

A taxonomic review of the genera *Eriostemon* and *Philotheca* (Rutaceae: Boronieae)

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. A taxonomic review of the genera *Eriostemon* and *Philotheca* (Rutaceae: Boronieae). *Nuytsia* 12 (2): 239-265 (1998). The circumscription of the genera *Eriostemon* and *Philotheca* (Rutaceae: Boronieae) is reviewed with the majority of the species of the former genus being transferred to *Philotheca*. Five species are described as new, namely *P. acrolopha* Paul G. Wilson, *P. coateana*, *P. cuticularis*, *P. eremicola*, and *P. kalbarriensis*. Five new subspecies are described, namely *P. buxifolia* subsp. *falcata*, *P. deserti* subsp. *brevifolius*, *P. gardneri* subsp. *globosa*, *P. nodiflora* subsp. *latericola*, and *P. salsolifolia* subsp. *pedicellata*. The following three new sectional combinations are made: *Philotheca* sect. *Corynonema* (Paul G. Wilson) Paul G. Wilson, *Philotheca* sect. *Cyanochlamys* (F. Muell.) Paul G. Wilson, and *Philotheca* sect. *Erionema* (F. Muell.) Paul G. Wilson. Thirty-three new species combinations and eight new subspecies combinations are made, these having been transferred from *Eriostemon*.

Introduction

Since Bentham's (1863) treatment of the genus, *Eriostemon* (Rutaceae: Boronieae) has been distinguished from the apparently closely related genus *Philotheca* by its free rather than united stamens. Wilson (1970) retained this circumscription although he pointed out that *Philotheca* was more closely related to *Eriostemon* sect. *Nigrostipulae* than that section was to the others in *Eriostemon*.

Smith-White (1954) indicated that this broad circumscription of *Eriostemon* is incorrect and that the genus should be recognized as consisting of only the one or two species that are placed in *Eriostemon* sect. *Eriostemon*. This suggestion is here accepted.

Armstrong (1991) examined the question of generic relationships in the tribe Boronieae but he has yet to publish on this matter. Basically, his preliminary conclusion was that *Eriostemon* sect. *Eriostemon* is the sister taxon to the genus *Crowea* Sm. and that these together form the sister taxon to the remainder of the sections in *Eriostemon* and *Philotheca* (but excluding *E. deserti*).

Michael Bayly, formerly of Melbourne University, has studied the relationships within the genus *Eriostemon* s.lat. but has yet to publish on this matter. He has also a particular interest in the *Eriostemon*

myoporoides complex in sect. *Eriostemon* which will be the subject of a separate paper by him. For this reason *E. myoporoides* is omitted from this revision.

The New Caledonian species, *Eriostemon pallidus* Schltr., was excluded from the genus by Wilson (1970) who based his decision solely on his interpretation of the protologue provided by Schlechter. However, herbarium material has since been examined and it is clear that this species is representative of a taxon quite distinct from either *Eriostemon* or *Philothea*. The flowers have very thick induplicate valvate petals which have only one vascular strand (imbricate with c. 5 strands in *Eriostemon*), while the seed lacks both a sclerotesta and a circular chalazal aperture (characters that are found in all Australian and New Zealand members of the tribe Boronieae but which have not been observed elsewhere). Hartley (1995) implied that *E. pallidus* possessed a linear embryo similar to that found in the Australian members of the Boronieae, however, he now considers (Hartley 1996, pers. comm.) that this conclusion was based on the examination of immature seeds. The examination of more mature seeds suggests that they have flattened elliptic cotyledons which are considerably wider than the hypocotyl; this implies that *E. pallidus* is part of the lineage comprising *Boronellas* Baill., *Myrtopsis* Engl., *Euodia* J.R. & G. Forst., *Brombya* F. Muell., and *Medicosma* Hook. f., which suggestion is supported by the seed morphology. The chromosome number of *E. pallidus* has been determined as $n=20$ (Guerra 1984) whereas for *Eriostemon* s. str. it is $n=17$, and for *Philothea* in the sense here accepted it is $n=14, 28$ (Smith-White 1954).

The generic circumscription of *Philothea* is still not satisfactorily resolved. I have here delineated it in a broad sense so as to include the sections formerly placed in *Eriostemon*, other than sect. *Eriostemon*, although, as is explained in the notes under *Philothea* sect. *Philothea*, this would appear to render *Philothea* paraphyletic with reference to *Geleznovia* Turcz.

Morphology

In discriminating the generic and infrageneric taxa within the *Eriostemon* group attention has been given to two morphological characters that have not previously been included in its description and therefore require explanation. These are as follows.

Foliar sclereids (terminology following Rao 1991). The idioblasts present in leaves of a range of species in all members of the Boronieae were examined. In most of the taxa investigated tracheoids were present. Sclereids were confirmed in a number of species of *Boronia* whose presence has been documented by Rao & Bhattacharya (1978, 1981).

In the *Eriostemon* group tracheoids associated with vein-endings were found to be widespread. The only sclereids observed in the genus, in the broad sense, were the filiform type (Figure 1A). These were found in all species of *Philothea* and in each of the 10 species examined of *Eriostemon* sect. *Nigrostipulae* except for *E. linearis* in which neither sclereids nor tracheoids were observed. This filiform type of sclereid was also found in *Geleznovia verrucosa* Turcz. but in none of the other taxa of the Boronieae.

Petal venation. All members of the tribe Boronieae subtribe Eriostemoninae possess only one central nerve (Figure 1C) except for the two species of *Eriostemon* sect. *Eriostemon* in which about five parallel nerves are found (Figure 1B). Petals with three to five nerves are also found in most members of *Boronia* sect. *Boronia* and in the New Caledonian genus *Boronella* but not elsewhere in the Boronieae.

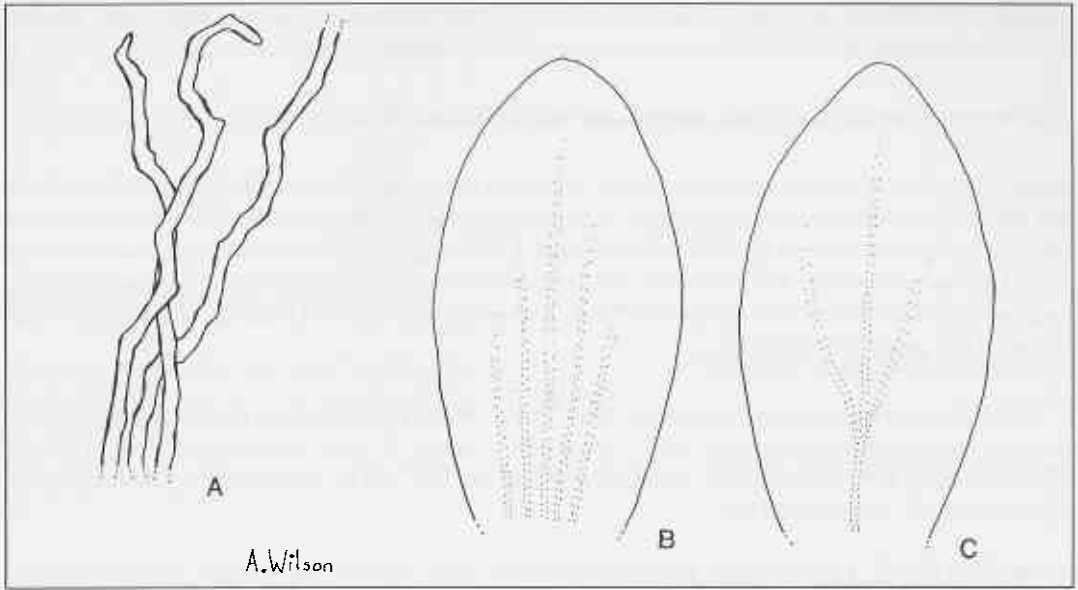


Figure 1. A – sclereids (x200) from leaf of *Philotheca deserti* subsp. *deserti*; B – petal of *Eriostemon australasius* showing venation (x4); C – petal of *Philotheca verrucosa* showing venation (x8).

Key to genera in the Eriostemon complex

- 1 Petals valvate, thick, covered with basally branched silky hairs; seeds with pale brown thin weak inner testa, without a circular chalazal opening; embryo with flattened elliptic cotyledons (New Caledonia; n=20) **Eriostemon pallidus**
- 1: Petals imbricate, ± papery, glabrous or with stellate or simple hairs; seeds with black thick brittle inner testa, with a supra-basal circular chalazal opening; embryo with terete cotyledons
 - 2 Petals multinerved, stellate-lepidote; staminal filaments with a subapical adaxial and abaxial verrucosity; anther apiculum absent or glabrous; (Eastern Australia; n=17) **Eriostemon**
 - 2: Petals 1-nerved; glabrous or with simple hairs; staminal filaments smooth; anther apiculum glabrous or pilose
 - 3 Anther and apiculum glabrous (Southern and eastern Australia; n=14, 28) **Philotheca**
 - 3: Anther and apiculum pilose (South-west and eastern Australia; n=19) **Crowea**

Eriostemon

Eriostemon Sm., *Trans. Linn. Soc.* 4: 221 (1798). Type: *Eriostemon australasius* Pers. (1805), lectotype, see Wilson (1970) and below.

Critical features. Leaves with tracheoids. Petals stellate-lepidote, with c. 5 parallel nerves. Staminal filaments with adaxial verrucosity near apex and an opposite abaxial hump; anther with a rounded apex or with a white non-glandular apiculum. Seed reniform; adaxial face concave; outer testa coriaceous, crinkled and glossy; sclerotesta smooth; hilum elliptic in centre of adaxial face; raphe in centre of

adaxial face beneath a thick crustaceous cover; chalazal opening at base of raphe and beneath crustaceous cover; placental endocarp thick, persistent. (Figures 1B, 2A–C)

Chromosome number: $n=17$ in *E. australasius* (Smith-White 1954).

Notes. The protologue of *Eriostemon* gave the locality of the genus as Australasia (i.e. Australia). Smith did not indicate which Australian species were to be included in the genus but did state that *Diosma uniflora* L. (a South African species) belonged here even though it differed from *Eriostemon* in having five of its stamens sterile. The first Australian species described in the genus was *E. australasius* Pers. and, judging from Smith's protologue and from his herbarium, it was on material of this species that he based the generic description.

A brief nomenclatural history of the genus is given in Wilson (1970) where *E. australasius* is stated to be the type, whereas in Farr *et al.* (1979) the type is given as '*E. lanceolatus* K.F. Gaertner (1805)'. The date cited for the latter name is incorrect, it should be 1807, and the name is simply an illegitimate *nom. nov.* for *E. australasius* Pers.

Two species are now recognized in the genus (Bayly *et al.* 1998) and these are endemic to near the east coast of Australia. The solitary species of *Eriostemon* recorded from New Caledonia (*E. pallidus* R. Schlechter, *nom. illeg.*) clearly belongs to its own monotypic genus (see above).

Eriostemon australasius Pers., *Syn. Plant.* 1: 465 (1805). *Type*: not seen.

Note. See Wilson (1970) for synonymy.

