

## New species and nomenclatural changes in *Phebalium* and related genera (Rutaceae)

Paul G. Wilson

Western Australian Herbarium, Department of Conservation and Land Management,  
Locked Bag 104, Bentley Delivery Centre, Western Australia 6983

### Abstract

Wilson, Paul G. New species and nomenclatural changes in *Phebalium* and related genera (Rutaceae). *Nuytsia* 12 (2): 267-288 (1998). *Phebalium* is considered to consist only of those species previously included in sect. *Phebalium*. The other three sections of *Phebalium* are either raised to generic status or referred to other genera: *Phebalium* sect. *Goniocladus* is united with *Rhadinothamnus*, *Phebalium* sect. *Eriostemoides* is united with *Nematolepis*, and *Phebalium* sect. *Leionema* becomes the genus *Leionema*. A key to genera that have been associated with *Phebalium* is provided.

In *Phebalium* four new species and one new subspecies are described: *P. appressum* Paul G. Wilson, *P. elegans*, *P. festivum*, *P. glandulosum* subsp. *nitidum*, and *P. laevigatum*. Also, one new name, *P. brevifolium* is published, and two new combinations are made.

In *Nematolepis* six new species combinations are made. In *Rhadinothamnus* two species and two infraspecific combinations are made. In *Leionema* one species, *L. ellipticum*, is described as new and 22 new species combinations and one infraspecific combination are made.

### Introduction

For over 100 years, following Bentham (1863), the genus *Phebalium* (Rutaceae) has been widely regarded as a discrete taxon, for although Mueller (1875) united it with *Eriostemon* his classification has not been accepted.

In 1970 the genus was divided into four sections (Wilson 1970) but it was recognized that the species in three of the sections were more closely related to one or more species in other genera than they were to those in other sections of *Phebalium*. The situation appeared to be as follows:

1. *Phebalium* sect. *Phebalium* – closely related to *Microcybe* species.
2. *Phebalium* sect. *Eriostemoides* – closely related to *Nematolepis phebaliioides*.
3. *Phebalium* sect. *Goniocladus* – closely related to *Rhadinothamnus euphemiae* and to *Chorilaena quercifolia*.
4. *Phebalium* sect. *Leionema* – with no close relatives.

These suggested relationships, which were largely based on floral characters, are now strongly supported by seed morphology which is distinct and uniform within each of the above groups.

The traditional classification obviously requires attention. The options that are available in order to provide a more natural classification are:

1. to unite under *Phebalium* all the closely related genera that are indicated above, or
2. to recognize that *Phebalium* consists of the species in sect. *Phebalium*, with or without the inclusion of *Microcybe*, and to transfer those species in sect. *Goniocladus* to *Rhadinothamnus*, and those in sect. *Eriostemoides* to *Nematolepis*, while sect. *Leionema* would be given generic status.

It has been decided to take the second course, in particular because each of the resultant genera is homogeneous and clearly distinct morphologically. *Microcybe*, which is closely related to *Phebalium* but differs in having sessile flowers and 2-carpellary ovaries, is retained as a distinct genus.

This paper is a precursor to an account of the genera that will be published in Volume 26 of the "Flora of Australia", therefore descriptions are only provided for newly recognized or newly circumscribed taxa.

#### Hilar strands of the seed

The ovaries and developing carpels in dried herbarium material of a number of genera in the Rutaceae tribe Boronieae were studied in order to establish the homology of certain characters evident on the seed.

In some genera of the Boronieae the seed possesses a cream-coloured ligament-like tissue on its adaxial surface between the micropyle and the chalazal opening. This tissue has the appearance when dry of a cartilaginous strand; it surrounds the hilum and extends, as a single thread, to the raphe. This cartilaginous material, which is here called the 'hilar strand', is shed on, or shortly after, the dispersal of the seed.

Hilar strands of identical form and origin are found in seed of the following taxa:

1. *Chorilaena* (Figure 1)
2. *Phebalium* sect. *Goniocladus*
3. *Rhadinothamnus euphemiae*
4. *Asterolasia* p.p.

From a study of stages in the development of ovules through to seed in the above taxa, and comparing these stages with similar stages in seeds of other members of the Boronieae, it became apparent that the hilar strand arises from the narrow portion of the outer testa (formed from the outer integument) that surrounds the hilum. In early stages of seed development the future strand is intimately fused to the rest of the outer testa but when nearly mature it becomes separated and eventually falls away from the seed.

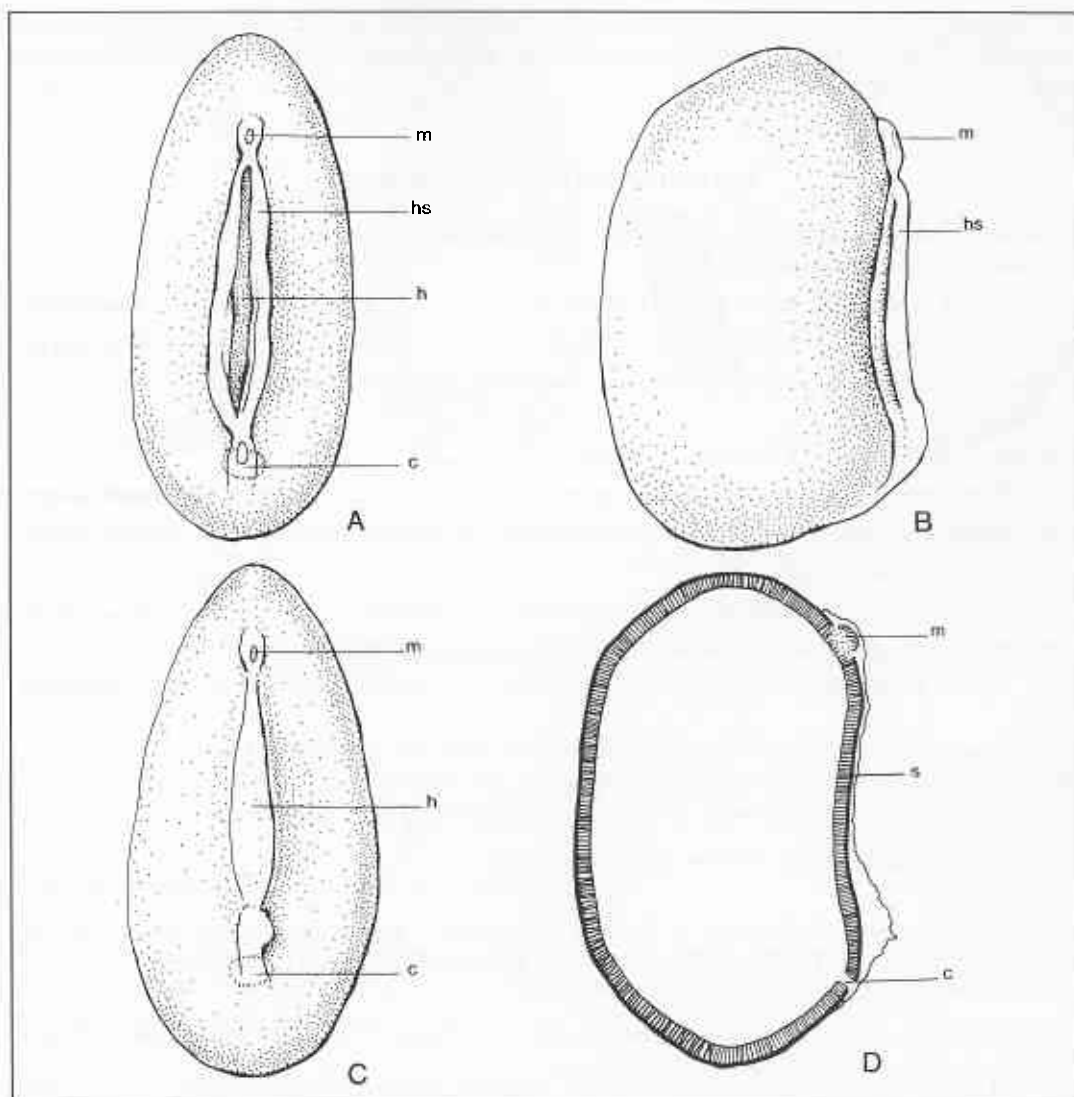


Figure 1. *Chorilaena quercifolia* seed (x15). A – adaxial surface with hilar strands attached; B – lateral view with hilar strands attached; C – adaxial surface without hilar strands; D – longitudinal radial section; c – chalazal aperture; h – hilum; hs – hilar strands; m – micropyle; s – sclerotesta. Drawn from Paul G. Wilson 3976 (PERTH).

