

A revision of the south-western Australian genus *Babingtonia* (Myrtaceae: Chamelaucieae)

Barbara L. Rye

Western Australian Herbarium, Department of Parks and Wildlife,
Locked Bag 104, Bentley Delivery Centre, Western Australia 6983
Email: Barbara.Rye@dpaw.wa.gov.au

Abstract

Rye, B.L. A revision of the south-western Australian genus *Babingtonia* (Myrtaceae: Chamelaucieae). *Nuytsia* 25: 219–250 (2015). In this revision of *Babingtonia* Lindl., 11 species are recognised, all endemic to the south-west of Western Australia. Previously, the type species *B. camphorosmae* (Endl.) Lindl. was the only Western Australian species housed as a *Babingtonia*. The new combination *B. grandiflora* (Benth.) Rye is made, and nine new taxa are named: *B. cherticola* Rye & Trudgen, *B. delicata* Rye & Trudgen, *B. erecta* Rye & Trudgen, *B. fascifolia* Rye, *B. maleyae* Rye & Trudgen, *B. minutifolia* Rye & Trudgen, *B. pelloeae* Rye & Trudgen, *B. triandra* Rye & Hislop and *B. urbana* Rye. A key is given and some of the taxa are illustrated. Most have conservation priority.

Introduction

This paper presents a taxonomic revision of *Babingtonia* Lindl. (Myrtaceae: Chamelaucieae DC.), treating it as a genus of 11 species endemic to the South-west Botanical Province of Western Australia. The reasons for this circumscription are discussed below in relation to morphological characters, such as the distinctive anther morphology, and molecular evidence regarding the affinities of the genus. Further studies are needed to determine whether the circumscription of the genus should be expanded to encompass a wider range of anther morphology.

Taxonomic history

Babingtonia has been variously treated as a genus or as a section, or not recognised at all, and its size has waxed and waned depending mainly on the interpretation by different authors of the importance of its anther morphology. At its broadest *Babingtonia* included many species throughout Australia and a few from New Caledonia and Borneo (see Mueller 1864; Bean 1997, 1999), while at its narrowest (e.g. Schauer 1844) it consisted just of its type species, Camphor Myrtle, *B. camphorosmae* (Endl.) Lindl.

Camphor Myrtle is distributed (Figure 1A) almost as widely as the Jarrah (*Eucalyptus marginata* Sm.) forests and woodlands of south-western Australia. It was among the earliest species to be named after the establishment of a colony at the Swan River in 1829. The indigenous people used this species to

treat headaches, by inhalation of the essential oils from its crushed leaves, while the settlers used its leaves to make bush tea (Bindon 1996). In 1837 this relatively well known plant was described as *Baeckea camphorosmae* Endl. (Endlicher *et al.* 1837).

Lindley (1842) established the genus *Babingtonia*, describing its single species *B. camphorosmae* as ‘a very pretty greenhouse shrub’. Lindley noted its similarity to *Baeckea* L. in having its style base inserted below the summit of the ovary, distinguishing it from that genus by differences in its androecium. He noted that its anthers opened by apical pores rather than by longitudinal slits and that they were ‘inserted on the filaments as if the latter were half pushed into their base’. Schauer (1843, 1844) maintained *Babingtonia* as a monotypic genus, there being no very closely related species known at that time.

Mueller (1864) published new combinations in *Babingtonia* for both eastern and western Australian species that had various kinds of derived anthers, although he seemed unsure whether the genus should be recognised or included within *Baeckea*. Mueller’s very broad concept of *Babingtonia* incorporated species that had previously been placed in *Anticoryne* Turcz., *Harmogia* Schauer, *Oxymyrrhine* Schauer and *Tetrapora* Schauer.

