to 1 m tall ..... 1. *A. arrecta*
Flower-heads cylindrical 15

15. Peduncles 1-3 cm long; phyllodes to 6 cm long, green; legumes woody, sticky (at least when young), linear but basally narrowed, c. 4 mm wide, margins thickened; resinous, spreading shrubs to 1 m tall ..... **A. hilliana*
Peduncles to 1 cm long; phyllodes variable, grey-green; legumes papery, not sticky, ± oblong, 4-15 mm wide; shrubs or trees more than 1 m tall ... **A. aneura*

16. Flower-heads globular, arranged in axillary racemes; phyllodes 4-nerved in all, together with the branchlets always glabrous 17
Flower-heads cylindrical spikes, simple and axillary (not racemose); phyllodes more than 4-nerved (nerves often very fine and obscure) 18

17. Legumes papery and flat; calyx divided into free, linear-spathulate sepals; branchlets red-brown; phyllodes finely filiform, c. 0.5 mm diam., ± quadrangular, smooth ..... **A. pachyacra*
Legumes woody and moniliform; calyx united, ± truncate; branchlets light grey; phyllodes 1 mm or more wide, often distinctly flattened, coarsely wrinkled when dry ..... *A. sclerosperma*

18. Branchlet apices and/or phyllodes (at least when young) hairy to some degree (hairs minute, appressed, and on phyllodes in *A. aneura* often confined to the region between the nerves: observe at x10 mag.) 19
Branchlet apices and phyllodes glabrous (neglect pulvinar area in *A. exilis*) ... 20

19. Legumes woody and moniliform; young phyllodes not resinous, covered with a dense silvery or greenish yellow indumentum; sepals variably united for about half their length ..... *A. wanyu*
Legumes papery and flat; young phyllodes resin-nerved, indumentum generally less conspicuous than above, mature phyllodes grey-green; sepals free to base ..... **A. aneura*

20. Branchlet apices with yellow, crenulated, resin ribs (observe at x10 mag.); spikes dense, to c. 1 cm long, pale yellow; phyllodes 6-15 cm long; legumes 2-3 mm wide; shrubs normally to 2 m tall ..... **A. tenuissima*
Branchlet apices without resin ribs; spikes not dense, 1-2 cm long, light golden; phyllodes 14-18 cm long; legumes 4-5 mm wide; tall shrubs or small trees to 4 m ..... 7. *A. exilis*

21. Phyllodes with 1 longitudinal nerve on each face (nerve often obscure in *A. victoriae*, the phyllodes then finely wrinkled when dry) 22
Phyllodes with more than 1 longitudinal nerve on each face (nerves normally numerous, very fine and close together but sometimes few, conspicuous and widely spaced; in *A. bivenosa* nerves reduced to 2 with one of them poorly developed—best observed on dried specimens) 29

22. Flower-heads cylindrical (on fruiting specimens inspect receptacle for flower scars); bark "Minni Ritchi" i.e. reddish and exfoliating in narrow shavings which curl retrorsely from each end; legumes circinate, ± reticulate, resinous 23
Flower-heads globular; bark not "Minni Ritchi" 24

23. Phyllodes asymmetrically elliptic, 9-15 mm long, 3-7 mm wide, apex rounded with an acute, laterally positioned, acute mucro; wide-spreading shrubs to 1 m tall ..... 6. *A. effusa*
Phyllodes narrowly linear, longer and narrower than above; tall shrubs more than 1 m ..... 12. *A. trachycarpa*

24. Phyllodes all less than 5 cm long 25
Phyllodes some or all more than 5 cm long 26

25. Stipules spiny on young plants, often deciduous with age; branchlets not resinous, often pruinose; peduncles normally in pairs; phyllodes never spiny-tipped, often finely wrinkled when dry; shrubs or small trees ..... *A. victoriae*
Stipules not spiny, persistent, appressed, c. 1 mm long; branchlets resinous, never pruinose; peduncles solitary in phyllode axils; phyllodes normally spiny-tipped; rather spindly, open shrubs 2-3 m tall ..... *A. maitlandii*

26. Phyllodes long and narrowly linear, less than 5 mm wide, normally terete but appearing flat when broad (see lead 17 above) ..... *A. sclerosperma*
Phyllodes more than 5 mm wide 27

27. Peduncles less than 1 cm long; phyllodes less than 10 cm long; attractive, fragrant shrubs to 3 m tall, commonly forming groves along roadsides, trunks white ..... *A. validinervia*
Peduncles more than 1 cm long; phyllodes normally more than 10 cm long. . . . 28

28. Legumes ± chartaceous, 10-17 mm wide; bracteole and sepal apices densely golden puberulous (best observed at x10 mag. on unexpanded heads); trees to 10 m tall, not confined to watercourses, flowering from October to December (heads bright golden) ..... *A. pruinocarpa*
Legumes ± woody, c. 5 mm wide; bracteoles and sepals glabrous; bushy shrubs or trees confined to watercourses, flowering from May to August (heads white or cream) ..... *A. ampliceps*

29. Phyllodes large (c. 10-20 cm long and 1-2.5 cm wide) AND the minor nerves forming a loose, open reticulum between the 2-4 main longitudinal nerves; flower-heads cylindrical 30
Phyllodes shorter or narrower OR if not, then the minor nerves very fine, close together and parallel (nor forming a loose, open reticulum); flower-heads globular to cylindrical 31

30. Petals glabrous (best to observe unexpanded spikes); phyllodes ± symmetrically and gently falcate ..... *A. cowleana*
Petals minutely sericeous; phyllodes ± straight although normally curved near their apices, somewhat asymmetric ..... *A. holosericea*

31. Flower-heads globular or obloid i.e. less than twice as long as wide (on fruiting specimens inspect receptacle for flower scars) 32
Flower-heads distinctly cylindrical i.e. more than twice as long as wide 37

32. Phyllodes with numerous, very fine, parallel (never anastomosing) nerves which are situated close together 33
Phyllodes with 2-5 widely spaced main longitudinal nerves between which the minor nerves frequently anastomose and form a reticulum 34

33. Flower-heads globular; legumes moniliform, to 23 cm long, 6-13 mm wide; phyllodes ± linear, 12-35 cm long, 1-7 mm wide, lax and often pendulous; trees to 10 m tall and normally confined to watercourses ..... *A. coriacea*
Flower-heads obloid; legumes flat and broadly linear, to 10 cm long, 4-6 mm wide; phyllodes very narrowly elliptic to narrowly oblanceolate, 6-15 cm long, (4)5-10(12) mm wide, ascending; shrubs to 3.3 m tall, favouring open spinifex plains ..... 2. *A. atkinsiana*

34. Branchlets and phyllodes hairy (sometimes the hairs are very fine—observe at x10 mag.); inflorescences normally not racemose 35
Branchlets and phyllodes completely glabrous; bark never "Minni Ritchi". . . . 36

35. Phyllodes 3-7.5 cm long, 2-4 cm wide, strongly reticulate; indumentum conspicuous and densely tomentose; flower-heads large; open shrubs to 3 m tall, bark not "Minni Ritchi" ..... **A. retivenia*
Phyllodes 1.2-3 cm long, 5-15 mm wide, nerves of reticulum fine and impressed; indumentum finely puberulous, less conspicuous than above; shrubs or trees to 5 m tall, bark "Minni Ritchi" i.e. reddish brown and exfoliating in narrow shavings which curl retrorsely from each end ..... **A. monticola*

36. Inflorescences racemose but racemes normally grow out as leafy shoots with the peduncles then appearing axillary; phyllodes not conspicuously reticulate, fleshy, finely wrinkled when dry, with 2 longitudinal nerves (but one of these is poorly developed); legumes woody, less than 1 cm wide; shrubs not resinous ..... 3. *A. bivenosa*
Inflorescences not racemose; phyllodes conspicuously reticulate, coriaceous, with 2-5 longitudinal nerves; legumes firmly chartaceous, 1-1.5 cm wide; shrubs resinous ..... **A. dictyophleba*

37. Phyllodes narrowly linear, 1-2 mm wide, not rigid, 1-3 longitudinal nerves on each face; legumes circinate and reticulate; bark "Minni Ritchi" i.e. reddish and exfoliating in narrow shavings which curl retrorsely from each end; shrubs or small trees normally found along watercourses ..... 12. *A. trachycarpa*
Characters not combined as above 38

38. Phyllodes c. 6-11 cm long and 1-3 cm wide, obliquely narrowly elliptic with acuminate apices, not falcate, some nerves obviously confluent with the lower margin for a distance above the base; branchlets resinous and minutely puberulous ..... **A. acradenia*
Phyllode nerves not basally confluent or if so (rare) then other characters not combined as above 39

39. Phyllodes some or all more than 8 cm long 40
Phyllodes all less than 8 cm long 46

40. All parts glabrous (neglect calyx) 41
Either flowering peduncles or receptacles, phyllodes and/or branchlets (especially on new shoots) or legumes hairy to some degree (hairs often minute and appressed—observed at x10 mag.) 44

41. Phyllodes conspicuously lanceolate-falcate, about 10-15 cm long and 10-20 mm wide, together with the branchlets often pruinose; spikes arranged in racemes which normally grow out as new shoots; legumes obviously longitudinally wrinkled when dry, not resinous ..... **A. tumida*
Phyllodes often straight, not above 12 mm wide; spikes axillary, not racemose; legumes not obviously wrinkled 42

42. Phyllodes bright olive green, somewhat shiny (observe fresh), c. 10-18 cm long and 2-11 mm wide, 1-3 yellowish nerves more evident than the very obscure, impressed, distant, minor nerves, marginal nerve discrete and yellowish; legumes resinous, 7-12 mm wide, subwoody ..... **A. ancistrocarpa*
Phyllodes not as above; legumes not resinous, ± chartaceous 43

43. Phyllodes 11-20 cm long, 2-3 mm wide, narrowly linear, pale green; spikes dense, pale yellow; calyx more than half the length of the corolla ..... 11a. **A. adsurgens*
Phyllodes variable, 4.5-12.5 cm long, 1-8 mm wide, often broadly linear or very narrowly eliptic but occasionally narrowly linear; spikes a darker yellow and less dense than above; calyx less than half the length of the corolla ..... 11e. **A. stowardii*

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44. Legumes glabrous, to 21 cm long; spikes comprising somewhat widely spaced rather large flowers with short, cupular, ± truncate, golden puberulous calyxes that are readily observable at x10 mag.; phyllodes coriaceous, rather rigid and normally ± straight, extremely finely nerved, silvery-sericeous when intermediate aged but glabrous at maturity, very young new shoots golden; small, spreading often gnarled trees on alluvial flats ..... 13. *A. xiphophylla*
Legumes hairy, hairs, yellow when young but turning white with age; spikes dense; calyx not as above; phyllodes often falcate, generally less rigid, less coriaceous and more obviously nerved (at x10 mag.) than above, normally 8-14 cm long and 5-15 mm wide 45

45. Legumes with a dense, soft appressed sericeous indumentum; flowering peduncles and spike axes (i.e. the receptacles) golden puberulous; phyllodes falcate, the new shoots citron-sericeous but hairs turning silvery-white on intermediate aged phyllodes, glabrous at maturity; graceful trees often with pendulous branches, normally found along watercourses. (Small phyllode variants, c. 5-6 cm long and c. 5 mm wide, are known from tops of rocky ranges) ..... **A. citrinoviridis*
Legumes with spreading, pilose hairs; peduncles and receptacles sparsely resinous-papillose (not golden puberulous); very young new shoots pale citron-sericeous, quickly passing to glabrous phyllodes; spreading shrubby trees to 4 m, normally on ridges and upper slopes of ranges ..... 8. *A. hamersleyensis*

46. Sepals free and linear-spathulate; legumes chartaceous, ± glabrescent, loosely reticulate; phyllodes very variable in shape and size, grey-green, together with branchlets minutely appressed puberulous (at least when young); tall shrubs or trees common on alluvial flats ..... **A. aneura*
Characters not combined as above; sepals normally united 47

47. Phyllode nerves rather widely spaced (interstices readily observable and wider than diameter of the nerves); phyllodes about 3-5 cm long and 5-10 mm wide; legumes woody and glabrous; uncommon shrubs 48
Phyllode nerves very fine and close together, either uniform or 1 or more slightly more evident than the rest; legumes chartaceous to coriaceous, hairy or glabrous 49

48. Phyllodes and brachlets glabrous; legumes not wrinkled, narrowed towards their base, 6-8 mm wide, to 6 cm long; phyllodes with numerous, prominent, longitudinal nerves which rarely anastomose ..... **A. ptychophylla*
Phyllodes and branchlets densely and minutely appressed sericeous; legumes coarsely wrinkled when dry, narrowly oblong, 1-2 cm wide, to 16 cm long; phyllodes with rather few, not prominent, widely spaced main longitudinal nerves with sparsely and openly anastomosing, longitudinally oriented lateral nerves between them ..... **A. cuthbertsonii*

49. Branchlets and/or phyllodes (at least when young) and flowering peduncles hairy (observe at x10 mag.); legumes hairy or glabrous; bark never "Minni Ritchi" 50
Branchlets and phyllodes glabrous or if sparsely hairy then bark "Minni Ritchi" i.e. red and exfoliating in narrow shavings which curl retrorsely from each end; legumes glabrous 51

50. Low shrubs to 1 m tall; young legumes with sparse, short, spreading hairs, mature legumes not seen; stipules frequently persistent on branchlets, dark brown, 1-2 mm long; phyllodes (3.5) 4-5.5 cm long, 6-10 mm wide, very sparsely reticulate; new shoots not golden hairy; spikes dense ..... 5. *A. daweana*
Tall shrubs (exceeding 1 m) or more commonly small trees; stipules early deciduous ..... 13. *A. xiphophylla*
(or a short phyllode variant of *A. citrinoviridis,* see lead 44 above).

51. Bark "Minni Ritchi"; phyllodes 4.5-6.5 cm long, 5-8 mm wide; flower-heads dense; calyx slightly more than half the length of the corolla; legumes narrowly oblong, c. 5 mm wide; seeds longitudinal. . . . . 11d. **A. rhodophloia*
Bark grey; flower-heads often less dense than above; calyx half or less than half the length of the corolla 52
52. Legumes narrowly oblong, 4-7 mm wide; seeds longitudinal to longitudinally oblique in the legumes; phyllodes variable, linear to narrowly elliptic, 4.5-9 (10-12.5) cm long, 2-8 mm wide, length to width ratio 9-40 . . . . . 11e. **A. stowardii*
Legumes broadly oblong 10-26 mm wide; seeds transverse to transversely oblique in the legumes; phyllodes ± narrowly elliptic, 3-7.5(9) cm long, 4-15(17) mm wide, length to width ratio 3-13 . . . . . 11c. **A. kempeana*

1. **Acacia arrecta** Maslin, sp. nov. (Figure 2)

Acacia arida Benth. et *A. orthocarpa* F. Muell. affinis a qua capitulis floralibus globularibus, phyllodiis nec punctulatis, (1.5)2-4 cm longis, 1 mm diam., teretibus, sursum curvatis differt. Etiam ad *Acacia hilliana* Maiden affinis a qua capitalis floralibus globularibus et marginibus leguminis nec incrassatis differt.

Typus: 11 km E of Wittenoom on the road to Port Hedland, Western Australia. 12 July 1980. *B. R. Maslin* 4644. "Dense rounded shrub 1 m tall, sometimes spreading and ± flat-topped, dividing at ground level into 6 main branches; bark grey; phyllodes grey-green, slightly curved, ascending; inflorescences and legumes erect. Stony clay in spinifex with *Acacia hilliana*." (holo: PERTH; iso: CANB, K, MEL).

Low, dense, spreading, rounded or ± flat-topped, slightly viscid *shrubs* to 1 tall and 2 m diam., dividing at ground level into up to 6 main branches. *Bark* smooth except at extreme base of stems where it is slightly fissured, grey but reddish brown towards ends of branches. *Branches* terete, with crenulated resinous ribs which are most evident towards the ends of the branchlets, glabrous. *New shoots* light to medium green, slightly resinous. *Stipules* deciduous. *Phyllodes* terete but slightly compressed upon drying, (1.5)2-4 cm long, 1 mm diam., curved upwards near the base to give a characteristic ascending aspect, glabrous except for the pulvinus, grey-green; abruptly narrowed at *apex* into callose, acute, innocuous, straight or slightly hooked, light orange-brown points which are c. 1 mm long; *pulvinus* obscure, c. 0.5 mm long, obscurely transversely wrinkled, yellowish orange, grooved adaxially near base, groove densely villous; *nerves* 8, barely visible, submerged; *gland* obscure, situated on the upper margin of the phyllode at the distal end of the pulvinus, comprising raised yellowish nectiferous tissue c. 0.2 mm diam., orifice absent. *Inflorescences* simple and axillary, 1-2 per node, erect. *Peduncles* 15-40 mm long, robust, glabrous, slightly resinous; *basal peduncular bract* solitary, small (c. 0.8 mm long), triangular and ± persistent. *Flower-heads* globular, light golden 30-45-flowered, c. 7-10 mm diam. at anthesis, quite resinous, flowers densely arranged; *bracteoles* c. 1 mm long, glabrous, claws linear and ending in thickened and inflexed laminae. *Flowers* 5-merous, buds bluntly acute. *Calyx* stout, 1/2-2/3 length of corolla, very shortly divided into broadly triangular lobes, calyx tube strongly 5-nerved with translucent tissue between nerves. *Petals* 2.5 mm long, connate for c. 2/3 their length, glabrous, 1-nerved. *Legumes* erect, subterete to compressed, not constricted between the seeds, tapering towards the base, 4-5.5 cm long, 4-6 mm wide at broadest point, woody, glabrous, yellowish brown to dark brown, vernicose when young, longitudinally nerved, splitting elastically from the top, valves curved following dehiscence, shallowly sigmoid with a swollen apical portion; *margins* not thickened.

Seeds positioned obliquely in the legumes within pronounced depressions, rather persistent following dehiscence of legume, ellipsoid, 3 mm long, 1.5 mm wide, turgid but laterally compressed (2 mm thick), blackish and rather dull, marked with a darker coloured narrow peripheral band of tissue; *pleurogram* fine, open towards the hilum, bordered by pale coloured tissue; *areole* c. 1.7 mm long, 0.6 mm wide; *funicle-aril* narrowly turbinate and straight.

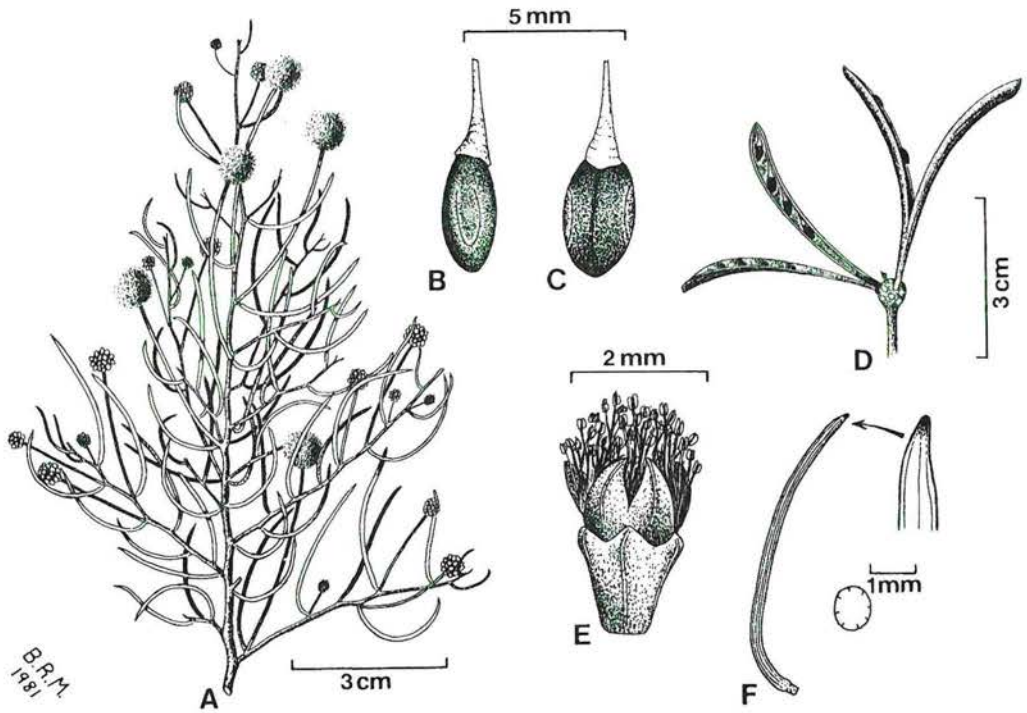

Figure 2. *Acacia arrecta*. A—Portion of branch. B and C—Seed (B—plane view; C—side view). D—Legumes held erect on receptacle (note persistent seeds following dehiscence). E—Flower. F—Phyllode with enlargements showing apex and transverse sectional shape (note position of the 8 nerves).

A from *I. L. Lethbridge* s.n.; B-D from *M. I. H. Brooker* 2089a; E from *K. Stewart* s.n.; F from *B. R. Maslin* 4644 (the type).

Other collections examined. WESTERN AUSTRALIA: 15 mi (24 km) E of Nullagine, *J. S. Beard* 4603 (KP); Millstream, 6 Dec. 1974 and 10 Oct. 1975, *R. F. Black* s.n. (PERTH); Southern tributary of the Fortescue River just E of Gregory Gorge, 30 Jan. 1975, *R. F. Black* s.n. (NSW, PERTH); About 0.5 mi (1 km) SE of Millstream Station homestead, *M.I.H. Brooker* 2089a (CANB, K, MEL, PERTH); 2 mi (3.4 km) E of Yampire Gorge, 22°20′S, 118°30′E, *H. Demarz* 4416 (KP, PERTH); Wittenoom Gorge, Hamersley Range, *A. S. George* 1068 (PERTH); 10 mi (16 km) SE of Wittenoom on Drillers Hill, July and Aug. 1971, *I. L. Lethbridge* s.n. (BRI, PERTH); 40 km E of Wittenoom, *A. A. Mitchell* 348 (PERTH, WAIT); Wittenoom Gorge, Sept. 1957, *K. Stewart* s.n. (PERTH).

Distribution. (Figure 10) North-west Western Australia in the Fortescue Botanical District (1:250 000 maps F50-6, 7, 11, 12; F51-5). Ranging from Millstream (21°35′S, 117°04′E) east to near Nullagine (21°53′S, 120°07′E) and extending south to the northern part of the Hamersley Range around Wittenoom Gorge (22°14′S, 118°20′E).

Habitat. Judging from the relatively few collections to hand, the species favours low rocky hills and associated stony flats in shrub-steppe dominated by 'spinifex' (*Triodia* sp.).

Flowering and fruiting period. It appears as though some flowers are present during most months of the year but the main period is from about December and August. Legumes with mature seeds have been collected in late September. Specimens collected between July and September frequently possess both flowers (in bud and at anthesis) and also developing legumes.

Using Pedley's (1978) classification, *A. arrecta* is placed in section Plurinerves (Benth.) Maiden et Betche. In Bentham's (1864) classification the species would occur in series Calamiformes (Benth.) Benth., an unnatural series not recognized by Pedley.

Acacia arrecta is a distinctive species with its small, terete, ascending phyllodes, its quite large, globular flower-heads which are held erect, its erect, woody ± terete, basally narrowed, longitudinally nerved legumes and its straight, narrowly turbinate funicle-aril. These carpological features are essentially the same as those of the closely related species *A. arida* Benth. and *A. orthocarpa* F. Muell. but *A. arrecta* is readily distinguished by its globular (not cylindrical) flower-heads and its non-punctate phyllodes which are either narrower or shorter. In habit and general phyllode morphology the species resembles *A. hilliana* Maiden but is again distinguished by its globular flower-heads and also by its legumes which lack prominently thickened margins. *Acacia arida, A. orthocarpa* and *A. hilliana* are all recorded for the Hamersley Range.

The specific epithet alludes to the characteristically ascending phyllodes and also to the erect inflorescences which bear legumes that are held rigidly erect.

2. **Acacia atkinsiana** Maslin, sp. nov. (Figure 3)

Acacia rhodophloia Maslin affinis a qua cortice cinereis non 'Minni Ritchi', etiam characteribus secundis in combinatione differt: capitulis floralibus obloideis (sub anthesi c. 10 mm longis et 8 mm latis), et leguminibus 4-6 mm latis.

Typus: 1 km along South Fortescue Pipeline road (towards Mt Tom Price) from the Mt Bruce to Wittenoom road, 22°38'S, 117°59'E, Western Australia. 10 May 1980. *Malcolm Trudgen* 2493. "Bush 2.2m tall, spreading habit. Bark smooth, reddish brown, rough and fibrous at base of largest stems. Phyllodes dull green. Flowers yellow. Growing in stony, red-brown soil on hilltop. *Veg: Triodia wiseana* hummock grassland with *Eucalyptus leucophloia* emergents." (holo: PERTH; iso: CANB, K, NY).

Open, spreading, rounded or infundibular *shrubs* to 3.3 m tall and with up to c. 6 spreading-erect main stems arising from ground level, occasionally single-stemmed and with a spindly aspect, becoming bushy in regrowth situations. *Bark* fissured at base of main stems otherwise smooth, grey externally but reddish brown underneath. *New shoots* resinous, dark brownish when dry, either terminal on branchlets or if axillary then associated with inflorescences. *Branchlets* terete, very obscurely nerved, glabrous, apically somewhat resinous and reddish brown or light brown but becoming grey with age. *Stipules* deciduous, triangular, c. 0.5 mm long, thickened adaxially. *Phyllodes* variable, very narrowly elliptic to narrowly oblanceolate, 6-14.5 cm long,

(4)5-10(12) mm wide, length to width ratio (8.5)10-20(26), slightly curved, ascending, coriaceous but not particularly rigid, glabrous, characteristically pale grey-green, reflecting sunlight in a ± silvery fashion, resinous (resin layer very thin and not sticky); *apex* possessing a brown, obtuse, knob-like callosity which is often slightly recurved, callosity very pronounced on young phyllodes; *pulvinus* 3-5 mm long, transversely wrinkled, yellow to brown; *gland* situated on upper margin of the phyllode at the distal end of the pulvinus, lamina swollen about the gland, submerged, comprising a circular orifice c. 0.3 mm diam. and a very indistinct rim; longitudinal *nerves* numerous, very fine and close together, not anastomosing, the central nerve and normally one on either side of it slightly more evident than the rest, margins yellowish but not thickened. *Inflorescences* axillary, 1-2 per node, normally arising at extreme base of a rudimentary shoot which usually grows out. *Peduncles* 8-15 mm long, rather stout, glabrous; *basal peduncular bract* deciduous, triangular, c. 1-1.5 mm long, concave. *Flower-heads* obloid, c. 10 mm long and 8 mm wide at anthesis, somewhat resinous, c. 90-flowered, flowers densely arranged; *bracteoles* linear-spathulate, c. 1-1.5 mm long, lamina inflexed and resin-papillose (papillae white). *Flowers* predominantly 5-merous although a few 6-merous flowers are present in some heads. *Calyx* slightly exceeding half the length of the corolla, gamosepalous, stout, very shallowly divided into broadly triangular resin-papillose (papillae white) lobes which are visible in inflorescence buds, calyx tube ± obscurely 5-nerved and glabrous. *Petals* c. 2-2.5 mm long, glabrous, 1-nerved. *Legumes* broadly linear, to 10 cm long, 4-6 mm wide, slightly curved, ± cartilaginous to firmly chartaceous, wrinkled when young, flat, barely raised over seeds, glabrous, slightly greyish brown, somewhat resinous but not sticky, abruptly narrowed at apex, basal stipe c. 5 mm long; *margins* slightly thickened, not constricted between seeds. *Seeds* longitudinal to very slightly obliquely placed in the legume, narrowly obloid or sometimes narrowly elliptic, narrowed at hilar end, 4.5-5 mm long, 2 mm wide, somewhat compressed (1 mm thick), dark brown but areolar area yellowish, not mottled, shiny; *pleurogram* obscure, open towards the hilum, surrounded by yellowish tissue; *areole* less than 0.5 mm long; *funicle* c. 3 mm long, flattened and membranous, gradually expanded into a convoluted creamy white *aril* which extends down c. 1/3 the length of the seed.