In most genera of the Boroniaceae a pale line around the hilum can be observed in the developing ovule. In *Correa* this area remains pale in the mature seed. In *Boronia* sect. *Boronia* and in *Eriostemon* sect. *Erionema* this area becomes brittle (and usually glossy) and raised around an apparently sunken hilum. In *Philothea* and in *Eriostemon* sect. *Nigrostipulae* the developing ovule has a brown ring around the hilum and raphe and this appears to develop into the hard cover to the raphe.

The hilar strand is therefore apparently homologous with the lips that surround the hilum and raphe in *Boronia* sect. *Boronia* and in *Eriostemon* sect. *Erionema*, and is homologous with the hard cover to the raphe that is found in *Drummondita*, *Geleznowia*, and *Eriostemon* sect. *Nigrostipulae*.

It is unlikely that the hilar strands arose independently in *Chorilaena* and in *Rhadinothamnus* since a close relationship between these genera is supported by other characters, e.g. the hemispherical calyx,

the valvate petals, and the non-glandular apiculum to the anthers. A relationship with *Asterolasia* is more remote since in that genus the calyx is extremely small, the petals are imbricate, and the anthers have a glandular apiculum.

### Key to genera of the *Phebalium* group

- 1 Anthers basifixed, apex with a prominent spherical gland; bracteoles basal to pedicel and insignificant
  - 2 Flowers pedicellate; sepals united; carpels 5 ..... **Phebalium**
  - 2: Flowers sessile; sepals free or united; carpels 2 ..... **Microcybe**
- 1: Anthers versatile, without an apical gland; bracteoles medial or supra-medial on pedicel
  - 3 Sepals united; anthers obtusely apiculate
    - 4 Plants lepidote; flowers solitary or cymose ..... **Rhadinothamnus**
    - 4: Plants with stellate hairs; inflorescence a 6-flowered umbel ..... **Chorilaena**
  - 3: Sepals free; anthers retuse at apex
    - 5 Plants lepidote; sepals imbricate; petals imbricate or united ..... **Nematolepis**
    - 5: Plant glabrous or with simple or stellate hairs; sepals valvate; petals valvate or united ..... **Leionema**

### Leionema

*Leionema* (F. Muell.) Paul G. Wilson, *gen. et comb. nov.*

*Eriostemon* sect. *Leionema* F. Muell., Pl. Victoria 1: 125 (1862). – *Phebalium* sect. *Leionema* (F. Muell.) Benth., Fl. Austral. 1: 337 (1863). *Type: Leionema bilobum* (Lindl.) Paul G. Wilson.

*Eriostemon* sect. *Chorilaenopsis* F. Muell., *op. cit.* 131. *Type: Eriostemon phylicoides* F. Muell. [= *Leionema diosmeum* (A. Juss.) Paul G. Wilson].

*Shrubs*, glabrous or with simple or stellate hairs. *Branches* smooth. *Leaves*, alternate, simple, sessile or shortly petiolate, glandular-punctate, smooth. *Flowers* terminal or axillary, cymose or solitary, pentamerous. *Pedicels* slender, medially bibracteolate. *Sepals* free. *Petals* free or united, valvate, elliptic, usually glabrous; apex inflexed. *Stamens* 10; filaments terete, glabrous; anthers versatile, loculi deeply separated at base, apex deeply retuse, terminal gland or apiculum absent. *Disc* usually present and forming a short gynophore. *Carpels* 5, glabrous or stellate-hairy, apex sterile. *Ovules* 2 per carpel. *Style* solitary, slender, glabrous, affixed to adaxial medial surface of carpels; stigma minutely lobed. *Seed* sub-reniform, c. 3 mm long, adaxial margin  $\pm$  straight; outer testa thin, smooth; sclerotesta smooth; hilum linear to narrowly elliptic; raphe fleshy basal or sub-basal with a thin coriaceous to crustaceous glossy covering; chalazal opening basal or sub-basal, obscured by raphe; placental endocarp thick, persistent. (Figure 2)

*Chromosome number.*  $n=16$  (Smith-White 1954).

A genus of 22 species, 21 in the eastern States of Australia and one in New Zealand.

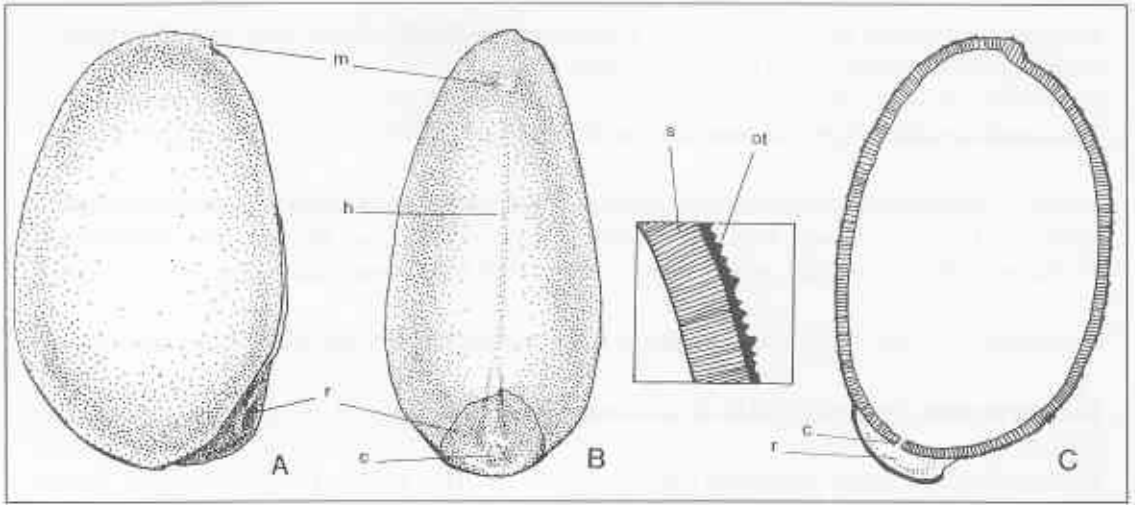


Figure 2. *Leonema lamprophyllum* seed (x10). A – lateral view; B – adaxial surface; C – longitudinal radial section with enlarged section through testa; c – chalazal aperture; h – hilum; m – micropyle; ot – outer testa; r – raphe; s – sclerotesta. Drawn from *F. Mueller s.n.* (MEL 4318)

*Notes.* The relationship of this genus to others in the tribe Boronieae is not clear, however, it appears to show no close affinity to *Phebalium s. str.*, to *Rhadinothamnus*, or to *Nematolepis*.

*Leonema elliptica* differs from the other members of the genus in leaf form, in having minutely apiculate anthers, and in having a divided disc. It is probably wrongly placed in this genus, but until fruit and seed are available its correct classification may not be apparent.

***Leonema ambiens*** (F. Muell.) Paul G. Wilson, *comb. nov.*

*Eriostemon ambiens* F. Muell., *Fragm.* 6: 166 (1868). – *Phebalium ambiens* (F. Muell.) Maiden & E. Betche, *Census New South Wales Pl.* 116 (1916). *Type:* near Timbarra, New South Wales, *C. Stuart* 570 (*lecto:* MEL 4552) *vide* Wilson (1970).

*Distribution.* Occurs in the Guyra district in the extreme north-east New South Wales and near Wallangarra in south-east Queensland.

***Leonema bilobum*** (Lindl.) Paul G. Wilson, *comb. nov.*

*Phebalium bilobum* Lindl. in *T. Mitch.*, *Three Exped. Australia* 2: 177 (1838). – *Eriostemon hillebrandii* F. Muell. *nom. illeg.*, *Trans. Philos. Soc. Victoria* 1: 10 (1854) including *P. bilobum*. *Type:* Mt William, Victoria, 15 July 1836, *T. Mitchell* 249 (*holo:* CGE; *iso:* K, MEL).

*E. hillebrandii* var. *longifolius* F. Muell., *Trans. Philos. Soc. Victoria* 1: 10 (1854). *Type:* Mt William, Victoria, November 1853. *F. Mueller* (*syn:* MEL 4608, 4616, 4617).

*P. truncatum* Hook.f., *Fl. Tasm.* 1: 64 t. 9 (1855). *Type:* Flinders Island, Tasmania, *R. Gunn* 1947 (*syn:* HO).

*E. serrulatus* F. Muell., *Fragm.* 1: 4 (1858). *Type:* Bunip-Bunip Creek, Victoria, *F. Mueller* (*holo:* MEL 4620; *iso:* K).

*Distribution.* Occurs in Victoria in The Grampians, Central Highlands, and west Gippsland; in Tasmania on the mainland and on islands in Bass Strait.

**Leionema carruthersii** (F. Muell.) Paul G. Wilson, *comb. nov.*

*Eriostemon carruthersii* F. Muell., *Victorian Nat.* 7: 46 (1890). – *Phebalium carruthersii* (F. Muell.) Maiden & E. Betche, *Census New South Wales Pl.* 116 (1916). *Type:* Moruya, New South Wales, *W. Bauerlen* 564 (*lecto:* MEL 4638; *isolecto:* MEL 4639) *fide* Wilson (1970).