Bentham (1862) reduced *Babingtonia* and several other genera to sections of *Baeckea*. Later, in his treatment of *Baeckea* sect. *Babingtonia* (Lindl.) Benth. & Hook.f. in *Flora Australiensis*, Bentham (1867) named a new member of the group as *Baeckea grandiflora* Benth. Bentham’s circumscription of *Babingtonia* was less broad than Mueller’s, as it was restricted to western species that had the anther cells united more fully than in the other sections, with each cell opening by a terminal pore or short slit. This concept of *Babingtonia* included *Anticoryne* and *Tetrapora* but not *Harmogia* and *Oxymyrrhine*.

For the next 140 years *Babingtonia* was treated in the literature as a synonym of *Baeckea* rather than as a distinct genus. Niedenzu (1893) had continued to recognise *Babingtonia* as a section, but he included it, together with two more of Bentham’s (1867) sections and also the genus *Scholtzia* Schauer, under his subgenus *Hysterobaeckea* Nied. All members of *Baeckea* subg. *Hysterobaeckea* had derived anthers with a fused connective gland, distinguishing them from the typical subgenus of *Baeckea* in which the connective gland was free.

From 1994 to 1996, Malcolm Trudgen established phrase names for five new species considered to be closely related to *Baeckea grandiflora*. These were *B. sp.* Bunjil (B.R. Maslin 5067), *B. sp.* Darling Range (R.J. Cranfield 1673), *B. sp.* Moora (R. Bone 1993/1), *B. sp.* Narrogin (R. Hnatiuk 780011) and *Malleostemon sp.* Cooljarloo (B. Backhouse s.n. 16/11/88). Draft descriptions had been prepared previously under his supervision for some of these taxa by Sandra Maley, and prior to that, two of the unnamed *Babingtonia* species had been treated in *Flora of the Perth Region* (Rye 1987).

Bean (1997, 1999) reinstated the genus *Babingtonia* when he was revising eastern Australian and New Caledonian species of the *Hysterobaeckea* group, including all of these species and also an unrelated species from Borneo (now placed in the genus *Seorsus* Rye & Trudgen). Wilson *et al.* (2007) favoured restricting the use of *Babingtonia* to Western Australian species. Using a combination of morphological and molecular evidence, they reinstated *Harmogia* and named two new genera, *Kardomia* Peter G. Wilson and *Sannantha* Peter G. Wilson, to accommodate the New Caledonian species and most of the eastern Australian species. However, at this stage, all of the Western Australian species were still housed under *Baeckea*, while one eastern species retained the name *Babingtonia behrii* (Schltdl.) A.R.Bean.

My study of *Babingtonia* commenced in 2002 and resulted in two more phrase names, *Baeckea sp.*