Selected specimens. WESTERN AUSTRALIA: About 1 km S of Tom Price airport, *K. Atkins* 1209 (CANB, PERTH) and 1213 (K, PERTH); Marandoo, just S of Mount Bruce, Hamersley Range, ± 22°40′S, 118°09′E, *C. Dawe* M154 (CBG, PERTH); Rio Tinto Gorge, Hamersley Station, *H. Demarz* D5755 (KP, PERTH); 65 km W of Millstream, *H. Demarz* D7084 (PERTH, TLF); 75 mi (120 km) from Wittenoom towards Roebourne, *B. R. Maslin* 2733 (AD, MEL, NSW, PERTH); 14 mi (22.5 km) S of Robe River crossing on North West Coastal Highway, *B. R. Maslin* 2761 (B, BM, G, NSW, P, PERTH); Hamersley Range National Park, on the Wittenoom to Juna Downs road 7.2 mi (11.5 km) S of turn-off to Mount Bruce, *M. E. Trudgen* 2503 and *G. Marney* (BRI, PERTH).

Distribution. (Figure 10) North-west Western Australia in the Fortescue Botanical District (1:250 000 maps F50-6, 7, 10, 11, 16). Extending from the vicinity of Mount Bruce in the Hamersley Range (22°36′S, 118°08′E) north-west to the North West Coastal Highway around Yarraloola Station (21°34′S, 115°53′E).

Habitat. Favours rocky loam on spinifex (*Triodia pungens, T. wiseana*) plains and is associated with a variety of species including *Acacia ancistrocarpa, A. aneura, A. pruinocarpa, Cassia* spp., *Eucalyptus leucophloia*, etc. *Acacia atkinsiana* often forms dense regrowth populations in disturbed sites such as along road verges and in burnt areas.

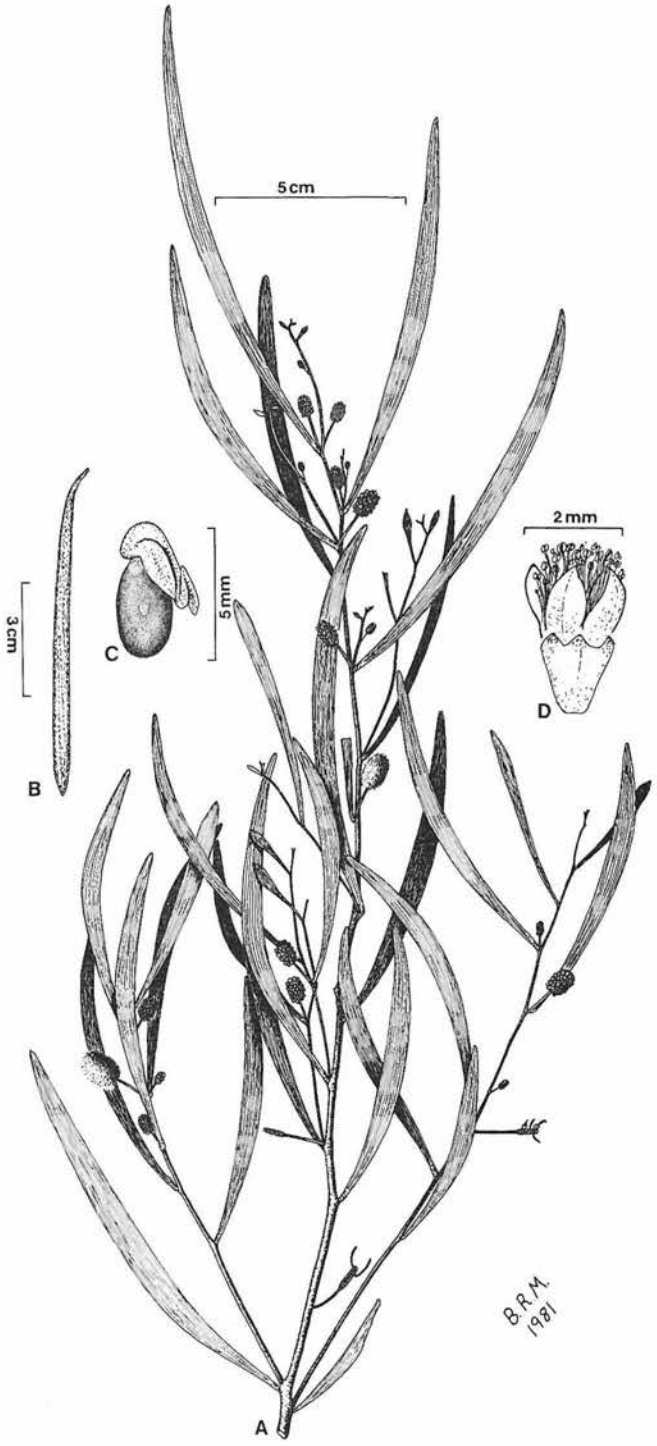

Figure 3. *Acacia atkinsiana*. A—Portion of branch. B—Legume. C—Seed. D—Flower.
A from *M. E. Trudgen* 2503 and *G. Marney*; B, C from *H. Demarz* D5755; D from *B. R. Maslin* 2761.

Flowering and fruiting period. Most flowering specimens have been gathered from May to July, however, some have also been collected between December and March. From anthesis it takes about 3 months for seed to mature. Fruits with mature seeds have been collected in September and October.

Acacia atkinsiana belongs to section Juliflorae (Benth.) Maiden et Betche and is a member of the *A. stowardii* Maiden group of species (see species no. 11 below). The new species is most closely related to *A. rhodophloia* Maslin from which it is readily distinguished by its grey bark (not red and exfoliating in narrow strips which curl retrorsely from each end i.e. 'Minni Ritchi'). *Acacia rhodophloia* is a variable species (Maslin, 1980) and throughout most of its range has cylindrical flower-heads, a character further distinguishing it from *A. atkinsiana.* However, in the region of the Murchison River (which is about 600 km south of the main area of distribution of *A. atkinsiana*) *A. rhodophloia* has flower-heads which are globular or obloid and phyllodes which are 3-8 mm wide. Flowering specimens from these populations may therefore resemble those of *A. atkinsiana,* but in addition to its grey bark and its more northerly distribution, the new species is recognized by its generally longer phyllodes (4-8(9) cm in the Murchison River variant of *A. rhodophloia*), its lack of minute, ferruginous resin-hairs on its new shoots, peduncles, calyx lobes and bracteole laminae, and by its broader legumes (2 mm wide on the Murchison River variant).

The specimen, *H. Demarz* D7084, 65 km W of Millstream, previously cited under *A. rhodophloia* (Maslin, 1980) is *A. atkinsiana.*

The species is named in honour of Mr Ken Atkins who provided much valuable field data and many specimens of *Acacia* from the Tom Price-Paraburdoo area.

3. **Acacia bivenosa** DC., Prod. 2: 452 (1825)

The Hamersley Range populations of this variable species are characterized as follows. Dense, bushy shrubs to 2.5 m tall, with up to 6 spreading-erect branches arising from ground level, occasionally single-stemmed and whispy (see pendulous variant referred to below). Phyllodes obovate to narrowly elliptic, 2-5.5 cm long, 8-15 mm wide, length to width ratio 2.5-6, bright green on new growth, fleshy and subglaucous to distinctly glaucescent when mature, finely wrinkled upon drying, 2-nerved (the principal longitudinal nerve is ± centrally situated and a minor second nerve occurs on the adaxial side of it). Inflorescences racemose but racemes normally grow out as leafy shoots, the peduncles then appearing axillary, conflorescence acropetalous, flower-heads rich golden, buds bright green. Legumes woody.

As discussed by Pedley (1977) *A. bivenosa* is a member of a complex species-group whose centre of diversity is Western Australia. The Hamersley Range populations of *A. bivenosa* often have phyllodes slightly more elongate than normal for this species which according to Pedley are usually less than 3.5 times as long as wide. Seemingly when initiated the inflorescences are always racemes of which most, but usually not all, grow out as leafy shoots. This explains why on a single plant both racemes and simple axillary heads can be observed. No plants definitely attributable to the sand-loving species *A. ligulata* A. Cunn. ex Benth. have been observed from the Hamersley Range area. This species is very closely related to *A. bivenosa* and differs in its generally more elongate, 1-nerved phyllodes and in its racemes which normally do not grow out. Pedley (1.c.) treats *A. ligulata* as a subspecies of *A. bivenosa,* however, I feel that until a thorough analysis of these two species and their allies has been

undertaken it is preferable to treat them as distinct species. If subspecific rank is applied, then other species such as *A. rostellifera* Benth., *A. xanthina* Benth., *A. tysonii* Luehm. and perhaps even *A. sclerosperma* F. Muell., *A. ampliceps* Maslin and *A. salicina* Lindl. would have to be considered subspecies of a single, highly polymorphic species. Judging from morphological evidence based on limited field observations, it seems that hybridity may possibly be a causal factor in contributing to the complexities observed within this species-group. Chromosomal and pollen analyses of the possible hybrids discovered so far are currently being undertaken and the results will be published elsewhere.

In various places between Tom Price in the Hamersley Range and Dampier on the coast some 200 km to the north, a very attractive variant of *A. bivenosa* has been observed. It seemingly differs from typical *A. bivenosa* only in its habit (although legumes and seeds have not been seen) which is open and rather whispy. The variant is single-stemmed or sparingly branched at ground level and has delicate, characteristically pendulous branchlets. I have refrained from attributing formal rank to this variant until a detailed overall appraisal of the *A. bivenosa* group is undertaken.

4. **Acacia cuspidifolia** Maslin, sp. nov. (Figure 4)

Acacia victoriae Benth. affinis a qua phyllodiis pungentibus, inflorescentiis semper axillaribus differt. Etiam ad *Acacia pickardii* Tindale affinis a qua phyllodiis planis differt.

Typus: 2 km south of Hill 4 East (mine) Paraburdoo, Western Australia. 28 Nov. 1980. *K. Atkins* 1257. "Sub-tree 3.5 m tall. Growing on a low silcrete mound in association with *Acacia victoriae, Lawrencia glomerata* and *Enchylaena tomentosa*." (holo: PERTH; iso: CANB, K, NY).

Dense, bushy, much branched *shrubs* to c. 3 m diam., growing to more or less gnarled *trees* 3-7 m tall. *Bark* fibrous and fissured on main trunks. *Branchlets* terete, finely nerved, glabrous or sometimes sparsely puberulous, grey-green to brownish. *Stipules* 2-4 mm long, stout, indurate, spiny, spreading and slightly recurved, absent from some nodes. *Phyllodes* narrowly oblong to narrowly obovate, size rather variable, (2)3-6(7.5) cm long, 2-5 mm wide, L/W = 6-15(25), straight to slightly curved, normally medium olive green when mature, bright light green when young, glabrous to glabrescent, ± abruptly contracted at apices into fine yet sharply pungent light brown apical points c. 2 mm long; *pulvinus* obscure and < 0.5 mm long; *midrib* prominent, lateral veins fine (yet readily apparent at least when dry) and forming a sparse open reticulum; *gland* situated on the upper margin of the phyllode at the distal end of the pulvinus or up to 5 mm above it, circular to oblong, 0.5-1 mm long, lip not prominent, an additional (smaller) gland normally present on the upper margin below the apical mucro. *Inflorescences* simple and axillary, (1)2 per node, conflorescences acropetalous i.e. inflorescences initiated within axils of young phyllodes along actively growing terminal new shoots, these subtending phyllodes reach maturity by the time the heads reach anthesis. *Peduncles* 15-20 mm long, glabrous or sometimes puberulous, base ebracteate at anthesis. *Flower-heads* globular, pale yellow, 23-32-flowered. *Bracteoles* linear-spathulate, 0.5-1 mm long, laminae ciliolate, claws glabrous. *Flowers* 5-merous. *Sepals* 1/3-1/2 length of petals, free or variably united for c. 1/2 their length, this range of variation present even in a single flower-head, narrowly oblong, apically minutely puberulous. *Petals* c. 2.5 mm long, apically marginally minutely white-papillose otherwise glabrous, nerveless.

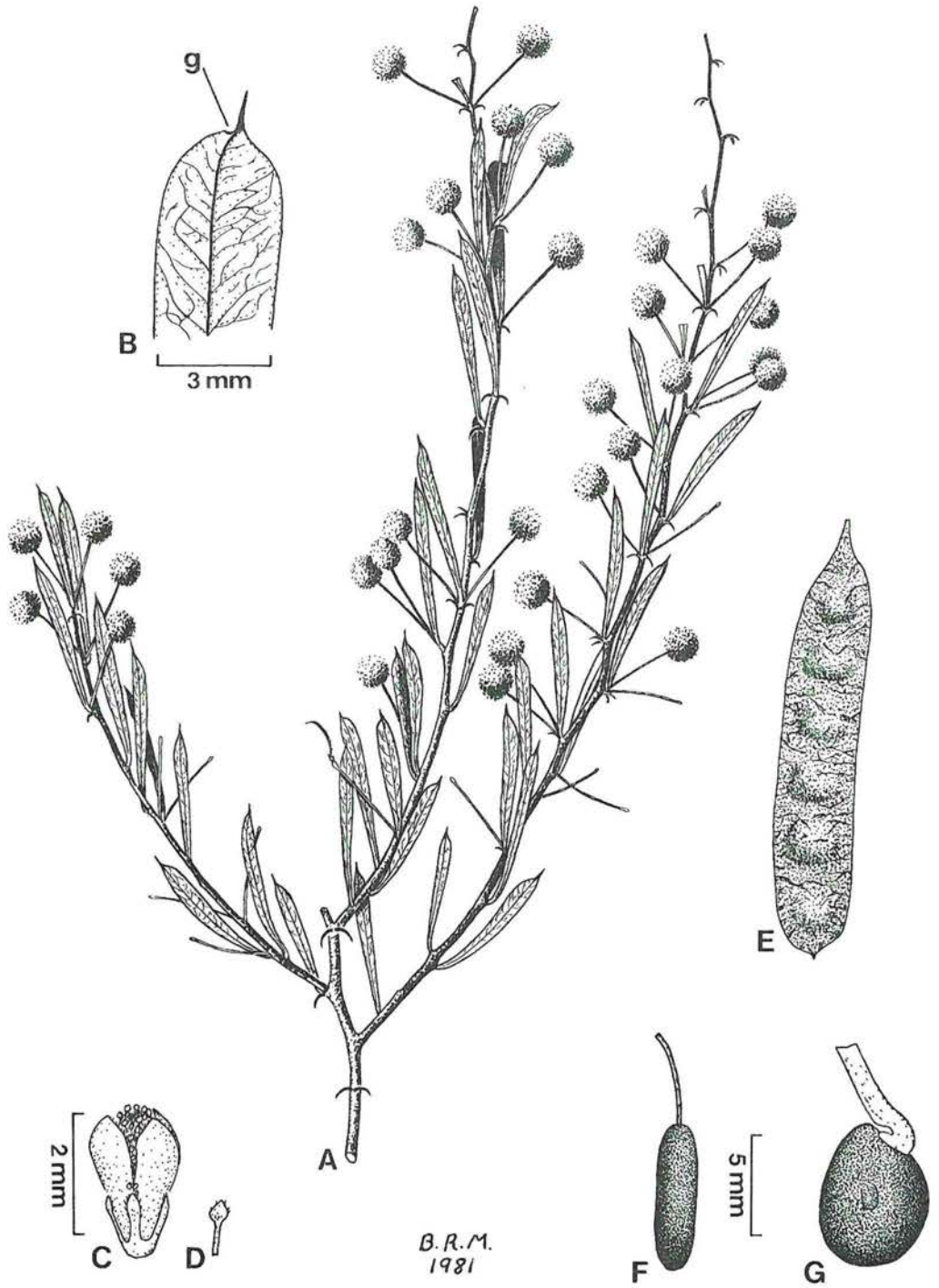

Figure 4. *Acacia cuspidifolia*. A—Portion of branch (note recurved spiny stipules and twinned peduncles). B—Phyllode apex showing spiny apical mucro with a small gland (g) at its base. C—Flower. D—Bracteole. E—Legume. F and G—Seed showing strap-like funicle (F—side view; G—plane view).
A, B from *H. Demarz* 2778; C, D from *A. M. Ashby* 4491; E-G from *B. R. Maslin* 2771.

Legumes narrowly oblong, 4.5-9 cm long, 1-2 cm wide, chartaceous, flat, glabrous, light brown, transversely openly reticulate, slightly umbonate over seeds; *margins* barely thickened, yellowish, normally only very slightly constricted between the seeds but random deep constrictions do occur. *Seeds* positioned transversely to obliquely in the legume, broadly ellipsoid to broadly obovoid, 6-7.5 mm long, 5-6 mm wide, compressed (1.5-2 mm thick), brown, not shiny; *pleurogram* an elongated "u"-shape, open towards the hilum; *areole* c. 1.5 mm long. 0.5-1 mm wide, a darker colour than rest of the seed prior to maturity; *funicle* relatively thick and strap-like, normally straight but once-folded close to the hilum, not expanded into an aril.

Other collections examined. WESTERN AUSTRALIA: North West Coastal Highway between Geraldton and Carnarvon, c. 5 km S of Yaringa Station turn-off, *A. M. Ashby* 4491, flower specimens collected 12 Dec. 1971, fruits collected by G. Phillips from the same plant 15 April 1972 (CANB, K, MEL, PERTH); About 130 km N of Meekatharra on Great Northern Highway, *K. Atkins* 1264 (PERTH); West of Salt Lake, *J. S. Beard* 3510 (KP, PERTH); Gascoyne Junction, *J. S. Beard* 4366 (PERTH); 33 km along road from Mundiwindi to Mount Newman, *H. Demarz* 611 (KP, PERTH); 53.5 mi (85.5 km) N of Meekatharra, *H. Demarz* 2778 (KP, PERTH); 45 km N of Lyndon River, *H. Demarz* 7652 (PERTH); Dairy Creek Station, 160 mi (256 km) E of Carnarvon, *R. O'Farrell* 48 (PERTH); Merlinleigh, between Gascoyne and Minilya Rivers, *C. A. Gardner* 6152 (PERTH); Wandagee, Minilya River, *C. A. Gardner* 6208 (PERTH); 125 km S of Carnarvon of North West Coastal Highway, *B. R. Maslin* 2771 (PERTH); Paraburdoo, *B. R. Maslin* 4653 (PERTH); 41.5 km E of North West Coastal Highway on the Carnarvon-Gascoyne Junction road, *B. R. Maslin* 4996 (PERTH); 24.5 km S of Gascoyne Junction on the road to Towrana Station, *B. R. Maslin* 5003 (PERTH); Glenburgh Station, 120 km E of Gascoyne Junction on the road to Meekatharra, *B. R. Maslin* 5012 (PERTH).

Distribution. (Figure 10) North-west Western Australia in the Ashburton, Carnarvon, northern Austin and southern Fortescue Botanical Districts (1:250 000 maps F49-16; F50-13, 15; F51-13; G50-1, 5, 6, 8) extending from the vicinity of Shark Bay (c. 25°30'S, 114°E) east to near Meekatharra (26°35'S, 118°30'E) and north to the Hamersley Range. The species extends only to the southern extremity of the Hamersleys (around Paraburdoo—23°12'S, 117°40'E) and is not a conspicuous element of the *Acacia* flora of the region.

Habitat. Favours open floodplain areas in clay or loam.

Flowering and fruiting period. Flowers from October to December; mature seed has been collected in April and June.

Acacia cuspidifolia is a member of Sect. Phyllodineae DC. and has its closest affinities with the widespread, variable species *A. victoriae* Benth. These two species have been observed to grow sympatrically in places e.g. between Carnarvon and Gascoyne Junction. The significant gross morphological features shared by the two species include their spiny stipules. their flat, 1-nerved phyllodes, their normally twinned inflorescences, their globular, pale yellow flower-heads bearing a similar number of flowers, their ± free sepals and their large, flat, chartaceous legumes. *Acacia cuspidifolia* is readily distinguished from *A. victoriae* by its pungent phyllodes and by its inflorescences which are never racemosely arranged. Pollen studies by Ph. Guinet (pers. comm.) support a close *A. cuspidifolia-A. victoriae* relationship and also show these species to be closely related to *A. pickardii* Tindale

(which is restricted to the extreme north-east of South Australia and adjacent Northern Territory). *Acacia pickardii* is distinguished from these two species, and indeed from all other members of the *A. victoriae* group by its terete, pungent phyllodes.

The specific epithet alludes to the spiny phyllode apices which are characteristic for this taxon.

5. **Acacia daweana** Maslin, sp. nov. (Figure 5)

Acacia hammondii Maiden et *A. malloclada* Maiden et Blakely affinis sed combinatione characterum secundarum distinguenda: fruticibus ad 1 m altis phyllodiis anguste ellipticis (3.5) 4-5.5 cm longis, 6-10 mm latis, nervis tenuibus numerosisque nervo medio (et plerumque nervo uterque latis) plus prominentibus, parce reticulatis; spicis densis; calyce breviter tomentoso.

Typus: 6 km N of Marandoo (which is just south of Mount Bruce) on the road to Tom Price, 22°35'S, 118°05'E, Western Australia. 16 July 1980. *B. R. Maslin* 4682. "Shrub 1 m tall, stem 2-branched at base; phyllodes dull green; flower-heads bright golden. Low rocky rise in spinifex at base of rocky range." (holo: PERTH, iso: CANB, K, NY).

Low, spreading, often more or less flat-topped, dense *shrubs* to 1 m tall, dividing near ground level into a few to many spreading-erect, slender branches. *Bark* on main stems grey but near their base peeling to reveal a reddish undersurface. *Branchlets* terete, very finely nerved, very slightly resinous, apically yellow but becoming reddish-brown with age, shortly tomentose or shortly antrorsely strigose but becoming glabrous with age. *Stipules* frequently persistent on branchlets, triangular, 1-2 mm long, 0.6-0.8 mm wide at base, dark brown, 3-nerved (nerves sometimes obscure), adaxially appressed hairy or sometimes glabrous. *Phyllodes* narrowly elliptic with the upper margin slightly more convex than the lower margin, (3.5)4-5.5 cm long, 6-10 mm wide, length to width ratio 4.5-8, straight or more normally slightly curved towards the apex, rather spreading, glabrous or glabrescent (indumentum as on branchlets), medium olive green, not shiny; *apical mucro* thickened, acute but not pungent, normally slightly curved, brown; *pulvinus* 1-2 mm long, transversely wrinkled, yellowish; *nerves* fine with the central one (and normally one on either side of it) more evident than the rest, very sparsely anastomosing, nerves close together but the interstices broader than the width of the nerve, marginal nerve discrete and yellow; *gland* situated on upper margin of the phyllode at the distal end of the pulvinus (or 1-3 mm above it), obscure, 0.3-0.5 mm long, lip narrow and yellowish and not significantly thickened, normally with a discrete circular or oblong central orifice. *Inflorescences* simple and axillary but sometimes appearing falsely racemose due to the loss of the subtending phyllode, 1 per node, somewhat clustered towards the ends of the branchlets. *Peduncles* 5-10 mm long, indumentum as on branchlets, base ebracteate at anthesis. *Spikes* light golden, flowers densely arranged, 25-40 mm long and 5-6 mm wide when dry; *bracteoles* linear-spathulate, minute (< 1 mm long), light or dark brown, sparsely hairy abaxially, lamina inflexed and acute. *Flowers* 5-merous. *Calyx* c. 1/3 the length of the corolla, cupular, gamosepalous, shortly divided into broadly triangular lobes, shortly tomentose. *Petals* c. 1.7 mm long, connate for c. 1/2 their length, glabrous or sparsely shortly tomentose on lower half, obscurely 1-nerved. *Ovary* papillose. *Legumes* (immature, few seen) to 40 mm long and 7 mm wide, prominently raised over seeds,

the umbo dark brown and the intervening flat area greyish brown, rather obscurely transversely reticulate, slightly viscid, sparsely shortly pilose with a mixture of white and yellow hairs; *margins* yellowish, constricted between the seeds. *Seeds* (immature) obliquely placed in the legume, ± ellipsoid, 3 mm long, 2 mm wide, light brown, not shiny; *funicle-aril* somewhat thickened and fleshy, convoluted yellowish, somewhat shiny.

Other collections examined. WESTERN AUSTRALIA: East side of a conical hill lying 3 km W of Mt Bruce, *C. G. Dawe* 210 (PERTH); 15 km N of Juna Downs on the road to Wittenoom, *B. R. Maslin* 4628 (PERTH).

Distribution. (Figure 11) North-west Western Australia in the Fortescue Botanical District (1:250 000: F50-11). Known only from the Hamersley Range National Park where it has been collected from a low hill about 3 km west of Mount Bruce (22°36'S, 118°08'E) and also 30 km to the south-east at about 15 km north of Juna Downs Station (22°53'S, 118°29'E). At both these localities *A. daweana* occurs sympatrically with *A. effusa* (see below). Current indications are that both these species have restricted distributions, however, much of the Hamersley Range area is poorly collected, therefore, an accurate assessment of their conservation status cannot be made at the present time.

Habitat. As for *A. effusa* (see below).

Flowering and fruiting period. Due to the paucity of collections the full flowering-fruiting range has not been determined. All flowering specimens to hand were gathered in mid-July. The one fruiting specimen seen possessed immature seeds and was collected in late September. Despite prolific flowering at the Mount Bruce population very little fruit was set (Chris Dawe, pers. comm.).

Acacia daweana is placed in section Juliflorae (Benth.) Maiden et Betche and on account of its persistent stipules, its narrowly elliptic, multistriate phyllodes, its long, spicate inflorescences and its gamosepalous calyx, seems best placed near *A. hammondii* Maiden (W.A. N.T. Qld.) and *A. malloclada* Maiden et Blakely (N.T.) but the relationship is not particularly close. *Acacia daweana* is distinguised from both these species by its broader, sparingly reticulate phyllodes, its denser spikes and its more hairy calyx. *Acacia hammondii* has glabrous or glabrescent branchlets and grows to a tree about 4 m tall (Pedley 1978: 155). Its phyllodes have two nerves slightly more pronounced than the rest and these are situated more or less midway between the centre of the phyllode and each of its margins. *Acacia daweana* on the other hand has conspicuously short-tomentose branchlet apices, is a shrub to 1 m tall and has its phyllodes show the central nerve to be slightly more evident than the rest. *Acacia malloclada* apparently is not a very common species and besides the type (which is simply annotated "Northern Australia") the only other specimen known to me is *G. Chippendale* 4347 collected from 2.6 mi (4 km) N of Edith River, Northern Territory (NT). According to John Maconochie (pers. comm.) the plants at this locality are spreading shrubs to 2 m tall. Although *A. malloclada* has quite densely hairy branchlets (hairs more or less silky and antrorse) it can be distinguished from *A. daweana* (in addition to the characters already noted above) by its phyllodes which are more coarsely striate and which do not have a more pronounced central nerve.

The species is named in honour of Chris Dawe in appreciation of his help in collecting specimens and providing valuable field data on many of the species included in this paper.

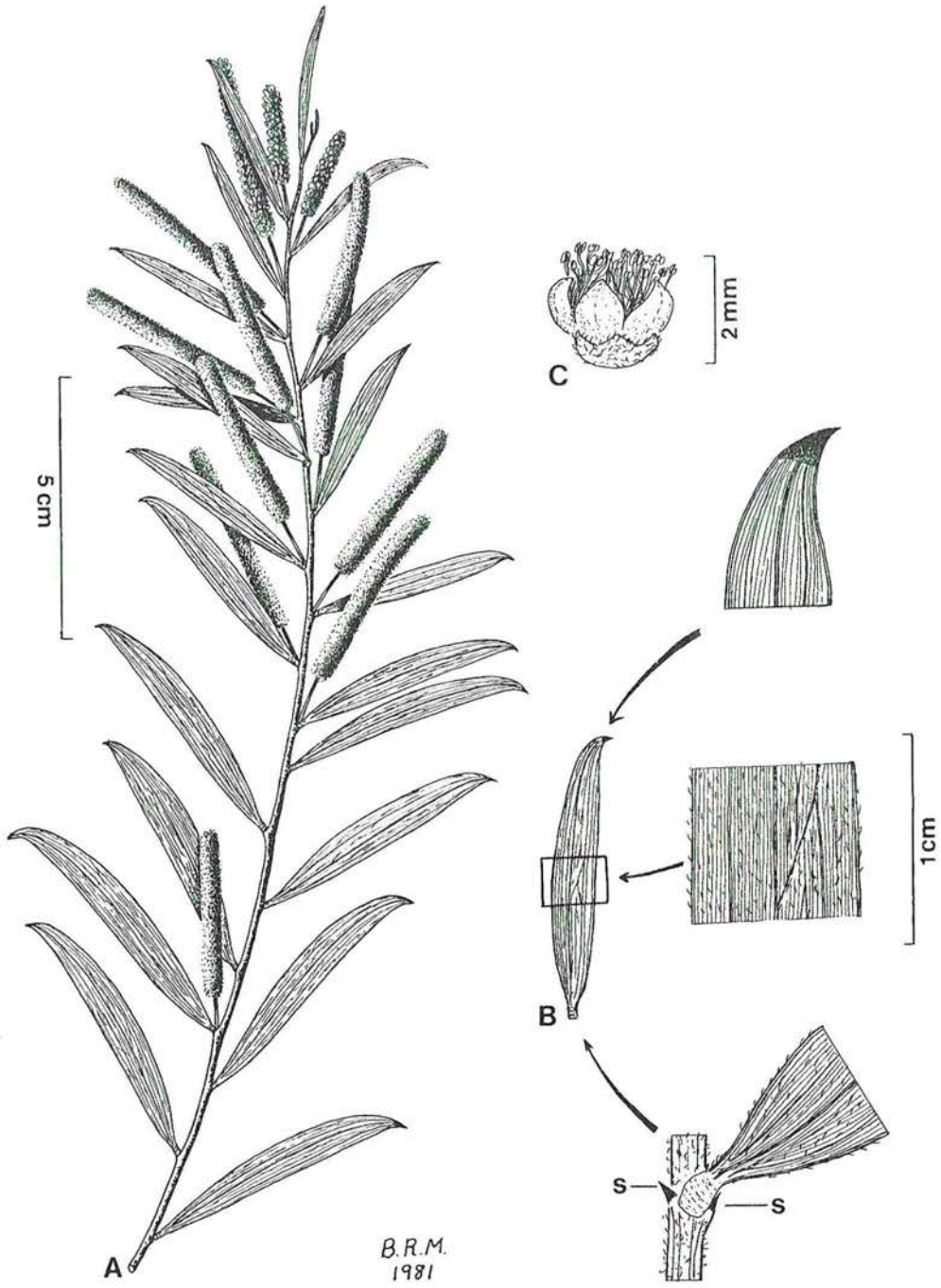

Figure 5. *Acacia daweana*. A—Portion of branch. B—Phyllode with enlargement showing apex, sparsely anastomosing nerves in middle of lamina and base showing stipules (s). C—Flower. A from *B. R. Maslin* 4682 (the type); B, C from *B. R. Maslin* 4628.