*Distribution.* Occurs in the Batemans Bay to Bega district of New South Wales.

**Leionema coxii** (F. Muell.) Paul G. Wilson, *comb. nov.*

*Eriostemon coxii* F. Muell., *Australas. Chem. Druggist* 7: 64 (Dec. 1884). – *Phebalium coxii* (F. Muell.) Maiden & E. Betche, *Census New South Wales Pl.* 116 (1916). *Type:* Braidwood district, New South Wales, *W. Baeuerlen* 199 (*holo:* MEL 4649; *iso:* NSW 70184).

*Distribution.* Occurs chiefly in the Budawang Range in south-eastern New South Wales.

**Leionema dentatum** (Sm.) Paul G. Wilson, *comb. nov.*

*Phebalium dentatum* Sm. in Rees, *Cyclop.* 27: (1814). *Type:* "Brought by Gen. Grose from some part of New Holland, and communicated to us by A.B. Lambert Esq" (*holo:* LINN).

*P. salicifolium* A. Juss., *Ann. Sci. Nat. (Paris)* 4: 472 (1825). *Type:* Port Jackson, New South Wales, *anon.* (n.v.).

*Eriostemon umbellatus* Turcz., *Bull. Soc. Imp. Naturalistes Moscou* 22/2: 15 (1849). – *P. umbellatum* (Turcz.) Turcz., *op. cit.* 25/2: 160 (1852). *Type:* 125 miles [c. 200 km] from Sydney, New South Wales, *W. Stephenson* (*holo:* KW photo seen).

*Distribution.* Occurs in New South Wales chiefly near the coast from Illawarra north to Port Stephens, and also in the Gibraltar Range.

**Leionema diosmeum** (A. Juss.) Paul G. Wilson, *comb. nov.*

*Phebalium diosmeum* A. Juss., *Ann. Sci. Nat. (Paris)* 4: 472 (1825). – *P. phyllicoides* Sieber ex Spreng. *nom. illeg.*, *Syst. Veg.* 4 pt 2: 1640 (1827), superfluous name based on above. – *Eriostemon phyllicoides* F. Muell. *nom. illeg.*, *Fragm.* 1: 107 (1859). *Type:* Port Jackson, New South Wales, *comm.* J. Gay (*iso:* K).

*Chorilaena angustifolia* F. Muell., *Trans. Philos. Soc. Victoria* 1: 10 (1854) [as *angustifolia*]. *Type:* Argyle County [i.e. Goulburn district], New South Wales, *anon.* 826 (*holo:* MEL 4680; *iso:* K, MEL 4812).

*Distribution.* Occurs near the south-east coast of New South Wales.

**Leionema elatius** (F. Muell.) Paul G. Wilson, *comb. nov.*

*Eriostemon elatior* F. Muell., *Fragm.* 1: 181 (1859). – *Phebalium elatius* (F. Muell.) Benth., *Fl. Austral.* 1: 340 (1863). *Type*: Near Tenterfield, New South Wales, C. Stuart 153 (*holo*: MEL 4700).

*Distribution*. Occurs in north-east New South Wales and extreme south-east Queensland.

*Notes*. Two subspecies are recognized.

**a. Leionema elatius** (F. Muell.) Paul G. Wilson subsp. **elatius**

*Distribution*. Occurs in ranges in north-east New South Wales north of Bulahdelah, and in the extreme south-east of Queensland.

**b. Leionema elatius** subsp. **beckleri** (F. Muell.) Paul G. Wilson, *comb. nov.*

*Eriostemon beckleri* F. Muell., *Fragm.* 9: 109 (1875). – *P. beckleri* (F. Muell.) Engler in Engler & Prantl, *Nat. Pflanzenfam.* III 4: 141 (1890); *Phebalium elatius* subsp. *beckleri* (F. Muell.) Paul G. Wilson, *Nuytsia* 1: 105 (1970). *Type*: McLennan's Creek, Clarence River, New South Wales, H. Beckler (*holo*: MEL 4589; *iso*: NSW 69929).

*Distribution*. Known from a small area in the McPherson Range, Queensland and north-eastern New South Wales.

*Notes*. A plant from Hungryway Creek, Colo, New South Wales, referred to as '*Phebalium* species A' by Weston & Porteners (1991), may be a hybrid since it has deformed flowers and apparently sterile anthers. Although it most closely resembles *L. elatius* the latter species has not been recorded from the Colo area.

**Leionema ellipticum** Paul G. Wilson, *sp. nov.*

Ramuli laeves, nitidi, glabri. Folia glabra, chartacea, elliptica, ad 5 cm longa, 2 cm lata, integra, obtusa, in petiolem 5 mm longa ad basim attenuata. Inflorescentia terminalis, cymosa, multiflora, c. 2 cm longa, sparse puberula pilis simplicibus vel fasciculatis tectis; bracteolae caducae; pedicelli 1–2 mm longi. Flores glabri; sepala prope basim breviter connata, carnosa, deltata, c. 0.8 mm longa; petala valvata, crassa, anguste oblonga, c. 4.5 mm longa, 1.3 mm lata, manifeste carinata, alba, ad apicem incrassata et leviter inflexa; stamina petala breviter superantia, filamentis gracilibus, teretibus, antheris cordatis, c. 1.2 mm longis, obtuso mucronatis; ovarium glabrum; stylus teres petalis leviter brevior.

*Typus*: Mountain in north-east Queensland [precise locality withheld], 25 December 1991, K.R. McDonald (*holo*: BRI 520388).

*Shrub* to 2 m high. *Branchlets* smooth, glossy, glabrous, somewhat angular when dry due to ribs decurrent from leaf bases. *Leaves* glabrous; lamina chartaceous, pinnately veined, pellucid-dotted, elliptic, to 5 cm long, 2 cm wide, entire, obtuse, narrowed at base into a petiole to 5 mm long. *Inflorescence* terminal, cymose, multiflowered, c. 2 cm long, sparsely puberulous with simple and

fasciculate hairs; pedicels 1–2 mm long; bracteoles caducous. *Flowers* glabrous. *Sepals* 5, very shortly united at base, fleshy, deltate, *c.* 0.8 mm long. *Petals* valvate, thick, firm, narrowly oblong, *c.* 4.5 mm long, 1.3 mm wide, strongly keeled, white; apex thickened and slightly inflexed. *Stamens* glabrous; filaments slender, terete, shortly exceeding petals; anthers cordate, *c.* 1.2 mm long, bluntly mucronulate. Gynophore *c.* 0.5 mm high, deeply 10-grooved. *Ovary* barrel-shaped, *c.* 1.3 mm high, glabrous or with a few minute hairs, terminal 1/3 solid; style fixed to near base of carpels, terete, slightly shorter than petals. *Fruit* not seen.

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

*Distribution.* North-east Queensland.

*Habitat.* Windswept shrubland on top of mountain.

*Etymology.* The epithet is derived from the Latin *ellipticus* and refers to the elliptical shape of the leaves.

*Notes.* This species is only known from the type collection. The flowers are similar to those of other species of *Leionema* except for the anthers which are bluntly mucronulate (not retuse) and for the gynophore which is deeply grooved. These anomalous characters suggest that it is incorrectly placed in this genus although neither T. Hartley (CANB pers. comm.), nor I can suggest a more appropriate one. I consider that it would be inadvisable for it to be described as a new monotypic genus while fruiting material is lacking.

***Leionema equestre*** (D.A. Cooke) Paul G. Wilson, *comb. nov.*

*Phebalium equestre* D.A. Cooke, *J. Adelaide Bot. Gard.* 10: 241 (1987). *Type:* Kangaroo Island, South Australia, B.M. Overton 435 (*iso:* PERTH).

*Distribution.* Endemic to Kangaroo Island, South Australia.

***Leionema gracile*** (C.T. White) Paul G. Wilson, *comb. nov.*

*Phebalium gracile* C.T. White, *Proc. Roy. Soc. Queensland* 50: 69 (1939). *Type:* Mt Greville, Queensland, C.T. White 9947 (*holo:* BRI 011387).

*Distribution.* Occurs in extreme south-east Queensland where it is apparently restricted to the summits of Mt Moon and Mt Greville.

***Leionema hillebrandii*** (J.H. Willis) Paul G. Wilson, *comb. nov.*

*Phebalium hillebrandii* J.H. Willis, *Victorian Nat.* 73: 195 (1957). – Based on *Eriostemon hillebrandii* var. *brevifolius* F. Muell. *nom illeg.*, *Trans. Philos. Soc. Victoria* 1: 10 (1854). *Type:* Mt Lofty Ranges, South Australia, F. Mueller (*lecto:* MEL 4590) *vide* J.H. Willis *loc. cit.*

*Distribution.* Occurs in the Mt Lofty Ranges of South Australia.