Eriostemon banksii A. Cunn. ex Endl. in Endl. *et al.*, *Enum. Pl. Huegel* 15 (1837). – *E. australasius* subsp. *banksii* (A. Cunn. ex Endl.) Paul G. Wilson, *Nuytsia* 1: 24 (1970). *Type*: Endeavour River, Queensland, July 1819, A. Cunningham (*iso*: CANB, K).

Notes. This taxon was made a subspecies of *E. australasius* by Wilson (1970) who, due to the absence of flowering material, thought that the two species differed only in leaf shape. Recent collections have shown that in flower, fruit and leaf characters they are distinct (see Bayly *et al.* 1988). In *E. banksii* the petals are white, the anthers have no white apiculum and the cocci have a distinct beak, whereas in *E. australasius* the petals are pink, the anthers have a white apiculum and the cocci are erostrate. In addition, the leaves of *E. banksii* are distinctly 5-nerved, while in *E. australasius* they are 3-nerved, even in broadly leaved variants. The areas of distribution of the two species do not overlap.

Philotheca

Philotheca Rudge, *Trans. Linn. Soc. Botany* 11: 298 (1816). *Type*: *P. australis* Rudge [= *P. salsolifolia* (Sm.) Druce].

Critical features. *Leaves* with filiform sclereids or non-filiform tracheoids, frequently, in sect. *Philotheca*, with a pair of small dark-coloured stipular excrescences. *Petals* glabrous or sparsely pilose, 1-nerved. *Staminal filaments* terete or linear-acuminate, smooth throughout; anther with a white apiculum. *Seed* reniform; adaxial face concave; outer testa coriaceous or membranous; sclerotesta

smooth or rugose; hilum elliptic to linear in centre of adaxial face; raphe variable; chalazal opening at base of raphe; placental endocarp thick and persistent or membranous and deciduous.

A genus of 45 species endemic to Australia. They are divided into four sections.

Philothea Rudge Sect. 1. **Philothea**

Philothea Rudge sect. *Philothea*

Eriostemon sect. *Nigrostipulae* Paul G. Wilson, *Nuytsia* 1: 25 (1970). Type: *E. difformis* A. Cunn. ex Endl. [= *P. difformis* (A. Cunn. ex Endl.) Paul G. Wilson].

Eriostemon sect. *Gymnanthos* Paul G. Wilson, *Nuytsia* 1: 59 (1970). Type: *E. deserti* E. Pritz. [= *P. deserti* (E. Pritz.) Paul G. Wilson].

Critical features. Leaves with filiform sclereids (sclereids absent in *P. linearis*). Petals glabrous or with simple hairs, 1-nerved. Staminal filaments slender, flattened, smooth; anthers with a white non-glandular apiculum. Seed reniform; adaxial face concave; outer testa thin, smooth, glossy; sclerotesta smooth; hilum delta-shaped, in centre of adaxial face; raphe in centre of adaxial face beneath a thin crustaceous cover or this crustaceous cover absent; chalazal opening at base of raphe and beneath cover; placental endocarp thick, persistent. (Figures 1A, 2D-I)

Chromosome number. $n=14$ in *P. reichenbachii* and *P. salsolifolia* (Smith-White 1954), and *P. tubiflora* (Keighery 1978); $n=28$ in *P. brevifolia* (Smith-White 1954).

Notes. A section of 31 species in southern and eastern Australia. The genus *Philothea* has previously been separated from *Eriostemon* sect. *Nigrostipulae* solely on the presence of united staminal filaments, however, this is a character of little moment since a gradation from free to united filaments can be found within sect. *Philothea*.

Filiform sclereids (Figure 1A) of the type present in *Philothea* sect. *Philothea* (with apparently the sole exception of *P. linearis*), also occur in *Geleznovia* which genus possesses a similar seed and the same chromosome number. *Geleznovia* has, however, a retuse anther that lacks an apiculum. The morphological similarity otherwise suggests a close relationship between the two genera and therefore it is possible that the inclusion of the three non-typical sections in *Philothea* renders the genus paraphyletic.

Philothea acrolopha Paul G. Wilson, *sp. nov.*

Frutex densus ad 1 m altus. Ramuli ascendentes, in lineis latis puberuli inter decurrentias glabras. Folia congesta; lamina anguste cuneata, 7-13 mm longa, ad apice obcordata minute glandulariter apiculata, basi attenuata in petiolo brevi, tenuiter coriacea, glabra, laevis, margo recurvo. Stipula resinosa, c. 0.3 mm longa. Flores terminales, solitarii; pedicellus c. 2.5 mm longus, glaber. Sepala orbicularia, c. 1.5 mm longa, coriacea. Petala anguste ovata, c. 5 m longa, subcoriacea, intra sparse puberula, extra marginem versus sparse puberula. Filamenta staminum anguste oblongo-attenuata, ad basim adnata et ad petalas connata, pilosa; apiculum antherorum minutum, rubellum.

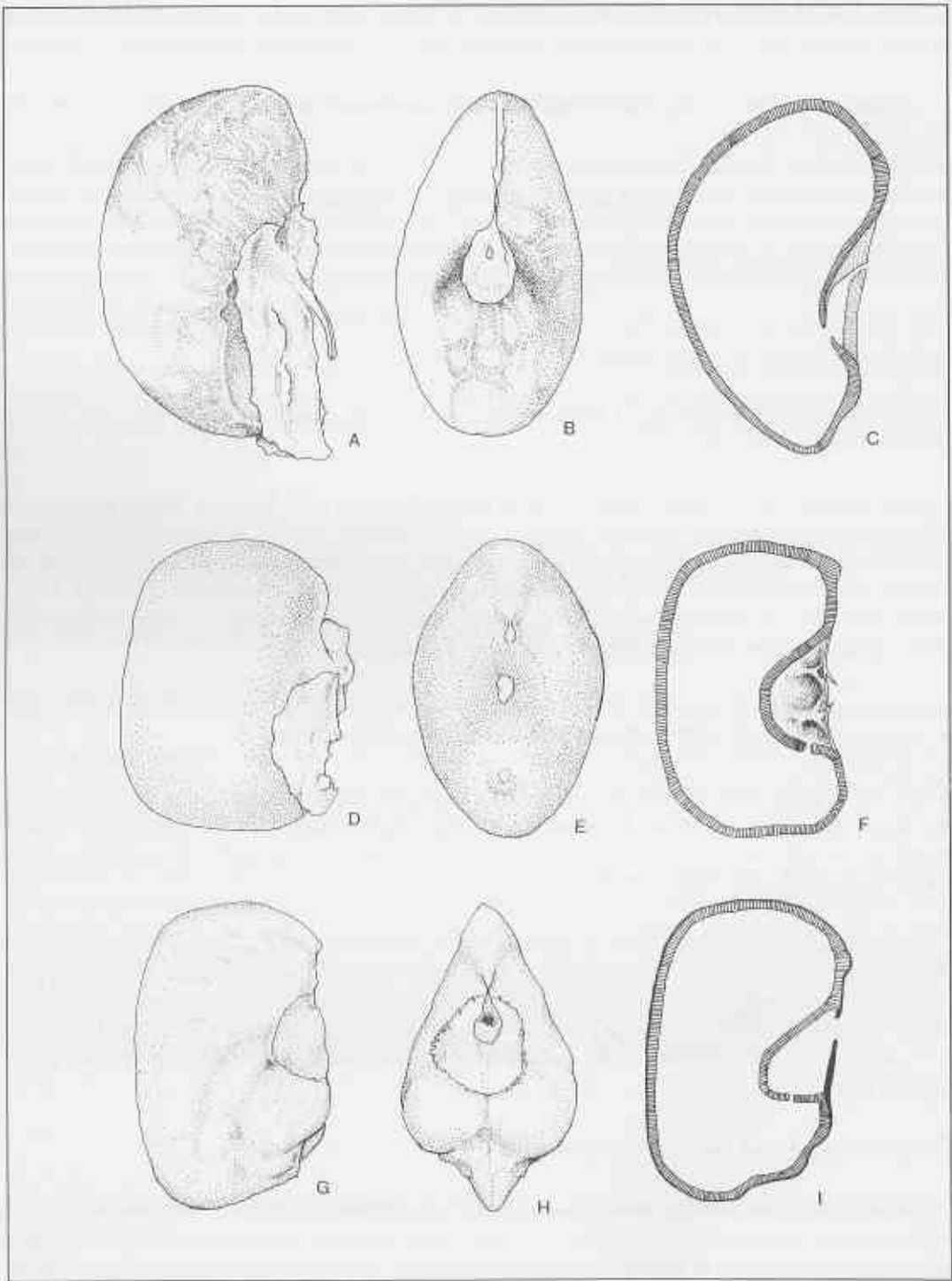


Figure 2. A-C. Seed of *Eriostemon australasius* (x10) from C. Dunn & T. James 580 (NSW). A - lateral view; B - view of adaxial surface; C - longitudinal radial section. D-F. Seed of *Philotheca deserti* subsp. *deserti* (x20) from Paul G. Wilson 13076 (PERTH). D - lateral view, placental endocarp present; E - view of adaxial surface, placental endocarp removed; F - longitudinal radial section. G-I. Seed of *Philotheca difformis* (x10) from Adelaide Botanic Garden, 1965. G - lateral view; H - view of adaxial surface; I - longitudinal radial section.

Typus: Summit of Mt Tozer, Queensland, 28 July 1986, K. Hill 1839, P. Hind & D. Healey (holo: BRI ex NSW).

Dense shrub to 1 m high. *Branchlets* ascending, reddish when young, puberulous in broad lines between glabrous leaf-decurrences. *Leaves* congested; lamina cuneate, apex obtusate and minutely glandular-apiculate, base attenuate to a short petiole, in all 7–13 mm long, 3–6 mm wide, thinly coriaceous, recurved on margin, glabrous, smooth. *Stipules* c. 0.3 mm long, resinous. *Flowers* terminal, solitary; mature bud narrowly ovoid; pedicel c. 2.5 mm long, glabrous, fleshy. *Sepals* orbicular, c. 1.5 mm long, coriaceous, glabrous. *Petals* narrowly ovate, c. 5 mm long, firm, subcoriaceous, sparsely puberulous within and towards margin outside, white to very pale pink; keel thickened. *Staminal filaments* narrowly oblong-attenuate, at their bases united to each other and to the petals, pilose; anthers suborbicular, c. 0.6 mm long with a minute reddish apiculum. *Disc* continuous with ovary. *Carpels* glabrous; style terete, pilose in lower half; stigma small, capitate. *Cocci* (immature) with a small rounded apiculum. *Seed* not seen. (Figure 3)