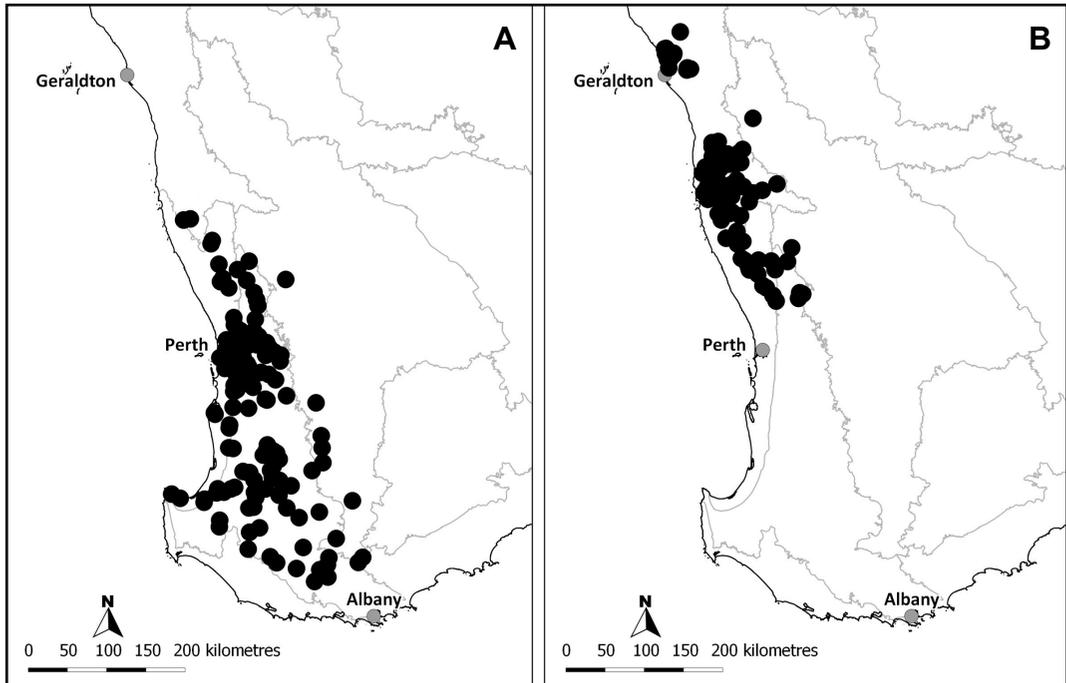


Figure 1. Distribution maps for two previously named species of *Babingtonia*. A – *B. camphorosmae* (●); B – *B. grandiflora* (●).

Perth Region (R.J. Cranfield 444) and *B. sp.* Yandanooka (R. Soullier 421), being recognised. In addition, *B. sp.* Bunney Rd (S. Patrick 4059) was established by Malcolm Trudgen and *B. sp.* Calingiri (F. Hort 1710) by Mike Hislop.

In 2010, a step was taken towards reinstating *Babingtonia* in Western Australia by changing the identification of all the Camphor Myrtle specimens at the Western Australian Herbarium (PERTH), including many specimens that were on loan from other herbaria, from *Baeckea camphorosmae* to *Babingtonia camphorosmae*. This move coincided with the Myrtaceae updates for the *Australian Plant Census* (Council of Heads of Australasian Herbaria 2007a–) and standardised the use of *Babingtonia* for this species throughout Australia.

The eastern Australian species that has been known as *Babingtonia behrii* has now become *Hysterobaeckea behrii* (Schltdl.) Rye (see Rye 2015).

Molecular evidence

In molecular studies using the *matK* gene and *atpβ-rbcL* spacer chloroplast regions, *Babingtonia camphorosmae* was placed in a strongly supported clade together with three species of *Scholtzia* and one species of *Malleostemon* J.W.Green, these five species sharing a uniquely derived indel (Lam *et al.* 2002). A later analysis (Wilson *et al.* 2004), based on the previous chloroplast regions and two additional regions (*trnK* spacer and *ndhF* gene), placed *B. camphorosmae* in a large clade that also included *Anticoryne* [as *Baeckea ovalifolia* (F.Muell.) F.Muell.], *Malleostemon*, *Scholtzia* and *Tetrapora* [as *Baeckea preissiana* (Schauer) F.Muell.].

A nuclear region (ETS), the four chloroplast regions listed above and morphological data were used in the most recent analyses published for *Babingtonia* (Wilson *et al.* 2007). That study added a second

member of the genus, *B. triandra* Rye & Hislop [as *Baeckea* sp. 'Calingiri']. These two *Babingtonia* species had a strongly supported sister relationship in each of the cladograms presented, and sister to them in all cases was the single species of *Anticoryne*. Four other clades for members of the *Hysterobaeckea* group were identified in these analyses, one consisting of the two Western Australian species *Baeckea pentagonantha* F.Muell. and *B. sp.* Dudawa (M.E. Trudgen MET 5369) [as 'megaflores'], another comprising two South Australian species, and the others comprising species from eastern Australia and New Caledonia. In some of the analyses the two Western Australian species were in an unsupported sister position to the *Babingtonia* plus *Anticoryne* clade, but there was no support for including them or any of the non-Western Australian species in *Babingtonia*.