***Leionema lachnaeoides*** (A. Cunn.) Paul G. Wilson, *comb. nov.*

*Phebalium lachnaeoides* A. Cunn. in Field, Geog. Mem. New South Wales 332 (1825). – *Eriostemon phyllicifolius* var. *lachnaeoides* (A. Cunn.) F. Muell. ex C. Moore *nom. illeg.*, Handb. Fl. New South Wales 43 (1893). *Type*: Blackheath, Blue Mountains, New South Wales, 1822, A. Cunningham 56 (*holo*: K; *iso*: BRI, MEL).

*Distribution*. A rare species occurring on rocky outcrops in the Blue Mountains, New South Wales.

*Notes*. This species is similar to some variants of *L. phyllicifolium* but it can be distinguished from them principally by the presence of only one flower in the axillary cymes.

***Leionema lamprophyllum*** (F. Muell.) Paul G. Wilson, *comb. nov.*

*Eriostemon lamprophyllus* F. Muell., *Quart. J. Pharm. Soc. Victoria* 2: 43 (1859). – *Phebalium lamprophyllum* (F. Muell.) Benth., *Fl. Austral.* 1: 340 (1863). *Type*: mountains on the Macalister River, Victoria, January 1859, F. Mueller (*holo*: MEL 4784; *iso*: AD, K, NSW).

*Distribution*. Occurs in the Dividing Range of eastern New South Wales, from Rylstone southwards, and in eastern Victoria.

***Leionema microphyllum*** (F. Muell.) Paul G. Wilson, *comb. nov.*

*Eriostemon microphyllus* F. Muell., *Trans. Philos. Soc. Victoria* 1: 99 (1855). *Type citation*: On the low coast ranges of Spencer's and St. Vincent's Gulf. *Type*: Encounter Bay, South Australia, 27 September, F. Mueller (*lecto*: MEL 4628) lectotype here chosen.

*Phebalium brachyphyllum* Benth., *Fl. Austral.* 1: 341 (1863). – *Eriostemon brachyphyllus* (Benth.) Tate, *Handb. Fl. Extratr. S. Austral.* 24 (1890). *Type*: Encounter Bay and near Coffin Bay, South Australia, F. Mueller (*syn*: K, MEL 4628).

*Distribution*. Occurs in southern Eyre Peninsula, South Australia, east to far western Victoria.

***Leionema montanum*** (Hook.) Paul G. Wilson, *comb. nov.*

*Phebalium montanum* Hook., *J. Bot. (Hooker)* 1: 255 (1834). – *Eriostemon montanus* (Hook.) F. Muell., *Pl. Indig. Col. Victoria* 1: 129 (1862). *Type*: Western Mountains, Tasmania, R. Gunn 283 & R. Lawrence 321 (*syn*: K).

*Distribution*. Occurs in the mountains of north-east Tasmania.

***Leionema nudum*** (Hook.) Paul G. Wilson, *comb. nov.*

*Phebalium nudum* Hook., *Icon. Pl.* 6: t. 568 (1843). – *Eriostemon nudus* (Hook.) F. Muell., *Fragm.* 1: 181 (1859). *Type citation*: New Zealand; Ouae, on the east coast of the northern Island, Mr. Colenso, 1838 (n. 56). Hokeanga, Edgerley. *Type*: Ouae, New Zealand, Colenso 56 (*syn*: K).

*Distribution.* North Island, New Zealand.

*Note.* This is the only member of the genus that is found outside of Australia.

**Leionema obtusifolium** (Paul G. Wilson) Paul G. Wilson, *comb. nov.*

*Phebalium obtusifolium* Paul G. Wilson, *Nuytsia* 1: 107 (1970). *Type:* Upper reaches of Alice Creek, about 8 miles [c. 13 km] north of Helidon, Queensland, August 1963, F.D. Hockings (*holo:* BRI 042851).

*Distribution.* Occurs in the Helidon and Ravensbourne areas of south-east Queensland.

**Leionema oldfieldii** (F. Muell.) Paul G. Wilson, *comb. nov.*

*Eriostemon oldfieldii* F. Muell., *Fragm.* 1: 3 (1858). – *Phebalium oldfieldii* (F. Muell.) F. Muell. ex Benth., *Fl. Austral.* 1: 340 (1863). *Type:* Mount La Perouse, 27 February 1857, A. Oldfield & C. Stuart 1875 (*holo:* MEL 4822; *iso:* K).

*Distribution.* Endemic to mountains near the west coast of Tasmania.

**Leionema phyllicifolium** (F. Muell.) Paul G. Wilson, *comb. nov.*

*Phebalium phyllicifolium* F. Muell., *Trans. & Proc. Victorian Inst. Advancem. Sci.* 1: 32 (1855). – *Eriostemon phyllicifolius* (F. Muell.) F. Muell., *Fragm.* 1: 105 (1859). *Type:* Munyang Mountains [Snowy Mountains], also on the Snowy River, New South Wales, January 1855, F. Mueller (*lecto:* MEL 4888; *isolecto:* K) *fide* Paul G. Wilson (1970).

*Distribution.* Occurs in the mountains of eastern Victoria and of the extreme south-east of New South Wales.

*Notes.* See notes under *L. lachnaeoides*.

**Leionema ralstonii** (F. Muell.) Paul G. Wilson, *comb. nov.*

*Eriostemon ralstonii* F. Muell., *Fragm.* 2: 101. t. 14 (1860). – *Phebalium ralstonii* (F. Muell.) Benth., *Fl. Austral.* 1: 339 (1863). *Type:* Twofold Bay, New South Wales, F. Mueller (*holo:* MEL 4945; *iso:* K, MEL 4946).

*Distribution.* Occurs in the Bega to Eden district of New South Wales.

**Leionema rotundifolium** (Endl.) Paul G. Wilson, *comb. nov.*

*Eriostemon rotundifolius* Endl. in Endl. *et al.*, *Enum. Pl. Huegel* 15 (1837). – *Phebalium rotundifolium* (Endl.) Benth., *Fl. Austral.* 1: 341 (1863). *Type:* Mount Dangar, Hunters River, New South Wales, A. Cunningham 55 (*iso:* K, MEL 4954).

*Distribution.* Occurs in the Howell and Torrington districts of north-east New South Wales and in the extreme south-east of Queensland.

***Leionema sympetalum*** (Paul G. Wilson) Paul G. Wilson, *comb. nov.*

*Phebalium sympetalum* Paul G. Wilson, *Nuytsia* 1: 116 (1970). *Type:* Near Olinda, New South Wales, 2 September 1951, L.A.S. Johnson (*holo:* AD 96434202; *iso:* NSW, PERTH 01617079).

*Distribution.* Occurs in the ranges near Rylstone, New South Wales.

***Leionema viridiflorum*** (Paul G. Wilson) Paul G. Wilson, *comb. nov.*

*Phebalium viridiflorum* Paul G. Wilson, *Nuytsia* 1: 117 (1970). *Type:* Belougery Mountain, Warrumbungle Range, New South Wales, 28 May 1948, E.F. Constable (*holo:* NSW 6277; *iso:* MEL 4949).

*Distribution.* Occurs in Mt Kaputar and Warrumbungle Range National Parks, New South Wales.

### Nematolepis

*Nematolepis* Turcz., *Bull. Soc. Imp. Naturalistes Moscou* 25(2): 158 (1852). *Type:* *N. phebalioides* Turcz.

*Phebalium* sect. *Eriostemoides* Endl., *Gen. Pl.* 1156 (1840). *Type:* *Eriostemon squameus* Labill. [= *Nematolepis squamea* (Labill.) Paul G. Wilson].

*Symphypetalon* J. Drumm. ex Harv., *Hooker's J. Bot. Kew Gard. Misc.* 7: 54 (1855). *Type:* *S. corraeoides* Harv. [= *Nematolepis phebalioides* Turcz.].

Lepidote shrubs or small trees. Branchlets smooth or verrucose. Leaves alternate, simple, ± flat, shortly petiolate, glandular-punctate, smooth. Flowers axillary, cymose or solitary, pentamerous. Bracteoles two, near middle of pedicel or apical and immediately subtending the fleshy floral receptacle. Sepals free, imbricate. Petals imbricate (united in *N. phebalioides*), lepidote or glabrous. Stamens 10, free; filaments flattened terete, glabrous or basally stellate-hairy; anthers versatile, loculi deeply separated at base, apex slightly retuse, not glandular. Disc prominent. Carpels 5, with a short, sterile apex. Ovules 2 per carpel. Style solitary, terete, affixed to adaxial medial surface of carpels. Stigma scarcely lobed. Seed broadly ellipsoid to sub-reniform, 2–2.5 mm long, adaxial margin straight; outer testa thin, coriaceous, smooth, satin-like; sclerotesta smooth; hilum superficial, narrowly elliptic; raphe small, somewhat cartilaginous, situated between base of hilum and chalazal aperture, covered by thin coriaceous layer that is continuous with outer testa; chalazal aperture on lower adaxial face; aril linear; placental endocarp membranous, deciduous. (Figure 3)

*Chromosome number.* n=16 (Smith-White 1954, Stace & Armstrong 1992).