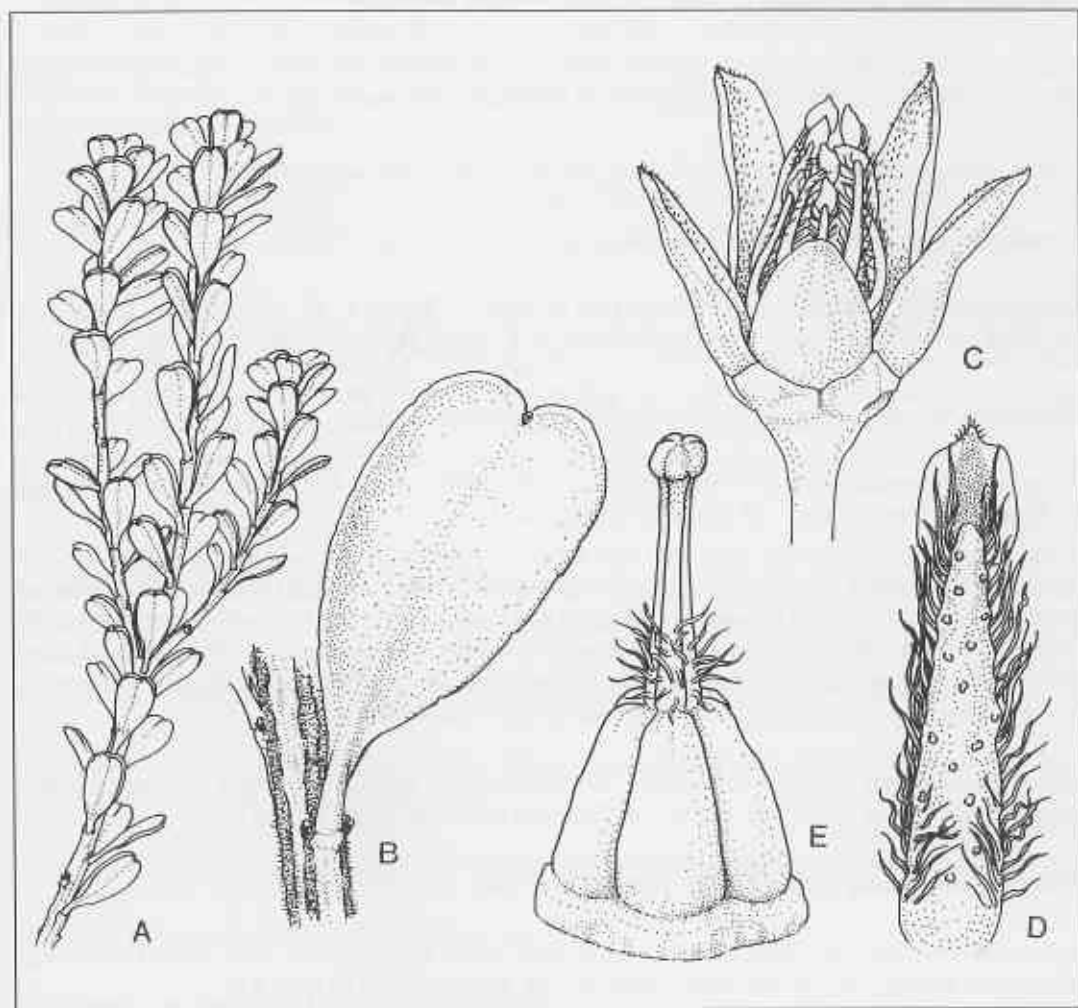


Figure 3. *Philotheca acrolopha*. A - branch (x0.8); B - leaf showing gland-like stipules (x6); C - flower (x0.7); D - petaline stamen, abaxial view (x2); E - pistil and disc (x2). From P.I. Forster 15433 (BRI).

Additional specimens examined. QUEENSLAND: Mt Tozer, P. Foster 47 (BRI); *ibid.*, M.B. Thomas 302 (BRI); *ibid.*, L.J. Brass 19483 (CANB).

Distribution. Known only from Mt Tozer, Cape York Peninsula, Queensland.

Habitat. Growing on granite near the mountain summit in heathland.

Etymology. The epithet is derived from the Greek words *acros* – summit, and *lophos* – crest, and has reference to the habitat of the plant.

Notes. This species has leaves that are different in shape from those of any other member of the genus, however, in floral morphology and in the possession of filiform sclereids it is typical of sect. *Philothea*. It is also the most northerly representative of the genus.

Philothea angustifolia (Paul G. Wilson) Paul G. Wilson, *comb. nov.*

Eriostemon angustifolius Paul G. Wilson, *Nuytsia* 1: 31 (1970). *Type:* Near Finnis River, South Australia, 25 August 1963, D.N. Kraehenbuehl 906 (*holo:* AD 96415113).

a. *Philothea angustifolia* (Paul G. Wilson) Paul G. Wilson subsp. ***angustifolia***

b. *Philothea angustifolia* subsp. ***montana*** (Paul G. Wilson) Paul G. Wilson, *comb. nov.*

Eriostemon angustifolius subsp. *montanus* Paul G. Wilson, *Nuytsia* 1: 32 (1970). *Type:* North-west slopes of Mt Difficult, Victoria, 12 October 1962, T.B. Muir 2647 (*holo:* MEL 4057; *iso:* CANB).

Philothea apiculata (Paul G. Wilson) Paul G. Wilson, *comb. nov.*

Eriostemon apiculatus Paul G. Wilson, *Nuytsia* 1: 35 (1970). *Type:* Norseman, Western Australia, 17 September 1965, J. Bale 185 (*holo:* PERTH 01615440).

Notes. This species in its typical form occurs in southern Western Australia near Norseman where it grows on ultra basic rocks. Recently a collection was made c. 180 km south-east of Norseman at Mt Buraminya. This collection differs from the specimens of the Norseman area in having leaves that are prominently channelled above (not smooth) and sepals that are less than 1 mm long (not 1.5–2 mm); further study may indicate that it should be recognized as a distinct taxon.

Philothea basistyla Mollemans, *Nuytsia* 9: 101 (1993). *Type:* south-south-east of Trayning, Western Australia, 25 August 1991, F.H. & M.P. Mollemans 4126 (*holo:* PERTH 01615440).

Philothea brevifolia (Endl.) Paul G. Wilson, *comb. nov.*

Eriostemon brevifolius A. Cunn. ex Endl. in Endl. *et al.*, Enum. Pl. Huegel 16 (1837). *Type:* Peels Range [Cocoparra Range], New South Wales, June 1817, A. Cunningham 162 (*iso:* K).

E. difformis var. *teretifolius* Benth., Fl. Austral. 1: 335 (1863). *Type:* Peels Range [Cocoparra Range], New South Wales, June 1817, A. Cunningham 162 (*lecto:* K) *fide* Wilson, *Nuytsia* 1: 31 (1970).

Notes. The name *E. difformis* var. *teretifolius* Benth. was stated by Wilson (1970) to be based on *E. brevifolius* Endl. However, Bentham cited several collections in addition to the type of that species and therefore Wilson's statement should be taken as a lectotypification.

Philotheca ciliata Hook. in T.L. Mitch., J. Exped. Int. Trop. Australia 347 (1848). – *P. australis* var. *parviflora* Benth., Fl. Austral. 1: 348 (1863). *Type:* Mount Faraday, Queensland, 10 October 1846, Stephenson & T.L. Mitchell (*syn:* K (Mitchell 392,395, photo seen), MEL (Mitchell s.n.), TCD (Mitchell s.n.)).

Philotheca citrina Paul G. Wilson, *Nuytsia* 8: 247 (1992). *Type:* Curbur Station, Western Australia, 30 August 1989, R.C. Cranfield 7665 & S. Patrick (*holo:* PERTH 1461192).

Philotheca coateana Paul G. Wilson, *sp. nov.*

Frutex ad 50 cm altus. Ramuli laeves, griseo-viridi, glabri. Folia exstipulata; lamina ellipsoidea, 3–4 mm longa, giseo-virida, obtusa, glabra, supra applanata. Flores terminales, solitarii; pedicellus 1–3 mm longus, glaber. Sepala late-triangularia, c. 3 mm longa, glabra. Petala elliptica, 7–9 mm longa, intra sparse puberula, extra glabra, alba, costa pallido-rubra. Filamenta staminalia libra, lanato-ciliata; anthera minute albo-apiculata.

Typus: 20 km south of Bulga Downs Station boundary, Western Australia, 3 August 1993, K.H. Coate 292 (*holo:* PERTH 03281973).

Shrub to 50 cm high. *Branchlets* smooth, greyish green, glabrous. *Leaves* exstipulate; lamina ellipsoid, 3–4 mm long, dull greyish green, flattened above, obtuse, glandular-punctate, glabrous. *Flowers* terminal, solitary; pedicel 1–3 mm long, glabrous. *Sepals* broadly triangular, c. 3 mm long, smooth, glabrous. *Petals* elliptic, 7–9 mm long, sparsely puberulous within, glabrous outside, white with pink midrib. *Staminal filaments* free, linear-attenuate, woolly ciliate; anther c. 1.5 mm long, minutely white-apiculate. *Style* terete, glabrous. *Cocci* truncate, with a slender apiculum c. 1.5 mm long.

Additional specimens examined. WESTERN AUSTRALIA: Boundary of Perrinvale and Walling Rock Stations, R.J. Cranfield 7169 (CANB, PERTH); near Menzies, Sep. 1927, C.A. Gardner & W.E. Blackall (PERTH); 18 miles [29 km] W of Old Gidgee, R.D. Royce 10457 (PERTH).

Distribution. Found near Menzies in the Austin Botanical District of Western Australia.

Conservation status. Known from a few collections over an area of 300 km. CALM Conservation Code for Western Australian Flora: Priority Three.

Etymology. Named after the naturalist Kevin Coate who drew my attention to this species.

Note. This species is similar to *P. eremicola*, q.v.

Philotheca coccinea (C.A. Gardner) Paul G. Wilson, *comb. nov.*

Eriostemon coccineus C.A. Gardner, *Hooker's Icon. Pl.* 34: t. 3378 (1939). *Type:* Near Koorarawalyee, Western Australia, October 1931, W.E. Blackall 936 (*holo:* PERTH 01615483).

Philotheca cuticularis Paul G. Wilson, *sp. nov.*

Frutex rotundatus ad 60 cm altus. Ramuli glanduloso-verrucosi, sparse puberuli; cuticula mox secedens, tunicam formans. Folia congesta, minutissime stipulata vel exstipulata; lamina carnosa, subteretia, 1.5–2 mm longa, glanduloso verrucosa, glabra, supra applanata, apice obtusa vel rotundata. Flores terminales, solitarii; pedicellus carnosus, 0.5–1 mm longus, sparse puberulus. Sepala glabra, amplitudine admodum variabilia, triangularia *c.* 1 mm longa vel semiteretia obtusa foliacea *c.* 2 mm longa. Petala elliptica, *c.* 2.5 mm longa, alba, intra puberula, extra glabra. Stamina libra; filamenta lineari-attenuata, ciliata; anthera minute albo-apiculata.

Typus: Grey-Gowan Ranges, Queensland, 9 April 1984, R. W. Purdie 2075 (*holo:* CBG; *iso:* BRI *n.v.*).