In unpublished molecular analyses, five of the species treated in the current revision of *Babingtonia* formed a clade with high support (Peter Wilson pers. comm. 2004). The five species sampled were *B. erecta* Rye & Trudgen, *B. camphorosmae*, *B. cherticola* Rye & Trudgen, *B. pelloeae* Rye & Trudgen and *B. triandra*. This result supports the morphological evidence for including these four new Western Australian species together with the type species in *Babingtonia*.

Methods

Measurements were recorded from dry specimens using the largest leaves available and taking care to measure other organs only when they appeared to be mature and sufficiently well pressed. For leaves, the words 'in outline' are used in the descriptions to indicate the shape of the blade from top (rather than from side) view.

Distribution maps were prepared using Quantum GIS Desktop (1.8.0) and images of overseas types were examined through *Global Plants* (<http://plants.jstor.org/>).

Morphology

Habit. Most species are low shrubs 0.3 to 1.3 m high, although *B. erecta* has a maximum height of about 3 m. They are usually single-stemmed, with a tendency to become multi-branched at the base as they age, but *B. camphorosmae* can develop a lignotuber.

Stems. Young stems tend to be 4-angled and sometimes have narrow ridges (almost slight wings) protruding at the angles when very young. The oil glands in the epidermis of the new stems vary from scattered and scarcely protruding to crowded and conspicuous. In *B. cherticola* and *B. minutifolia* Rye & Trudgen they protrude to the extent that the stems are tuberculate.

Leaf arrangement. All species have opposite, decussate leaves, but occasionally some leaves of flowering stems are arranged in whorls of three in *B. pelloeae*. Several species, such as *B. fascifolia* Rye, are characterised by having the leaves densely clustered on very short lateral branchlets.

Leaf morphology. Mature leaves usually have a short but distinct petiole. The blade varies from moderately thickened to about as thick as it is broad. The abaxial surface is shallowly to deeply convex or more commonly with steep sides below a flattened surface, which often has a linear groove along the midvein. Oil glands are most commonly in only one or two main rows on each side of the midvein, but the broadest leaves may have three or more rows of glands on each side.

Inflorescence. Most *Babingtonia* species have axillary peduncles bearing monads and less commonly

triads, similar to those illustrated schematically in Briggs and Johnson (1979: Figure 12A) for *Leptospermum* J.R.Forst. & G.Forst. *Babingtonia minutifolia* appears to only have monads, whereas all of the other species produce at least some multi-flowered peduncles. One-flowered peduncles have a pair of opposite or sub-opposite bracteoles, with the stalk above this level referred to as the pedicel. Triads have secondary axes arising in the axils of each of the bracteoles and bearing another pair of bracteoles. Often there is only one secondary axis, resulting in a diad, while *B. camphorosmae* and *B. erecta* often have additional axes, resulting in up to seven flowers per peduncle. The species with the smallest flowers, *B. triandra*, is exceptional in that up to 16 flowers have been recorded per peduncle. On many-flowered peduncles, the basal bracteoles are longer than the upper bracteoles and are distinguished in the descriptions below by being referred to as bracts.

Hypanthium. In dried specimens, flowers at anthesis may have a smooth to wrinkled hypanthium, but some species such as *B. delicata* Rye & Trudgen have the oil glands of the hypanthium depressed into pits (referred to as rugose-pitted in the descriptions). The hypanthium surface becomes smoother in fruit.

Calyx. The sepals are always much shorter than the petals and sometimes almost absent. They usually have a green or reddish, herbaceous, keeled part that is continuous with the hypanthium and a much thinner, scarious to petaloid margin, which may be partially hyaline but is usually white or pinkish. In a few taxa the dorsal keel may be produced into a short horn. In *B. grandiflora* (Benth.) Rye the margin often has rather dark, maroon markings.

Stamen number and arrangement. The highest stamen number recorded for *Babingtonia* is 26. Most *Babingtonia* species have *c.* 20 stamens per flower, inserted in one row in all positions around the circumference of the ovary summit, with the bases of the filaments abutting each other or separated by a gap that is much narrower than the filaments. However, two of these species occasionally have their stamen number reduced to 10–12 per flower, in which case all or most of the stamens tend to be strictly opposite the sepals and petals.