A genus of seven species endemic to Australia.

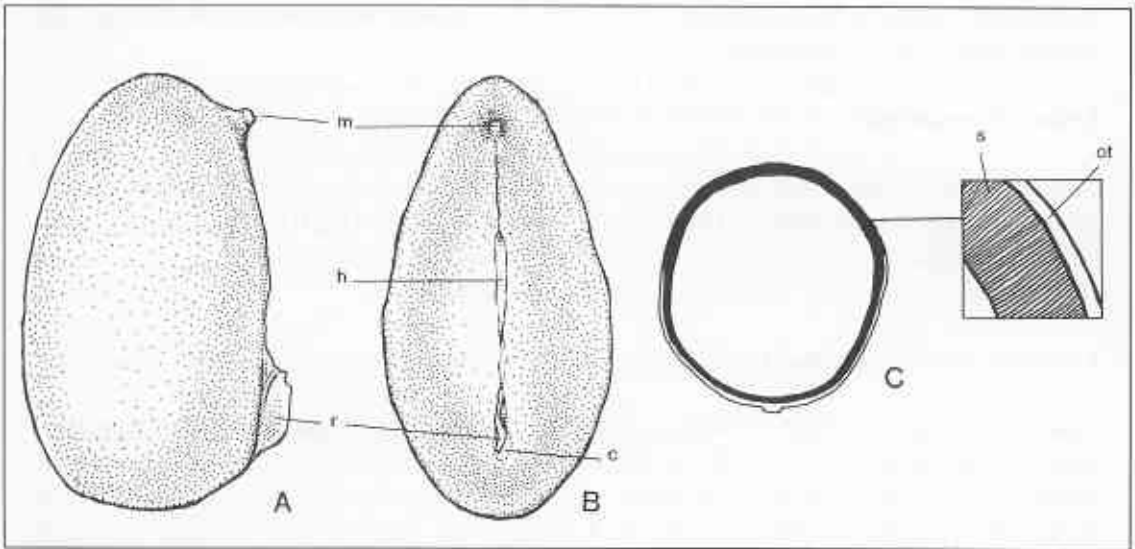


Figure 3. *Nematolepis squamea* seed (x25). A – lateral view; B – adaxial surface; C – transverse section with enlarged section through testa; c – chalazal aperture; h – hilum; m – micropyle; ot – outer testa; r – raphe; s – sclerotesta. Drawn from F.A. Rodway 1179 (NSW).

***Nematolepis elliptica*** (Paul G. Wilson) Paul G. Wilson, *comb. nov.*

*Phebalium ellipticum* Paul G. Wilson, *Nuytsia* 1: 341 (1974). *Type:* Big Badja Mountain, New South Wales, J.P. Baker 907 (*holo:* NSW; *iso:* CANB, K, MEL, PERTH 01616587).

*Distribution.* Occurs in the ranges east of Cooma, New South Wales.

***Nematolepis frondosa*** (N.G. Walsh & Alb.) Paul G. Wilson, *comb. nov.*

*Phebalium frondosum* N.G. Walsh & Alb., *Muelleria* 6: 405 (1988). *Type:* Eastern Victoria [precise locality withheld], D.E. Albrecht 2875 (*holo:* MEL).

*Distribution.* Known only from the upper slopes of a mountain in eastern Victoria.

***Nematolepis ovatifolia*** (F. Muell.) Paul G. Wilson, *comb. nov.*

*Phebalium ovatifolium* F. Muell., *Trans. Philos. Soc. Victoria* 1: 99 (1855). – *Eriostemon ovatifolius* (F. Muell.) F. Muell., *Fragm.* 1: 103 (1859). *Type:* In the alpine parts of the Munyang Mountains, New South Wales, F. Mueller (*lecto:* MEL 4828) *fide* Wilson (1970).

*Distribution.* Occurs in the Snowy Mountains of New South Wales.

***Nematolepis phebaliioides*** Turcz., *Bull. Soc. Imp. Naturalistes Moscou* 25(2): 158 (1852). *Type:* Swan River Colony, Western Australia, J. Drummond 5th coll. n. 194 (*holo:* KW, photo seen; *iso:* K, TCD).

*Symphypetalon corraeoides* J. Drumm. ex Harv., *Hooker's J. Bot. Kew Gard. Misc.* 7: 54 (1855). *Type:* Near Middle Mt Barren, J. Drummond 194 (*holo:* TCD; *iso:* K).

*Distribution.* Occurs towards the south coast of Western Australia from Dumbleyung east to Israelite Bay.

***Nematolepis rhytidophylla*** (Alb. & N.G. Walsh) Paul G. Wilson, *comb. nov.*

*Phebalium rhytidophyllum* Alb. & N.G. Walsh, *Muelleria* 6: 402 (1988). *Type:* Wog Wog Mount, New South Wales, D.E. Albrecht 2333 (*holo:* MEL 1553279; *iso:* PERTH 1617044).

*Distribution.* Occurs on the plateau between Wog Wog and White Rock Mountains in far south-east New South Wales.

***Nematolepis squamea*** (Labill.) Paul G. Wilson, *comb. nov.*

*Eriostemon squameus* Labill., *Nov. Holl. Pl. Sp.* 1: 111, t.141 (1806). – *Phebalium argenteum* Smith *nom. illeg.*, in Rees, *Cyclop.* 27: n.3 (1814) as to name only. – *Phebalium billardieri* A. Juss. *nom. illeg.*, *Mem. Soc. Hist. Nat. Paris* 2: 134 (1825). – *Phebalium squameum* (Labill.) Engl., *Nat. Pflanzenfam.* III 4: 141 (1896). *Type:* "Habitat in capite Van-Diemen", Tasmania (?*iso:* MEL 5025, 5026).

*Distribution.* Widespread in eastern Australia.

*Notes.* Three subspecies are recognized.

**a. *Nematolepis squamea*** (Labill.) Paul G. Wilson subsp. ***squamea***

*Phebalium elatum* Cunn. in B. Field, *Geog. Mem. New South Wales* 331 (1825). *Type:* in the vicinity of Spring Wood, New South Wales, A. Cunningham (*holo:* K).

*Distribution.* Occurs in south-eastern Queensland, coastal New South Wales, Victoria, and Tasmania.

**b. *Nematolepis squamea*** subsp. ***coriacea*** (Paul G. Wilson) Paul G. Wilson, *comb. nov.*

*Phebalium squameum* subsp. *coriaceum* Paul G. Wilson, *Nuytsia* 1: 94 (1970).

*Type:* Between Haidinger Range and Mt Wellington, Victoria, March 1861, F. Mueller (*holo:* MEL 4833; *iso:* K).

*Distribution.* Only known from eastern Victoria in the mountains near the head of the Macallister River and from near Wulgulmerang.

**c. *Nematolepis squamea*** subsp. ***retusa*** (Hook.) Paul G. Wilson, *comb. nov.*

*Phebalium retusum* Hook., *J. Bot. (Hooker)* 1: 254 (1834). – *P. billardieri* var. *retusum* (Hook.) Hook.f., *Fl. Tasm.* 1: 63 (1855). – *Phebalium squameum* subsp. *retusum* (Hook.) Paul G. Wilson, *Nuytsia* 1: 94 (1970). *Type:* Tasmania, 1831, T. Scott & R.W. Lawrence (*syn:* K photo seen).

*Distribution.* Occurs in north-eastern Tasmania.

*Notes.* This subspecies grades into the variant of the typical subspecies that is found in north-east Tasmania. It is evidently closely related to the subsp. *coriacea* from Victoria. Superficially it is similar to *N. ovatifolia* but it differs in having a glabrous (not lepidote) ovary and in not having sub-floral bracteoles.

**Nematolepis wilsonii** (N.G. Walsh & Alb.) Paul G. Wilson, *comb. nov.*

*Phebalium wilsonii* N.G. Walsh & Alb., *Muelleria* 6: 399 (1988). *Type:* Near Mt Grant, Victoria, N.G. Walsh 1494 (*holo:* MEL 1540265; *iso:* PERTH 009055069).

*Distribution.* Known only from the type locality in the Central Highlands of Victoria.