6. **Acacia effusa** Maslin, sp. nov. (Figure 6)

Ex affinitate *A. lysiphloia* F. Muell. et specierum affinium sed fruitice ad 1 m alto; phyllodiis asymmetrice ellipticis ad apice rostriformibus, 9-15 mm longis, 3-7 mm latis distinguenda.

Typus: 6 km N of Marandoo (which is situated just south of Mount Bruce) on the road to Tom Price, Hamersley Range, 22°35'S, 118°05'E, Western Australia. 16 July 1980. *B. R. Maslin* 4681. "Low, dense, spreading, sometimes flat-topped shrub to 1 m x 2-3 m; bark 'Minni Ritchi'; phyllodes olive green, venation mealy white; spikes bright golden. Low rocky rise in spinifex at base of rocky range." (holo: PERTH; iso: CANB, K, MEL).

Low, dense, somewhat viscid, wide-spreading *shrubs* to 1 m tall and 2-3 m diam., either domed or flat-topped, stems branching at ground level. *Bark* "Minni Ritchi", outer cortex grey (old trunks) or greyish red (younger branches) and exfoliating in narrow shavings which tend to curl retrorsely from each end to reveal a dull red under layer. *Branchlets* terete, obscurely nerved, minutely puberulous (hairs very fine, patent, ± straight or curled), becoming glabrous with age. *Stipules* persistent on branchlets but deciduous with age, triangular, 1-2 mm long, scarious, dark brown. Phyllodes asymmetrically elliptic with rostriform apices (i.e. rounded and ending in a laterally positioned, acute, subpungent, straight, brown mucro), 9-15 mm long, 3-7 mm wide, length to width ratio 2-4, ± ascending, indumentum as on branchlets, olive green; with one central *nerve* and a second longitudinal nerve running adjacent to the thickened adaxial margin, lateral nerves anastomosing and trending longitudinally, nerves sometimes meally (observe fresh); *pulvinus* c. 0.5 mm long, yellowish; *gland* not prominent, situated on the upper margin of the phyllode 2-4.5 mm above the pulvinus, margin sometimes shallowly indented about the gland, circular or slightly elongated, c. 0.3 mm long, lip not prominent, sometimes with a dark brown central area. *Inflorescences* simple and axillary, 1 per node, concentrated towards the ends of the branches. *Peduncles* 7-10 mm long, puberulous, base ebracteate at anthesis, often with a very small (0.5-1 mm long) appressed brown scarious bract situated on upper half of peduncles. *Spikes* bright golden, normally about twice as long as the peduncles (10-15 mm at anthesis or up to 25 mm when in fruit), flowers not particularly densely arranged; *bracteoles* subsessile, c. 0.5 mm long, laminae slightly thickened and slightly inflexed, apiculate, glabrescent. *Flowers* 5-merous but occasionally a few 4-merous flowers interspersed within the spikes. *Calyx* rather membranous, glabrescent, about 1/3 the length of the corolla, divided 1/2-2/3 its length into lobes that are apically yellow. *Petals* spreading at anthesis, glabrous, obscurely 1-nerved (nerves slightly thickened at petal apices). *Legumes* circinate, 6-8.5 cm long (expanded length), 7-8 mm wide, thickly coriaceous, flat but slightly raised over the seeds, resinous, glabrous, dark brown, ± obscurely longitudinally reticulate; *margins* thickened, not (or slightly) constricted between the seed, yellowish. *Seeds* obliquely positioned in the legume, ellipsoid, 3 mm long, 2.5 mm wide, compressed (1 mm thick), dark tan; *pleurogram* circular, continuous; *areole* situated in the middle of the seed, 0.5 mm diam., surrounded by a definite band of yellowish tissue which is c. 0.3 mm wide; *funicle* filiform, c. 1 mm long, expanded into a large folded *aril* positioned on top of the seed and often extending about half way down one side of it, the aril is cream and membranous but becomes darker and indurate near the hilum.

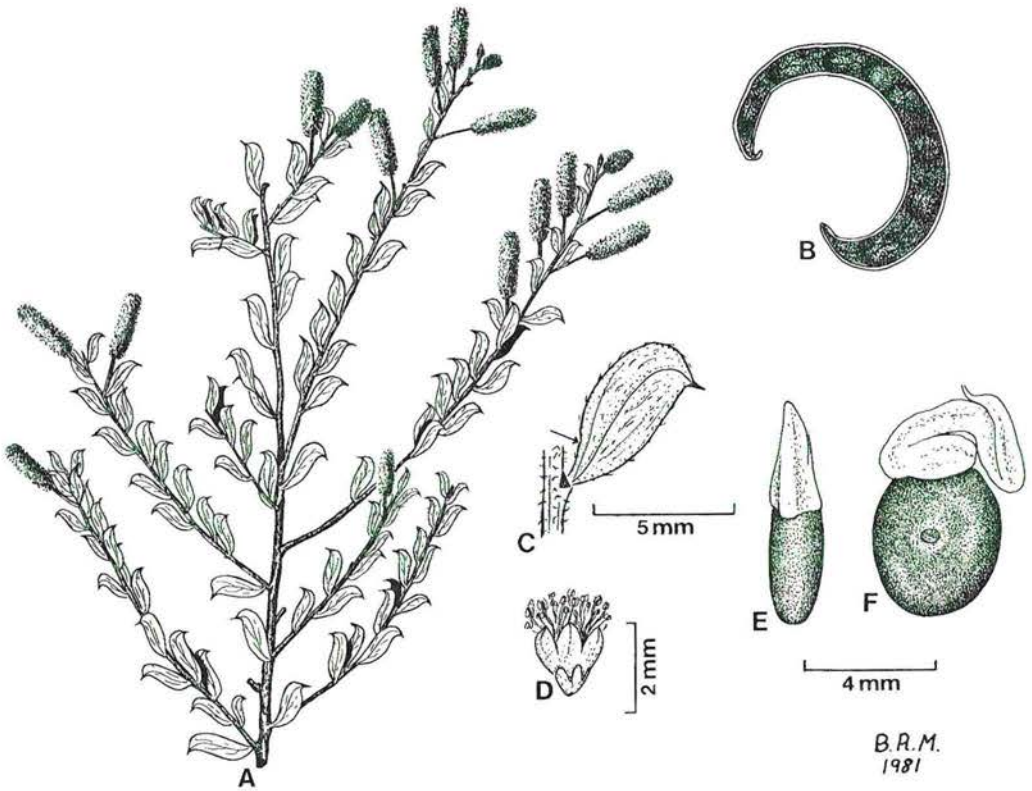

Figure 6. *Acacia effusa*. A—Portion of branch. B—Legume. C—Node showing phyllode subtended by stipule (gland position arrowed). D—Flower. E and F—Seed (E—side view; F—plane view).

A, C, D from *B. R. Maslin* 4681 (the type); B, E, F from *C. G. Dawe* 212.

Other collections examined. WESTERN AUSTRALIA: Just west of the base of Mount Bruce, *C. G. Dawe* 008 (PERTH); East side of conical hill, 3 km W of Mt. Bruce, 22°35'S, 118°05'E, *C. G. Dawe* 212 (BRI, CANB, K, PERTH); 15 km N of Juna Downs on the road to Wittenoom, *B. R. Maslin* 4627 (PERTH); North-east slope of Mount Bruce, *R. Pullen* 10.940 (AD); Gully at base of south side of Mount Bruce, Hamersley Range National Park, 22°36'S, 118°07'E, *M. E. Trudgen* 319 (BRI, PERTH); Hamersley Range National Park, western foot of Mount Bruce, 17 Aug. 1974, *J. H. Willis* s.n. (MEL 503364, PERTH).

Distribution. (Figure 11) North-west Western Australia in the Fortescue Botanical District (1:250 000:F50-11). Known only from the Hamersley Range National Park where it has been collected from around the base of Mount Bruce (22°36'S, 118°08'E) and also 30 km to the south-east at about 15 km north of Juna Downs Station (22°53'S, 118°29'E). According to the collector's notes on *C. G. Dawe* 008 the species is common between Mount Bruce and Wittenoom Gorge (22°14'S, 118°20'E). At the localities from where collections have been made, *A. effusa* is locally abundant and occurs sympatrically with *A. daweana* (see above). Current indications are that both these species have restricted distributions. However, much of the Hamersley Range area is poorly collected, therefore an accurate assessment of the conservation status of these species cannot be made at the present time.

Habitat. Among spinifex (*Triodia* sp.) in rocky red loam on the lower scree slopes of low ranges and in particular along creek lines where these watercourses leave the hills. *Acacia effusa* seemingly does not extend far up the rocky slopes nor does it spread far along the alluvial flats where the creeks run into broad valleys.

Flowering and fruiting period. Judging from the specimens at hand the flowering period extends from about May to August. Legumes with slightly immature seeds have been collected in late September.

Acacia effusa belongs to section Juliflorae (Benth.) Maiden et Betche and is related to *A. lysiphloia* F. Muell. and its allies (i.e. *A. chisholmii* F. M. Bailey, *A. gracillima* Tindale and *A. trachycarpa* E. Pritzel). These arid zone-subtropical* species all have "Minni Ritchi" bark (i.e. reddish and exfoliating in narrow shavings which curl retrorsely from each end), persistent stipules, few-nerved mucronulate phyllodes, viscid flat reticulate often circinate legumes with thickened margins, and obliquely positioned, dark coloured seeds with small continuous areoles that are surrounded by a narrow band of pale coloured tissue. *Acacia effusa* is readily distinguished from other members of the *A. lysiphloia* group by its low, diffuse habit and by its small, asymmetrically elliptic phyllodes (normally long and linear in the other species). *Acacia monticola* J. M. Black is another "Minni Ritchi" species that is not too distantly removed from the *A. lysiphloia* group but is readily recognized by its short, broad phyllodes (12-30 mm long and 5-15 mm wide) and its normally globular (not spicate) flower-heads. Both *A. monticola* and *A. trachycarpa* occur in the Hamersley Range. Aspects of speciation in *Acacia*, including the *A. lysiphloia* group, are discussed in Hopper and Maslin (1978) and Maslin and Hopper (in press).

The specific epithet refers to the characteristic wide-spreading growth habit of this species.

7. **Acacia exilis** Maslin, sp. nov. (Figure 7)

Acacia tenuissima F. Muell. affinis a qua ramulis non resinocostatis, phyllodiis 14-18 cm longis, spicis minus confertis perflavidis (magis aureis), leguminis 4-5 mm latis, funiculo-arillo albido differt.

Typus: Hamersley Range National Park, 8.1 km from Milli Milli Springs towards Coppin Pool, Western Australia. 7 May 1980. *Malcolm Trudgen* 2413. "A bush 2.5 m tall with several stems. Bark grey, reddish on upper branchlets, twigs orange. Flowers yellow. Phyllodes quite soft. Veg: *Triodia* grassland with *Eucalyptus* cf. *oleosa* (MET 2412) mallee and *Acacia*. Soil light brown loam (calcrete area)." (holo: PERTH; iso: CANB, K, MEL, NY).

Shrubs or *small trees* 3-4 m tall, either single-stemmed or with up to c. 6 main trunks arising from ground level, main trunks and branches with an ascending aspect, crowns normally rather dense and bushy. *Bark* fibrous and longitudinally fissured on main trunks but smooth on branches and branchlets, grey except on branchlets which are light brown or red-brown. *Branchlets* terete, very obscurely nerved, not resin-ribbed, glabrous. *New shoots* glabrous, resinous when very young. *Stipules* deciduous. *Phyllodes* filiform, 14-18 cm long, c. 1 mm diam., terete, ascending, not rigid, slightly curved to very shallowly serpentinous, pale subglaucous,

* Subtropical is used here in a climatological sense (see Maslin and Hopper, in press).

glabrous except on upper side of the pulvinus at its extreme base which is densely minutely villous, uniformly longitudinally multistriate; narrowed at *apices* into normally delicately hooked, light brown, non-pungent points; *pulvinus* c. 3 mm long, orange, wrinkled; *gland* situated on upper surface of phyllode at distal end of pulvinus, very indistinct, submerged, phyllode lamina normally very slightly swollen about the gland. *Inflorescences* normally twinned and with a new shoot developing from within the axil, the subtending phyllode often deciduous by the fruiting stage. *Spikes* light golden, 1-2 cm long, flowers somewhat distant; *bracteoles* minute (c. 0.3 mm long), puberulous, claws oblong, laminae inflexed. *Peduncles* 10-13 mm long, glabrous, base ebracteate at anthesis. *Flowers* 5-merous. *Calyx* cupular, 1/4-1/3 the length of the corolla, membranous, sinuate-toothed with widely triangular non-thickened lobes, white-villous. *Petals* 1.5-2 mm long, glabrous, very obscurely 1-nerved. *Legumes* (slightly immature) narrowly oblong, to 7 cm long, 4-5 mm wide, firmly chartaceous, gently curved, flat but slightly raised over the seeds, glabrous, greyish brown; *margins* constricted between the seeds. *Seeds* (slightly immature) longitudinally positioned in the legume, obloid-ellipsoid, 4-4.5 mm long, 2.5 mm wide, compressed, dark brown but with a yellow central portion, not shiny; *pleurogram* "u"-shaped, open towards the hilum; *areole* c. 0.6 mm long and 0.4 mm wide; *funicle* much convoluted, flattened, membranous, whitish, imperceivably passing into the *aril*.

Other collections examined. WESTERN AUSTRALIA: Tom Price, 0.8 km from minesite entrance, *K. Atkins* 1221 (CANB, K, PERTH); Marra Mamba area, Fortescue River, Hamersley Range, *J. V. Blockley* 291 (PERTH); Hamersley Ranges, 22°40′S, 117°43′E, *M. Cole* WA5097 (PERTH); 27 km from Tom Price on the road to Paraburdoo, *B. R. Maslin* 4666 (BRI, CANB, K, MEL, NY, PERTH, WAIT); 20 km S of Tom Price-Dampier rail crossing on the Wittenoom-Nanutarra road, *B. R. Maslin* 4672 (PERTH); Hamersley Range National Park, 4.8 km from Milli Milli Springs towards Coppin Pool, *M. E. Trudgen* 2407 (BM, G. NT, P, PERTH); Hamersley Range National Park, 1.4 km south-west of hut at Coppin Pool, *M. E. Trudgen* 2548 (AD, BRI, NSW, PERTH).

Distribution. (Figure 11) North-west Western Australia in the Fortescue Botanical District. (1:250 000 map F50-11). Known only from a restricted area of the Hamersley Range from Hamersley Station (22°17′S, 117°41′E) south-east to Coppin Pool (22°53′S, 118°08′E).

Habitat. Low, undulating, rocky hills in ferruginous soil derived from the Marra Mamba and Brockman Iron Formations (de la Hunty, 1965). Some of the species recorded in association with *A. exilis* include *A. aneura, A. maitlandii, A, spondylophylla, Burtonia polyzga, Calytrix longifolia* and *Goodenia scaevolina.* The ground cover is dominated by species of 'spinifex' (*Triodia* sp.)

Flowering and fruiting periods. Flowers from May to July; legumes with near-mature seeds have been collected in late September.

Acacia exilis is placed in section Juliflorae (Benth.) Maiden et Betche and is most closely allied to the widespread and zone-subtropical* species *A. tenuissima* F. Muell. (W.A., N.T., Qld.). Although both species occur in the Hamersley Range they have not been observed to grow sympatrically. *Acacia exilis* is distinguished from *A. tenuissima* by its branchlet apices which are not resin-ribbed, its normally longer phyllodes (14-18 cm compared with 6-15 cm), its longer spikes (10-20 mm compared with 5-10 mm) which are a light golden colour (paler yellow in *A. tenuissima*) and

* Subtropical is used here in a climatological sense (see Maslin and Hopper, in press).

Figure 7. *Acacia exilis*. A—Phyllode base showing gland (g) and pulvinus (p). B—Flower. C—Portion of branch. D—Seed. E—Legume (slightly immature).

A from *J. V. Blockley* 291; B from *M. E. Trudgen* 2413 (the type); C from *B. R. Maslin* 4666; D, E from *M. Cole* WA5097.

which possess flowers that are less densely arranged, its broader legumes (4-5 mm compared with 2-3 mm) and its whitish funicle-aril (funicle-aril drying yellow in *A. tenuissima*). Although *A. tenuissima* can reach 4 m tall (Pedley, 1978), in the Hamersley Range it is generally a shrub not exceeding about 2 m in height. *Acacia exilis* on the other hand is a taller shrub or small tree up to 4 m high. In the field, flowering plants of *A. exilis* may superficially resemble *A. aneura* F. Muell. ex Benth. (the two species occur sympatrically in places), however, the new species is readily distinguished by its longer, lighter green phyllodes (grey-green in *A. aneura*), by its less dense flower-heads and by its long, narrow legumes.

The specific epithet refers to the slender, lax phyllodes.

8. **Acacia hamersleyensis** Maslin, sp. nov. (Figure 8)

Acacia tumida F. Muell. ex Benth., *A. citrinoviridis* Tindale et Maslin et *A. xiphophylla* E. Pritzel affinis sed combinatione characterum secundarum distinguenda: phyllodiis plerumque leviter falcatis 8-14 cm longis, 1-1.5(2) cm latis, demum glabris, manifeste subtiliter nervatis; inflorescentiis axillaribus (non racemosis); spicis densis, 3-6 cm longis, 6-8 mm latis; leguminibus breviter pilosis, planis, non rugosis differt.

Typus: Rhodes Ridge, Hamersley Range, ± 23°06'S, 119°25'E, Western Australia. 10 Aug. 1973. *M. E. Trudgen* 391. "A bush 2.5 m tall. Bark on lower stems silver-grey and somewhat fissured, higher up bark is grey-brown. Older phyllodes slightly glaucous, others medium green. Quite common on stony ground just above small breakaway on the south side of a ridge (forming a thicket at top of ridge)." (holo: PERTH; iso: CANB, K).

Spreading, open shrubby *trees* 3.5-4 m tall, often rather slender and with a whispy aspect when young, single-stemmed or sparingly branched at ground level (with up to 6 spreading-erect stems when young). *Bark* grey, normally fibrous and fissured on main stems especially near their base, smooth on branches. *New shoots* very pale citron-sericeous when very young. *Branchlets* terete but angular towards the apices, finely ribbed, marked with distant scars of fallen phyllodes, glabrous or sometimes glabrescent towards the apices, sometimes pruinose. *Stipules* deciduous. *Phyllodes* normally slightly falcate and tapered equally at both ends, slightly asymmetric with the upper margin more convex than the lower margin, 8-14 cm long, 1-1.5(2) cm wide, length to width ratio 6-12, coriaceous, normally speading, glabrous except when young, subglaucous to distinctly glaucescent, light green when young, the acuminate apices narrowing to blunt callose points which are slightly hooked; longitudinal *nerves* numerous, very fine and close together, neither anastomosing nor basally confluent, c. 3 nerves yellowish and slightly more evident than the rest, marginal nerve discrete and yellowish; *pulvinus* distinct, 5-10 mm long, conspicuously wrinkled, normally glabrous, light orange, depressed and slightly dilated at the base; *gland* situated on the upper margin of the phyllode at the distal end of the pulvinus, lamina slightly swollen about the gland, submerged, comprising a circular or oblong pore (0.3-0.6 mm long) and a very obscure rim. *Inflorescences* simple and axillary but often falsely racemose at the ends of the branches due to phyllode reduction, 1-2 per node, clustered at ends of branches. *Peduncles* 4-10 mm long, thick, longitudinally wrinkled, ± sparsely puberulous, base ebracteate at anthesis. *Receptacle* sparsely resinous-papillose. *Spikes* bright medium golden, 3-6 cm long, 6-8 mm wide, flowers

densely arranged; *bracteoles* linear-spathulate, c. 1 mm long, densely villous, lamina inflexed. *Flowers* 5-merous. *Calyx* 1/2-2/3 length of corolla, divided for 1/3-2/3 its length into oblong lobes which are apically thickened and yellowish, calyx tube obscurely 5-nerved and normally brownish, white-villous (indumentum often dense). *Petals* 2.5 mm long, connate for c. 1/2 their length, glabrous or glabrescent, obscurely 1-nerved. *Legumes* often clustered on receptacles, narrowly oblong, to 8 cm long, 5-8 mm wide, firmly chartaceous, slightly undulate, slightly resinous, raised over the seeds, very obscurely reticulate, shortly pilose (hairs pale golden when young but whitish at maturity), medium brown, abruptly narrowed at apex, basal stipe 3-7 mm long; *margins* thickened, yellowish or light brown, not (or sometimes slightly) constricted between the seeds. *Seeds* obliquely placed in the legume, obloid to ellipsoid, 4-4.5 mm long, 2.5-3.5 mm wide, slightly compressed (c. 2 mm thick), light greyish brown with pale coloured tissue surrounding the areole, reasonably shiny; *pleurogram* obscure, continuous or "u"-shaped and open towards the hilum; *areole* minute, 0.2-0.5 mm wide; *funicle* filiform, expanded into a very pale yellow fleshy folded *aril* positioned on top of the seed.

Other collections examined. WESTERN AUSTRALIA: Tom Price townsite, *K. Atkins* 445 (PERTH); Upper slopes of Mt Nameless, Tom Price, *K, Atkins* 1225 (K, PERTH) and 1240 (MEL, PERTH); Above Devil's staircase, 22°15′S, 118°20′E, *J. V. Blockley* 378 (KP); Hamersley Ranges, 22°30′S, 117°43′E, *M. Cole* WA5006 (PERTH); Marandoo Ridge (first ridge S of Mt Bruce), Hamersley Range, *C. Dawe* M112 (PERTH, TLF, WAIT); Creek crossing on main Marandoo-Tom Price road, c. 4 km N of Marandoo and immediately west of Mount Bruce, *C. G. Dawe* 218 (CANB, PERTH); Mount Whaleback, Newman, *B. R. Maslin* 4586 (PERTH, WAIT); Rhodes Ridge, 53.5 km NW of Newman on the road to Juna Downs, *B. R. Maslin* 4609 (PERTH); 89 km NW of Newman on the road to Juna Downs, *B. R. Maslin* 4621 (PERTH); Wittenoom Gorge, 4 km S of Wittenoom township, *B. R. Maslin* 4630 (PERTH); Dales Gorge Lookout, Hamersley Range, *B. R. Maslin* 4646 (PERTH); Top of Hancock Gorge, Hamersley Range, *B. R. Maslin* 4677 (PERTH); 4 km N of Marandoo (just S of Mt Bruce) on the road to Tom Price, *B. R. Maslin* 4683 (BRI, NSW, NY, PERTH); In gully near base of south side of Mount Bruce, Hamersley Range, 22°37′S, 118°07′E, *M. E. Trudgen* 327; Rhodes Ridge, Hamersley Range, *M. E. Trudgen* 391 (PERTH); An unnamed gorge in the Hamersley Range, ± 22°25′S, 118°00′E, *M. E. Trudgen* 1042 (PERTH); Marandoo Ridge, Hamersley Range, ± 22°40′S, 118°09′E, *M. E. Trudgen* 1045 (PERTH); "Manganese" gully, Marandoo Ridge, Hamersley Range, ± 22°40′S, 118°09′E, *M. E. Trudgen* 1151 (MEL, PERTH); Hamersley Range National Park, Marandoo Ridge (first ridge south of Mt Bruce) on south side, 200 m east of "Grimace Gulch", *M. E. Trudgen* 2263 (CANB, PERTH); Mount Whaleback, Newman, *K. Walker* 95 (CBG, MEL, NSW, PERTH), 96 (PERTH) and 97 (PERTH); Ophthalmia Range, 23°39′S, 119°43′E, *K. Walker* 113 (PERTH); Hamersley Range National Park, SW declivities of Mount Bruce at c. 3 500 ft. alt., 17 Aug. 1974, *J. H. Willis* s.n. (PERTH-dup. of MEL 503366).

Distribution. (Figure 11) North-west Western Australia in the Fortescue Botanical District (1:250 000 maps F50-11, 12, 16). Known only from the Hamersley Range area where it extends from Mount Newman (23°16′S, 119°34′E) west to Paraburdoo (23°12′S, 117°40′E) and north to the vicinity of Mount Brockman (22°28′S, 117°18′E).

Habitat. Seems restricted to ferruginous soils where it normally grows on the ridges and the upper slopes of ranges. It not uncommonly forms groves, especially along watercourses leading from the ranges. Along the high ridges *A. hamersleyensis*

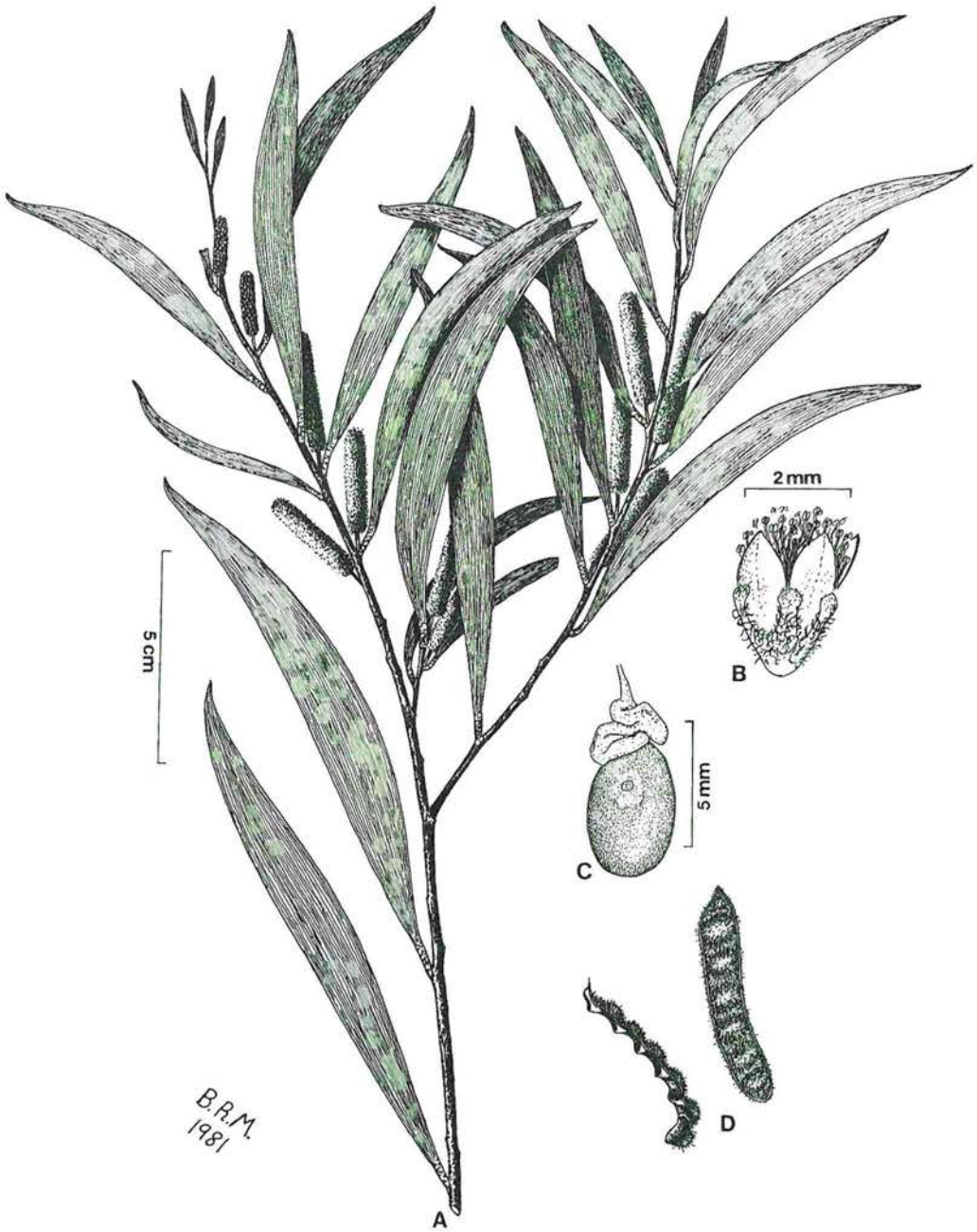

Figure 8. *Acacia hamersleyensis*. A—Portion of branch. B—Flower. C—Seed. D—Legume (side and plane views). A from *M. E. Trudgen* 391 (the type); B from *B. R. Maslin* 4630; C, D from *C. G. Dawe* 218.

frequently assumes a spindly habit and can be seen in places e.g. Mount Newman, Wittenoom Gorge, to form a whispy band silhouetted against the sky. The species grows in "spinifex" country e.g. *Plectrachne schinzii, Triodia pungens, T. lanigera* and *T. wiseana* in association with other *Acacia* species e.g. *A. aneura, A. pruinocarpa, A. maitlandii* and *Eucalyptus* species e.g. *Eucalyptus gamophylla, E. leucophloia* and *E. dichromophloia.*

Flowering and fruiting period. Flowering commences in July and extends until about late August. Legumes with mature seeds have been collected from late September to early November.