Rounded *shrub* to 60 cm high. *Branchlets* glandular-verrucose, sparsely puberulous when young; cuticle soon separating as a membranous pale tunic; corky eruptions not forming. *Leaves* crowded, extremely minutely stipulate when young or exstipulate; petiole 0.3 mm long; lamina fleshy, subterete, 1.5–2 mm long, glandular-verrucose, glabrous, somewhat flattened above; apex obtuse to rounded. *Flowers* terminal, solitary. *Pedicel* fleshy, 0.5–1 mm long, very sparsely puberulous. *Sepals* glabrous, irregular in size and shape, from triangular and very fleshy with scarious margins *c.* 1 mm long, to semiterete, obtuse, foliaceous and *c.* 2 mm long. *Petals* elliptic, *c.* 2.5 mm long, white, glabrous outside, puberulous within. *Stamens* free; filaments linear-attenuate, ciliate; anthers orbicular, minutely white-apiculate. *Ovary* sparsely pilose; style short, glabrous.

Additional specimen examined. QUEENSLAND: 33 miles [53 km] E of Adavale, 16 Sep. 1967, L. Pedley 2502 (CBG).

Distribution. Found in the Gowan Range area of southern Queensland and possibly in north-west New South Wales (see below).

Etymology. The specific epithet is Latin for cuticular, and refers to the cuticle which soon separates as a grey membrane.

Habitat. Growing in shallow soil overlying laterite.

Notes. This species is unusual in having sepals that vary in size on the same flower, and that range in shape from triangular to semiterete and leaf-like.

A vegetative collection from Koonenberry Mountain, New South Wales, 17 August 1883, P.H. MacGillivray 965 (NSW 69047), appears to belong to this species.

Philotheca cymbiformis (Paul G. Wilson) Paul G. Wilson, *comb. nov.*

Eriostemon cymbiformis Paul G. Wilson, *Nyctisia* 1: 205 (1971). *Type:* Fitzgerald River Reserve, Western Australia, 7 October 1970, Paul G. Wilson 10176 (*holo:* PERTH 01066293).

Philotheca deserti (E. Pritz.) Paul G. Wilson, *comb. nov.*

Eriostemon deserti E. Pritz. in Diels & E. Pritz., *Bot. Jahrb. Syst.* 35: 320, tab. 39 A–C (1904); *Phebalium deserti* (E. Pritz.) Ewart & B. Rees, *Proc. Roy. Soc. Victoria* ser. 2, 25: 111 (1912). *Type:* Ghooli, Western Australia, October 1901, E. Pritzel 868 (*iso:* AD 96350140, K, MEL 4674, NSW 69249).

Notes. This species was placed in its own section of *Eriostemon* by Wilson (1970) who considered that it was not closely related to any other section of either *Eriostemon* or of *Phebalium*. This uncertainty was due to the presence of a broad disc and of glabrous spreading stamens. Further study has shown that its seed is typical of that found in *Philotheca* sect. *Philotheca* and that it possesses abundant filiform foliar sclereids which are also typical of that section. The chromosome number is unknown. Two subspecies are recognized.

Leaves subulate, 2–3 cm long subsp. **deserti**

Leaves fusiform to narrowly obovoid, 3–5 mm long subsp. **brevifolia**

a. *Philotheca deserti* (E. Pritz.) Paul G. Wilson subsp. *deserti*

Eriostemon intermedius Ewart *nom. illeg.*, *Proc. Roy. Soc. Victoria* ser 2, 19: 40 (1907), *non* Hook. (1849). *Type:* Cowcowing, Western Australia, August 1904, *M. Koch* 1168 (*syn:* MEL 4541, 4543); between the sources of the Blackwood River and Lake Lefroy, Western Australia, 1893, *M. Cronin* (*syn:* MEL 4542).

b. *Philotheca deserti* subsp. *brevifolia* Paul G. Wilson, *subsp. nov.*

Folia breviter petiolata; lamina fusiformis vel anguste obovoidea, 3–5 mm longa, acuta vel obtusa, supra laevis et applanata, infra rotundata.

Typus: Walling Rock Station, Western Australia, 9 September 1988, *R.J. Cranfield* 7258 (*holo:* PERTH 02251191; *iso:* CANB, K, MEL).

Leaves shortly petiolate; lamina fusiform to narrowly obovoid, 3–5 mm long, smooth and somewhat flattened above, rounded below, acute to obtuse. (Figure 4)

Specimens examined. Only known from the type collection.

Distribution. Occurs in central southern Western Australia, c. 70 km north-west of Menzies.

Habitat. Found growing on red sandy clay.

Conservation status. Although only known from one locality on unreserved land, it does not appear to be under immediate threat. CALM Conservation Code for Western Australian Flora: Priority One.

Etymology. The varietal epithet is a Latin word meaning short-leaved.

Notes. This subspecies appears to differ from the typical only in the size and shape of the leaves. It is found about 100 km north-east of the nearest recorded population of subsp. *deserti*.

Philotheca difformis* (A. Cunn. ex Endl.) Paul G. Wilson, *comb. nov.

Eriostemon difformis A. Cunn. ex Endl. in Endl. *et al.*, *Enum. Pl. Huegel* 15 (1837). *Type:* Lachlan River, New South Wales, 24 May 1817, *A. Cunningham* 163 (*iso:* K).

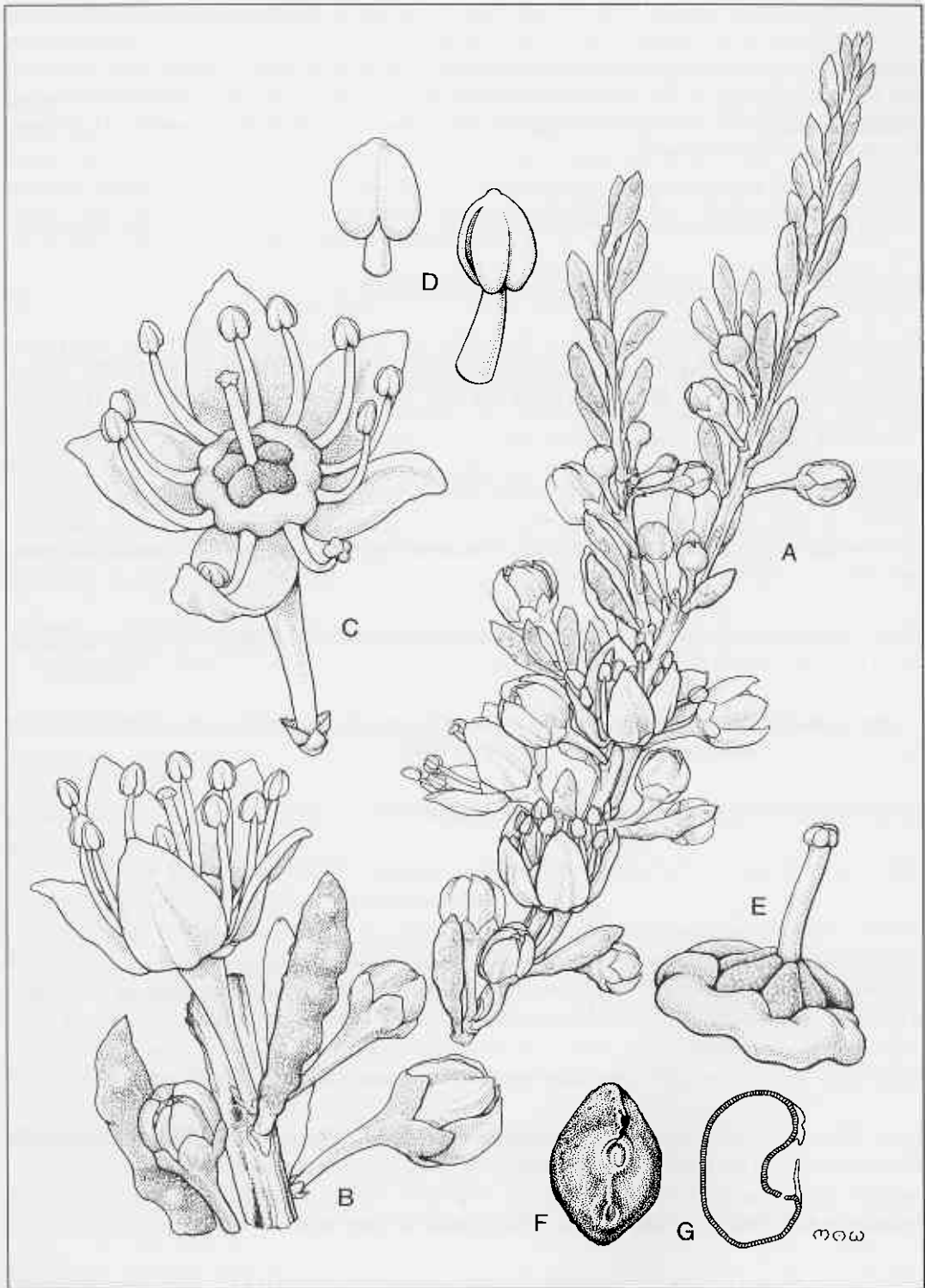


Figure 4. *Philotheca deserti* subsp. *brevifolia*. A - branch (x3); B - flowers and buds (x8); C - flower (x8); D - anthers (x20); E - pistil and disc (x10); F - seed, abaxial surface (x12); G - seed, longitudinal radial section (x12). From R.J. Cranfield 7258 (PERTH).

a. *Philotheca difformis* (Endl.) Paul G. Wilson subsp. *difformis*

E. rhombeus Lindl. in T. Mitch., J. Trop. Australia 293 (1848). *Type*: Mantuan Downs [= Drummond Var.], Queensland, 1 September 1846, T.L. Mitchell 590 (*holo*: CGE; *iso*: TCD).

b. *Philotheca difformis* subsp. *smithiana* (Benth.) Paul G. Wilson, *comb. nov.*

Eriostemon difformis subsp. *smithianus* (Benth.) Paul G. Wilson, *Nuytsia* 1: 30 (1970). – *E. difformis* var. *smithianus* Benth., Fl. Austral. 1: 335 (1863). *Type*: Wide Bay, Queensland, W. Hill (*lecto*: MEL 4094) *vide* Wilson, *loc. cit.*

E. parvifolius R. Br. ex Benth., Fl. Austral. 1: 335 (1863). *Type*: Shoalwater Bay, Queensland, 26 August 1802, R. Brown (*holo*: K; *iso*: CANB, MEL 4018).

Philotheca eremicola* Paul G. Wilson, *sp. nov.

Ex affinitate *P. coateanae* foliis congestis, anguste fusiformis, acutis *c.* 2.5 mm longis glabris nitidis, pedicellis tenuibus *c.* 4 mm longis, sepalis ovatis vel anguste triangularibus acutis vel acuminatis glandulis bruneis ornatis differt.

Typus: 5 km south-east of Tjirrkarli Outstation (Blyth Pool), Gibson Desert, Western Australia, 19 September 1992, D.J. Pearson 2875 (*holo*: PERTH 03080048).

Distribution. Only known from the type locality in the Gibson Desert, Western Australia.

Habitat. Growing in *Acacia aneura* shrubland on rocky slopes of red skeletal laterite.

Conservation status. Only known from one locality on unreserved land, but does not appear to be under threat. CALM Conservation Code for Western Australian Flora: Priority One.

Etymology. The epithet is derived from the Latin words *eremus* – a desert, and *incola* – a dweller.