Two species, *B. erecta* and *B. camphorosmae*, have 8–17 stamens per flower, with one to four stamens opposite each sepal and none directly opposite the petals. *Babingtonia delicata* shows a further reduction to four to eight stamens per flower; here the stamens are mostly antisepalous and the gaps between them often exceed the width of their filaments. Finally, the 3-staminate *B. triandra* has a solitary stamen opposite three of its five sepals.

Filaments. The filaments are flattened and may be uniformly pink or cream to white or have a reddish base. Antipetalous filaments are the longest. Usually, the higher the number of stamens present, the greater the difference in size between the largest and smallest ones, with some particularly small stamens present opposite some of the sepals. All filaments are normally free to the base, but occasionally two antisepalous stamens are fused by the filaments, resulting in an exceptionally broad filament with two anthers. Perhaps related to this is the occasional occurrence of the broadest filaments (with a single stamen) in this location. Such fusions rarely occur opposite the petals.

Anther shape. In most species the loculi are fused into a thick, coherent structure 0.5–1.3 mm long, which is broadest close to the attachment to the filament. Each side of the anther has a longitudinal groove such that the anther somewhat resembles a bicycle helmet, especially when viewed from above. Anthers of this type are illustrated for *B. grandiflora* (Figure 2A–D) and *B. pelloeae* (Figure 3C). Two species, *B. erecta* and *B. camphorosmae*, have anthers that are similar except that they are distinctly 2-lobed in their distal half. Another species, *B. fascifolia*, has anthers that are intermediate in appearance, being somewhat 2-lobed terminally.