Acacia hamersleyensis belongs to section Juliflorae (Benth.) Maiden et Betche and appears to have affinities with the more widely distributed species *A. tumida* F. Muell. ex Benth., *A. citrinoviridis* Tindale et Maslin and *A. xiphophylla* E. Pritzel.

Acacia tumida is common in tropical/subtropical W.A. and N.T. but in the Hamersley Range area it is relatively uncommon and, unlike *A. hamersleyensis* is mainly confined to watercourses. Both this species and *A. hamersleyensis* are tall shrubs or small trees with long spicate inflorescences, with glabrous, sometimes pruinose mature branchlets, and with large, glabrous, sometimes glaucescent, multistriate phyllodes which are tapered equally at both ends. *Acacia hamersleyensis* is distinguished from *A. tumida* by its often narrower, less conspicuously falcate phyllodes, its axillary (not racemose), broader spikes and by its non-wrinkled, shortly pilose legumes.

Acacia citrinoviridis ("river jam"), is also normally restricted to watercourses. Compared with *A. hamersleyensis* it is a taller, more graceful tree (to 8 m) which seemingly flowers mainly between April and July. *Acacia citrinoviridis* has generally narrower, more falcate phyllodes which have an appressed, citron or silvery indumentum until intermediate age (indumentum very quickly lost in *A. hamersleyensis*), it has densely golden puberulous peduncles and receptacles and densely appressed (not patent), citron or silvery sericeous young legumes.

Acacia xiphophylla ("snakewood") and *A. hamersleyensis* are small spreading trees (although more gnarled in the former species) with long, spicate inflorescences and with phyllodes of a similar shape and size. *Acacia xiphophylla* occurs on low lying alluvial flats and flowers mainly between September and February. Morphologically *A. hamersleyensis* is distinguished from *A. xiphophylla* by its more obviously nerved phyllodes (observe at x10 mag.), its dense spikes, its larger, more deeply divided calyx which is never golden puberulous, its smaller, pilose legumes and its smaller, less compressed, oblique seeds. In *A. xiphophylla* the legumes are glabrous and can reach 21 cm long and are 1-1.5 cm wide, its longitudinally arranged seeds are 9-11 mm long, 7-10 mm wide, almost orbicular and are distinctly flattened. Although both species have yellow sericeous new shoots when first initiated, in *A. hamersleyensis* these quickly pass to glabrous bright green young phyllodes which in turn become subglaucous to distinctly glaucescent. In *A. xiphophylla* on the other hand the sericeous indumentum turns silver and persists for a considerable time, the mature phyllodes tend to be more coriaceous and never distinctly glaucescent.

The specific epithet refers to the fact that the species is known only from the Hamersley Range area.

9. **Acacia marramamba** Maslin, sp. nov. (Figure 9)

Acacia inaequilatera Domin affinis a qua cortice fibrosa; remulis non-pruinosis, phyllodiis 2-4 cm longis, 1-2 cm latis, vix undulatis, pallide-viridis vel subglaucis, obscure reticulatis, axibus racemorum pedunculisque rubiginosis, legumis leviter arcuatis, funiculo brevissimo differt.

Typus: Marandoo Ridge (first ridge south of Mount Bruce), Hamersley Range, ± 22°40'S, 118°09'E, Western Australia. 24 June, 1975. *Malcolm Trudgen* 1338. "A dense bush 2-2½ metres high, fairly spreading. Bark grey-brown, smooth, dull. Branchlets red, flower stalks red, leaves dull whitish green. Growing with *Triodia* and other *Acacia* species in stony red loam." (holo: PERTH; iso: CANB, K).

Spreading *shrubby trees* 2-3 (5) m tall, becoming ± gnarled and straggly with age, trunks sparingly divided near ground level. *Bark* not corky, fibrous and slightly fissured at base of main trunks otherwise smooth, grey on trunks and branches but red-brown, light brown or orange on branchlets. *Branchlets* terete, finely ribbed, marked with raised scars of fallen phyllodes, glabrous, not pruinose. *Stipules* indurate, spinescent, 2-4(7) mm long, patent, straight, brown, often absent from some nodes especially with age. *Phyllodes* asymmetrically elliptic, very unequal-sided with the upper margin longer and much more convex than the lower, 2-4 cm long, 1-2 cm wide, length to width ratio 1.2-3, coriaceous, barely undulate, glabrous, pale green to subglaucous, not conspicuously pruinose, ± abruptly acuminate and ending in a straight sharp brown point 1-3 mm long, narrowed towards the base, margins yellowish; principal *nerve* situated near lower margin, raised, yellowish, lateral nerves obscure and tardily anastomosing; *pulvinus* c. 1 mm long, wrinkled, slightly dilated at base, brownish; *gland* situated on upper margin of phyllode at distal end of the pulvinus or up to 1 mm above it, oblong, c. 0.8 mm long, lip yellow and very slightly raised, lacking a distinct central orifice. *Racemes* acropetalous, 1-2 per node, greatly exceeding the phyllodes, 6-15 cm long, concentrated towards the ends of the branches, the axes together with the peduncles glabrous and red-brown. *Peduncles* twinned along raceme axes, 1-2 cm long, base ebracteate and very slightly dilated. *Flower-heads* globular, light to medium golden, the red-brown petals often visible through the stamens in the centre of the heads at anthesis, 25-35-flowered; *bracteoles* linear-spathulate, c. 1 mm long, glabrescent. *Flowers* 5-merous. *Sepals* united at their extreme base, linear-spathulate, c. 1/2 length of petals, glabrous, apically light brown otherwise normally colourless. *Petals* 1.5-2.5 mm long, connate for c. 2/3 their length, the free portion red-brown, glabrous. *Legumes* narrowly oblong, to 7.5 cm long, 7-8 mm wide, ± chartaceous, slightly curved, slightly undulate, raised over seeds (umbo wrinkled), glabrous, slightly shiny, light brown (yellow-brown prior to maturity); *margins* narrow, barely constricted between the seeds. *Seeds* mostly oblique in the legume although some may be longitudinal, widely ellipsoid to almost orbicular, 4.5-5 mm long, c. 4 mm wide, slightly compressed, black, dull; *pleurogram* very obscure, represented by a shallowly curved line c. 0.5 mm long which is situated near the top of the seed; *funicle* thickly filiform, expanded into a clavate *aril* which extends down about 1/4 the length of the seed.

Other collections examined. WESTERN AUSTRALIA: Northern end of the Mount Beasley group of mountains, S of Mt. Beasley itself, between Meekatharra and Mount Labouchere on the road to Mount Augustus, 2 May 1981, *M. I. Blackwell* 10 (PERTH); Hamersley Range, (Mt.) Brockman, 22°32'S, 117°14'E, *M. Cole* WA5068 (PERTH); Rhodes Ridge, 53.5 km NW of Newman on the road to Juna Downs, *B. R. Maslin* 4610 (K, MEL, NY, PERTH, WAIT); Paraburdoo, *B. R. Maslin* 4660

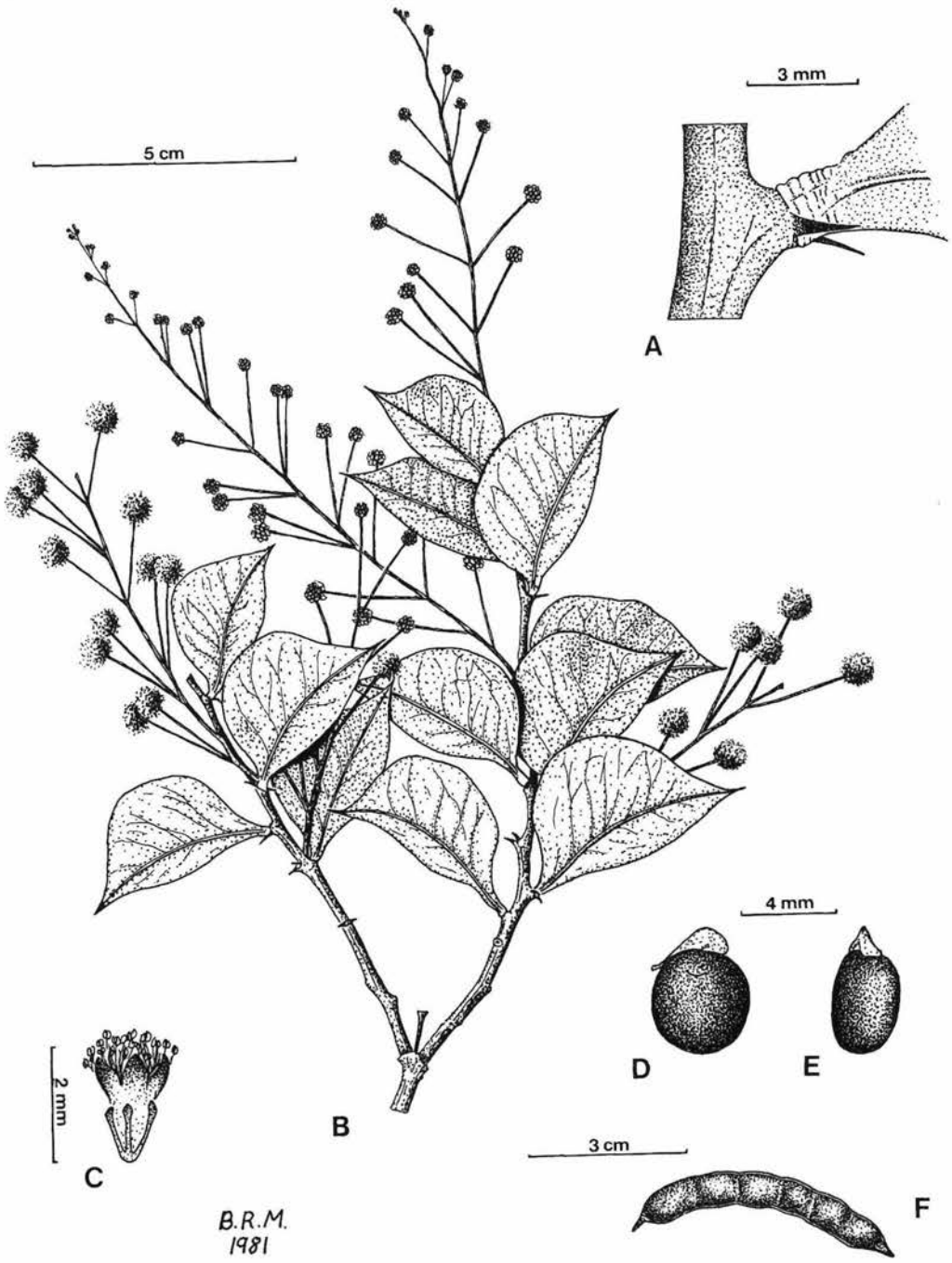

Figure 9. *Acacia marramamba*. A—Node showing spiny stipules and phyllode base. B—Portion of branch. C—Flower. D and E—Seed (D—plane view; E—side view). F—Legume.

A from *M. E. Trudgen* 2576; B from *M. E. Trudgen* 2631; C from *M. E. Trudgen* 1338 (the type); D-F from *A. A. Mitchell* 269.

(PERTH); 16 km S of Kumarina Hotel on Great Northern Highway, *B. R. Maslin* 4965 (PERTH); 50 km N of Mt Vernon Hst. and S of Mininer Stn., *A. A. Mitchell* 76/186 (PERTH); 50 km N of Tangadie Station, *A. A. Mitchell* 269 (CANB, PERTH); 20 km E of Prairie Downs Hst., Upper Ashburton, *A. A. Mitchell* 341 (PERTH); Marandoo Ridge, Hamersley Range, ± 22°40'S, 118°09'E, *M. E. Trudgen* 1049 (PERTH); Hamersley Range National Park, 4.6 mi (7.5 km) south on track to Turee Creek from the Juna Downs to Coppin Pool track, *M. E. Trudgen* 2576 (NSW, PERTH); Hamersley Range National Park, small unnamed hill on the north side of Mount Trevarton, *M. E. Trudgen* 2631 (BM, BRI, PERTH).

Distribution. (Figure 11) North-west Western Australia in the Fortescue and northern Ashburton Botanical Districts (1:250 000 maps F50-11, 15, 16; G50-4, 8). Most collections are from the Hamersley Range area from about Mount Brockman (22°28'S, 117°18'E) east to Rhodes Ridge (23°05'S, 119°22'E), however, the species does extend south into the Ashburton River basin. Although not forming locally dense populations, the species is not uncommon throughout its area of distribution.

Habitat. In the Hamersley Range area the species grows on low hills the rocks of which normally belong to the Marra Mamba Iron Formation (Macleod, 1966). Soils are skeletal and comprise highly ferruginous red-brown loam. The associated vegetation is *Acacia* shrubland e.g. *A. aneura, A. pruinocarpa, A. maitlandii, A. stowardii,* with a *Triodia wiseana* ground cover.

Flowering and fruiting period. Flowers from May to July. Legumes with immature seeds have been collected in late August. It is probable that these seeds would have reached maturity by about late September.

Acacia marramamba belongs to Sect. Phyllodineae DC. and is mostly closely allied to the Western Australia—Northern Territory arid zone species *A. inaequilatera* Domin. Both these taxa are small trees with spiny stipules, distinctly asymmetric, pungent phyllodes and long terminal racemes with brightly coloured axes. Although the two species sometimes occur sympatrically in the Hamersley Range, *A. marramamba* is readily distinguished by its smooth or fibrous (not corky) bark, its non-pruinose branchlets, its normally smaller, less undulate, pale green to subglaucous phyllodes with their very obscure lateral venation (phyllodes in *A. inaequilatera* are 2.5-7 cm long, 1.5-3.5 cm wide, often grey-green, and always with a prominent reticulum), its red-brown raceme axes and peduncles (not purple), its slightly curved legumes (not circinate) and its funicle which does not encircle the seeds.

The specific epithet refers to the Marra Mamba Iron Formation on which the species is frequently found.

10. **Acacia pyrifolia** DC., Prodr. 2: 452 (1925). *Type:* Nouvelle Hollande, cote Orient, Mus. de Paris 1821 (holo: G-DC; iso: K, P).

Acacia clementii Domin, Biblioth. Bot. 89: 812 (1926), non Maiden et Blakely (1928) syn. nov. *Lectotype* (here selected): N.W. Australia. Between the Ashburton and De Grey rivers. *E. Clement* s.n. (PR527758—right hand specimen on the sheet; iso: K, PR—left hand specimen on sheet no. 527758). *Lectoparatypes:* (1) Western Australia: Between the Ashburton and Yule Rivers. *E. Clement* (K—vegetative specimens on the sheet are *A. pyrifolia,* seeds are those of *A. inaequilatera);* (2) Bay of Rest, Dampier's Archipelago, Feb. 1818, *A. Cunningham* s.n. (K).

The name *A. clementii* Domin was based on three collections. The species was distinguished from *A. pyrifolia* by its coriaceous phyllodes and by its funicles which completely encircle the seeds. I have examined the holotype of *A. pyrifolia* and also all syntypes of *A. clementii* and can detect no substantial differences between them. Although *A. pyrifolia* in the broad sense (here I would include *A. morrisonii* Domin) does exhibit some phyllode textural variability (i.e. some can be more coriaceous than others) this is not a significant or diagnostic taxonomic character. The seeds which Domin described under *A. clementii* are at Kew and are included in a packet with the Clement (sterile) specimens collected from between the Ashburton and Yule rivers. The vegetative material on this sheet readily falls within the natural range of variation for *A. pyrifolia*. In the seed packet, besides the seeds themselves, are loose phyllodes some of which are referable to *A. inaequilatera* Domin. The seed differences between *A. pyrifolia* and *A. inaequilatera* are based primarily on the length of the funicle which completely encircles the seed in a double fold in *A. inaequilatera* but is much shorter in *A. pyrifolia*. There are some seeds in the above-mentioned packet which have funicles completely encircling them, although on most the funicle has been broken-off. Apparently what has happened is that under the name *A. clementii* Domin described foliage and flowers of *A. pyrifolia* and seeds of his own new species, *A. inaequilatera*.

11. **Acacia stowardii** group

Seven species are currently ascribed to this taxonomically complex species-group viz. *A. adsurgens* Maiden et Blakely, *A. atkinsiana* Maslin, *A. duriuscula* W. V. Fitzg., *A. kempeana* F. Muell. (syn. *A. sibirica* S. Moore), *A. nelsonii* Maslin, *A. rhodophloia* Maslin and *A. stowardii* Maiden (syn. *A. clivicola* Pedley). More than half of these species are wide-ranging arid zone taxa (Maslin and Pedley, in press), and all but *A. duriuscula* and *A. nelsonii* are recorded for the Hamersley Range area. The members of this group are characterized by their non-anastomosing, finely multistriate phyllodes with nerves very close together, their obloid or cylindrical (rarely globular) flower-heads, their gamosepalous, shortly dissected calyxes and their flat, linear to oblong, chartaceous to ± cartilaginous legumes. Difficulties encountered in distinguishing certain members of the *A. stowardii* group have been noted under *A. atkinsiana* above and also in Maslin (1980) and Pedley (1981). The species are distinguished principally by their phyllode and legume dimensions, their seed orientation and their bark and flower-head characteristics. However, it is evident from both field and herbarium studies that considerable variation exists in certain of these morphological features. Additionally, many of the species superficially resemble one another, especially when viewed on herbarium sheets. For these reasons the following notes are provided as a guide to the variation and as an aid to identification for species from the Hamersley Range area. Undoubtedly more intensive field and laboratory studies are required in order to fully resolve the taxonomic complexities within this group.

11a. **A. adsurgens** Maiden et Blakely

The salient features of the Hamersley Range specimens referred to this species are: Phyllodes narrowly linear, 11-20 cm long, 2-3 mm wide, pale subglaucous, finely multistriate with the central nerve slightly more evident than the other nerves. Spikes pale yellow, flowers densely arranged. Calyx gamosepalous, more than half the length of the corolla. Legumes unknown.

The characters given above accord with those of *A. adsurgens* (see Maslin, 1981), however, legumes from the Hamersley Range populations are required to confirm the identification.

This species is superficially very similar to the long, linear phyllode forms of *A. stowardii* (see below) but can be distinguished by its generally longer and slightly broader phyllodes with a slightly pronounced central nerve, its denser, paler yellow spikes and its slightly longer calyx.

11b. **A. atkinsiana** Maslin

See species no. 2 above.

11c. **A. kempeana** F. Muell. (syn. *A. sibirica*)

This widespread arid zone species is not common in the Hamersley Range area having been recorded only from Marandoo which is situated near the base of Mount Bruce. *Acacia kempeana* is most closely allied to *A. stowardii* from which it is distinguished mainly by its broader phyllodes and legumes and its transverse to obliquely transverse seeds (see key to species above). Pedley (1978) reports that where the ranges of the two species adjoin in north-western Queensland intermediates sometimes occur. Judging from some specimens seen, it seems probable that intermediates between *A. kempeana* and *A. stowardii* also occur within the Hamersley Range area. More intensive field studies (in particular to gather fruiting material) are required in order to gain a clearer understanding of the relationship between these two species in the Hamersleys.

11d. **A. rhodophloia** Maslin

As noted previously (Maslin, 1980) *A. rhodophloia* is a variable species. The Hamersley Range populations of this species possess phyllodes that are narrowly elliptic (often linear elsewhere) and which range from 4.5-6.5 cm long and 5-8 mm wide with a length to width ratio of 6-13. Sometimes *A. stowardii* (see below) has phyllodes similar to this but *A. rhodophloia* is readily distinguished by its "Minni Ritchi" bark (i.e. red and exfoliating in narrow shavings which curl retrorsely from each end) and also by its flower-heads which are broader and with flowers more densely arranged. Additionally, the calyx on *A. rhodophloia* slightly exceeds half the length of the corolla whereas on *A. stowardii* it is as long as, or shorter than, half the corolla. Flowering specimens of *A. rhodophloia* from the Murchison River area may superficially resemble *A. atkinsiana* (see species no. 2 above).

11e. **A. stowardii** Maiden (syn. *A. clivicola* Pedley)

This species is recognized by its grey bark, its finely multistriate phyllodes, its light golden spikes with flowers not densely arranged, its gamosepalous calyx which does not exceed c. 1/2 the length of the corolla, its chartaceous legumes which are from 4-9(10) mm wide and its longitudinal to longitudinally oblique seeds. As noted by Pedley (1978) under *A. clivicola* (= *A. stowardii*), the normal range in phyllode size for this species is from (2)3-6(7) cm long and (0.7)1-3(4) mm wide. *Acacia stowardii* in the Hamersley Range area is very variable with respect to its phyllodes which are often longer and/or broader than normal. In some populations the phyllodes are of a constant size but in others considerable variation has been observed. For example, on the collection *B. R. Maslin* 4605 and 4605A (which is

referable to variant 2 below) from 38 km NW of Newman, the phyllodes varied from 5-7(9) cm long, 2-4(6-7) mm wide and had a length to width ratio of 10-18(22-35). On the basis of phyllode dimensions, two variants of *A. stowardii* from the Hamersley Range area are described below. It is noted, however, that the distinction between these two variants may well be artificial and that future sampling will show a continuum from one to the other.

1. Phyllodes narrowly linear, (6)8-12.5 cm long, 1-2 mm wide, length to width ratio 30-120, uniformly finely multistriate. Of restricted distribution being recorded only from Tom Price, Paraburdoo and Marandoo areas. This variant superficially resembles *A. adsurgens* (see 11a. above for distinguishing characters).

2. Phyllodes broadly linear to very narrowly elliptic, 4.5-9(10-12.5) cm long, 2-8 mm wide, length to width ratio 9-20(25-35). Widespread in the Hamersley Range area and has also been collected from the Rudall River area about 400 km to the east. Broad phyllode individuals may resemble either *A. kempeana* or *A. rhodophloia* (see 11c. and 11d. above). The bark on this variant is grey and is normally fissured near the base of the main trunks. On a few plants, however, the bark on the main trunks, although externally grey, exfoliates in a manner not dissimilar to the "Minni Ritchi" bark of *A. rhodophloia* and reveals a smooth, red underlayer.

12. **Acacia trachycarpa** E. Pritzel, Bot. Jb. 35:308 (1904). *Lectotype* (here selected): Harding River, Roebourne, 18 Apr. 1901, *L. Diels* 2755 (PERTH—ex Museo Botanico Berolinensis). *Lectoparatype*: Near Roebourne, April 1901, *E. Pritzel* 279 (B, DBN, E, K, L, M, P, PR). This collection is *A. arida* Benth.

A. gonocarpa var. *lasiocalyx* F. Muell., Plants of North-Western Australia. Part 1: 8 (1881). *Type citation*: "Yule and Fortescue Rivers. Jones' Creek and Georges River, *J. Forrest*" (n.v.).

Acacia trachycarpa is a "Minni Ritchi" species common throughout the Pilbara Region (i.e. Fortescue Botanical District) particularly along creeks and rivers. The original description was based on two syntypes viz. *Diels* 2755 and *Pritzel* 279. The former collection which is in flower has been selected as the lectotype because it accords well with the protologue and because it is representative of the taxon currently understood as *A. trachycarpa*. No specimen of *Diels* 2755 has been located at Berlin (B). The only duplicate of this collection known to me is at PERTH, it therefore has been selected as the type. *Pritzel* 279 is also a flowering collection but it differs from the original description with respect to its phyllodes which are minutely punctulate (not mentioned in the protologue) and nerveless (prominently 1-3-nerved in protologue). *Pritzel* 279 in fact is *A. arida* Benth. No fruiting syntype of *A. trachycarpa* has been located even though legumes were described in the protologue. The carpological description is comprehensive and almost certainly refers to *A. trachycarpa* sensu lectotypico but definitely not to *A. arida*. In view of these facts it is surprising to find in some herbaria e.g. DBN, M and PR, specimens of *Pritzel* 279 originally named *A. arida* but redetermined by Pritzel himself as *A. trachycarpa*.

Acacia gonocarpa var. *lasiocarpa* is queried as a synonym of *A. trachycarpa* mainly because I have not seen the type. The original description, although brief, enables me to be reasonably sure that it was *A. trachycarpa* that was being described. According to Maiden (1917:100) the type is no longer at the National Herbarium, Melbourne (MEL).

13. **Acacia xiphophylla** E.Pritzel, Bot. Jb. 35: 305 (1904). *Lectotype* (here selected): Tree, 4 m in height, 25 km south of Roebourne, 24 April 1901, *L. Diels* 2808 (PERTH—a single phyllode only, ex Museo Botanico Berolinensis).

Acacia clementii Maiden et Blakely (as 'clementi'), J. Roy. Soc. W. Aust. 13: 26 t.19 ff. 1-4 (1928), nom. illeg., non Domin (1926), *syn. nov. Type:* Between the Ashburton and Yule Rivers W.A., 1898, *E. Clement* (holo: NSW; iso: PERTH—fragment ex NSW).