### Phebalium

*Phebalium* Vent., *Jard. Malm.* 2: 102 (1805). – *Eriostemon* sect. *Phebalium* (Vent.) F. Muell., *Pl. Victoria* 1: 129 (1862). – *Phebalium* sect. *Euphebalium* Benth. *nom. inval.*, *Fl. Austral.* 1: 337 (1863). – *Crowea* sect. *Phebalium* (Vent.) Baillon, *Dict. Bot.* 11: 277 (1886). *Type:* *P. squamulosum* Vent.

*Shrubs* ± covered when young with a lepidote indumentum. *Branches* often glandular verrucose. *Leaves* alternate, simple, sessile or shortly petiolate, glandular-punctate, often glandular-verrucose. *Flowers* terminal to branches, solitary or umbellate, pentamerous. *Bracteoles* basal to pedicels and insignificant. *Calyx* 5-lobed, lepidote outside. *Petals* free, imbricate, elliptic, white, yellow, or pink, lepidote outside, apex not inflexed. *Stamens* 10; filaments slender-terete; anthers basifixed, loculi totally united, apex rounded with a spherical terminal gland. *Disc* not apparent. *Carpels* 5, lepidote, apical portions solid. *Ovules* 2 per carpel. *Style* terete, affixed to adaxial medial surface of carpels; stigma small with shortly spreading lobes. *Seed* oblong-reniform; surface longitudinally striate or corrugate due to the fine corrugations of the sclerotesta; outer testa membranous, black; hilum linear; raphe small, fleshy and shrivelled, situated in lower half of adaxial face, covered by membranous layer that is continuous with outer testa; chalazal aperture on lower adaxial face; aril linear; placental endocarp thin, caducous. (Figure 4)

*Chromosome number.*  $n=16, 32$  (Smith-White 1954).

A genus of 25 species endemic to Australia.

*Notes.* This genus, as circumscribed in this paper, is closely related to *Microcybe* Turcz. which is distinguished by its sessile flowers, small free or united sepals, and bicarpellary ovary. The seeds of the two genera are similar.

**Phebalium appressum** Paul G. Wilson, *sp. nov.*

Ramuli sparse glanduloso tuberculati. Folia densa, sessiles, erecta, ad ramulum adpressa, cordato ovata, c. 2 mm longa, 1.5 mm lata, crassa, arcte revoluta, supra aliquantum applanata, infra rotundata, laeves, virides, glabra vel sparse argenteo lepidota. Flores terminales, solitarii vel binati; pedicellus brevis, crassus, c. 1 mm longus. Calyx c. 1.5 mm altus, profunde deltato lobatus, extra ferrugineo lepidotus.

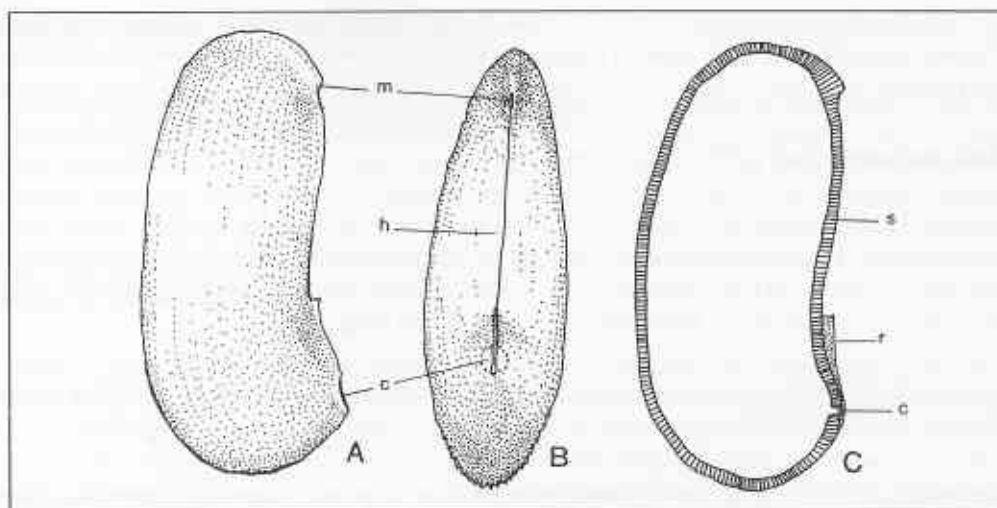


Figure 4. *Phebalium nottii* seed (x15). A – lateral view; B – view of adaxial surface; C – longitudinal radial section; c – chalazal aperture; h – hilum; m – micropyle; r – raphe; s – sclerotesta. Drawn from Lazarides & Story 113 (CANB).

*Typus*: North of Coolgardie [precise locality withheld], Western Australia, 16 July 1991, Shreeve & Spencer s.n. (*holo*: PERTH 4150120).

Rounded *shrub* to 1 m high. *Branchlets* silvery-lepidote, sparsely glandular-tuberculate. *Leaves* sessile, dense, erect and appressed to branch, cordate-ovate, c. 2 mm long, 1.5 mm wide, thick, closely revolute, somewhat flat above, rounded below, smooth, green, glabrous or sparsely silvery-lepidote. *Flowers* terminal, solitary or paired; pedicel short and thick, c. 1 mm long, densely ferruginous-lepidote, subtended by several narrowly cuneate bracteoles c. 0.5 mm long. *Calyx* c. 1.5 mm long, deeply deltate-lobed, ferruginous-lepidote outside. *Fruit* not seen.

*Distribution*. Known only from the type locality which is in the Coolgardie Botanical District (Beard 1980).

*Habitat*. Yellow sand plain. Growing in an area that had been refilled with local soil after mining.

*Conservation status*. The solitary collection is from an area subject to a mining lease which suggests that the species may be in need of protection. CALM Conservation Code for Western Australian Flora: Priority One.

*Etymology*. The specific epithet refers to the leaf position.

*Notes*. This species differs from the other eleven members of the *Phebalium microphyllum* complex in leaf shape and in the usually solitary flowers which have very short and thick pedicels.

***Phebalium brevifolium*** Paul G. Wilson, *nom. et stat. nov.*

*Phebalium tuberosum* subsp. *brachyphyllum* Paul G. Wilson, *Nuytsia* 1: 72 (1970). *Type*: Great Victoria Desert, camp 59, near Queen Victoria Spring, Western Australia, 22 September 1891, R. Helms (*holo*: AD 96350150; *iso*: MEL 4811, NSW 69582).

*Notes.* This species is only found in an area around Queen Victoria Spring in the Great Victoria Desert of Western Australia. It is here isolated from other species of *Phebalium* and shows no evidence of intergradation.

***Phebalium elegans*** Paul G. Wilson, *sp. nov.*

Ramuli lepidoti, glanduloso tuberculati. Folia divaricata, atro-viridia, cuneata, retusa, crassa, c. 5 mm longa, 2–3 mm lata, glanduloso tuberculata, marginis recurva, glanduloso undulata, supra glabra, infra argenteo- vel ferrugineo-lepidota. Inflorescentia 2–5-floris; pedicelli graciles, 5–10 mm longi. Calyx c. 1.5 mm altus. Petala late elliptica, 4–5 mm longa, alba.

*Typus:* 9 km WSW of Point Pleasant, Fraser Range, Western Australia, 20 September 1980, *K. Newbey* 7536 (*holo:* PERTH 00909726).

Spreading *shrub* to 90 cm high. *Branchlets* spreading, lepidote, glandular-tuberculate. *Leaves* spreading, shortly petiolate, dark green; lamina cuneate, retuse, thick, c. 5 mm long, 2–3 mm wide, glandular-tuberculate (at least when dry). margins recurved and glandular-undulate, upper surface glabrous, lower surface silvery- or ferruginous-lepidote. *Inflorescence* a terminal umbel of 2–5 flowers; pedicels slender, 5–10 mm long, lepidote. *Calyx* c. 1.5 mm high, silvery- to ferruginous-lepidote outside, divided two-thirds into deltate lobes. *Petals* broadly elliptic, 4–5 mm long, white, silvery- to ferruginous-lepidote outside. *Fruiting cocci* broadly oblong, c. 3 mm high, rounded at apex with a small spreading apiculum on outer angle.

*Distribution.* Southern Western Australia from Mt Day (120 km west of Norseman) east to the Fraser Range, Coolgardie Botanical District (Beard 1980).

*Selected specimens examined.* WESTERN AUSTRALIA: 96 km E of Norseman, *D.E. Albrecht* 4032 (PERTH); 98 km E of Norseman, *R.J. Cranfield* 10065 (PERTH); 9 km E of Norseman, *C.A. Gardner* 14222 (PERTH); Mt Day, *K.R. Newbey* 5273 (PERTH).

*Habitat.* In well-drained sandy or granitic loam on rocky slopes.

*Flowering period.* July to September.