Notes. This species is similar to *P. coateana* from which it differs as follows: leaves congested, narrowly fusiform, acute, *c.* 2.5 mm long, glabrous, glossy; pedicels slender, *c.* 4 mm long; sepals ovate to narrowly triangular, acute to acuminate, with prominent brown glands.

Philotheca ericifolia* (A. Cunn. ex Benth.) Paul G. Wilson, *comb. nov.

Eriostemon ericifolius A. Cunn. ex Benth., Fl. Austral. 1: 335 (1863). *Type*: Liverpool Plains, New South Wales, May 1825, A. Cunningham 13 (*holo*: K).

Philotheca falcata* (Paul G. Wilson) Paul G. Wilson, *comb. nov.

Eriostemon falcatus Paul G. Wilson, *Nuytsia* 1: 11 (1970). *Type*: Yellowdine, Western Australia, October 1931, W.E. Blackall 917 (*holo*: PERTH 01174053).

Philotheca gardneri (Paul G. Wilson) Paul G. Wilson, *comb. nov.*

Eriostemon gardneri Paul G. Wilson, *Nuytsia* 1: 33 (1970). *Type*: Jerramungup, Western Australia, September 1939, C.A. Gardner 5006 (*holo*: PERTH 01615556).

a. Philotheca gardneri (Paul G. Wilson) Paul G. Wilson subsp. **gardneri**

b. Philotheca gardneri subsp. **globosa** Paul G. Wilson, *subsp. nov.*

Philothecae gardneri subsp. *gardneri* affinis, a qua imprimis differt foliis globularibus, 1.5–2 mm longis, carnosis.

Typus: 11 km west-south-west of Dog Rock, Western Australia, 21 September 1979, J. Taylor 723 (*holo*: CBG; *iso*: PERTH 03514536).

Rounded *shrub* to 30 cm high. *Branchlets* glabrous beneath leaves, otherwise puberulous. *Stipular excrescences* prominent, reddish brown. *Leaves* glabrous; petiole *c.* 0.5 mm long; lamina globular, 1.5–2 mm long, fleshy; apex rounded. *Flowers* terminal, solitary; pedicel *c.* 1.5 mm long, puberulous. *Sepals* ovate, *c.* 1.5 mm long, very fleshy with a narrow scarious margin, ciliate, otherwise glabrous. *Petals* ovate, *c.* 6 mm long, white, glabrous outside, puberulous within. *Stamens* free; filaments linear-attenuate, woolly-ciliate; anthers *c.* 0.8 mm long, apiculum 0.3–1.0 mm long, white. *Ovary* puberulous towards apex; style short, glabrous. *Fruit* not seen.

Specimens examined. WESTERN AUSTRALIA: 22.5 km ENE of Coujinup Hill, M.A. Burgman 1535 (PERTH); 40 km ENE of Muckinwobert Rock, M.A. Burgman 2190a (PERTH); 39 km SSW of Peak Eleanora, M.A. Burgman 1928a (PERTH).

Distribution. Known from a small area between Ravensthorpe and Norseman in southern Western Australia.

Habitat. Growing on sand in heathland.

Etymology. The specific epithet refers to the shape of the leaves.

Notes. This subspecies is distinctive because of the shape and size of its leaves which in the typical subspecies are narrowly clavate and 5–8 mm long.

Philotheca glabra (Paul G. Wilson) Paul G. Wilson, *comb. nov.*

Eriostemon glaber Paul G. Wilson, *Nuytsia* 1: 35 (1970). *Type*: Cowcowing, Western Australia, September 1904, M. Koch 1020 (*holo*: NSW; *iso*: PERTH 01615564).

Philotheca kalbarriensis Paul G. Wilson, *sp. nov.*

Philothecae wonganensi affinis sed foliis fusiformis, staminum filamentis ciliatis, disco angustiore differt.

Typus: Kalbarri National Park, Western Australia, 4 August 1996, G.J. Keighery & N. Gibson 2034 (*holo*: PERTH 04629817).

Shrub to 1 m; branchlets ascending, reddish brown except for short green leaf decurrencies, sparsely puberulous when young otherwise glabrous. *Leaves* ascending, crowded, narrowly fusiform, c. 4 mm long, flattened and sulcate above, rounded below and sparsely glandular-bullate. *Flowers* axillary, solitary; pedicel 1–2 mm long. *Sepals* deltate, c. 0.7 mm long, fleshy, glabrous. *Petals* ovate, obtuse, c. 3 x 2 mm, glabrous, white. *Stamens* free; filaments linear, moderately ciliate; anthers suborbicular, c. 0.5 mm long with a prominent rounded white apiculum c. 0.2 mm long. *Disc* narrow, glabrous. *Ovary* glabrous; style terete, glabrous, c. 0.5 mm long; stigma capitate.

Additional specimen examined. WESTERN AUSTRALIA: 320 miles [c. 510 km] S of Carnarvon on Geraldton road, I. Olsen 575 (PERTH).

Distribution. Only known for certainty from Kalbarri National Park, c. 120 km north of Geraldton, Western Australia.

Habitat. *Acacia acuminata* scrub over mixed heath.

Etymology. The specific epithet refers to the Kalbarri National Park within whose boundaries the type, and possibly also the paratype, were collected.

Conservation status. The only locality where this is known to occur is in a national park. CALM Conservation Code for Western Australian Flora: Priority Two.

Notes. This species differs most noticeably from *P. wonganensis*, to which it is most closely allied, in leaf shape, in having ciliate staminal filaments, and in having a narrow disc.

Philotheca langei Mollemans, *Nuytsia* 9: 98 (1993). *Type*: North-west of Chiddarcooping Hill, Western Australia, 25 August 1991, F.H. & M.P. Mollemans 4127 (*holo*: PERTH 2005360).

Philotheca linearis (A. Cunn. ex Endl.) Paul G. Wilson, *comb. nov.*

Eriostemon linearis A. Cunn. ex Endl. in Endl. *et al.*, Enum. Pl. Huegel 16 (1837) *Type*: Barren ranges on the Lachlan River, New South Wales, 22 June 1817, A. Cunningham (?iso: K 'Peels Range, June 1817, A. Cunningham 161').

E. halmaturorum F. Muell., *Linnaea* 25: 376 (1853). *Type*: Elders Range, South Australia, October 1851, F. Mueller (*holo*: MEL 4021).

Philotheca nutans (Paul G. Wilson) Paul G. Wilson, *comb. nov.*

Eriostemon nutans Paul G. Wilson, *Nuytsia* 1: 28 (1970). *Type*: Ninghan, Western Australia, 17 August 1953, C.A. Gardner 12030 (*holo*: PERTH 01066285).

Philotheca pachyphylla (Paul G. Wilson) Paul G. Wilson, *comb. nov.*

Eriostemon pachyphyllus Paul G. Wilson, *Nuytsia* 1: 27 (1970). Type: 20 miles [32 km] west of Coolgardie, Western Australia, 17 September 1962, *M.E. Phillips* (*holo*: AD 964251).

Philotheca reichenbachii Sieber ex Sprengel, *Syst. Veg.* 4 pt 2: 253 (1827). *Philotheca reichenbachiana* Sieber ex Reichb. *nom. illeg.*, *Iconogr. Bot. Exot.* 200 (1828) based on above. *Philotheca australis* var. *reichenbachiana* Maiden & Betche, *Proc. Linn. Soc. New South Wales* 29: 736 (1905). Type: "Nov. Holl.", *F.W. Sieber* 308 (*iso*: K, MEL 232756, TCD).

Philotheca longifolia Turcz., *Bull. Soc. Naturalistes Moscou* 22/2: 16 (1849). Type: Nova Hollandia, *W. Stephenson* 147 (*holo*: KW, photo seen).

Nomenclature. Sprengel failed to cite any collections under *P. reichenbachii*, and while his description is too brief to permit precise identification, since he attributed the name to Sieber, it can be assumed that it was based on a Sieber collection from New South Wales. When H.G.L. Reichenbach redescribed and illustrated the species, and at the same time altered the spelling of the epithet to *reichenbachiana*, he cited Sieber 308 as his source. Bentham (1863) recognized this species [as *Philotheca Reichenbachiana*] and cited only 308 of the Sieber collections. I have therefore assumed this to be the type since it appears to have been the only collection of this species made by Sieber.

Notes. Although this species was recognized as distinct from *P. australis* (= *P. salsolifolia*) by Bentham (1863) his description failed to include the long hairs on the anthers which is its most distinctive feature. Possibly because of this omission Mueller (1869) and subsequent botanists have considered the two taxa to be conspecific. *Philotheca reichenbachii* is only found in the vicinity of Sydney.

Philotheca rhomboidea (Paul G. Wilson) Paul G. Wilson, *comb. nov.*

Eriostemon rhomboideus Paul G. Wilson, *Nuytsia* 1: 34 (1970). Type: 1 km north of Lake King township, 16 September 1964, *Paul G. Wilson* 3228 (*holo*: AD; *iso*: PERTH 01616005).

Philotheca salsolifolia (Sm.) Druce, *Bot. Soc. Exch. Club Brit. Isles* 4: 639 (1917). – *Eriostemon salsolifolius* Sm. in Rees, *Cyclo.* 13: n. 3 (1809). – *Philotheca australis* Rudge *nom. illeg.*, *Trans. Linn. Soc. Botany* 11: 298 (1816). Type: Port Jackson, New South Wales, 1795, *J. White* (*syn*: LINN, photo seen).

Note. Two subspecies can be recognized.

a. Philotheca salsolifolia (Sm.) Druce subsp. **salsolifolia**

Philotheca gaudichaudii G. Don, *Gen. Syst.* 1: 792 (1831) *nomen subnudum*. Type: Port Jackson, New South Wales, *T.N. Baudin* (*iso*: K), see below.

Eriostemon gracile Graham, *Edinburgh New Philos. J.* 16: 175 (1834) *ex descr.* Type: "raised from seed imported by Mr Cunningham, at Comely Bank Nursery, Edinburgh" (*n.v.*).

Leaves well-spaced to somewhat crowded, semiterete, thick, blunt, 3–5 mm long, to slender, acute, to 12 mm long, glabrous or sparsely ciliate. *Pedicels* turbinate 1–2 mm long. *Cocci* almost erect.

Typification. A collection of *P. salsolifolia* at herb. K that was received from the Paris Herbarium in December 1880 is labelled *Philothea Gaudichaudii* Don/Cap Baudin/Nouvelle-Hollande/Port Jackson. I consider it to be a probable isotype of the latter name.

Distribution. Occurs in near coastal New South Wales from near Taree south to near Bega, and inland near Coonabarabran and Pilliga.

Habitat. Generally growing in heathland on sandstone.

Notes. A widely distributed and variable subspecies.

b. *Philothea salsolifolia* subsp. *pedicellata* Paul G. Wilson, *subsp. nov.*

Folia congesta, lineares, acuta, supra applanata, c. 10 mm longa, glabra. Pedicelli tenues, c. 8 mm longi. Cocci divergentes.

Typus: 1 mile [1.6 km] from the coast and 4.5 miles [7.2 km] south of Yamba, New South Wales, 30 June 1966, L.P. & D.J. McGillivray 2145 (*holo:* NSW 93929).