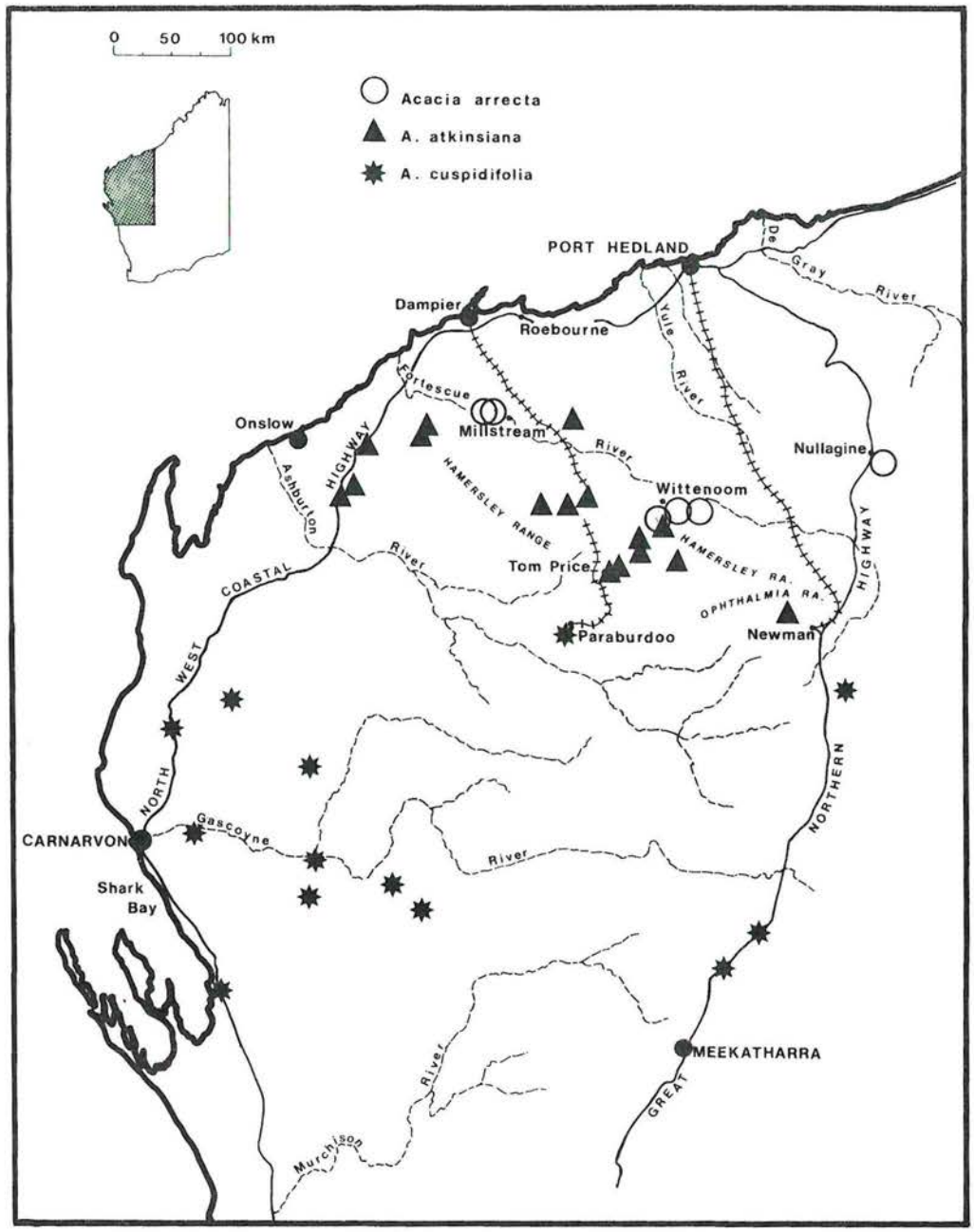

Figure 10. Distribution of *Acacia arrecta, A. atkinsiana* and *A. cuspidifolia*

Through the courtesy of the Director, Royal Botanic Garden and National Herbarium, Sydney (NSW) I have inspected Maiden and Blakely's type of *A. clementii* and compared it with the lectotype of *A. xiphophylla* at PERTH. Unfortunately Diels' original gathering of *A. xiphophylla* is not at the Botanisches Museum, Berlin (B) it probably having been destroyed when that institution was burnt in 1943. The PERTH lectotype comprises only a single phyllode but this accords very well with other collections attributed to *A. xiphophylla.* This species is very common around Roebourne (the type locality) and there is no other *Acacia* species known to occur in that area with which it is likely to be confused. The holotype of *A. clementii* Maiden et Blakely comprises the upper portion of a flowering branch and this accords well with other material at PERTH under *A. xiphophylla.* The two taxa are therefore considered conspecific.

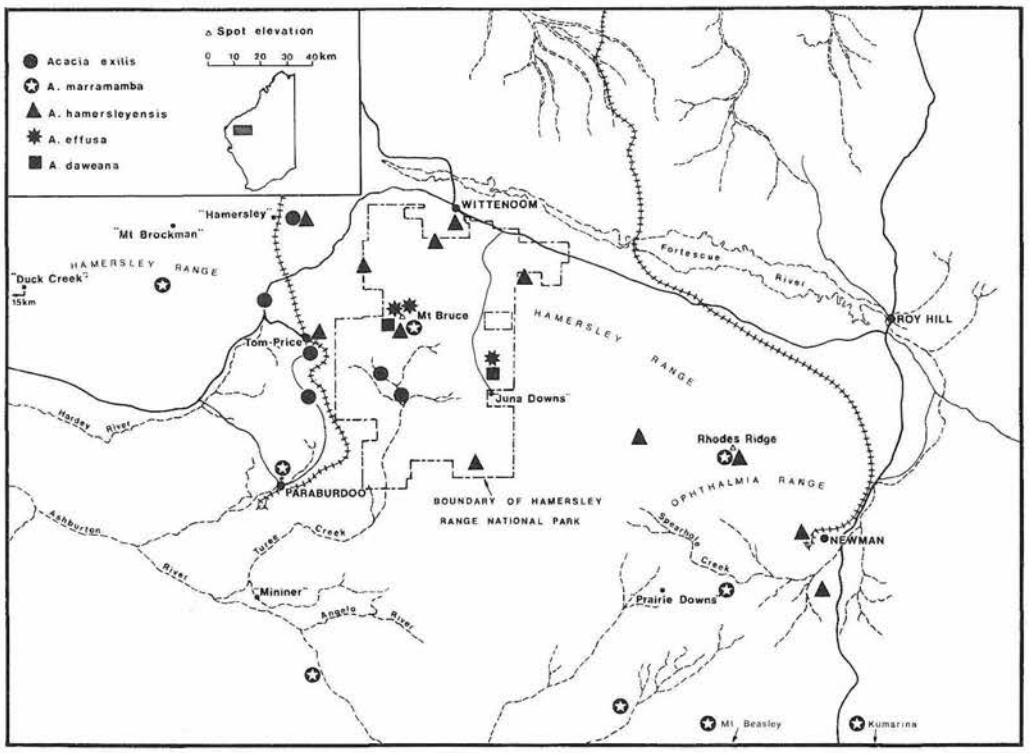

Figure 11. Distribution of *Acacia daweana, A. effusa, A. exilis, A. hamersleyensis* and *A. marramamba.*

Acknowledgements

Many workers have greatly facilitated this project by providing both collections and habit/habitat data for many of the included taxa. In particular I would like to thank Libby Mattiske, Penny Würm and Ken Atkins for material and data from the Tom Price-Paraburdoo area, Chris Dawe (Marandoo area), Ken Walker (Newman area), Ian and Eva Solomon (Wittenoom area) and Malcolm Trudgen (Pilbara area in general). John Fox (W.A. Institute of Technology) is thanked for providing an airfare in 1980. This facilitated botanical collecting in the Hamersley Range National Park during a biological survey sponsored by Ian Pound of Integrated

Environmental Services. Garry Marney is thanked for field assistance and Suzanne Curry for very competent technical help. The project was conducted at the Western Australian Herbarium (PERTH) with financial assistance provided under an Australian Biological Resources Study grant from the Bureau of Flora and Fauna.

Index to specimens studied for new species described herein

This index is arranged alphabetically according to the name of the collector. Numbers in parentheses refer to the corresponding numbered species in the text. Unless otherwise indicated, the specimens cited are housed at the Western Australian Herbarium (PERTH). Abbreviations for herbaria are those given in Index Herbariorum, Part 1, Edition 6 (1974). In the case of Kings Park and Botanic Garden, Murdoch University and the Western Australian Institute of Technology (all in Perth), there are no formal abbreviations so KP, MURD and WAIT respectively are used informally here.

Ashby, A. M. 4491 (4—CANB, K, MEL, PERTH).

Atkins, K. 445 (8), 1209 (2—CANB, PERTH), 1213 (2—K, PERTH), 1221 (7—CANB, K), 1225 (8—K, PERTH), 1240 (8—MEL, PERTH), 1257 (4—Type: CANB, K, NY, PERTH), 1264 (4).

Beard, J. S. 3510 (4—KP, PERTH), 4366 (4), 4569 (2—KP), 4603 (1—KP), 6148 (2).

Black, R. F. s.n. 10 Oct. 1975 (1), s.n. 30 Jan, 1975 (1—NSW, PERTH), s.n. 6 Dec. 1974 (1).

Blackwell, M. I. 10 (9).

Blockley, J. V. 291 (7), 378 (8—KP).

Brooker, M. I. H. 2089a (1—CANB, K, MEL, PERTH).

Cole, M. 5006 (8), 5030 (2), 5067 (2) 5068 (9), 5097 (7).

Dawe, C. G. 008 (6), 210 (5) M112 (8—PERTH, TLF, WAIT), M154 (2—CBG, PERTH), 212 (6—BRI, CANB, K, PERTH), 218 (8—CANB, PERTH).

Dell, B. s.n. 7 June 1979 (2—MURD).

Demarz, H. 611 (4—KP, PERTH), 2778 (4—KP, PERTH), 4416 (1—KP, PERTH), D5755 (2—KP, PERTH), D7084 (2—TLF, PERTH), 7652 (4)

Gardner, C. A. 6152 (4), 6208 (4).

George, A. S. 1068 (1).

Hastings, B. S4356 (2—KP).

Lethbridge, I. L. s.n. July/Aug. 1971 (1—BRI, PERTH).

Maloney, B. 73/53 (2).

Maslin, B. R. 2733 (2—AD, MEL, NSW, PERTH), 2761 (2—B, BM, G, NSW, P, PERTH), 2771 (4) 4586 (8—PERTH, WAIT), 4609 (8), 4610 (9—K, MEL, NY, PERTH, WAIT), 4621 (8), 4627 (6), 4628 (5), 4630 (8), 4644 (1—Type: CANB, K, MEL, PERTH), 4646 (8), 4648 (2), 4653 (4), 4660 (9), 4666 (7—BRI, CANB, K, MEL, NY, PERTH, WAIT), 4672 (7), 4677 (8), 4681 (6—Type: CANB, K, MEL, PERTH), 4682 (5—Type: CANB, K, NY, PERTH), 4683 (8—BRI, NSW, NY, PERTH), 4685 (2—PERTH, WAIT), 4746 (2), 4965 (9), 4996 (4), 5003 (4), 5012 (4).

Mitchell, A. A. 76/186 (9), 269 (9—CANB, PERTH), 341 (9) 348 (1—PERTH, WAIT), 367 (2).

O'Farrell, R. 48 (4).

Pullen, R. 10940 (6—AD, CANB, PERTH).

Stewart, K. s.n. Sept. 1957 (1).

Trudgen, M. E. 319 (6—BRI, PERTH), 323 (6), 327 (8), 391 (8—Type: CANB, K, PERTH), 1042 (8) 1045 (8), 1049 (9), 1151 (8—MEL, PERTH), 1299 (2—PERTH, WAIT), 1338 (9—Type: CANB, K, PERTH), 2263 (8—CANB, PERTH), 2407 (7—BM, NT, G, P, PERTH), 2413 (7—Type: CANB, K, MEL, NY, PERTH), 2493 (2—Type: CANB, K, NY, PERTH), 2503 (2—BRI, PERTH), 2548 (7—AD, BRI, NSW, PERTH), 2576 (9—NSW, PERTH), 2631 (9—BM, BRI, PERTH).

Walker, K. 95 (8—CBG, MEL, NSW, PERTH), 96 (8), 97 (8), 113 (8).

Weston, A. S. 10842 (2), 10844A (2).

Willis, J. H. PERTH—Dup. of MEL 503363 (2), MEL 503364 (6—MEL, PERTH), s.n. 17 Aug. 1974 (8)

References

Beard, J. S. (1975). 'The vegetation of the Pilbara area.' Explanatory Notes to Sheet 5 of the Vegetation survey of Western Australia. (University of W.A. Press: Nedlands.)

Beard, J. S. (1980). A new phytogeographic map of Western Australia. W. Austral. Herb. Res. Notes No. 3: 37-58, plus map.

Bentham, G. (1864) 'Flora Australiensis.' Vol. 2 (Reeve: London.)

Bowler, J. M. (In press.) Aridity in the late Tertiary and Quaternary of Australia. In W. R. Barker and P. J. M. Greenslade (eds.) 'Evolution of the Flora and Fauna of Arid Australia.'

de la Hunty, L. E. (1965). 'Explanatory Notes on the Mount Bruce Geological Sheet.' Geological Survey of Western Australia. 1:250 000 Geological Series. (Govt. Printer: Tasmania.)

Hnatiuk, R. J. and Maslin, B. R. (1980). The distribution of *Acacia* (Leguminosae-Mimosoideae) in Western Australia. Part 1. Individual species distribution. W. Austral. Herb. Res. Notes. No. 4: 1-103.

Hopper, S. D. and Maslin, B. R. (1978) Phytogeography of *Acacia* in Western Australia. Austral. J. Bot. 26: 63-78.

Macleod, W. V. (1966). The geology and iron deposits of the Hamersley Range area, Western Australia. Geol. Survey of W.A. Bull. No. 117 (Govt. Printer: Perth.)

Maiden, J. H. (1917). Notes on *Acacia* No. 2—Tropical Western Australia. J. and Proc. Roy. Soc. N.S.W. 51: 71-124, pl. i-iv.

Maslin, B. R. (1980). *Acacia* (Leguminosae-Mimosoideae): a contribution to the flora of Central Australia. J. Adelaide Bot. Gard. 2(4): 301-321.

Maslin, B. R. (1981). *Acacia.* In Jessop, J. P. (ed.) 'The Flora of Central Australia.' (A. H. and A. W. Reed: Sydney.)

Maslin, B. R. and Hopper, S. D. (In press.) Phytogeography of *Acacia* (Leguminosae: Mimosoideae) in Central Australia. In W. R. Barker and P. J. M. Greenslade (eds.). 'Evolution of the Flora and Fauna of Arid Australia.'

Maslin, B. R. and Pedley, L. (1982). The distribution of *Acacia* (Leguminosae: Mimosoideae) in Australia. Part 1. Species distribution maps. W. Austral. Herb. Res. Notes No. 6: 1-127.

Pedley, L. (1977). Notes on Leguminosae. 1. Austrobaileya 1(1): 25-42.

Pedley, L. (1978). A revision of *Acacia* Mill. in Queensland. Part 1 Austrobaileya 1(2): 75-234.

Pedley, L. (1981). Further notes on *Acacia* in Queensland. Austrobaileya 1(4): 339-345.

Randell, B. A. and Symon, D. E. (1977). Distribution of *Cassia* and *Solanum* species in arid regions of Australia. Search 8: 206-207.

Stebbins, G. L. and Major, J. 1965. Endemism and speciation in the California flora. Ecol. Monogr. 35: 1-35.

16559—(8)

Studies in the genus *Acacia* (Leguminosae:Mimosoideae)—12. Two new species from the eastern goldfields, Western Australia

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Abstract

Maslin, B. R. Studies in the genus *Acacia* (Leguminosae:Mimosoideae)—12. Two new species from the eastern goldfields, Western Australia. Nuytsia 4(1): 105-112 (1982). Two new species of *Acacia, A. kerryana (section Juliflorae) and A. warramaba* (section Plurinerves), are described and illustrated. Both taxa occur in the eastern goldfield area of Western Australia.

1. **Acacia kerryana** Maslin, sp. nov. (Figure 1)

Acacia filifolia Benth. et *A. merinthophora* E. Pritzel affinis a qua statura minore, phyllodiis decurrentibus in sicco teretibus et calyce minore differt.

Typus: 1 km S of Spargoville (c. 45 km S of Coolgardie) on the road to Norseman, Western Australia. "Shrub 0.6 m tall, dividing just above ground level into c. 4 slender, spreading-erect main branches; bark smooth, grey; branches somewhat flexuose on upper half; foliage soft and dense; phyllodes persistent upon dying, curved to serpentinous, light olive green; flower-heads light golden. Much regrowth here following a fire. Favours exposed areas and seems restricted to this low rocky hill." 16 February 1981, *B. R. Maslin* 4834 (holo: PERTH; iso: CANB, G, K, MEL, NY).

Low, spreading, rather dense *shrubs* 0.5-0.6(1) m tall and to 2 m diam., infundibular and flat-topped when young but amorphous with age, dividing just above ground level into about 4 slender spreading-erect stems. *Bark* smooth, grey except for the branchlet apices which are light brown to reddish brown. *Branches* somewhat flexuose especially towards their apices, terete, very obscurely nerved, apically very sparsely antrorsely strigillose, otherwise glabrous, apices slightly shiny. *Stipules* deciduous, triangular, c. 0.3 mm long. *Phyllodes* filiform-terete, 8-16 cm long, c. 0.5 mm diam., tortuous, cirrose, decurrent, persistent on branches upon dying, light olive green but upon dying turning first orange then grey, glabrous; *nerves* 8, fine, impressed when fresh, becoming slightly raised upon drying due to shrinkage of intervening tissue, distant (c. 0.2 mm apart); *gland* not prominent, situated on upper surface of the phyllode some distance above the base, lamina slightly swollen about the gland, circular, c. 0.2 mm diam., lip yellow to brown and slightly raised. *Inflorescences* simple and axillary, 2-3 per node. *Peduncles* 6-13 mm long, glabrous or very sparsely strigillose; *basal peduncular bract* ± ovate and shallowly concave, c. 1 mm long, glabrous. *Flower-heads* obloid, 6-7 mm long and c. 4 mm wide when dry, 12-15 flowered, flowers not very densely arranged, light golden; *bracteoles* c. 0.5 mm long, with minute claws and inflexed concave glabrescent brown laminae. *Flowers* 4-merous. *Calyx* cupular, 1/5-1/6 the length of the corolla, very shallowly divided into broadly triangular lobes. *Corolla* 1.5-2 mm long, readily

separating into elliptic petals which are very obscurely penninerved (apparently nerveless when dry). *Ovary* densely appressed white tomentose. Legumes seen only following dehiscence, valves twisted and coiled, to 8.5 cm long (expanded length), 2 mm wide, chartaceous, light brown, glabrous, obscurely longitudinally nerved; *margins* constricted between seeds, yellow. *Seeds* not seen.

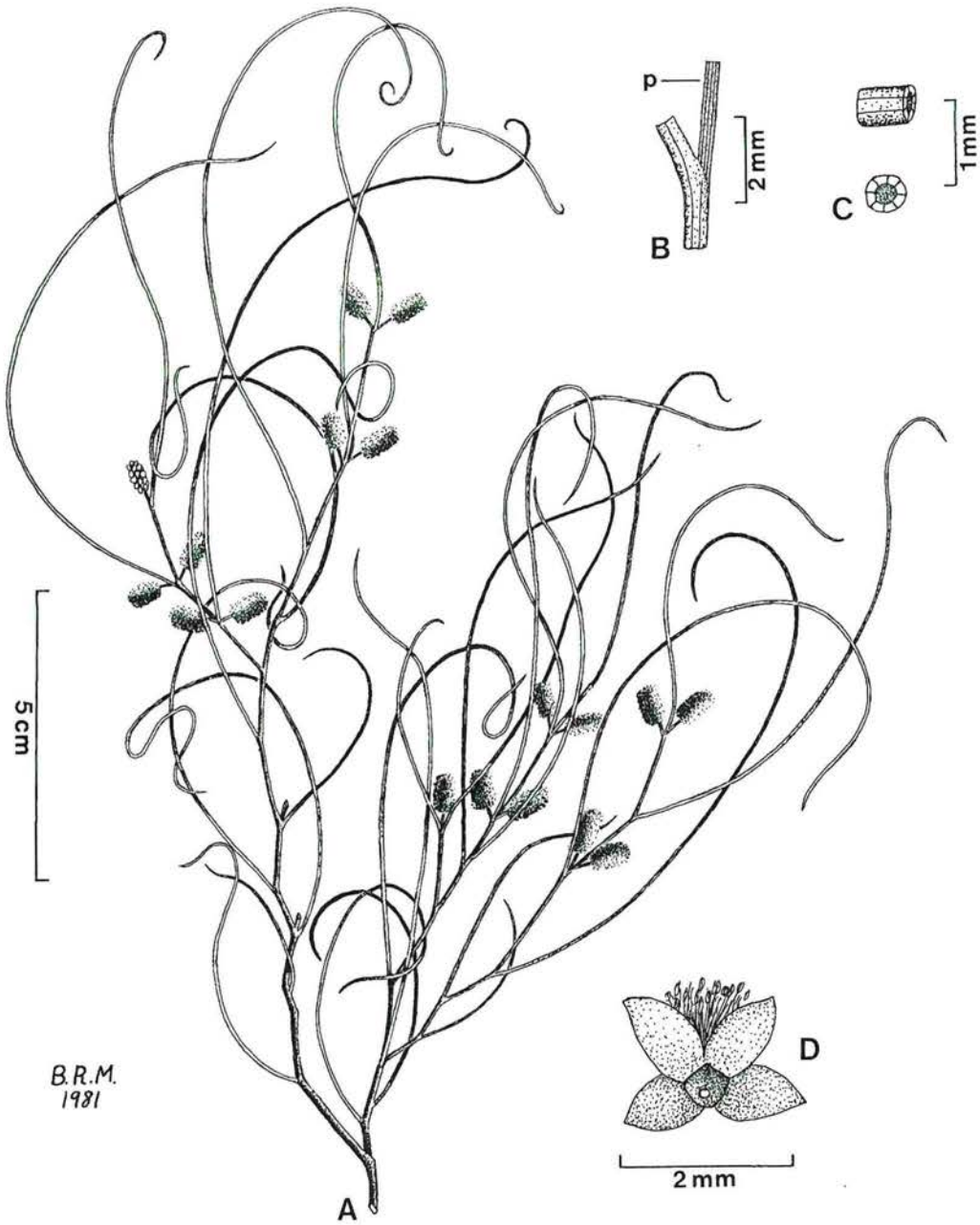

Figure 1. *Acacia kerryana*. A—Portion of branch showing tortuous phyllodes and obloid flower-heads. B—Node showing decurrent phyllodes (p). C—Phyllode, side view and transverse section showing position of nerves. D—Flower (viewed from below) showing cupular calyx and 4 petals.

A from fresh material collected by *B. R. Maslin* from the type locality; B and C from *K. Newbey* 8099; D from *B. R. Maslin* 4834 (the type).

Other collections examined. WESTERN AUSTRALIA: 9 km NE of Norseman, *K. Newbey* 7531 (PERTH); near Jimberlana Hill, 8 km NE of Norseman, *K. Newbey* 8099 (NSW, PERTH); 2 km NW of Lake Cronin, c. 45 km E of Hyden, *K. Newbey* 9177 (PERTH).

Distribution. (Figure 3) Of scattered occurrence in the eastern goldfield and southern wheatbelt areas of south-west Western Australia in the Coolgardie and Roe Botanical Districts (1:250 000 maps H51-13, I51-2; I50-4). *Acacia kerryana* is possibly more common than is indicated by current collections, but as the species is of low stature and flowers during the summer when generally little collecting is done, it may well have been overlooked in the past.

Habitat. Acacia kerryana seems always to be associated with low rocky hills. The Jimberlana Hill population occurs on a moderately exposed low stony ridge in shallow, well drained, granitic, loamy sand. The Spargoville population is restricted to a rocky hill and grows in shallow, red-brown loam in association with various species of *Acacia* (e.g. *A. erinacea, A. pachypoda, A. rendlei, A. warramaba*), *Casuarina campestris, Triodia scariosa* and mallee eucalypts. *Acacia kerryana* does not inhabit the taller scrub, dominated by *Acacia acuminata* and *Casuarina campestris,* occurring on deeper soil in a saddle adjacent to this hill. Near Lake Cronin the species grows in stony, red clayey loam on a moderately exposed slight slope.

Flowering and fruiting period. Based on herbarium label information the species is known to flower in late October and mid-February, suggesting a continuous season from late spring to summer. The fruiting period is uncertain.

On account of its obloid flower-heads and its plurinerved phyllodes *A. kerryana* is placed in section Juliflorae (Benth.) Maiden et Betche and seems most closely related to two reasonably common wheatbelt species, *A. filifolia* Benth. and *A. merinthophora* E. Pritzel. Besides being distributed further east (Maslin and Pedley, in press), *A. kerryana* is distinguished from both these species by its smaller stature, its decurrent phyllodes which are terete (not ± quadrangular) when dry and its smaller calyx.

Acacia kerryana is the second species with decurrent phyllodes recorded for section Juliflorae, the other being *A. aciphylla* Benth. (see Maslin, 1977). These two species are not particularly closely related to one another and neither is at all close to section Alatae (Benth.) Pedley, a heterogeneous group of species characterised by decurrent phyllodes and globular flower-heads.

Unlike the condition found in pulvinate species, the dead phyllodes of *A. kerryana* are persistent. Living phyllodes at branch apices are light olive green but upon dying they turn first orange then grey. The result of this progressive colour change was observed at the type locality in February 1981 when the plants were in full flower. In August 1981, however, plants from the same population lacked the intermediate, orange-coloured phyllodes. This suggests that phyllode death occurs seasonally at about the time of flowering.

I first encountered this new species in February 1981 while investigating populations of *A. warramaba* (see below) south of Spargoville. Unbeknown to me at the time, Mr Ken Newbey had already collected *A. kerryana* 5 months previously from near Norseman.

The species is named in honour of my good friend Ms Kerry Ward, librarian at the Western Australian Herbarium from 1975 until 1977 and presently deputy librarian at the W.A. Department of Agriculture.

2. **Acacia warramaba** Maslin, sp. nov. (Figure 2)

Acacia redolens Maslin affinis a qua ramulis nec resinoso-costatis, phyllodiis plerumque angustioribus longioribusque et nervis plus numerosis confertisque, nec anastomosantibus, differt.

Typus: Eyre Highway, 15.5 km E of Fraser Range, Western Australia. "Shrub 3 m tall with phyllodes concentrated towards ends of branches, 3-6-branched near ground level; bark smooth, grey; phyllodes spreading-erect, medium olive green, characteristically hooked at their apices. Red clay in *Casuarina, Cassia, Dodonaea* scrub with spinifex. Near top of rise just below a band of tall mallee eucalypts." 17 February 1981, *B. R. Maslin* 4843 (holo: PERTH; iso: CANB, K).