*Conservation status.* This species is not recorded from a reserve, however, it is found over a wide area of pastoral land and vacant crown land and is not in need of protection.

*Etymology.* The specific epithet refers to the elegant appearance of the shrub as has been noted by collectors.

*Affinities.* This species corresponds most closely to the polymorphic *Phebalium tuberosum* but it differs in having long slender pedicels, a cuneate leaf (not linear-terete), and a small calyx.

*Notes.* None of the eleven species in what may be considered the *Phebalium microphyllum* - *P. tuberosum* group can be satisfactorily discriminated since each exhibits a different variant at each different locality and each appears to hybridize with those of the group it comes into contact. A similar situation occurs in *P. elegans* which at its eastern extreme is silvery lepidote and at its western extreme ferruginous lepidote. The western variant may grade to the south and east into *P. obovatum*.



***Phebalium festivum*** Paul G. Wilson, *sp. nov.*

Folia coriacea, oblonga vel late elliptica, 2–3 mm longa, 1–1.5 mm lata, ad apicem rotundata, supra convexa fere laevia, ad margines recurva et leviter crenulata, infra argenteo lepidota. Umbellae parvae, sessiles; pedicelli c. 1.5 mm longi. Calyx breviter hemisphericus, 1–1.5 mm altus, laevis, argenteo vel ferrugineo lepidotus, ad marginem undulatus vel truncatus. Petala alba, extra ferrugineo lepidota.

*Typus:* Flagstaff Hill, 5.5 miles (c. 8.8 km) north of Eaglehawk, Victoria, 30 September 1952, *R. Melville* 1254 (*holo:* MEL 520053; *iso:* K, *n.v.*).

*Shrub* c. 0.6 m high. *Branchlets* slender, smooth. *Leaves* coriaceous, oblong to broadly elliptic, 2–3 mm long, 1–1.5 mm wide; apex rounded; upper surface convex and almost smooth; margins recurved and slightly crenulate; lower surface silvery-lepidote. *Flowers* in small sessile umbels terminal to branchlets; pedicels c. 1.5 mm long. *Calyx* shortly hemispherical, 1–1.5 mm high, smooth, silvery- to ferruginous-lepidote, margin undulate to truncate. *Petals* elliptic, 2.5 x 1.5 mm, white, ferruginous-lepidote outside.

*Selected specimens examined.* VICTORIA: Gobarup Flora Reserve, *A.C. Beaglehole* 68931 (MEL); Painswick, near Dunolly, *M.E. Phillips*, 18 Mar. 1961 (AD); Tarnagulla State Forest, 28 Aug. 1979, *P.G. Smith* (MEL).

*Distribution.* Found near Bendigo in western Victoria.

*Habitat.* Usually found growing in open eucalypt forest.

*Etymology.* The epithet *festivum*, refers to the pleasant aspect of the plant when in flower.

*Notes.* *Phebalium festivum* differs from *P. obcordatum* Benth., to which species the collections had previously been referred, principally in the shape of the leaves and in their smooth slightly convex upper surface which lacks a medial groove, while in addition, the petals of *P. festivum* are white within, whereas in *P. obcordatum* they are yellow.

***Phebalium glandulosum*** Hook. in T. Mitch., J. Exped. Trop. Australia 199 (1848). *Type:* c. 11 miles [17 km] south of Mt Owen near head of Maranoa River, Queensland, 16 June 1846, *T.L. Mitchell* 331 (*holo:* K; *iso:* MEL 4751).

*Notes.* This is a widespread and variable species. Three subspecies were recognized by Wilson (1970) who noted that large-leaved variants of subsp. *glandulosum* occurred in the Warrumbungle Range and at Mulgowen Station south of Bourke. Both of these variants probably warrant recognition, however, recent collections show that the plants from the Mulgowen locality are morphologically similar to a variant of subsp. *glandulosum* found in central and northern Queensland which approaches the type in leaf-size. On the other hand the variant found in the Warrumbungle Range is geographically and morphologically disjunct from other populations of the species and can be readily circumscribed, it is described below as subsp. *nitidum*.

**a. *Phebalium glandulosum* subsp. *nitidum*** Paul G. Wilson, *subsp. nov.*

*Phebalio glanduloso* subsp. *glanduloso* similis sed foliis grandioribus plerumque 2–3 cm longis, 3–5 mm latis, apice truncatis parum retusis, supra convexis secus costam leviter depressis nec canaliculatis differt.

*Typus:* Warrumbungle Mountains, New South Wales, 25 May 1948, *E.F. Constable* (*holo:* NSW 6462).

Branchlets sparsely glandular-verrucose. Leaves shortly (2–3 mm) petiolate; lamina narrowly oblong or narrowly oblong-elliptic, mostly 2–3 cm long, 3–5 mm wide; margin crenate and glandular-verrucose; base cuneate; apex truncate and slightly retuse; upper surface convex with shallow depression over midrib, glabrous, glossy, smooth or sparsely glandular-verrucose; lower surface smooth apart from the sparsely verrucose prominent midrib, fawn lepidote. Pedicels slender, 5–7 mm long. Calyx hemispherical, glandular-verrucose, c. 2 mm high including the broadly triangular lobes c. 0.7 mm long.

*Specimens examined.* NEW SOUTH WALES: Head of Tooraweenah Creek, Warrumbungle Mountains, *L.A.S. Johnson & E.F. Constable* (NSW 20490); Mt Naman, 34 km SW of Coonabarabran, *H. Streimann* 761 (PERTH).

*Distribution.* Endemic to the Warrumbungle Range in north-eastern New South Wales.

*Habitat.* Evidently confined to rocky basalt slopes.

*Etymology.* The epithet is derived from the Latin word *nitidus* which means shining and refers to the upper surface of the leaves.

*Notes.* This subspecies has much larger leaves than typical subsp. *glandulosum* but it is similar to the large-leaved variant of that subspecies which grows in the Gunderbooka Range south of Bourke in central New South Wales. The two subspecies may be readily distinguished by the appearance of the upper surface of the leaves; in subsp. *glandulosum* there is a sharp depressed line over the midrib whereas in subsp. *nitidum* there is a gentle depression. In addition, the leaves of subsp. *nitidum* are glossy above when mature whereas in the Gunderbooka Range variant the mature leaves are dull and often retain a sparse lepidote cover.

***Phebalium laevigatum*** Paul G. Wilson, *sp. nov.*

Lamina folio anguste oblonga, 12–15 mm longa, 1.5–2.0 mm lata, obtusa, integra, supra convexa, glabrescens, nitida, laevis vel leviter canaliculata, infra lepidota et manifeste costata. Inflorescentia c. 7-flora; pedicelli graciles, c. 4 mm longi. Calyx c. 1.5 mm altus, ad dimidium in lobis deltatis divisus. Petala late elliptica, 4–5 mm longa, flava vel alba, extra ferrugineo-lepidota.

*Typus:* 48 km ESE of Merredin, Western Australia, *N.N. Donner* 4600 (*holo:* PERTH 896632).

Erect slender *shrub* to 1 m high. *Branchlets* glandular-tuberculate. *Leaves* ascending; petiole 2 mm long; lamina narrowly oblong, 12–15 mm long, 1.5–2 mm wide, obtuse, margin entire; upper

surface convex, glabrescent, sparsely silvery-lepidote, glossy when mature, glandular-punctate, smooth or faintly channelled; lower surface silvery-lepidote with prominent midnerve. *Umbels* of c. 7 flowers; pedicels slender, c. 4 mm long. *Calyx* c. 1.5 mm long, ferruginous-lepidote, divided half way into deltate lobes. *Petals* broadly elliptic, 4–5 mm long, yellow to white, ferruginous-lepidote outside.

*Selected specimens examined.* WESTERNAUSTRALIA: 30 miles [48 km] E of Merredin, P.R. Jefferies 631004 (PERTH); 8.5 km NW of Wialki, F. & M. Mollemans 3369 (PERTH); Chandler near Campion, R.D. Royce 2060 (PERTH).

*Distribution.* Occurs in the Merredin–Bullfinch area of southern Western Australia.

*Habitat.* Grows principally in sand heath with *Acacia*.

*Conservation status.* This species is widespread, and evidently not under threat.

*Etymology.* The epithet is from the Latin word *laevigatus*, which means smooth and polished, and here refers to the appearance of the leaves.

*Notes.* This species had been assumed (Wilson 1970) to represent a stage in the introgression between *P. microphyllum* and *P. tuberosum*, but it is now evident that it is a distinct taxon which is found in areas where neither of the other two species occurs.