Leaves crowded, flattened above, linear, acute, c. 10 mm long, glabrous. *Pedicels* slender, c. 8 mm long. *Cocci* spreading.

Additional specimens examined. NEW SOUTH WALES: Angourie, 20 Sep. 1970, M.E. Phillips CBG 035333 (BRI); Angourie Bay, B. Auld 120484 (NSW).

Distribution. Known only from near Angourie on the north coast of New South Wales.

Habitat. Growing on sand in coastal or near coastal situations.

Etymology. The subspecific epithet refers to the prominent pedicels of the flowers.

Philothea sericea* (Paul G. Wilson) Paul G. Wilson, *comb. nov.

Eriostemon sericeus Paul G. Wilson, *Nuytsia* 1: 37 (1970). *Type:* 15 miles [c. 24 km] east of Kalli, Western Australia, 22 July 1958, N.H. Speck 1041 (*holo:* CANB; *iso:* PERTH 01616013).

Philothea sporadica* (M. Bayly) Paul G. Wilson, *comb. nov.

Eriostemon sporadicus M. Bayly, *Austral. Syst. Bot.* 7: 275 (1994). *Type:* 110 km south-west of Kogan, Queensland, 13 September 1992, M.J. Bayly, M. Duretto & N. Marsh MJB 149 (*iso:* PERTH 04097246).

Philothea thryptomenoides* (S. Moore) Paul G. Wilson, *comb. nov.

Eriostemon thryptomenoides S. Moore, *J. Linn. Soc. Bot.* 45: 166 (1920). *Type:* Nungarin, Western Australia, F. Stoward 784 (*n.v.*) *ex descr.*

Philotheca tomentella (Diels) Paul G. Wilson, *comb. nov.*

Eriostemon tomentellus Diels, *Bot. Jahrb. Syst.* 36: 320 tab. 39 G–J (1904). *Type*: South of Menzies, Western Australia, *F. Diels* 5164a (*holo*: B n.v. destroyed); 5 km north of Comet Vale, Western Australia, 5 July 1995, *R.J. Cranfield* 9852 (*neo*: PERTH 04366921), neotype here chosen.

E. stowardii S. Moore, *J. Linn. Soc. Bot.* 45: 166 (1920). *Type*: Trayning, Western Australia, *F. Stoward* 291 (*syn*: MEL 4547); Nungarin, Western Australia, *F. Stoward* 794 (*syn*: n.v.).

Philotheca tubiflora A.S. George, *Nuytsia* 1: 208 (1971). *Type*: Near Point Kidman, Western Australia, 29 June 1963, A.S. George 4506 (*holo*: PERTH 1070541).

Philotheca wonganensis (Paul G. Wilson) Paul G. Wilson, *comb. nov.*

Eriostemon wonganensis Paul G. Wilson, *Nuytsia* 4: 47 (1982). *Type*: 13.5 km north-east of Wongan Hills township, Western Australia, 1 September 1980, *K.F. Kenneally* 7466 (*holo*: PERTH 01005391).

Sect. 2. **Erionema**

Philotheca sect. *Erionema* (F. Muell.) Paul G. Wilson, *comb. nov.*

Eriostemon sect. *Erionema* F. Muell., *Pl. Victoria* 1: 121 (1862). *Type*: *E. myoporoides* DC., *fide* Paul G. Wilson, *Nuytsia* 1: 38 (1970).

Eriostemon sect. *Osmanthos* Paul G. Wilson, *Nuytsia* 1: 51 (1970). *Type*: *E. brucei* F. Muell. [= *P. brucei* (F. Muell.) Paul G. Wilson].

Critical features. Leaves with tracheoids, exstipulate, glabrous or with simple or rarely stellate hairs. Petals glabrous or with simple hairs, 1-nerved. Staminal filaments narrowly oblong, abruptly narrowed in upper third, usually pilose; anther with 2 (rarely more) glands (sometimes obscure) at base of thin white apiculum. Seed flattened-ellipsoid, 3.5–5 mm long; aril a narrow, fleshy cord along adaxial margin; outer testa somewhat coriaceous, smooth, glossy; sclerotesta smooth; hilum a prominent linear groove; raphe basal fleshy, prominent, covered by a thin black crustaceous layer; placental endocarp membranous, deciduous. (Figure 5)

Chromosome number. $n=14$ in *Philotheca buxifolia*, *P. hispidula*, *P. myoporoides*, *P. obovalis* and *P. scabra* (Smith-White 1954).

Notes. The nine species of this section differ most noticeably from those of sect. *Philotheca* in having two (or more) imbedded glands at the base of the anther apiculum, and in having a seed which is laterally flattened with a linear hilum and coriaceous outer testa. Recent work has shown that the anthers of *P. brucei*, the type of sect. *Osmanthos*, also have a biglandular apiculum and that its seed (Figure 5D–F) is similar to that of *E. myoporoides* (Figure 5A–C).

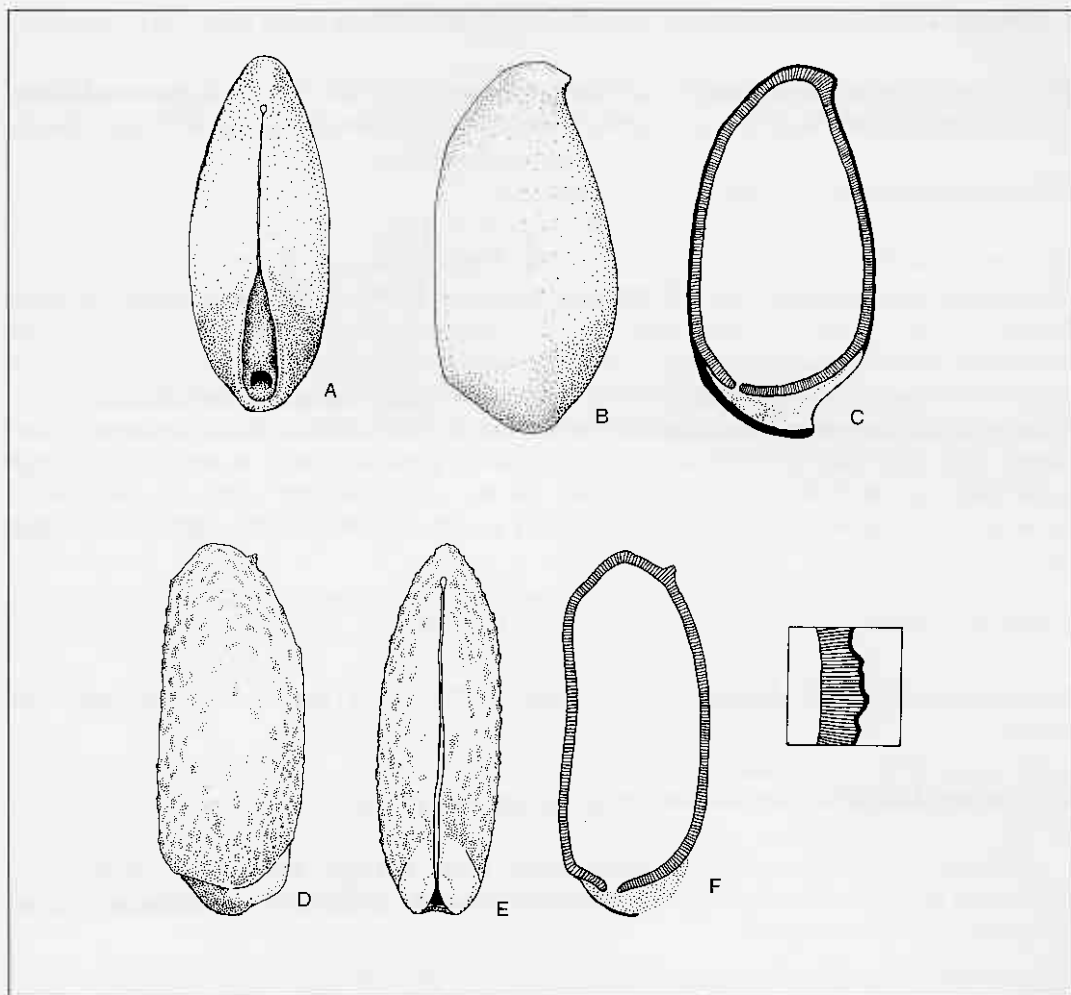


Figure 5. A–C. Seed of *Philotheca myoporoides* (x12), from *J.H. Maiden* (NSW 68749). A – view of adaxial surface; B – lateral view; C – longitudinal radial section. D–F. Seed of *Philotheca brucei* subsp. *brucei* (x10), from *R.D. Royce* 4473 (PERTH). D – lateral view; E – view of adaxial surface; F – longitudinal radial section, with magnified section through testa.

Philotheca brucei (F. Muell.) Paul G. Wilson, *comb. nov.*

Eriostemon brucei F. Muell., *Fragm.* 7: 38 (1869). *Type*: Near Lake Barlee, Western Australia, 1869, *J. Forrest* (*holo*: MEL 4533).

a. *Philotheca brucei* subsp. *brevifolia* (Paul G. Wilson) Paul G. Wilson, *comb. nov.*

Eriostemon brucei subsp. *brevifolius* Paul G. Wilson, *Nuytsia* 1: 52 (1970). *Type*: 34 miles [c. 54 km] east of Mount Magnet, Western Australia, 27 August 1957, *J.W. Green* 1618 (*holo*: PERTH 01615459).

b. *Philotheca brucei* (F. Muell.) Paul G. Wilson subsp. ***brucei***

c. *Philotheca brucei* subsp. *cinerea* (Paul G. Wilson) Paul G. Wilson, *comb. nov.*

Eriostemon brucei subsp. *cinereus* Paul G. Wilson, *Nuytsia* 1: 53 (1970). *Type*: Ejah, between Mileura and Nookawarra Stations, Western Australia, 2 June 1961, S.J.J. Davies (*holo*: PERTH 01615467).

Philotheca buxifolia (Sm.) Paul G. Wilson, *comb. nov.*

Eriostemon buxifolius Sm. in Rees, *Cycl.* 13: (1809). *Type*: Port Jackson, New South Wales, J. White (*lecto*: LINN, Smith herb. no 755.3, left-hand specimen), see P.G. Wilson, *Nuytsia* 1: 45 (1970) and note below.

Typification. Two 'varieties' were described by Smith under *E. buxifolius* but he gave no names to these. Wilson (1970) lectotypified the species name on the variety with the leaves "broadly elliptical, heart-shaped, and embracing the stem at their base generally even and entire at their edges, though occasionally furnished, in the very same manner, with blunt glandular teeth". At the time Wilson had not seen the corresponding specimen in herb. LINN but this omission has since been rectified (see above).

a. *Philotheca buxifolia* (Sm.) Paul G. Wilson subsp. ***buxifolia***

Eriostemon buxifolius var. *ellipticus* G. Don, *Gen. Hist.* 1: 792 (1831). *Type*: based on lectotype of the species.

b. *Philotheca buxifolia* subsp. ***falcata*** Paul G. Wilson, *subsp. nov.*

Philothecae buxifoliae subsp. *buxifoliae* affinis, a qua imprimis differt foliis conduplicatis, falcatis, ubi applanatis late ellipticis c. 10 mm longis 8 mm latis, acutis basi cuneatis, supra laevibus infra verrucosis in statu siccatis.