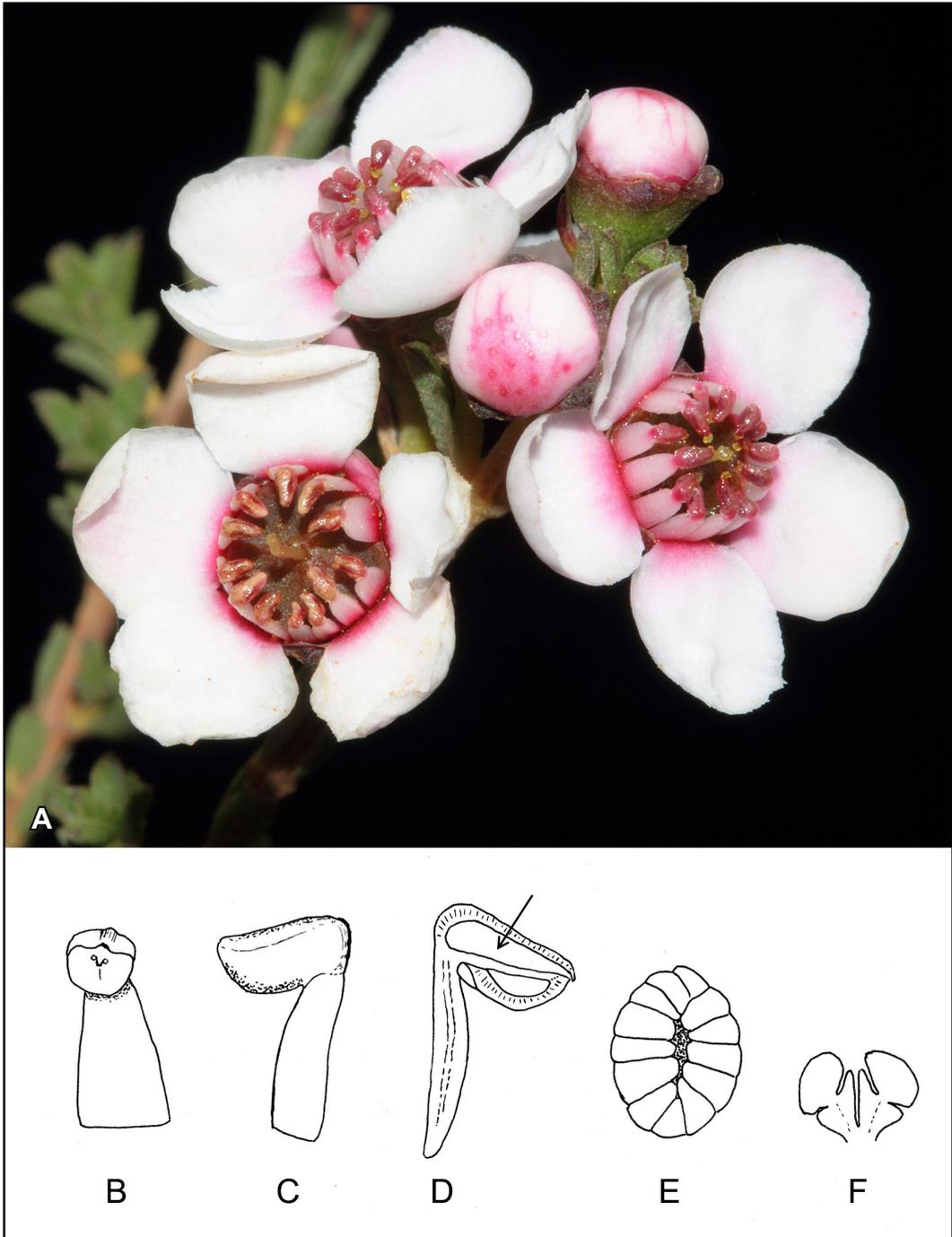


Figure 2. *Babingtonia grandiflora*. A – top and oblique views of flowers; B – ventral view of stamen; C – side view of stamen; D – L.S. of stamen showing large internal oil gland (arrowed); E – top view of 13 ovules radially arranged on a placenta; F – L.S. of placenta and ovules. Image (A) by Rob Davis (P.C. Jobson & R. Davis PCJ 10319) and drawings (B–F) by Malcolm Trudgen (M.E. Trudgen 1439, M. Clark & A. Travers).