Shrubs to 3.5 m tall with 3-6 spreading-erect main branches (to 5 cm diam.) arising from near ground level, bushy and rounded (to 3 m diam.) when young but at maturity becoming infundibular and more open with the phyllodes concentrated towards the ends of the branches. *Bark* smooth except at base of mature main stems where it may become finely longitudinally fissured, grey except for the yellow or brown branch apices which are rarely glaucescent. *Branches* terete but somewhat angular towards their apices, finely ribbed (ribs most prominent immediately below insertion of the phyllodes), marked with distant scars of fallen phyllodes. *New shoots* arising from distal end of raceme axis, resinous. *Stipules* deciduous. *Phyllodes* variable, linear to very narrowly elliptic or very narrowly oblanceolate, (3)4-8(10) cm long, 3-6(10) mm wide, length to width ratio (6)8-20(40), flat, spreading-erect to distinctly ascending, not particularly rigid, straight to slightly curved, light to medium olive green, rarely glaucescent, glabrous or sometimes glabrescent; *nerves* numerous, parallel and not anastomosing, close together (interstices 0.1-0.2 mm apart), impressed but the central one very slightly more evident that the rest; *apices* characteristically hooked, acute, not pungent, brown; *pulvinus* terete, 1-2 mm long, finely transversely wrinkled, yellow; *gland* very obscure, situated on upper margin of phyllode at the distal end of the pulvinus. *Inflorescences* comprising short axillary racemes of 2(3-4) flower-heads, 1(2) per node, scattered along branches and not showy; *raceme axes* 2-5 mm long, terminated by a vegetative bud which grows out following anthesis, hoary or sometimes (especially when in fruit) glabrous. *Peduncles* 4-8 mm long, indumentum as on raceme axes; *basal peduncular bract* sub-persistent, triangular, c. 0.5 mm long, light brown. *Flower-heads* globular, light golden, c. 45-flowered, flowers densely arranged, small (c. 3.5 mm diam. just prior to anthesis), slightly resinous; *bracteoles* linear-spathulate, c. 1 mm long, glabrescent, the laminae observable (at x10 mag.) between flowers in inflorescence buds, ovate, inflexed, concave and brown. *Flowers* 5-merous. *Sepals* linear-spathulate, 2/3-3/4 length of petals, claws very narrow and translucent, laminae slightly concave brown and sparsely ciliolate. *Petals* 1.5 mm long, glabrous, nerveless. *Legumes* narrowly oblong, to 7 cm long, (5)6-8 mm wide, pendulous, chartaceous, straight or slightly curved, frequently slightly undulate, rarely semicircinate or tardily sigmoid, raised over seeds, slightly shiny, red-brown when mature, grey-brown prior to maturity, glabrescent, very obscurely transversely nerved, abruptly narrowed at apex, basal stipe 3-4 mm long; *margins* usually not or only slightly contricted between seeds however random deep constrictions may occur, marginal nerve narrow and yellowish brown. *Seeds* normally transverse to oblique within the legume, sometimes a few seeds are longitudinal, obloid-ellipsoid but truncate along margin adjacent to the aril, size variable, 3-4.5 mm long and 2-3 mm wide, somewhat compressed (1-1.5 mm thick), colour variable, light brown or grey-brown to blackish, slightly shiny;

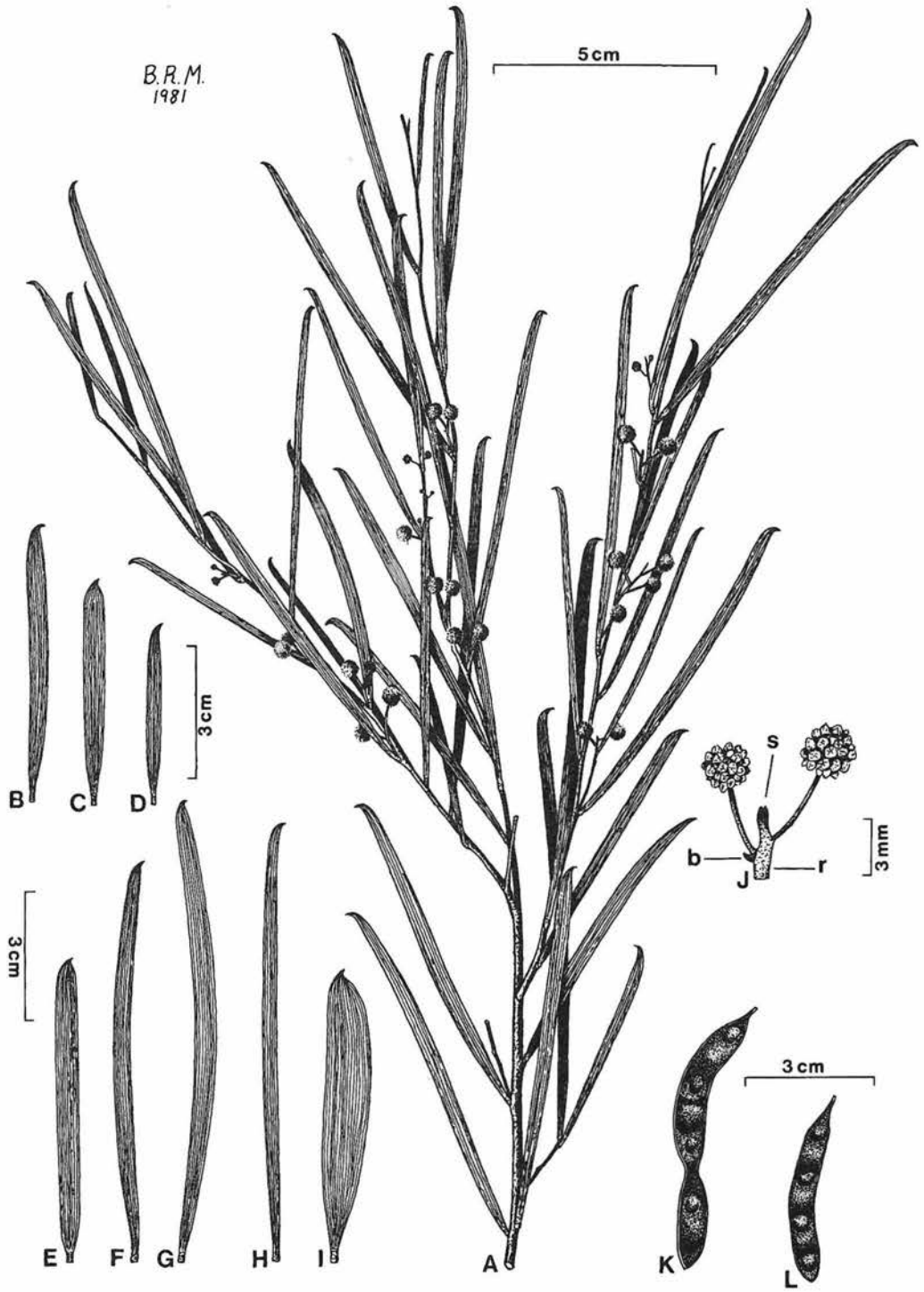

Figure 2. *Acacia warramaba*. A—Portion of branch. B to I—Phyllodes showing variability (D—an atypically small phyllode; I—an atypically broad phyllode; E to G—samples from separate plants in a single population). J—Inflorescence showing short raceme axis (r) with a dormant vegetative shoot(s) at its apex; note persistent bract (b) at base of one peduncle. K, L—Legumes showing variability.

A from *B. R. Maslin* 4843 (the type); B from *A. S. George* 8599; C from *B. R. Maslin* 2465; D from *A. S. George* s.n., 6 Feb. 1963; E from *B. R. Maslin* 4836B; F from *B. R. Maslin* 4836; G from *B. R. Maslin* 4836A; H and J from *M. J. D. White* s.n., 24 Feb. 1979; I from *K. Newbey* 6299; K from *A. E. Orchard* 4178; L from *M. J. D. White* s.n., 7 Feb. 1979.

pleurogram very obscure, "u"-shaped, open towards the hilum; *areole* 0.4-0.6 mm long, 0.2-0.5 mm wide; *funicle* filiform, 1.5-2 mm long, reflexed below and expanded into a yellowish clavate *aril* which extends down about 1/3-1/2 the length of the seed.

Other collections examined. WESTERN AUSTRALIA: Mt Day in the Bremer Range, *J. S. Beard* 3843 (PERTH); 56 mi (89.6 km) W of Eyre Highway, on Hyden-Norseman road, *A. S. George* 4343 (PERTH); 10 mi (16 km) E of Fraser Range on Eyre Highway, *A. S. George* 8599 (PERTH); ± 55 mi (88 km) W of Eyre Highway, on Hyden-Norseman road, 6 Feb. 1963, *A. S. George* s.n. (PERTH); 35 km N of Norseman towards Coolgardie, *B. R. Maslin* 2440 (CANB, K, PERTH); 9 km N of Daniell Siding towards Norseman, *B. R. Maslin* 2465 (PERTH); 1.5 km S of Spargoville (c. 45 km S of Coolgardie) on the Coolgardie-Esperance Highway, *B. R. Maslin* 4823 (AD, BRI, MEL, NSW, PERTH); 1 km S of Spargoville (c. 45 km S of Coolgardie) Coolgardie-Esperance Highway, *B. R. Maslin* 4836, 4836A and 4836B (all CANB, K, PERTH); 12.5 km E of Fraser Range on Eyre Highway, *B. R. Maslin* 4844 and 4844A (both PERTH); 34.5 km N of Norseman on Coolgardie-Esperance Highway, *B. R. Maslin* 4845 (PERTH); 30.5 km W of Norseman, *K. Newbey* 6299 (MEL, PERTH); Fraser Range, c. 115 km E of Norseman, 30°32′S, 122°58′E, *A. E. Orchard* 4178 (PERTH-ex AK); 27 mi (43 km) S of Coolgardie, *R. D. Royce* 6441 (PERTH); 1 km SE of Spargoville, near Coolgardie, *M. J. D. White* s.n. 7 Feb. 1979 (PERTH) and 24 Feb. 1979 (CBG, NY, PERTH).

Distribution. (Figure 3) The eastern goldfields area of south-west Western Australia in the Coolgardie Botanical District (1:250 000 maps H51-13, 14; I51-1, 2). Of scattered occurrence in an area bounded by Mount Day in the Bremer Range, Spargoville, Fraser Range and Lake Dundas.

Habitat. Found in undulating, low hilly country in red loam or clay which frequently has rock inclusions. The rocks at both the Mount Day and Fraser Range populations are recorded as being greenstones i.e. metamorphosed volcanic and sedimentary rocks. The species normally grows in mallee eucalypt woodland often with a ground cover of spinifex (*Triodia scariosa*). Species of *Acacia, Cassia, Casuarina* and *Dodonaea* are frequent associates of *A. warramaba.*

Flowering and fruiting period. Judging from herbarium label data, flowering occurs in summer between November and February. Bushes during this period frequently also bear legumes with mature seeds which are presumably from the previous years flowering.

On account of its plurinerved phyllodes and its globular flower-heads *A. warramaba* is placed in section Plurinerves (Benth.) Maiden et Betche. The new species seems most closely allied to *A. redolens* Maslin from which it can be distinguished by its branchlets which are not resin-ribbed, its phyllodes which are generally longer and narrower and with more numerous, closely arranged, non-anastomosing nerves and its legumes which are broader, flatter and less constricted between the seeds. Unlike *A. redolens, A. warramaba* is not a particularly fragrant shrub. The known geographical ranges of these two species do not overlap although only about 50 km separated them in the area south of Norseman between Daniell Siding and Salmon Gums.

Acacia warramaba has very variable phyllodes (Figure 2B-I). Young regrowth shrubs, especially following fire, tend to have longer and often narrower phyllodes than do mature shrubs from undisturbed sites. Likewise, there is considerable

variability in the size of legumes (Figure 2K and L) and seeds, the latter also showing variation in colour from light brown to almost black. Such extremes in seed colour are not common in *Acacia*.

This new species was first brought to my attention in 1975 by Professor M. J. D. White. It is one of the food plants for the parthenogenetic grasshopper *Warramaba virgo* (White, 1980; White and Contreras, 1981 and in press).

The specific epithet refers to the grasshopper genus *Warramaba*.

Acknowledgements

Special thanks are due to Professor Michael White for drawing my attention to *A. warramaba* and for accompanying me on a most enjoyable field excursion in February 1981 to inspect the species. During this trip *A. kerryana* was also located by the author. Ms Suzanne Curry is thanked for her very competent technical and field assistance and Mr Paul Wilson for preparing my Latin diagnoses. The project was conducted at the Western Australian Herbarium (PERTH) with financial assistance provided under an Australian Biological Resources Study grant from the Bureau of Flora and Fauna.

References

Maslin, B. R. (1977). Studies in the genus *Acacia* (Mimosaceae)—6. Miscellany. Nuytsia 2: 145-161.

Maslin, B. R. and Pedley, L. (In press.) The distribution of *Acacia* in Australia. Part 1. Species distribution maps. W. Austral. Herb. Res. Notes No. 6.

White, M. J. D. (1980). The genetic system of the Parthenogenetic Grasshopper *Warramaba virgo*. Roy. Ent. Soc. London. Symposium No. 10: 1-13.

White, M. J. D. and Contreras, N. (1981). Chromosome Architecture of the Parthenogenetic Grasshopper *Warramaba virgo* and its Bisexual Ancestors. Chromosomes Today 7:165-175.

White, M. J. D. and Contreras, N. (In press.) Cytogenetics of the parthenogenetic grasshopper *Warramaba virgo* and its bisexual relatives. VIII. Evolution of karyotypes and c-banding patterns in the clones of *W. virgo*. Cytogenetics and Cell Genetics.

Index to specimens studied

This index is arranged alphabetically according to the name of the collector. Numbers in parentheses refer to the corresponding numbered species in the text. Unless otherwise stated, the specimens are lodged at Western Australian Herbarium (PERTH).

Beard, J. S. 3843 (2).

George, A. S. 4343 (2); 8599 (2); s.n., 6 Feb. 1963 (2).

*Maslin, B. R.*2440 (2-CANB, K, PERTH); 2465 (2); 4823 (2-AD, BRI, MEL, NSW, PERTH); 4834 (1-Type, CANB, G, K, MEL, NY, PERTH); 4836, 4836A and 4836B (2-all CANB, K, PERTH); 4843 (2-Type, CANB, K, PERTH); 4844 and 4844A (2); 4845 (2).

Newbey, K. 6299 (2-MEL, PERTH); 7531 (1); 8099 (1-NSW, PERTH); 9177 (1).

Orchard, A. E. 4178 (2).

Royce, R. D. 6441 (2).

White, M. J. D. s.n. 7 Feb. 1979 (2) and 24 Feb. 1979 (2-CBG, NY, PERTH).

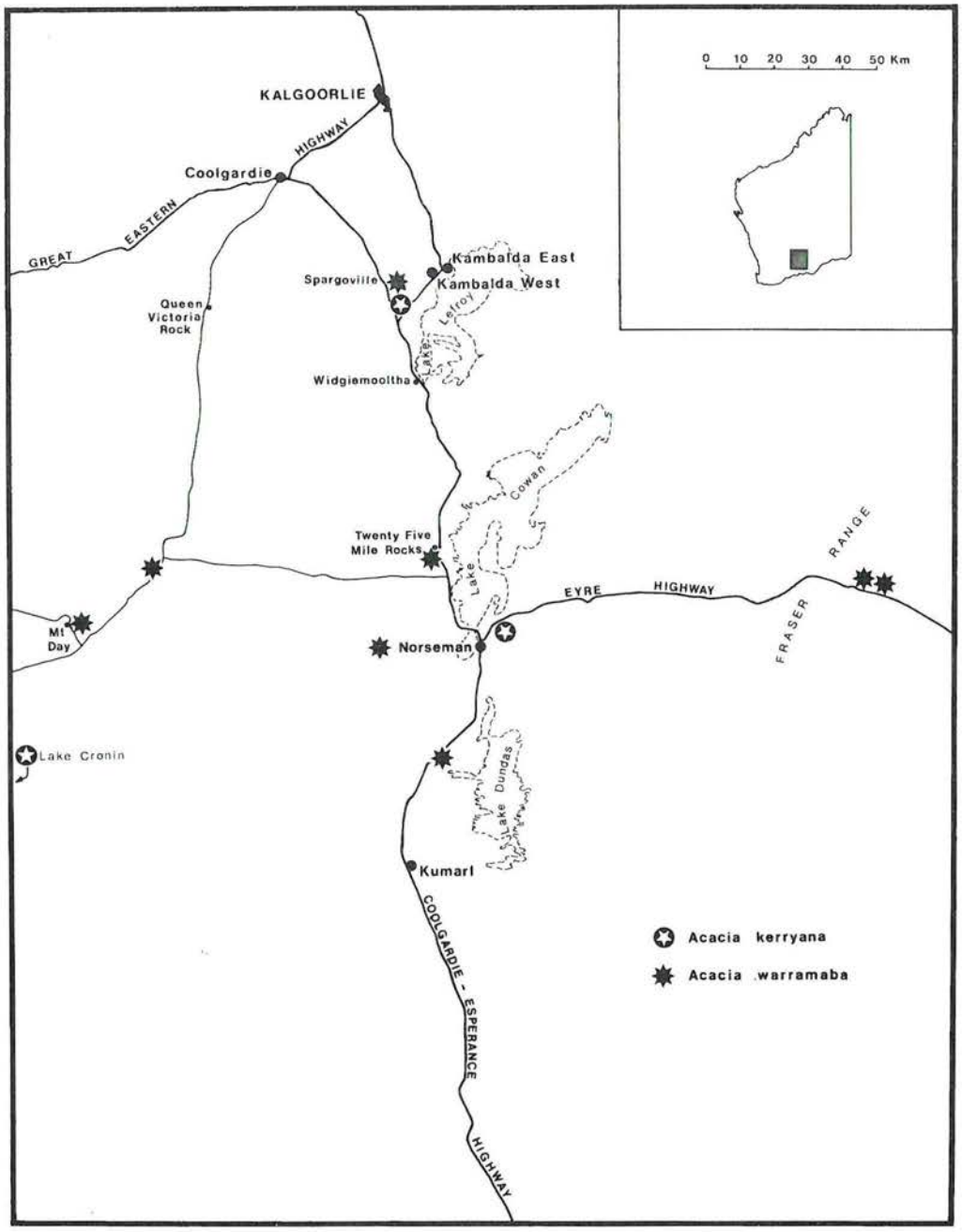

Figure 3. Distribution of *Acacia kerryana* and *A. warramaba*.

New subspecies in *Eucalyptus caesia* and in *E. crucis* (Myrtaceae) of Western Australia

M. I. H. Brooker[A] and S. D. Hopper[B]

Abstract

Brooker, M. I. H. and Hopper, S. D. New subspecies in Eucalyptus caesia and in *E. crucis* (Myrtaceae) of Western Australia. Nuytsia 4(1): 113-128 (1982). *Eucalyptus caesia* Benth. subsp. *magna* subsp. nov. and *E. crucis* Maiden subsp. *lanceolata* subsp. nov. of the informal subseries Orbifolinae are described and illustrated. Both taxa occur on granitic tors and ridges in an area north and east of Merredin in Western Australia. *E. caesia* subsp. *magna* has larger flowers, fruits and leaves than *E. caesia* subsp. *caesia*, and is widely known in the horticultural industry as the cultivar 'Silver Princess'. *E. crucis* subsp. *lanceolata* differs from the typical subspecies in having lanceolate or narrow-lanceolate adult leaves with distinct petioles 5-15 mm long, and in having erect stems up to 15 m tall. Each of the species in the subseries Orbifolinae has diagnostic seedling characters, and these are incorporated in a key to the four species and six subspecies of the Orbifolinae now recognised.

Introduction

Pryor and Johnson (1971) erected the informal subseries Orbifolinae which included four mallee eucalypts with the easily recognised red-brown over green bark, which partly decorticates longitudinally (or less often horizontally) remaining incompletely detached with the free margins becoming curled (Figure 1). This bark form does not occur elsewhere in the genus. It superficially resembles the rich red-brown crisped bark of some species of *Acacia*, for which the term 'Minni Ritchi' bark is now widely used. Because of this resemblance, we propose that the bark form characteristic of the subseries Orbifolinae in *Eucalyptus* should also be referred to as Minni Ritchi bark.

The Orbifolinae, with the subseries Leptopodinae and Macrocarpinae, compose the series Macrocarpae which consists of about 20 species and is based on the association of several characters, viz. 2 opercula, bisected cotyledons, and thick-walled, very woody fruit with a prominent, emergent, convex disc (apart from *E. caesia* Benth. in which the disc is descending).

For many years *E. caesia* has been known to exist in two fairly discrete variants (Gardner, 1954; Chippendale, 1973)—a typical form from, for example, Mount Caroline and Boyagin Rock, and a larger, coarser form from localities further to the north-east (Figure 2). This latter form has hitherto received no formal taxonomic status but it is a notable ornamental tree or mallee and has been known to horticulturalists as 'Silver Princess' (Molyneaux, 1978). Both forms as far as is known are restricted to certain granite rock sites.

Another species of the Orbifolinae also restricted to granite rocks is *E. crucis* Maiden. Maiden (1924) stated in the protologue for this species 'mature leaves rather thick, very shortly petiolate, from lanceolate to nearly ovoid and ovoid-lanceolate . . .'. The type specimen which was illustrated (Plate 242, no. 7) had shortly petiolate, ovate leaves (Figure 6) but specimens from some populations examined by us have been predominantly in the juvenile stage, i.e. the leaves of the mature plant were sessile, opposite, orbicular and strongly glaucous (Figure 5).

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Figure 1. Trunks of mallees of *E. caesia* subsp. *caesia* (upper left) and *E. orbifolia* (upper right, lower left) showing the variants of the 'Minni Ritchi' bark form characteristic of the species of subseries Orbifolinae.

Recent surveys in areas north and west of the known occurrences of *E. crucis* (e.g. at Chiddarcooping Hill) have resulted in the discovery or rediscovery of populations obviously related to, yet clearly distinct from typical *E. crucis* (Figures 5, 7). They are large erect-stemmed mallees (to 15 m tall as compared with 6 m for the more effuse *E. crucis)* and the canopy consists only of true lanceolate adult leaves that are distinctly petiolate.

We therefore consider that Maiden's circumscription in the protologue of *E. crucis* covers two forms recognizable by the nature of the leaves in the mature canopy, viz. the typical form (Figures 5, 6) which has ovate, juvenile and intermediate leaves, and a second form which bears lanceolate to narrow-lanceolate adult leaves. Both forms have associated habit features.

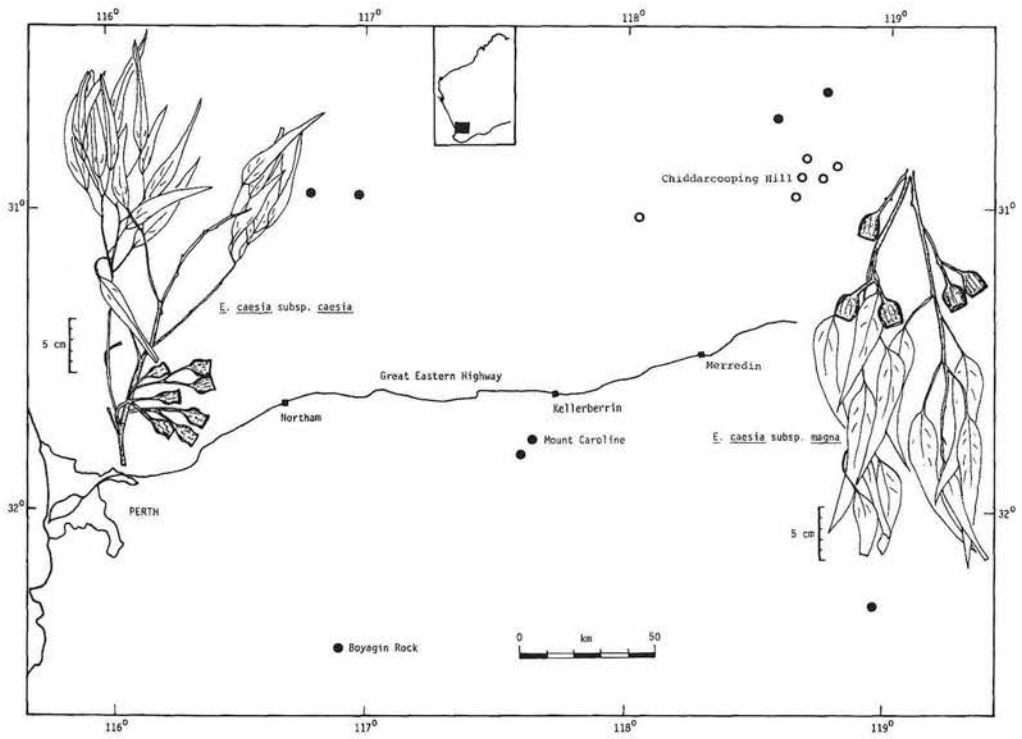

Figure 2. Geographical distributions of *Eucalyptus caesia* subsp. *magna* (open circles) and *E. caesia* subsp. *caesia* (closed circles) in the central wheatbelt of Western Australia. Also illustrated are line drawings of *E. caesia* subsp. *caesia (M.I.H. Brooker* 6738) and *E. caesia* subsp. *magna* (holotype).

From an examination of specimens annotated by Gardner at PERTH it is certain also that the reference to 'forms of *E. leptopoda*' (Gardner, 1954) are in fact this form of *E. crucis* with true adult leaves.

We believe that both the 'large-fruited *E. caesia*' and the large narrow-leaved mallees of *E. crucis* are worthy of formal taxonomic status. This view is supported both by the morphological considerations outlined below and by multivariate morphometric analyses of geographical variation that will be published elsewhere (Hopper, Campbell and Caputi, in press).

Figure 3. The holotype of *E. caesia* subsp. *caesia*, collected by James Drummond in 1847 in the Mt Caroline-Mt Stirling district.

Taxonomy

Eucalyptus caesia Benth. subsp. **caesia,** Fl. Aust. 3, 227 (1867); Maiden, Crit. Rev. Gen. Euc. 3, 31 (1917); Blakely, Key Eucs, 103 (1934); Gardner, W. Aust. Dept. Agric. Bull. No. 2123 (1954); Pryor & Johnson, Class. Eucs. 46 (1971); Chippendale, Eucs. W.A. Goldfields, 119 (1973)—Figures 2, 3 and 8b.

Typus: Drummond 5th coll., suppl. no. 36 (K)—Figure 3.

A small *mallee* to 10 m tall with imperfectly decorticated, crisped 'Minni Ritchi' bark. *Young branchlets* smooth, reddish and covered by glaucous bloom. *Seedling leaves* opposite for 5-6 pairs, petiolate, orbicular to broader than long or cordate. *Juvenile leaves* alternate, petiolate, cordate, to 8 x 6 cm, thick, bright shining green. *Adult leaves* alternate, on glaucous petioles 1-4 cm long, lanceolate or falcate, to 16 x 4 cm, dull grey-green or yellowish green. *Inflorescences* axillary, 3-flowered; *peduncles* and *pedicels* 10-35 mm long; *buds* clavate, glaucous, to 30 x 15 mm, hypanthium obconical, operculum conical or slightly beaked, outer operculum lost early in bud development. *Stamens* faded pink, to 20 mm long. *Fruit* on long stout pedicels, urceolate, glaucous, shallowly ribbed, to 31 x 28 mm; *disc* broad, descending; *valves* 5 or 6, below rim level.

Eucalyptus caesia Benth. subsp. **magna** Brooker et Hopper, subsp. nov. (Figures 2, 4 and 8a).

A subspecie typica habitu, foliis, alabastris et fructibus (plerumque > 2 cm latis) majoribus differt.

A subspecies differing from the typical subspecies in its larger habit, leaves, buds and fruit (usually > 2 cm broad). Pryor and Johnson code SIVCH.

Typus: Chutawalakin Hill, 24 August 1979, *M.I.H. Brooker* 6488 (holo: FRI; iso: PERTH).

A stout *mallee* to 15 m tall with imperfectly decorticated, crisped 'Minni Ritchi' bark. *Young branchlets* smooth, reddish and covered by glaucous bloom. *Seedling leaves* opposite for 5-6 pairs, petiolate, orbicular or cordate. *Juvenile leaves* alternate, petiolate, cordate, to 10 x 8 cm thick, bright, shining green. *Adult leaves* alternate, on glaucous petioles 2-6 cm long, lanceolate or falcate, to 24 x 5 cm, dull grey-green or yellowish green. *Inflorescences* axillary, 3-flowered; *peduncles* and *pedicels* 10-33 mm long; *buds* clavate, glaucous, to 40 x 20 mm, hypanthium obconical, operculum conical or slightly beaked, outer operculum lost early in bud development. *Stamens* red-pink, to 25 mm long. *Fruit* on long stout pedicels, bell-shaped, glaucous, shallowly ribbed, to 37 x 40 mm; *disc* broad descending; *valves* 5 or 6, below rim level.

Distribution. (Figure 2) Confined to a few granite tors (e.g. Chiddarcooping Hill, Chutawalakin Hill) in the eastern central wheatbelt of Western Australia.

Other collections examined. WESTERN AUSTRALIA: Chiddarcooping Rocks, N of Geelakin, 11 June 1928, *G. E. Brockway* s.n. (PERTH); Chiddarcooping Rock, 24 August 1979, *M. I. H. Brooker* 6485 (FRI); granite rock N of Westonia, September 1923, *C. A. Gardner* s.n. (PERTH); Warralakin, January 1964, *C. A. Gardner* s.n. (PERTH); 10 km N of Warralakin, 5 January 1965, *C. A. Gardner* s.n. (PERTH);

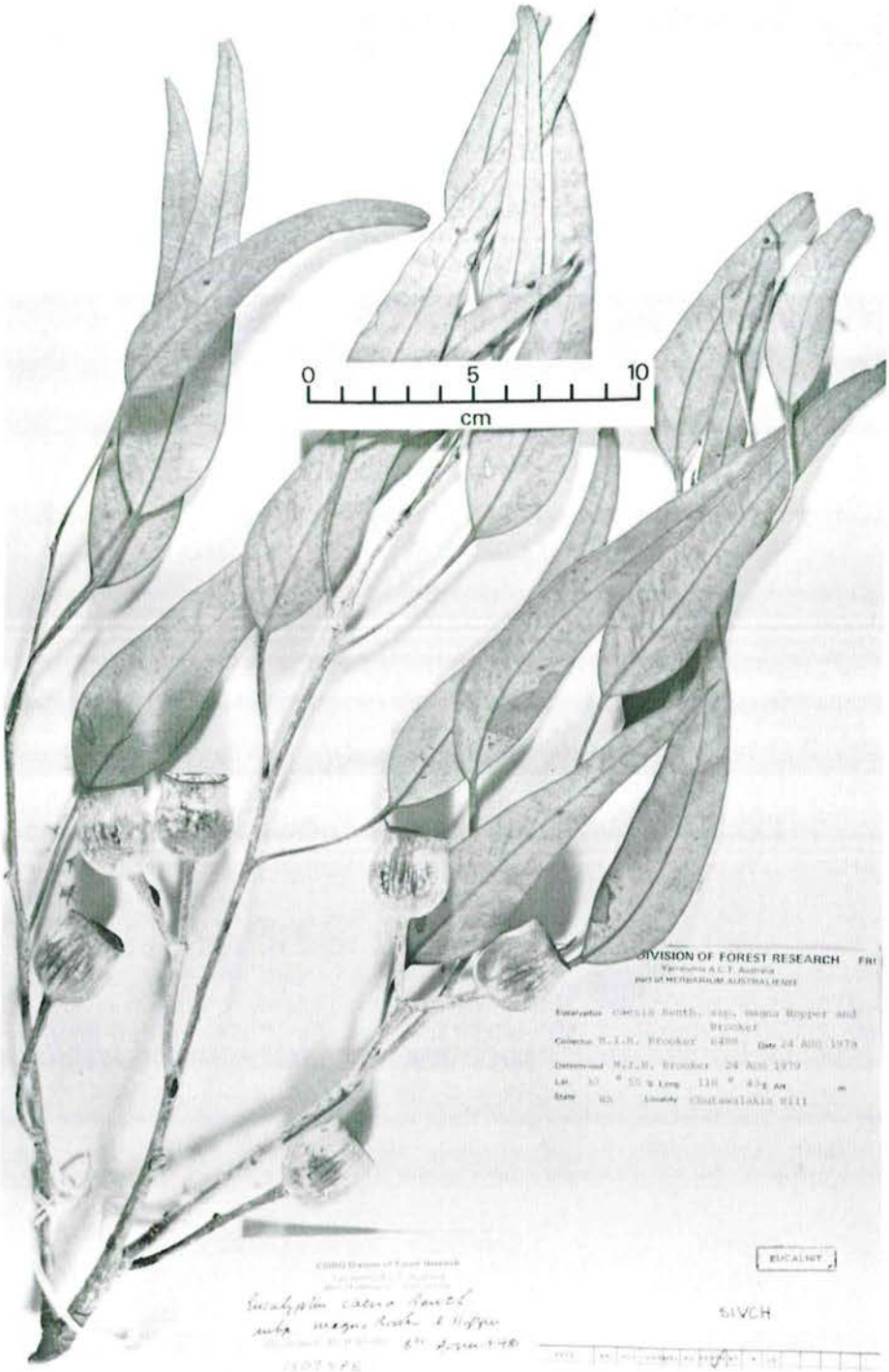

Figure 4. The holotype of *E. caesia* subsp. *magna*, collected by M.I.H. Brooker at Chutawalakin Hill on August 24, 1979. The specimen is mounted upside down, as the leaves and fruits of this subspecies are normally pendulous.