Typus: 4.5 km south-west of Jervis Bay on the Caves Beach Road, Australian Capital Territory, 12 October 1971, R. Coveny 3720 (*holo*: NSW 298558; *iso*: PERTH 00934615).

Similar to subsp. *buxifolia* but with leaves conduplicate falcate (or if flattened then broadly elliptic), c. 10 mm long and 8 mm wide, acute, narrowed at base, smooth above, somewhat verrucose below when dry.

Selected specimens examined. NEW SOUTH WALES: Point Perpendicular, July 1965, W. McRae (NSW); Beecroft Peninsula, A.M. Lyne 377 (CANB, PERTH).

Distribution. Jervis Bay area of the Australian Capital Territory and New South Wales.

Habitat. Found near the coast growing in sandy soil in dry sclerophyll forest.

Etymology. The Latin epithet *falcata* means falcate and refers to the shape of the leaf when folded.

Note. This subspecies appears to grade northward into subsp. *buxifolia*.

c. *Philotheca buxifolia* subsp. *obovata* (G. Don) Paul G. Wilson, *comb. nov.*

Eriostemon buxifolius subsp. *obovatus* (G. Don) Paul G. Wilson, *Nuytsia* 1: 45 (1970). -- *E. buxifolius* var. *obovatus* G. Don, Gen. Hist. 1: 792 (1831). *Type*: Port Jackson, New South Wales, 1795, J. White (*holo*: LINN Smith herb. n. 755.3, right-hand specimen).

[*Eriostemon buxifolius* var. 'a', Augustin P. de Candolle, Prod. 1: 720 (1824).]

Notes. No reference was given by G. Don for the use of the varietal epithet *obovatus* nor was any material cited by him. However, the reference "Smith in Rees" was given for the species, and the description of the variety is a translation of that provided by de Candolle for *Eriostemon buxifolius* var. *a*. De Candolle's description in its turn was based on the description given by Smith, *loc. cit.*, for the variety in which "the leaves are obovate, narrow at the base, bluntly crenate and glandular at the edges".

Philotheca hispidula (Spreng.) Paul G. Wilson, *comb. nov.*

Eriostemon hispidulus Sieber ex Spreng., Syst. Veg. 4/2: 164 (1827). *Type*: F.W. Sieber 305 (*iso*: K, MEL 4286 & 4534, TCD).

Philotheca obovalis (A. Cunn.) Paul G. Wilson, *comb. nov.*

Eriostemon obovalis A. Cunn. in Field, Geogr. Mem. New South Wales 331 (1825). *Type*: Blue Mountains, New South Wales, October 1822, A. Cunningham 45 (*holo*: K; *iso*: BRI 014176, CANB 251249, MEL 4532).

Philotheca scabra (Paxton) Paul G. Wilson, *comb. nov.*

Eriostemon scaber Paxton, Paxton's Mag. Bot. 11: 190 (1844). *Type*: cult. Messrs Henderson; seeds from gardens of C.A.A. von Huegel (*n.v.*).

E. scaber Gerard *nom. illeg.*, Hort. Univ. ser. 2, 7: 131 (1846), later homonym. *Type*: No mention of origin (*n.v.*).

E. scaber A.DC. *nom. illeg.*, Not. Pl. Rar. 10: 8 (1848), later homonym. *Type*: "Cette espece introduite dans les jardins de Belgique, a ete presentee par M. Muzy dans une exposition de fleurs, le 22 avril 1846, a Geneve" (*n.v.*).

a. *Philotheca scabra* subsp. *latifolia* (Paul G. Wilson) Paul G. Wilson, *comb. nov.*

Eriostemon scaber subsp. *latifolius* Paul G. Wilson, *Nuytsia* 1: 44 (1970). *Type*: Bundanoon, New South Wales, 27 September 1957, J.C.R. Holford 259 (*holo*: NSW 68808).

b. *Philotheca scabra* (Paxton) Paul G. Wilson subsp. ***scabra***

Philotheca trachyphylla (F. Muell.) Paul G. Wilson, *comb. nov.*

Eriostemon trachyphyllus F. Muell., *Defin. Austral. Pl.* 22 (June–July 1855); *Trans. Philos. Soc. Victoria* 1: 99 (Sept. 1855). *Type*: Snowy River near the Pinch Range, New South Wales, F. Mueller (*holo*: MEL 4531; *iso*: K).

Philotheca verrucosa (A. Rich.) Paul G. Wilson, *comb. nov.*

Eriostemon verrucosus A. Rich., *Voy. Astrolabe Bot.* pt. 2. Atlas tab. 26 (1833) with analysis; *Sertum Astrolabianum* 74 (1834). *Type*: "Crescit in Nova-Hollandia loco dicto baie Morton", Moreton Bay, Queensland [actually collected in Tasmania], (*n.v.*), see note.

? *E. dolabratus* H.G.L. Reichenbach, *Ic. Bot. Exot. Cent.* 2: 36 (1828). *Type citation*: "E Nova Hollandia", (*n.v.*).

E. obcordatus A. Cunn. ex Hook., *J. Bot. Hooker* 1: 254 (1834). *Type*: "About Hobart Town -- Mr Cunningham, Mr Lawrence, 1831, (n.153) R.C. Gunn, (n.14)" (*syn*: K, A. Cunningham 17).

Notes. Moreton Bay is in Queensland, however, the plant illustrated in the protologue of *Eriostemon verrucosus* must have come from Tasmania. The French explorer, Admiral Dumont D'Urville, commander of the corvette L'Astrolabe, visited Hobart in December 1827 when the type could have been collected.

The application of the name *Eriostemon dolabratus* is uncertain and therefore it has not been taken up for this species.

Philotheca virgata (Hook. f.) Paul G. Wilson, *comb. nov.*

Eriostemon virgatus Hook. f., *J. Bot. Hooker* 2: 417 (1840). *Type*: Rocky Cape, Tasmania, 1837, R.C. Gunn 485 (*lecto*: K; ? *isolecto*: NSW, see Wilson (1970)).

Sect. 3. **Corynonema**

Philotheca sect. *Corynonema* (Paul G. Wilson) Paul G. Wilson, *comb. nov.*

Eriostemon sect. *Corynonema* Paul G. Wilson, *Nuytsia* 1: 53 (1970). *Type*: *E. pungens* Lindl. [= *Philotheca pungens* (Lindl.) Paul G. Wilson].

Critical features. *Branchlets* pilosulose in furrows between leaf-decurrences. *Leaves* with tracheoids, exstipulate, linear or terete. *Flowers* solitary, axillary or terminal. *Petals* minutely papillose within, otherwise glabrous. *Staminal filaments* erect or inflexed, thick, abruptly apiculate at apex, glabrous or pilose; anthers minutely white-apiculate, eglandular. *Seed* somewhat reniform, plump, 2–4 mm long, with the attached (placental) endocarp sub-coriaceous and persistent; testa black, longitudinally striate, not easily separable into two layers, sclerotesta dominant, hilum short, narrowly oblong in centre of adaxial face; raphe covered with a glossy crustaceous layer. (Figure 6A–F)

A section of three species, two occurring in Western Australia and one in South Australia and Victoria.

Notes. The seed morphology alone readily distinguishes this section from the others in *Philothea* and suggests that the three species are more closely related to each other than their floral and vegetative morphologies would indicate.

Philothea fitzgeraldii (C.R.P. Andrews) Paul G. Wilson, *comb. nov.*

Eriostemon fitzgeraldii C.R.P. Andrews, *J. W. Austral. Nat. Hist. Soc.* no. 1: 37 (May 1904). *Type:* North of Esperance, Western Australia, October 1903, C.R.P. Andrews (*syn:* PERTH 01615513, 01615521).

E. apricus Diels & E. Pritzel, *Bot. Jahrb. Syst.* 35: 321 (Oct. 1904); *Phebalium apricum* (Diels) Ewart & B. Rees, *Proc. Roy. Soc. Victoria* ser. 2, 25: 111 (1912). *Type:* Near Gilmores, Western Australia, L. Diels 5267 (*iso:* PERTH 01615548).

E. gibbosus Luchm. ex Ewart, *Proc. Roy. Soc. Victoria* ser. 2, 20: 79 (1907). *Type:* Near Norseman, Western Australia, 1897, J.D. Batt (*holo:* MEL 4719).

Philothea pinoides (Paul G. Wilson) Paul G. Wilson, *comb. nov.*

Eriostemon pinoides Paul G. Wilson, *Nuytsia* 1: 54 (1970). *Type:* Summit of Mt Peron, Western Australia, 26 August 1949, C.A. Gardner 9408 (*holo:* PERTH 1137247).

Philothea pungens (Lindl.) Paul G. Wilson, *comb. nov.*

Eriostemon pungens Lindl. in Mitchell, *Three Exped. E. Australia* 2: 156 (1838); *Phebalium pungens* (Lindl.) Benth., *Fl. Austral.* 1: 338 (1863). *Type:* Mt Hope, Victoria, 28 June 1836, T.L. Mitchell 202 (*holo:* CGE; *iso:* MEL 4902).

Sect. 4. **Cyanochlamys**

Philothea sect. *Cyanochlamys* (F. Muell.) Paul G. Wilson, *comb. nov.*

Eriostemon subgen. *Cyanochlamys* Bartl. ex F. Muell., *Pl. Indig. Col. Victoria* 1: 119 (1862). — *Eriostemon* sect. *Cyanochlamys* (F. Muell.) F. Muell., *Fragm.* 9: 110 (1875). *Type:* *E. spicatus* A. Rich. [= *Philothea spicata* (A. Rich.) Paul G. Wilson].

Critical features. *Branchlets* with stellate hairs. *Leaves* with tracheoids. *Inflorescence* a terminal cluster or raceme; pedicel with a pair of basal bracteoles or these gland-like. *Petals* thin, glabrous. *Staminal filaments* free, flattened, pilose; anther white-apiculate, not glandular. *Disc* a narrow ring around base of ovary. *Cocci* erect, apiculate or shortly rostrate. *Seed* sub-reniform, abaxial margin convex, adaxial margin straight; attached (placental) endocarp thin, caducous; aril slender, linear, along adaxial face, firmly attached to placental-endocarp and easily separated from seed; outer testa membranous; sclerotesta smooth; hilum superficial, linear; raphe small, sub-basal, covered by only a thin integument; chalaza near base of adaxial margin. (Figure 6G, H).

A section of two species, both endemic to Western Australia.