***Phebalium megaphyllum*** (Ewart) Paul G. Wilson, *stat. et comb. nov.*

*Eriostemon tuberosus* var. *megaphyllus* Ewart, *Proc. Roy. Soc. Victoria* ser. 2, 19: 39 (1907). — *Phebalium tuberosum* subsp. *megaphyllum* (Ewart) Paul G. Wilson, *Nuytsia* 1: 72 (1970). *Type:* Cowcowing, Western Australia, September 1904, M. Koch 1330 (*holo:* MEL 4545).

*Notes.* This taxon is found in the Wubin to Southern Cross area of Western Australia; it was earlier (Wilson 1970) considered to be sufficiently similar to the lectotype of *Phebalium tuberosum* as to warrant only infraspecific status. However, further study has shown that the two are consistently different in leaf and flower characters; furthermore, the areas of distribution of *P. tuberosum* and *P. megaphyllum* do not overlap and therefore they do not hybridize in nature with each other, although each hybridizes with some other species of *Phebalium*.

***Phebalium obovatum*** (Paul G. Wilson) Paul G. Wilson, *stat. nov.*

*Phebalium lepidotum* var. *obovatum* Paul G. Wilson, *Nuytsia* 1: 74 (1970). *Type:* Between Israelite Bay and Point Culver, Western Australia, G. Maxwell (*holo:* MEL 4801).

*Notes.* This taxon is found in the far south-east corner of Western Australia. When first described the few collections seen were insufficient to clearly establish its status. Field studies over the past thirty years suggest that it warrants recognition as a distinct species.

### Rhadinothamnus

*Rhadinothamnus* Paul G. Wilson, *Nuytsia* 1: 197 (1971). Type: *R. euphemiae* (F. Muell.) Paul G. Wilson.

*Phebalium* sect. *Goniocladus* Paul G. Wilson, *Nuytsia* 1: 96 (1970). Type: *Rhadinothamnus anceps* (DC.) Paul G. Wilson.

Silvery-lepidote shrubs. Branches smooth. Leaves alternate, simple, shortly petiolate. Flowers cymose or solitary and axillary. Pedicel medially bibracteolate. Calyx patelliform or hemispherical, undulately lobed. Petals free, elliptic, valvate, slightly inflexed at tip, lepidote outside, white. Staminal filaments flattened in lower part, terete above, glabrous; anthers versatile, base cordate, apex obtuse, with a non-glandular apiculum, white. Disc short. Carpels 5, glabrous or lepidote, with or without a short sterile apex. Ovules 2 per carpel. Style solitary, terete, attached to adaxial medial surfaces of carpels; stigma not or scarcely lobed. Seed narrowly reniform or bluntly ellipsoid; outer testa membranous, dark brown, smooth; sclerotesta smooth; hilum superficial, narrowly elliptic, bordered by cartilaginous strands (hilar strands); raphe similar to hilar strands in texture, sub-basal, covered by membranous layer that is continuous with outer testa; aril linear, fleshy, situated between hilar strands, readily detached.

A genus of three species endemic to Western Australia.

*Notes.* The genus *Rhadinothamnus* was established to accommodate the species *Nematolepis euphemiae* (syn. *Phebalium euphemiae*) that appeared to be anomalous in both of the genera into which it had been placed. When the genus was first described, comment was made on its close relationship to the species in *Phebalium* sect. *Goniocladus*, but the species in this section were not concurrently transferred to the new genus. This action is now taken.

Some of the characters that serve to discriminate *Rhadinothamnus* are found in the seed, in particular the manner in which cartilaginous strands surround the hilum. These characters are described and discussed above. Refer to Figure 1, the seed of *Chorilaena*, which is the same as that for *Rhadinothamnus*.

***Rhadinothamnus anceps*** (DC.) Paul G. Wilson, *comb. nov.*

*Phebalium anceps* DC., Prodr. 1: 719 (1824). – *Eriostemon anceps* (DC.) Spreng., Syst. Veg. 2: 322 (1825). Type: "Nouvelle Hollande, cote orientale (Port du Roi Georges)" [King George Sound, Western Australia], *vide* Jussieu, Mem. Soc. Hist. Nat. Paris 2: 134 (1825) (*holo*: G-DC).

*Distribution.* Occurs in the south-west of Western Australia.

***Rhadinothamnus euphemiae*** (F. Muell.) Paul G. Wilson, *Nuytsia* 1: 198 (1971). – *Nematolepis euphemiae* F. Muell., Fragm. 3: 149 t. 25 (Apr. 1863). – *Phebalium euphemiae* (F. Muell.) C.A. Gardner, Enum. Pl. Austral. Occ. 70 (1931). Type: Near Cape Arid, Western Australia, G. Maxwell (*iso*: K).

*Phebalium baxteri* Benth., Fl. Austral. 1: 345 (30 May 1863). – *Nematolepis baxteri* (Benth.) Engler in Engler & Prantl, Nat. Pflanzenfam. III 4: 145 (1896). Type: South coast, Western Australia, W. Baxter (*holo*: K).

*Distribution.* Occurs near the south coast of Western Australia from the Eyre Range east to Mt Ragged.

**Rhadinothamnus rudis** (Bartl.) Paul G. Wilson, *comb. nov.*

*Phebalium rude* Bartl. in Lehm., Pl. Preiss. 1: 172 (1845). Type: Baldhead, Western Australia, L. Preiss 2038 (iso: MEL 4981, 4960).

*Distribution.* Occurs near the south coast of Western Australia from Albany east to near Esperance.

*Notes.* Three subspecies are recognized.

**a. Rhadinothamnus rudis** (Bartl.) Paul G. Wilson subsp. **rudis**

*P. bilobum* Bartl. *nom. illeg., loc. cit., non* Lindl. (1838). – *Eriostemon bilobum* F. Muell., Fragm. 1: 102 (1859). Type: Konkoberuphills [Mt Melville], Western Australia, L. Preiss 2039 (iso: MEL 4979).

*Distribution.* Occurs near the south coast of Western Australia between Point Irwin and Cape Arid, but also recorded in 1898 from Mount Barker.

**b. Rhadinothamnus rudis** subsp. **amblycarpus** (F. Muell.) Paul G. Wilson, *comb. nov.*

*Eriostemon amblycarpus* F. Muell., Fragm. 1: 102 (1859). – *Phebalium amblycarpum* (F. Muell.) Benth., Fl. Austral. 1: 345 (1863). – *Phebalium rude* subsp. *amblycarpum* (F. Muell.) Paul G. Wilson, *Nuytsia* 1: 98 (1970). Type: Fitzgerald River, Western Australia, G. Maxwell 935 (holo: MEL 4556).

*Distribution.* Occurs near the south coast of Western Australia, and somewhat inland, from Nyabing east to near Esperance.

*Notes.* The subspecies *rudis* and *amblycarpus* are distinguished by their leaf shape and ovary type (lepidote in subsp. *rudis* and glabrous in subsp. *amblycarpus*). They usually have separate though at times adjacent areas of distribution, however, in the Fitzgerald River area are found plants with the foliage of subsp. *amblycarpus* but with a lepidote ovary; these plants may represent an intergrade between the two subspecies.

**c. Rhadinothamnus rudis** subsp. **linearis** (C.A. Gardner) Paul G. Wilson, *comb. nov.*

*Phebalium lineare* C.A. Gardner, *J. Roy. Soc. Western Australia* 27: 180 (1942). – *P. rude* subsp. *lineare* (C.A. Gardner) Paul G. Wilson, *Nuytsia* 1: 98 (1970). Type: Mt Ragged, Western Australia, C.A. Gardner 2864 (holo: PERTH 01617052).

*Distribution.* Known from the Russell Range of south-eastern Western Australia.

*Conservation status.* This subspecies is evidently local in its distribution which is, however, totally within a National Park. CALM Conservation Code for Western Australian Flora: Priority Four.

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### References

- Beard, J.S. (1980). A new phytogeographic map of Western Australia. *Western Australian Herbarium Research Notes* 3: 37-58.
- Bentham, G. (1863). Rutaceae. "Flora Australiensis." Vol. 1. pp. 301-372. (L. Reeve & Co.: London.)
- Mueller, F. von (1875). Rutaceae. "Fragmenta Phytographiae Australiae." Vol. 6. pp. 166-167. (Government Printers: Melbourne.)
- Smith-White, S. (1954). Chromosome numbers in the Boronieae (Rutaceae) and their bearing on the evolutionary development of the tribe in the Australian flora. *Australian Journal of Botany* 2: 287-303.
- Stace, H.M. & Armstrong, J.W. (1992). New chromosome numbers for Rutaceae. *Australian Systematic Botany* 5: 501-505.
- Weston, P. & Porteners, M. (1991). In: Harden, G.J. "Flora of New South Wales." Vol. 2. (New South Wales University Press: Kensington.)
- Wilson, P.G. (1970). A taxonomic revision of the genera *Crowea*, *Eriostemon* and *Phebalium* (Rutaceae). *Nuytsia* 1: 5-155.