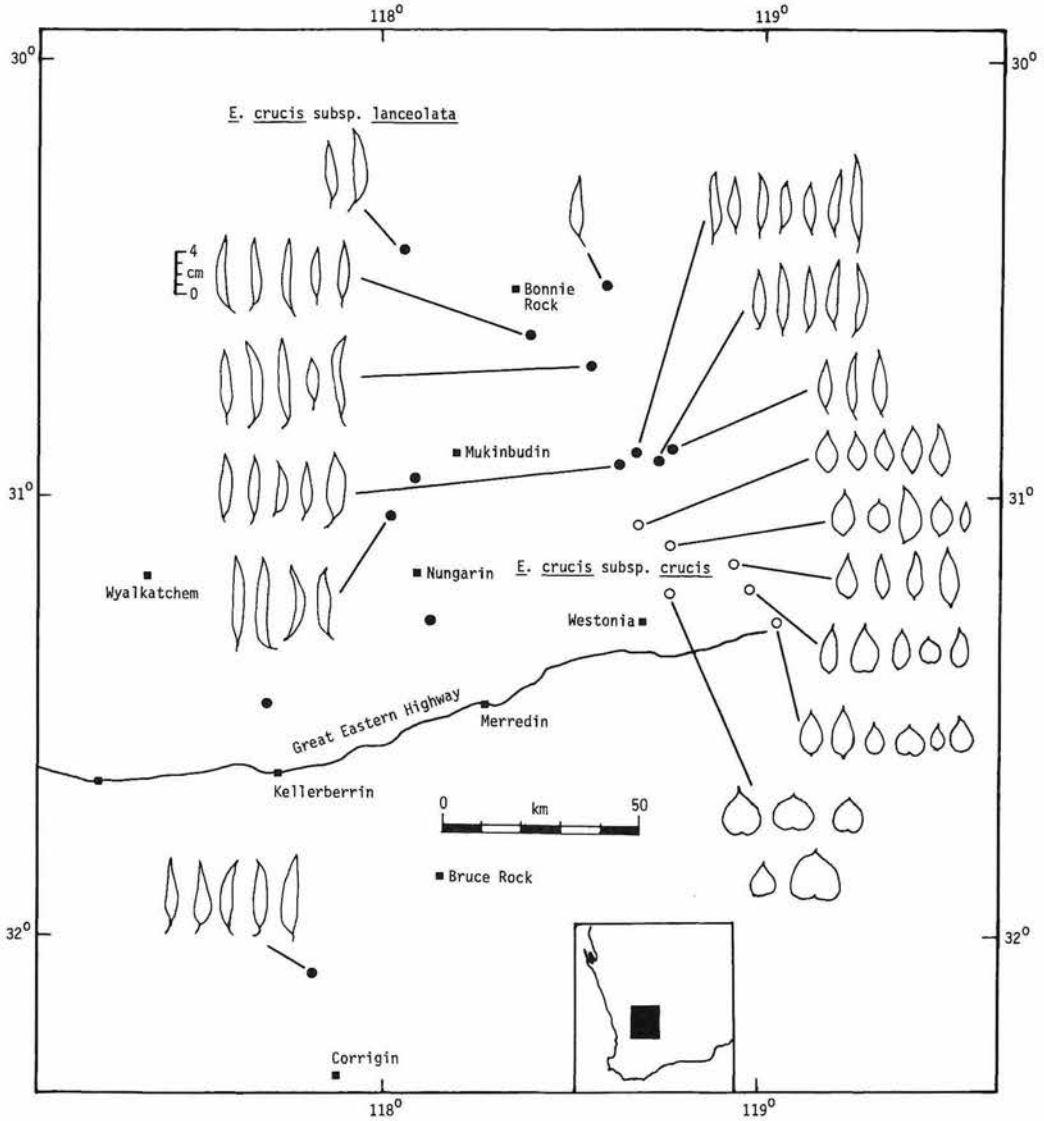

Figure 5. Geographical distributions of *Eucalyptus crucis* subsp. *lanceolata* (closed circles) and *E. crucis* subsp. *crucis* (open circles) in the central wheatbelt of Western Australia (*E. crucis* subsp. *crucis* also occurs at a few isolated localities outside the boundaries of this map). Line drawings of a range of leaves from populations of both subspecies are illustrated.

Billyacatting Hill, NE of Kununoppin, 1 September 1976, *A. M. George* 94 (PERTH); Billyacatting Hill, 16 km NW of Nungarin 31°03′S, 118°01′E, 7 June 1978, *S. D. Hopper* 1003 (PERTH); Chiddarcooping Hill 30°54′S, 118°41′E, 8 June 1978, *S. D. Hopper* 1006 (PERTH); Chutawalakin Hill 30°55′S, 118°44E, 9 June 1978, *S. D. Hopper* 1010 (PERTH); Coorancooping Hill 30°52′S, 118°41′E, 3 August 1978, *S. D. Hopper* 1044 (PERTH); Geelakin-Chiddarcooping, 17 August 1960, *H. Shugg* s.n. (PERTH).

Ecology. Eucalyptus caesia subsp. *magna* is known to occur only in shallow sandy loams at the base of granite rocks or in gullies bordered by ridges of sheet granite. Populations usually consist of less than 100 plants. It frequently occurs in pure

stands but is sometimes associated with *Eucalyptus crucis* subsp. *lanceolata* Brooker et Hopper. Some other prominent associated species are *Hakea petiolaris* Meissner and *Calothamnus quadrifidus.* R.Br.

Eucalyptus crucis Maiden subsp. **crucis.** Crit. Rev. Gen. Euc. 59, 514 (1923); Blakely, Key Eucs 272 (1934); Pryor & Johnson, Class. Eucs 46 (1971); Chippendale, Eucs. W.A. Goldfields 117 (1973)—Figure 5 and 8f, Table 1.

Typus: Southern Cross, April 1922, *H. Steedman* (NSW)—Figure 6.

An effuse *mallee* to 6 m tall with imperfectly decorticated, crisped 'Minni Ritchi' bark on stems to about 10 cm diameter. *Young branchlets* smooth, white, glaucous. *Seedling and juvenile leaves* remaining opposite for many nodes, sessile, orbicular or broader than long, conspicuously mucronate, to 5 x 4 cm, with minute black oil dots, greyish green. *Intermediate leaves* opposite or sub-opposite, sub-sessile or shortly (0.5-3.5 mm and distinctly petiolate, ovate, to 6.5 x 5.5 cm, grey-green.

Inflorescences axillary, 7-flowered; *peduncles* and *pedicels* slender; *buds* glaucous, to 6 x 4 mm, hypanthium hemispherical, operculum obtusely or acutely conical, outer operculum lost early in bud development. *Fruit* on long, slender pedicels, hemispherical, glaucous, to 6 x 4 mm; *disc* broad, flat or slightly ascending; *valves* 4, stout, strongly exserted.

Eucalyptus crucis subsp. **lanceolata** Brooker et Hopper subsp. nov. (Figures 5, 7 and 8e, Table 1).

A subspecie typica habitu majore et foliis adultis lanceolatis vel angusto-lanceolatis differt.

A subspecies differing from the typical subspecies in its larger habit and the canopy of lanceolate to narrow-lanceolate adult leaves (Table 1). Pryor and Johnson code SIVCF.

Typus: Chiddarcooping Rock, 24 August 1979, *M. I. H. Brooker* 6484 (holo: FRI; iso: PERTH, NSW).

A large erect *mallee* to 15 m tall with imperfectly decorticated, crisped 'Minni Ritchi' bark on stems to about 30 cm diameter. *Young branchlets* smooth, white, glaucous. *Seedling and juvenile leaves* remaining opposite for many nodes, sessile, orbicular or broader than long, conspicuously mucronate, to 5 x 3.5 cm, with minute black oil dots, greyish green. *Intermediate leaves* opposite or sub-opposite, sub-sessile or shortly and distinctly petiolate, ovate, to 6 x 2 cm, grey-green. *Adult leaves* alternate, on slender petioles 5-15 m long, lanceolate to narrow-lanceolate, to 10 x 2 cm, tapering to a fine, sometimes curved point, with many minute, black oil dots. *Inflorescences* axillary, 7-flowered; *peduncles* and *pedicels* slender; *buds* glaucous, to 6 x 4 mm, hypanthium hemispherical, operculum obtusely or acutely conical, outer operculum lost early in bud development. *Fruit* on long, slender pedicels, hemispherical, glaucous, to 16 x 10 mm; *disc* broad, flat or slightly ascending; *valves* 4, stout, strongly exserted.

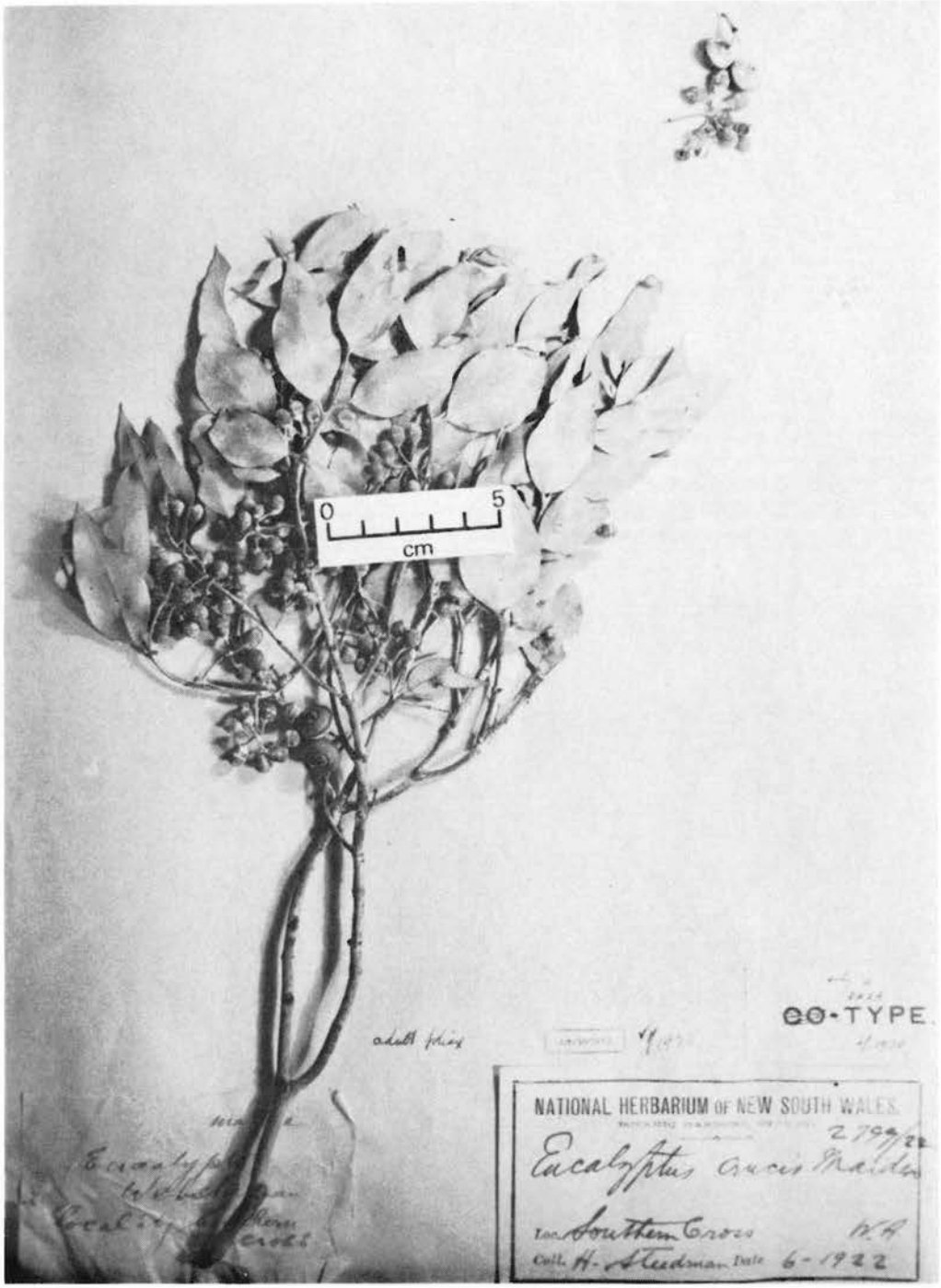

Figure 6. A paratype of *E. crucis* subsp. *crucis*, collected by H. Steedman from the Southern Cross district in June 1922. This specimen closely matches the holotype (D.F. Blaxell pers. comm.), which was also collected by H. Steedman from the same district but two months earlier in April 1922.

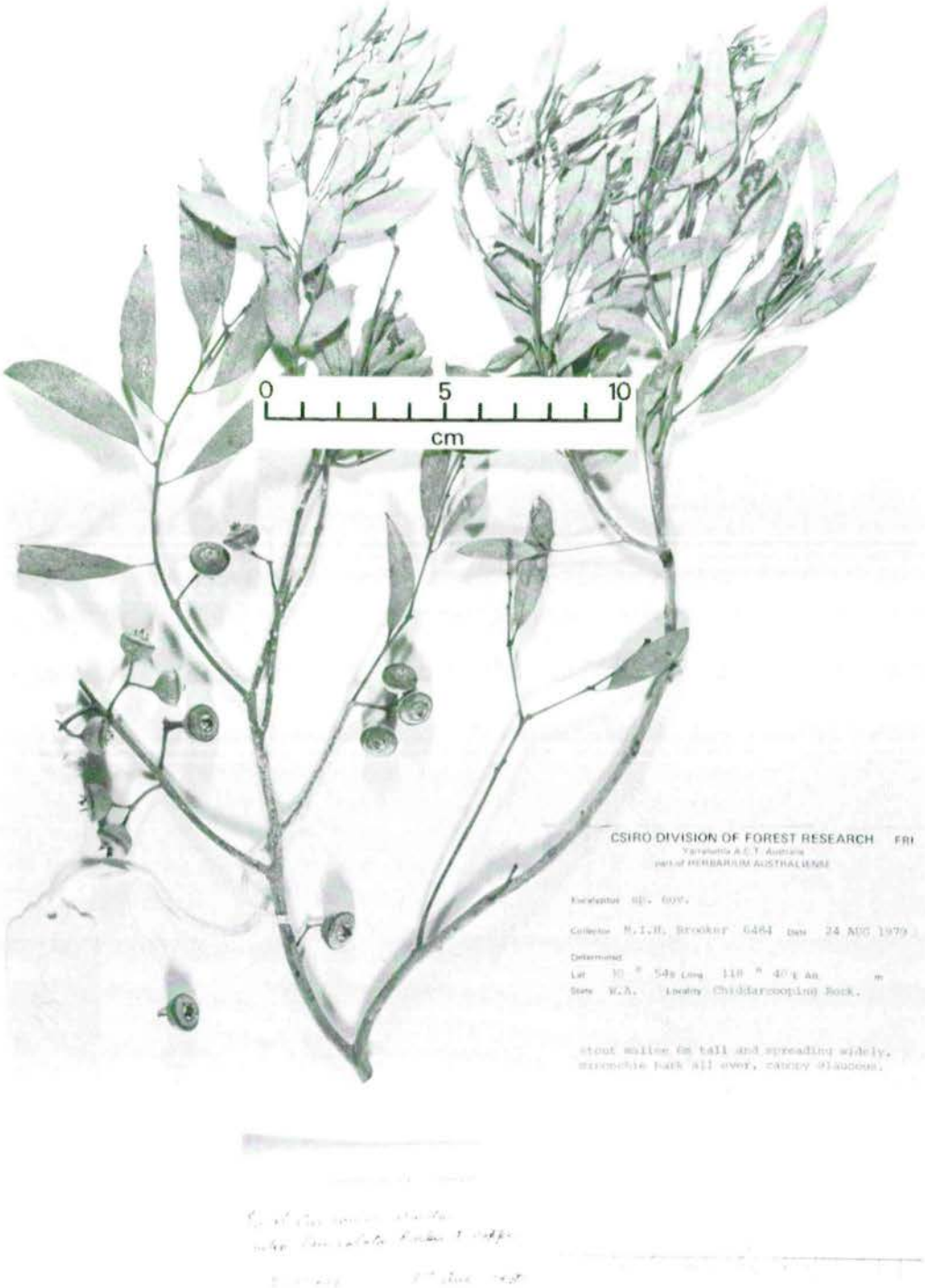

Figure 7. The holotype of *E. crucis* subsp. *lanceolata*, collected by M. I. H. Brooker from Chiddarcooping Hill on August 24, 1979.

Distribution. (Figure 5) Restricted to a number of granite rocks in the central wheatbelt of Western Australia.

Other collections examined. WESTERN AUSTRALIA: West of Nukarni, 20 Oct. 1946, *G. E. Brockway* 2 (PERTH); Chutawalakin Hill, 24 Aug. 1979, *M. I. H. Brooker* 6487 (FRI, PERTH, NSW); Kununoppin, Nov. 1929, *E. A. Cook* s.n. (PERTH); 6 miles N of Kununoppin, 22 Sept. 1975, *H. Demarz* 5605 (PERTH); Nalyering Well near Kellerberrin, 25 May 1961, *C. A. Gardner* s.n. (PERTH); 4 miles N Warralakin, 5 Jan. 1965, *C. A. Gardner* s.n. (PERTH); near Yorkrakine, 1 June 1957, *J. W. Green* 1356 (PERTH); Billyacatting Hill 31°03′S, 118°01′E, 7 June 1978, *S. D. Hopper* 1001 (PERTH); Chiddarcooping Hill 30°54′S, 118°41′E, 8 June 1978, *S. D. Hopper* 1005 (PERTH); 1 km SE of Chutawalakin Hill 30°56′S, 118°44′E, 9 June 1978, *S. D. Hopper* 1011 (PERTH); Yanneymooning Hill 30°43′S, 118°34′E, 28 June 1978, *S. D. Hopper* 1016 (PERTH); Jouerdine Hill 30°38′S, 118°24′E, 14 July 1978, *S. D. Hopper* 1022 (PERTH); 1 km SE of Chutawalakin Hill 30°56′S, 118°44′E, 2 Aug. 1978, *S. D. Hopper* 1033 (PERTH); 9.5 km E of Chiddarcooping Hill 30°54′S, 118°46′E, 2 Aug. 1978, *S. D. Hopper* 1041 (PERTH); c. 10 km NE of Chiddarcooping Hill, 3 Aug. 1978, *S. D. Hopper* 1042 (PERTH); Dajoing Rock 30°27′S, 118°04′E, 4 Aug. 1978, *S. D. Hopper* 1049 (PERTH); 8 km SW of Chiddarcooping Hill, 7 Sept. 1978, *S. D. Hopper* 1128 (PERTH); 30 km NNW of Corrigin 32°05′S, 117°44′E, 9 June 1979, *S. D. Hopper* s.n. (PERTH); Chiddarcooping Hill, N of Warralakin, 2 May 1978, *G. J. Keighery* 1602 (PERTH); Billyacatting Hill Reserve 17746, 11 km NE of Kununoppin, 3 Sept. 1977, *B. G. Muir* 102 (PERTH); Barbalin Rock, 2 Sept. 1969, *K. Newbey* 2871 (PERTH); Billyacatting Rock, 5 June 1976, *E. Wittwer* W1716 (PERTH).

Ecology. Eucalyptus crucis subsp. *lanceolata* occurs in shallow granitic sands and loams associated with large outcrops of granite rocks. It displays a clumped distribution at any particular location. It is sometimes associated with *Eucalyptus caesia* subsp. *magna* (e.g. at Chiddarcooping Hill, Billyacatting Hill), and with *E. orbifolia* at Jouerdine Hill. It has not been found in sympatry with *E. crucis* subsp. *crucis.*

Discussion. Eucalyptus crucis subsp. *lanceolata* and *E. crucis* subsp. *crucis* differ in having adult leaves and juvenile leaves respectively in their mature canopies. They show no obvious differences in the morphology of their fruits, buds or flowers. Elsewhere in *Eucalyptus,* related adult-leaved and juvenile-leaved taxa have been recognised as distinct species (e.g. *E. gamophylla* F. Muell.—*E. odontocarpa* F. Muell., *E. risdonii* Hook. f.—*E. tenuiramis* Miq., *E. fruticosa* M. I. H. Brooker—*E. foecunda* Schau.). However, in *E. crucis,* the typical subspecies shows a range in leaf form from populations stabilised for orbicular, apetiolate, fully juvenile leaves (e.g. at Sandford Rock) to populations with ovate, shortly petiolate leaves that are intermediate between the juvenile and adult conditions (e.g. at Moorine Rocks or Warren Double Cunyan) (Figure 5 and Table 1). These intermediate populations indicate that the genetic fixation of a fully juvenile-leaved form in all populations of *E. crucis* subsp. *crucis* has not yet occurred. Hence we feel it appropriate to recognise the two forms in *E. crucis* as subspecies rather than separate species.

Previously, *E. crucis* subsp. *lanceolata* has been confused with a number of species, including *E. leptopoda, E. drummondii* and *E. orbifolia* (e.g. Gardner, 1954). However, it is clearly distinct from the first two of these three taxa in having crisped 'Minni Ritchi' bark and in its restriction to granite rocks. It differs from *E. orbifolia* in having acute, non-emarginate, lanceolate to narrow-lanceolate leaves.

Table 1. Means, standard errors and ranges for three leaf measurements taken on the longest leaf of plants in populations of the two subspecies of *Eucalyptus crucis*.

Population	No. of leaves	Petiole length		Leaf length		Leaf width	
		Mean ±SE (cm)	Range (cm)	Mean ±SE (cm)	Range (cm)	Mean ±SE (cm)	Range (cm)
E. crucis subsp. *crucis*							
Sandford Rock	14	0.0	—	41.4±2.1	29.7-58.3	38.7±2.5	26.3-55.0
NW Moorine Rocks	12	1.1±0.3	0.0-2.7	39.0±2.6	26.2-55.5	22.5±1.2	15.2-30.5
Beacon Hill	10	0.7±0.4	0.0-2.6	42.7±3.3	29.0-62.4	23.0±1.5	14.9-31.3
SE Keokanie Rock	4	2.4±0.7	0.6-3.5	50.1±4.3	44.4-62.7	19.1±2.0	15.2-23.5
Moorine Rock	10	0.0	—	43.6±2.4	26.8-54.1	22.0±1.2	17.4-30.7
Warren Double Cunyan	5	0.8±0.8	0.0-4.1	50.2±2.3	44.0-54.6	19.1±1.5	15.2-24.0
E. crucis subsp. *lanceolata*							
Billyacatting Hill	7	8.0±0.5	6.1-9.1	79.6±3.5	69.7-97.9	11.5±0.8	8.9-13.6
Chiddarcooping Hill	12	7.8±0.7	4.7-12.1	62.9±3.3	49.5-92.6	10.1±0.6	7.1-12.7
S Chutawalakin Hill	5	7.1±1.1	5.1-10.1	64.5±3.1	55.9-72.4	11.2±0.7	8.3-12.1
Dajoing Rock	2	12.3±0.4	11.9-12.6	72.3±9.5	62.8-81.7	13.7±1.7	12.0-15.3
Geeraning Rock	1	11.5	—	67.8	—	13.6	—
Jouerdine Hill	13	9.0±0.6	5.9-12.5	68.6±2.6	54.5-85.8	9.3±0.4	7.8-11.7
S Kwolyin	6	9.4±0.5	8.5-11.8	75.7±2.1	71.3-85.9	14.0±0.8	12.1-17.0
N Python Rocks	3	9.4±0.3	8.7-9.7	60.0±4.1	51.8-64.3	10.2±1.3	8.5-12.7
SW Chiddarcooping Hill	8	9.0±1.0	6.9-14.4	61.8±3.5	42.1-75.2	12.0±1.1	9.6-19.5
Yanneymooning Hill	7	11.9±0.7	9.6-14.5	75.8±4.8	50.7-89.2	10.3±0.7	6.7-12.0

The patterns of subspecific variation in *E. crucis* and *E. caesia* differ considerably, the former species displaying interpopulational divergence from the juvenile-leaved to the adult-leaved condition, while subspecies in *E. caesia* have diverged primarily in the size of their buds, flowers, fruits and leaves. The evolutionary pressures responsible for these differing patterns of divergence warrant further investigation.

Notes on seedlings in the subseries Orbifolinae.

In eucalypts, the natural affinity between related species is often expressed by similarities in leaf ontogeny of the young plants. This is to be expected between sibling species of comparatively recent evolutionary divergence such as must be the case with *E. oleosa* F. Muell. and *E. longicornis* F. Muell. (a superspecies in the sense of Pryor and Johnson, 1971). The same can be said for some higher taxonomic categories, e.g. subseries Viminalinae, series Erythronemae, and more rarely at the section level, viz. Dumaria, the members of which have very similar seedlings.

It can probably be said for most subseries that seedling characters show little variation between species. Therefore it is surprising to observe the great variation in leaf ontogeny between species in the subseries Orbifolinae.

In this taxonomic study of the Orbifolinae, authenticated seed of all available collections were sown (Appendix 1) and the seedlings were grown in a glasshouse for 12 weeks by which time they were up to 30 cm tall and distinctions had become very obvious. Progeny of each number were remarkably uniform. Samples were harvested and pressed flat and photographed (Figure 8). After drying, the seedlings were mounted with the parent specimens at FRI.

The seedling observations provided a useful confirmation of the taxonomic levels recognised and formalised by this study and by Pryor and Johnson (1971) who suggest subspecies status for *E. orbifolia* and *E. websteriana.* Although there was variation within the 4 species (as now proposed) each was distinct from the others and identifiable (within the subseries) on the seedlings alone. Both members of the subspecies pairs (described and proposed), on the other hand, resembled each other closely and differed mainly in size.

The seedling leaves of *E. crucis* (both subspecies) are sessile, opposite for many nodes, orbicular, glaucous and thin. The seedling leaves of *E. orbifolia* and *E. websteriana* (proposed subspecies) are petiolate, opposite for few (5-10) pairs, orbicular to broader than long, glaucous to slightly glaucous, and thin. The seedling leaves of *E. ewartiana* are petiolate, opposite for very few (3-4) pairs, ovate, light dull green, and thin. The seedling leaves of *E. caesia* (both subspecies) are petiolate, opposite for very few (5-6) pairs, orbicular to broader than long, or cordate, bright shining green, and thick.

Even if the species in the series (as opposed to the subspecies) are of relatively ancient evolutionary divergence and a true seedling leaf phase has been suppressed in *E. ewartiana, E. caesia* sens. lat. and *E. orbifolia* sens. lat., it is difficult to relate the early leaves of these 3 species with the later leaves of *E. crucis* sens. lat. In other words the heterophyllous sequence and morphological distinction in leaf character at all ontogenetic stages has been remarkably different. This fortunately allows useful distinctions for a botanical key.