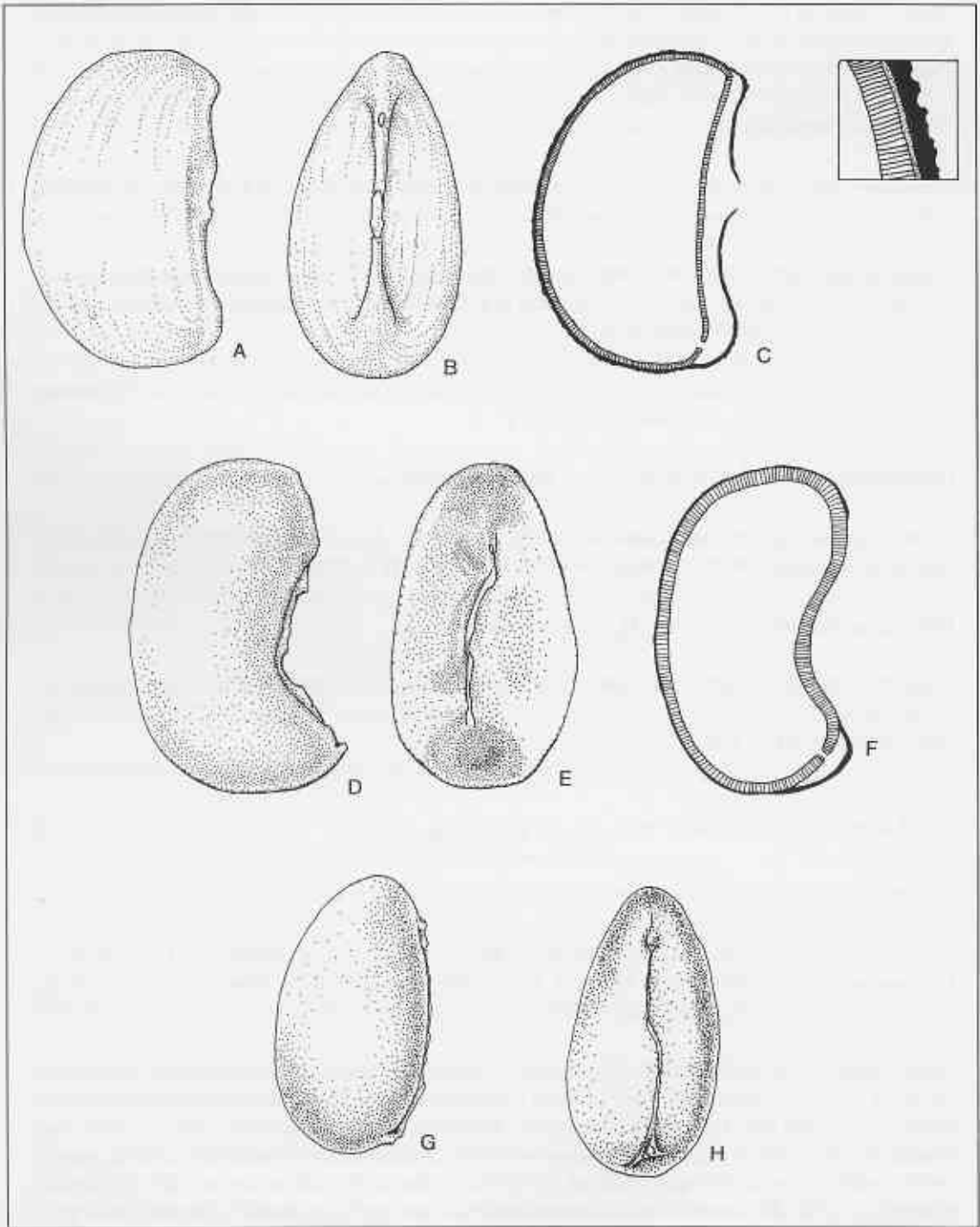


Figure 6 A-C. Seed of *Philotheca fitzgeraldii* (x10) from C.A. Gardner 2926 (PERTH). A - lateral view; B - view of adaxial surface; C - longitudinal radial section, with magnified section through testa. D-F. Seed of *Philotheca pinoides* (x10) from C. Chapman 3 Jan. 1971 (PERTH). D - lateral view; E - view of adaxial surface; F - longitudinal radial section. G, H. Seed of *Philotheca nodiflora* subsp. *lasiocalyx* (x10) from A. Strid 20961 (PERTH). G - lateral view of seed; H - view of adaxial surface.

Philothea nodiflora* (Lindl.) Paul G. Wilson, *comb. nov.

Eriostemon nodiflorus Lindl., Sketch Veg. Swan-Riv. Col. 17(1839). *Type*: Swan River Colony, Western Australia, 1839, J. Drummond s.n. (*holo*: CGE).

Distribution. This species is endemic to the south-west of Western Australia.

Note. Four subspecies can be recognized.

- 1 Flowerheads 2–3 cm diam.; petals elliptic
- 2 Sepals glabrous (but ciliate) subsp. **calycina**
- 2: Sepals pilose
- 3 Petals pilose outside subsp. **latericola**
- 3: Petals glabrous outside subsp. **nodiflora**
- 1: Flowerheads 1–1.5 cm diam.; petals obovate subsp. **lasiocalyx**

a. *Philothea nodiflora* subsp. *calycina* (Turcz.) Paul G. Wilson, *comb. et stat. nov.*

Eriostemon calycinus Turcz., *Bull. Soc. Imp. Naturalistes Moscou* 22/2: 14 (1849). *Type*: Western Australia, J. Drummond IV coll. n. 93 (*holo*: KW; *iso*: TCD).

Distribution. Found near Wooroloo and Wagin in south-western Western Australia

Habitat. This subspecies grows in gravelly soil.

b. *Philothea nodiflora* subsp. *lasiocalyx* (Domin) Paul G. Wilson, *comb. nov.*

Eriostemon nodiflorus var. *lasiocalyx* Domin, *Vestn. Kral. Ceske Spolecn. Nauk, Tr. Mat.-Prir.* 2: 54 (1923). – *E. nodiflorus* subsp. *lasiocalyx* (Domin) Paul G. Wilson, *Nuytsia* 1: 58 (1970). *Type*: Cranbrook to Warrungup, sandy plains, Mt Toolbrunup, Western Australia, A.A. Dorrien-Smith (*n.v.*).

Distribution. This subspecies occurs in southern Western Australia from Collie eastwards to Duke of Orleans Bay.

Habitat. Usually found growing in heathland on sandy loam.

c. *Philothea nodiflora* subsp. *latericola* Paul G. Wilson, *subsp. nov.*

Ex affinite *P. nodiflora* subsp. *nodiflora* sed petalis extra longe-pilosis differt.

Typus: Near York, Western Australia, 28 September 1921, P.A. Sargent (*holo*: PERTH 00895830).

Similar to subsp. *nodiflora* but with petals that are long-pilose on their abaxial surface.

Selected specimen examined. WESTERN AUSTRALIA: 13 km S on Watershed Road off Brookton Highway, R.J. Cranfield 1977 (PERTH).

Distribution. Occurs in the Darling Range, Western Australia, between York and Bannister.

Habitat. Found growing on laterite and ironstone.

Etymology. The epithet refers to the plant's preferred habitat.

d. *Philotheca nodiflora* (Lindl.) Paul G. Wilson subsp. *nodiflora*

Eriostemon nodiflorus var. *subglabriflorus* Domin, *Vestn. Kral. Ceske Spolecn. Nauk, Tr. Mat.-Prir.* 2: 54 (1923). *Type:* no specimens cited (see note below).

Distribution. This subspecies occurs between Chittering and Bindoon in the Darling Range of Western Australia.

Habitat. Found along creeks or in seasonal swamps.

Notes. Domin derived the Latin descriptions of his two varieties from the English descriptions of the two 'forms' mentioned by Bentham (1863). Bentham did not name these 'forms' and he did not indicate to which of them the collections he cited belonged. Domin cited one collection under var. *lasiocalyx* but none under var. *subglabriflorus*.

Philotheca spicata* (A. Rich.) Paul G. Wilson, *comb. nov.

Eriostemon spicatus A. Rich., *Voy. Astrolabe Bot.* part 2, Atlas tab. 27 (1833) (with analysis); *Sertum Astrolabianum* 76 (1834). *Type:* "Nova-Hollandia" (*n.v.*).

E. racemosus Endl. in Endl. *et al.*, *Enum. Pl. Huegel.* 15 (1837). *Type:* Swan-River Colony, Western Australia, *K. Huegel* (*n.v., ex descr.*).

E. ebracteatus Endl., *loc. cit.* *Type:* King George Sound, Western Australia, *K. Huegel* (*n.v., ex descr.*).

E. effusus Turcz., *Bull. Soc. Imp. Naturalistes Moscou* 22/2: 14 (1849). *Type:* Western Australia, *J. Gilbert* 95 (*holo:* KW).

Acknowledgements

I am grateful to Paul Forster for providing additional material to illustrate *Philotheca acrolopha*; to Jim Armstrong and Michael Bayly for discussions on various aspects of the taxonomy of the *Eriostemon* group; and, most particularly, to Margaret Wilson for preparing Figure 4 and to Annemarie Wilson for preparing the other illustrations used in this paper.

References

- Armstrong, J.A. (1991). "Studies on pollination and systematics in the Australian Rutaceae." Ph.D. Thesis, University of New South Wales.
- Bayly, M.J., Brophy, J.L., Forster, P.I., Goldsack, R.J., & Wilson, Paul G. (1998). Reinstatement of *Eriostemon banksii* (Rutaceae), with a report on the composition of leaf essential oils in *E. banksii* and *E. australasius* s.str. *Australian Systematic Botany* 11: 13–22.
- Bentham, G. (1863). "Flora Australiensis." Vol. 1. (Lovell Reeve: London.)
- Farr, E.R., Leussink, J.A. & Stafleu, F.A. (eds) (1979). "Index Nominum Genericorum." Vol. 1. (Bohn, Scheltema & Holkema: Utrecht.)
- Gaertner, K.F. (1805). "De fructibus et seminibus plantarum." Vol. 3. (Richter: Leipzig.)
- Guerra, M. dos S. (1984). New chromosome numbers in Rutaceae. *Plant Systematics and Evolution* 146: 13–30.
- Hartley, T.G. (1995). A new combination in *Boronella* (Rutaceae) and a view on relationships of the genus. *Bulletin du Museum National d'Histoire Naturelle*. Section B, *Adansonia* ser. 4, 17: 107–111.
- Keighery, G.J. (1978). Chromosome numbers in Western Australian Plants, I. *Journal of the Royal Society of Western Australia* 60: 105–106.
- Mueller, F. (1869). "Fragmenta Phytographiae Australiae." Vol. 7. (Government Printer: Melbourne.)
- Rao, T.A. (1991). "Compendium of foliar sclereids in angiosperms." (Wiley Eastern Ltd: New Delhi.)
- Rao, T.A. & Bhattacharya, J. (1978). Taxonomic significance of foliar sclereids in *Boronia* Sm. (Rutaceae). *Proceedings, Indian Academy of Sciences*. Section B 87: 197–203.
- Rao, T.A. & Bhattacharya, J. (1981). Comparative morphology of foliar sclereids in *Boronia* Sm. (Rutaceae). *Proceedings, Indian Academy of Sciences, Plant Sciences* 90: 9–29.
- 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.
- Wilson, P.G. (1970). A taxonomic revision of the genera *Crowea*, *Eriostemon* and *Phebalium* (Rutaceae). *Nuytsia* 1: 5–155.