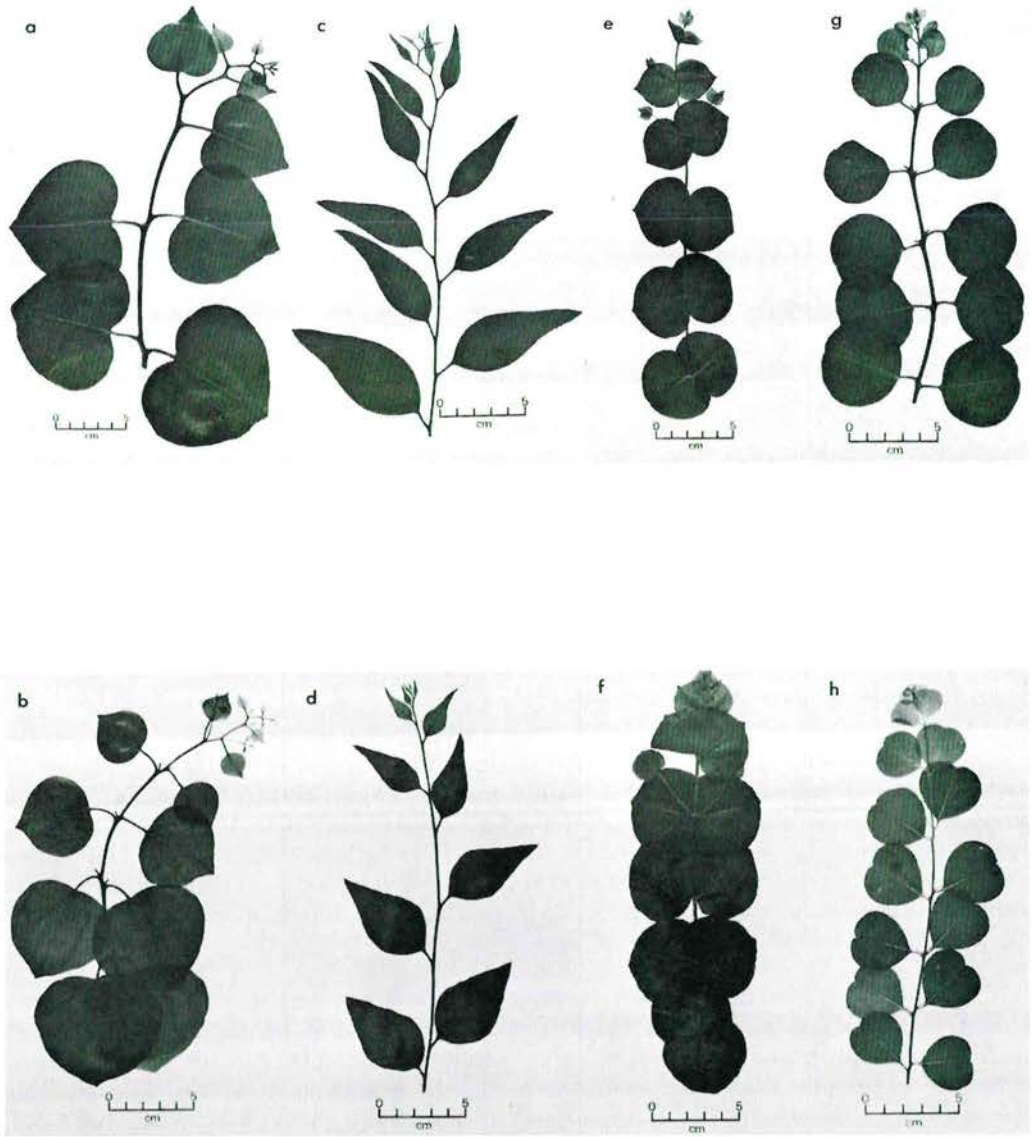

Figure 8. Pressed seedlings of (a) *E. caesia* subsp. *magna* (seed from *M. I. H. Brooker* 6488), (b) *E. caesia* subsp. *caesia* (FRI 14408), (c) and (d) *E. ewartiana* (*M. I. H. Brooker* 2424 and *M. I. H. Brooker* 6479), (e) *E. crucis* subsp. *lanceolata* (*M. I. H. Brooker* 6487), (f) *E. crucis* subsp. *crucis* (*M. I. H. Brooker* 2427), (g) *E. orbifolia* (*M.I.H. Brooker* 5114), (h) *E. Websteriana* (*M.I.H. Brooker* 2224).

Key to the species of subseries Orbifolinae

1. Disc of fruit descending; leaves of the seedling petiolate, shining green, thick

    2. Fruit usually urceolate, less than 2 cm broad, stamens faded pink..... *E. caesia* subsp. *caesia*

    2. Fruit usually bell-shaped, more than 2 cm broad, stamens red-pink..... *E. caesia* subsp. *magna*

1. Disc of fruit broad, ascending or horizontal; leaves of the seedling petiolate or sessile, glaucous or dull green, thin

    3. Operculum shorter than or equal to hypanthium, rounded, or pileate with buds constricted, pedicels stout and often angular; leaves of the seedling petiolate, dull green ..... *E. ewartiana*

    3. Operculum longer than hypanthium, pointed, buds not constricted, pedicels not strongly angular; leaves of the seedling petiolate or sessile, glaucous

        4. Leaves of mature plant lanceolate or narrow-lanceolate, petiolate, entire..... *E. crucis* subsp. *lanceolata*

        4. Leaves of mature plant orbicular or elliptical or ovate, sessile or petiolate, entire or emarginate

            5. Leaves of mature plant glaucous, sessile and orbicular or broader than long, or shortly petiolate and ovate, entire; seedling leaves sessile, tree or mallee ..... *E. crucis* subsp. *crucis*

            5. Leaves of mature plant green or glaucous, petioles to 2 cm long, elliptical or ovate to orbicular, emarginate; seedling leaves petiolate; usually a mallee

                6. Leaves ovate or orbicular, glaucous..... *E. orbifolia*

                6. Leaves longer than broad, green or yellow-green... *E. websteriana*

References

Chippendale, G. M. (1973). 'Eucalypts of the Western Australian Goldfields'. (AGPS : Canberra).

Gardner, C. A. (1954). Trees of Western Australia No. 23—Gungunnu. West Aust. Dept. Agric. Bull. No. 2123 : 5-6.

Hopper, S. D., Campbell, N. A. and Caputi, N. (In press). Geographical variation in fruits, leaves and buds of *Eucalyptus caesia*. Aust. J. Bot.

Maiden, J. H. (1923). 'A Critical Revision of the Genus *Eucalyptus*' 6 : 514. (Govt. Printer : Sydney).

Molyneaux, W. (1978). Plant Cultivars. Aust. Plants 9 : 78-81.

Pryor, L. D., and Johnson, L. A. S. (1971). 'A Classification of the Eucalypts'. (Aust. Natl. Univ. : Canberra).

Appendix 1. Seed source for seedling trial.

E. caesia subsp. *magna* Chutawalakin Hill, W.A. (*Brooker* 6488)
Chiddarcooping Hill, W.A. (*Hopper* 1006)

E. caesia subsp. *caesia* Mt Caroline, W.A. (FRI 14408)
Boyagin Rock, W.A. (*Brooker* 6753)

E. ewartiana 55 mi NE of Wubin, W.A. (*Brooker* 1978)
c. 60 mi SW of Sandstone, W.A. (*Brooker* 2424)
c. 85 mi N of Bullfinch, W.A. (*Brooker* 2452)
5 km NW of Bullfinch, W.A. (*Brooker* 6429)
4.5 mi W of Westonia, W.A. (FRI 15625)
58.5 mi N of Bullfinch, W.A. (FRI 15645)

E. crucis subsp. *lanceolata* Chutawalakin Hill, W.A. (*Brooker* 6487)
Chiddarcooping Rock, W.A. (*Brooker* 6484)

E. crucis subsp. *crucis* Sandford Rock, W.A. (*Brooker* 2427)
Moorine Rock, W.A. (*G. Moran* 3,4)
5 km SE of Keokanie, W.A. (*G. Moran* 11)

E. orbifolia c. 55 mi NE of Kalgoorlie, W.A. (*Brooker* 2581)
Serpentine Gorge, N. Terr. (*Brooker* 5095)
Krichauff Range, N. Terr. (*Brooker* 5114)
Mt Sonder, N. Terr. (*C. Dunlop* 2513)
Pigeon Rock, W.A. (FRI 15664)

E. websteriana Mt Edward, W.A. (*Brooker* 2224)
5.7 mi NW of Norseman, W.A. (*Brooker* 4537)
Comet Hill, W.A. (*Brooker* 6466)

Eucalyptus synandra (Myrtaceae), a new species of mallee from Western Australia

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Abstract

Crisp, M.D. *Eucalyptus synandra,* (Myrtaceae) a new species of mallee from Western Australia. Nuytsia 4(1): 129-134 (1982). A new Western Australian species, *Eucalyptus synandra,* is described from a few populations scattered from near Morawa to the Great Victoria Desert. It is distinguished by its stamens being united into a tube, by its non urceolate fruit which is usually grooved between disc and hypanthium and by its long (7-15 mm) fruiting pedicel. A lectotype is chosen for its near relative, *E. leptopoda* Benth.

Eucalyptus synandra Crisp, sp. nov. (Figure 1)

Frutex ad *E. leptopodam* arte cognatus sed propter filamenta longiora in tubum connata, flores pendentes, alabastra operculo longiore (10-20 mm), pedicellos longiores (7-15 mm), fructum plerumque sulco inter hypanthium discumque, valde differt. *Eucalyptus synandra* ad *E. beardianam* etiam accedit, sed propter folia juvenales ad basin attenuata nec rotundata et hypanthium fructus depressum-hemisphaericum nec cupulatum-urceolatum facile dignoscenda.

Typus : ± 5 km S of Jingymia, 30°31'S, 117°25'E, 2 Jan. 1981, *A. S. George* 16203, fl., fr., photo, spirit material (holo : PERTH; iso : CBG, FRI, K, NSW, PERTH).

Mallee 2-6 m tall, with erect or pendulous branchlets; *bark* smooth, white to grey. *Cotyledons* bisected; petiole 2-3 mm long; lobes 3-4 mm long. *Juvenile leaves* opposite only for 1-4 pairs, linear- to narrow-ovate, with slightly recurved margins, tapering to a short petiole, 15-90 x 2-15 mm, dull, grey-green, paler beneath; seedling stem tuberculate. *Adult leaves* not opposite, linear or rarely narrow-elliptic, tapering gently to both ends, uncinate, 40-200 x 4-15 mm; *veins* and *glands* obscure on dried specimens; *petiole* 3-15 mm long. *Unit inflorescences* axillary, 7-flowered. *Peduncle* decurved, terete, slender, 9-18 mm long. *Mature buds* ovoid to conical, 15-25 mm long; *hypanthium* depressed-hemispherical, much broader than long; *operculum* 10-20 mm long, attenuated into a long, sometimes filiform beak; *pedicel* filiform, 7-15 mm long. *Flowers* pendulous. *Androecium* united in a tube by filaments in lower 1/3 to 2/3 but sometimes with a few outermost filaments free almost to base, shed intact, creamy yellow at anthesis, becoming pink or red with age. *Inner filaments* shorter than outer filaments, inflexed in bud. *Anthers* versatile, obloid-globular, c. 0.7 mm long. *Style* slender, more or less reaching inner tip of operculum beak in bud. *Ovary* 4-7-locular. *Fruit* 9-14 mm diam.; *hypanthium* depressed-hemispherical, 3-5 mm long; *disc* narrower, truncate-conical, steep-sided, 2-5 mm high; *operculum scars* and *staminophore* usually in a groove between hypanthium rim and disc; *valves* exserted. *Seed* irregularly compressed-ovoid, with acute margins, pale brown, semi-lustrous, finely reticulate with shallow pits, dorsally rounded, ventrally angular; *hilum* inconspicuous.

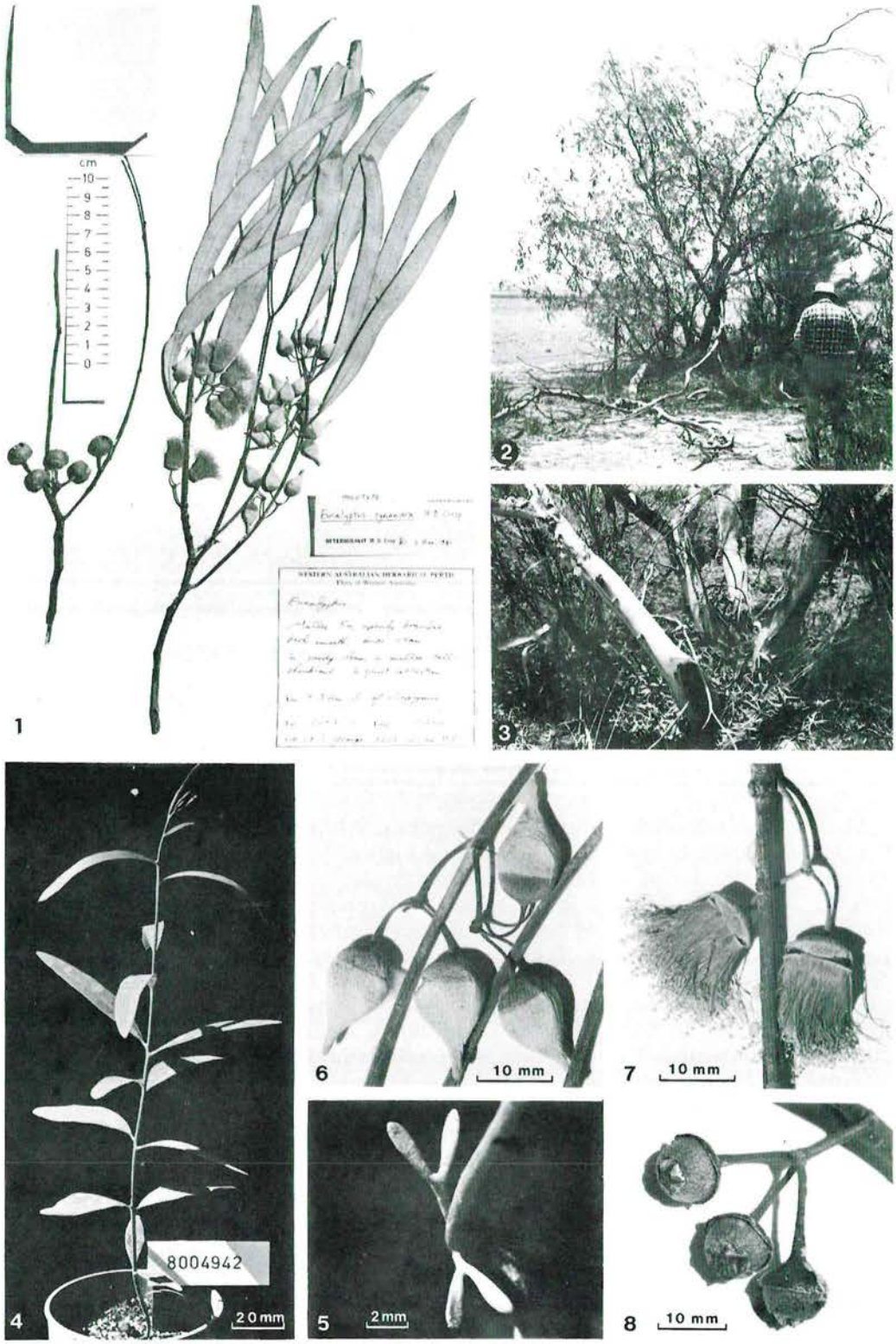

Figure 1. *Eucalyptus synandra* 1—Holotype specimen, *A. S. George* 16203. 2—Plant near Jingymia from which type was collected (photo by A. S. George). 3—Stems and bark (photo by A. S. George). 4—Seedling, from *M. D. Crisp* 6693. 5—Cotyledons, from *M. D. Crisp* 6693. 6—Buds, from holotype. 7—Flowers showing connate filaments, from holotype. 8—Fruits, from *M. D. Crisp* 6693.

Distribution.(Figure 2) Western Australia : about six known populations scattered from the southern Great Victoria Desert to north of Koorda, Mt Gibson and north of Morawa.

Habitat. Eucalyptus synandra usually grows on laterite or on ironstone ridges, but one collection (*Hallberg* S4671) is from sand. It typically occurs in small stands. At the type locality the substrate is a pale cemented soil with ironstone nodules, weathering to a sandy loam, and the vegetation is a tall shrubland of *Acacia* sp.

Selected collections (21 seen). WESTERN AUSTRALIA: In arenosis saxosis prope montem Gibson, Oct. 1968, *C. A. Gardner* s.n. (Perth); 6.5 miles [10.4 km] E of Gutha, *H. Demarz* 1449 (PERTH); 5.5 km S of Jingymia, *M. D. Crisp* 6693-6 (CBG, FRI, NSW, PERTH); near Kulja, *C. A. Gardner* 12100 (PERTH); 200 km SE of Laverton, 37 km E of Dead Horse Soak, *J. Hallberg* S4671 (FRI); 15 miles [24 km] S of Queen Victoria Springs, *R. D. Royce* 5286 (PERTH); 52 miles [83 km] N of transline [transcontinental railway line] road from a point 13 miles [21 km] E of Kitchener, *Forester Brennan* K 133 (PERTH).

Affinities. Eucalyptus synandra belongs to the informal section Bisectaria subseries Leptopodinae of Pryor and Johnson (1971), within which it is best placed between *E. leptopoda* Benth. (code SIVAA) and *E. beardiana* Brooker et Blaxell (code SIVAB). Unfortunately no code is available in that position in Pryor and Johnson's classification.

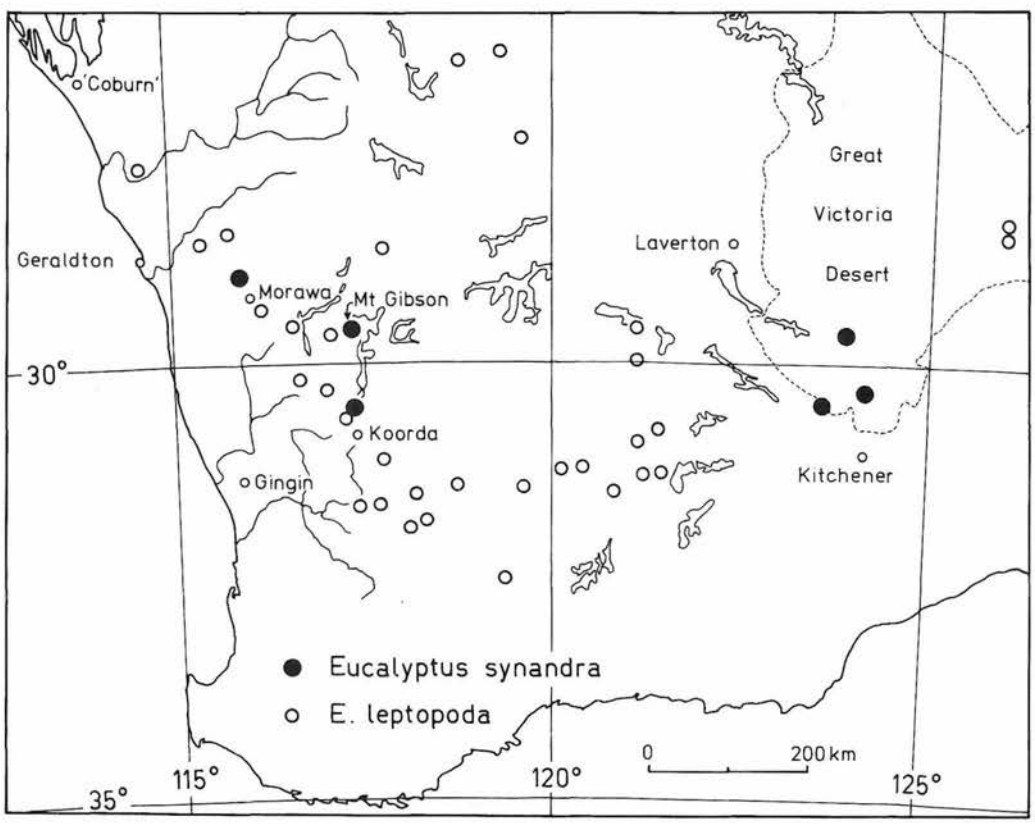

Figure 2. Distribution of *Eucalyptus synandra* and *E. leptopoda*.

Table 1 gives diagnostic characters separating these three species. The most striking character of *E. synandra*, its connate androecium (Figure 1), at once separates it from *E. leptopoda*. Brooker and Blaxell (1978) report a population of *E. leptopoda* with united stamens, but the specimen (*R. D. Royce* 5286) on which the report is based (M. I. H. Brooker, personal communication) belongs to *E. synandra*. The type population of *E. beardiana* at "Coburn" Station also has united stamens (Brooker and Blaxell, 1978). Within *Eucalyptus* this character is restricted to these two species, and is clearly a derived condition. However, the central population of *E. beardiana*, at "158 km peg, N of Geraldton on Highway 1", appears to have stamens which are free to the base, as seen on old flowers attached to the specimen *M. I. H. Brooker* 5023 (FRI, NSW). These flowers were collected from the ground but almost certainly had fallen from the plant from which the specimen was taken (D. F. Blaxell, personal communication). There is a third population of *E. beardiana* at "158 km N of Gingin on Highway 1", but the only specimen, L. D. Pryor s.n., 28 June 1978 (FRI), lacks flowers. The similarity between the localities cited for the central and southern populations is coincidental. It is apparent that the variation of the androecium of *E. beardiana* needs to be investigated further.

Table 1. Diagnostic characters of *Eucalyptus synandra, E. leptopoda* and *E. beardiana*

	E. synandra	*E. leptopoda*	*E. beardiana*
Stamens	All except outermost coherent in a tube for lower 1/2 to 2/3.	Free to base.	Type population: united in a tube. Central population: free to base. Southern population: unknown.
Operculum length (mm)	12.9 ± 2.6[1] (n = 9)[2] shortest measured 10.3	5.9 ± 1.0 (n = 12) longest measured 8.1	13.3 ± 1.3 (n = 20)[3]
Juvenile leaves	Tapering to petiole, grey-green.	Tapering to petiole, grey-green.	Rounded at base, green.
Soil	Usually outcropping laterite, rarely sand.	Deep, usually yellow sand.	Sand, usually dunes.
Fruiting pedicel length (mm)	10.8 ± 1.8 (n = 15) shortest measured 7.3	4.5 ± 1.1 (n = 44) Longest measured 7.7	—
Ratio—pedicel length: hypanthium length	3.2 ± 0.7 (n =15) lowest 2.2	1.1 ± 0.2 (n = 44) highest 2.2	—
Fruit diameter (mm)	10.1 ± 1.5 (n = 15)	8.0 ± 1.0 (n = 44)	10.9 ± 0.9 (n = 29)[4]
Fruit shape	Hypanthium depressed-hemispherical, not constricted; disc truncate-conical, steep-sided; usually hypanthium rimmed, with a groove between it and disc.	Hypanthium hemispherical; disc from flat to broadly convex; when disc strongly convex, fruit not or slightly rimmed or grooved.	Hypanthium cupular-urceolate (constricted just below rim); disc slightly depressed to slightly convex.

1. Standard deviation.
2. Except where otherwise indicated (below), each datum is an average of ten measurements from a single specimen.
3. Twenty measurements from one specimen from the type locality. A specimen from the central locality had much shorter buds but was not measured.
4. Twenty nine measurements from four specimens.

Eucalyptus beardiana is readily separated from *E. synandra* and *E. leptopoda* by its urceolate fruits and by its juvenile leaves being green and being rounded at the base (Table 1). Also, the adult leaves of *E. beardiana* contract abruptly to the petiole by contrast with the gently tapering leaves of *E. synandra* (Figure 1) and *E. leptopoda*. *Eucalyptus leptopoda* resembles *E. synandra* very closely, especially in vegetative morphology, but a combination of fruit morphology, length of pedicel, ratio of pedicel to hypanthium length and soil of the habitat will serve to separate non-flowering material of these species (Table 1).

Variation. There is slight geographic variation in the morphology and habitat of *Eucalyptus synandra*. Plants from the vicinity of the Great Victoria Desert have erect non-glaucous branchlets and in places may grow in sand, whereas plants from all populations farther west, including the type, have pendulous glaucous branchlets and always grow on laterite or ironstone hills. However, I am reluctant to propose formal infra-specific taxa before the species is known better. It is worth noting that the peduncles of *E. synandra* always appear to be decurved such that the flowers are pendulous, irrespective of the orientation of the branchlet. Thus the peduncles are recurved away from the tips of the erect branchlets in the Great Victoria Desert populations, whereas in the western populations they have the same direction as the pendulous branchlet tips.

Eucalyptus leptopoda Benth., *Fl. Austral.* 3: 238 (1867).

Type citation: "W. Australia, *Drummond,* 5th Coll. Suppl. n. 33 and 36, also n. 151 and 188 of other sets".

Lectotype (here designated): *Drummond* 5th Coll. Suppl. no. 33 (K; iso: BM, CGE, E, FI, K, KW, LE, MEL, NSW, PERTH, W). The chosen sheet is labelled, in part, "33 J. Drummond S.W. Australia 1850" and stamped "Herbarium Hookerianum 1867".

E. angustifolia Turcz., Bull. Phys. Math. Acad. Petersb. 10: 337 (1852), non Desf. (1804). Holotype: "Nova Hollandia Drummond coll: V n. 33" (KW).

A lectotype is chosen here to fix the application of the name of *E. leptopoda* according to current usage. This is necessary because the syntypes no. 151 and 188 belong to *E. salmonophloia* F. Muell. (1878). In fact, Bentham (1867; p. 239) implies that 188 is atypical and cites it and 151 apparently as an afterthought. Only the syntypes *Drummond* 5th Coll. nos. 33 and 36 belong to the species currently regarded as *E. leptopoda*. At K, there are two sheets of *Drummond* 5th Coll. no. 33. The lectotype carries the name "*E. leptopoda* Benth." in Bentham's handwriting, and has an abundance of leaves, fruits and immature buds. By contrast, *Drummond* 5th Coll. no. 36 (K) and the other sheet of *Drummond* 5th Coll. no. 33 in K both have few fruits and are consequently poorer specimens. Mueller (1878; p. 11, 14) excludes *Drummond* 151 and 188 from *E. leptopoda*, assigning them instead to his new species *E. salmonophloia*. He states that he has no specimen of "*Drummond* 36" and implicitly chooses "*Drummond* no. 33" as the type of *E. leptopoda* by citing it alone. This implied lectotypification is not valid because the single sheet of "*Drummond* 33" in MEL carries no indication that Bentham has seen it (*vide* para. 4 (a) under "Guide for the determining of types" in Stafleu et al. (1978)). Maiden

(1912) follows Mueller by including *Drummond* 151 and 188 in *E. salmonophloia* but makes no further attempt to clarify the typification of *E. leptopoda.* I have seen only photographs (at FRI) of the type material, with the exception of the isolectotypes at MEL and NSW, which I have seen.

Eucalyptus leptopoda is variable, especially in its fruit morphology, but is an integral species which cannot be readily subdivided. The disc of the fruit varies from more or less flat in populations south of 30°S to strongly convex further north, but intergradation is continuous between the extremes and the geographic pattern is not entirely consistent (strongly convex fruits have been collected at 32°S).

There is no evidence that *E. leptopoda* intergrades with *E. synandra,* even though the species are sympatric (Figure 2). Typical *Eucalyptus leptopoda* is growing on sand in two populations very close to the type locality of *E. synandra.* One population has its southern boundary only 0.8 km N of the *E. synandra*, and extends c. 1 km northward (B. V. Smith, personal communication). The other population occurs 3.5 km SW from the *E. synandra* and has the erect bushy habit, fruit morphology and short fruiting pedicels typical of *E. leptopoda* (*Crisp* 6697, CBG, FRI, PERTH).

Acknowledgements

I wish to thank Basil and Mary Smith for bringing *E. synandra* to my attention and for their hospitality. I would like to thank also Alex George who collected the type specimens, supplied photographs, and commented on the manuscript.

References

Bentham, G. (1867). *Eucalyptus leptopoda.* 'Flora Australiensis'. Vol. 3. (Reeve: London.)

Brooker, M. I. H. and Blaxell, D. F. (1978). Five new species of *Eucalyptus* from Western Australia. Nuytsia 2, 220-231.

Maiden, J. H. (1912). 'A critical revision of the genus *Eucalyptus*'. Vol. 2. (Govt. Printer: Sydney.)

Mueller, F. von (1878). 'Fragmenta Phytographiae Australiae'. Vol. 11. (Govt. Printer: Melbourne.)

Pryor, L. D. and Johnson, L. A. S. (1971). 'A classification of the Eucalypts.' (Aust. Natl. Univ. Press: Canberra.)

Stafleu, F. A. et al. (1978). 'International Code of Botanical Nomenclature.' (Bohn, Scheltema & Holkema: Utrecht.)

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