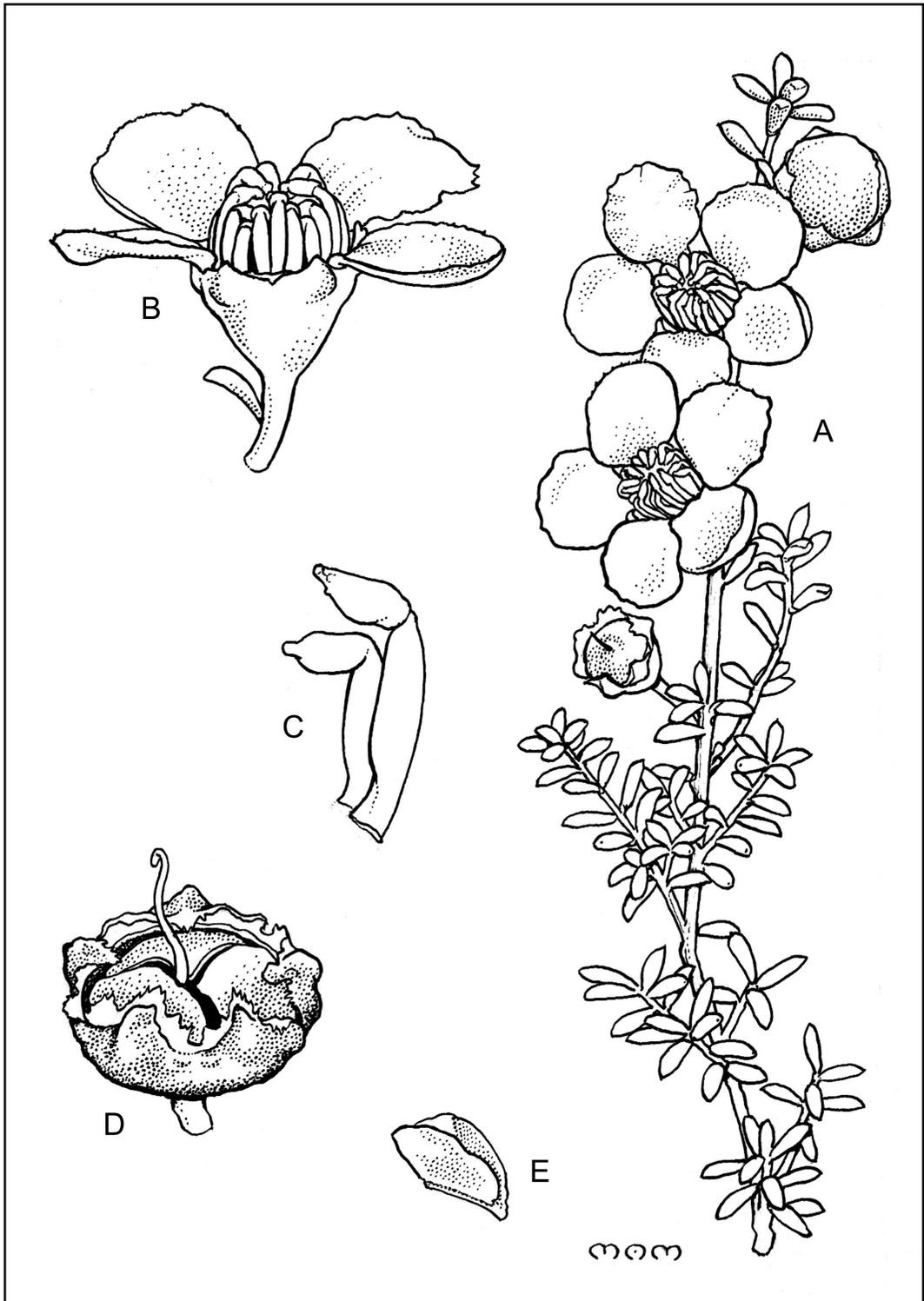


Figure 3. *Babingtonia pelloeae*. A – branch with a bud, two flowers and a young fruit; B – flower (with one petal removed); C – stamens; D – fruit; E – seed. Unused plate prepared for *Flora of the Perth region*, drawn by Margaret Menadue from fresh material collected at Gooseberry Hill in January 1982.

Anther orientation and dehiscence. The anthers are basifixed and held facing into the flower at 60–90 degrees to their filament (Figure 2C,D). Pollen is extruded, via terminal pores, in two yellow streams, which are well separated in the species with 2-lobed anthers but adjacent and likely sometimes to combine in species such as *B. grandiflora*. Recently extruded pollen is visible on some of the anthers in the flowers of Figure 2A.

Connective gland. The large connective gland, which makes up most of the internal space within the anther (Figure 2D), either protrudes at the base of the anther as a distinct swelling or is fully enclosed, together with pollen sacs, within the main body of the anther. Where the connective gland is shortly protruding it is often dark pink or red. Even when the gland is fully enclosed it may be evident because of variations in colour within the anther. The gland can be seen best in the flower buds before the anthers dehisce; it shrinks as its oily contents are released together with the pollen.

Ovary. The ovary summit is almost level, or shallowly concave except at the centre, and bright green in flower, expanding upwards and turning reddish in fruit. The ovaries of *B. delicata* and *B. triandra* are uniformly 1-locular and have a placenta positioned above the middle of one side of the loculus. The other species' ovaries are predominantly 3-locular, although occasional specimens of *B. camphorosmae* may have a majority of their flowers 2-locular. Ovules are radially arranged (Figure 2E) on more or less sessile to long-stalked placentas.

Style. In species with a 3-locular ovary, the base of the style is included in a long, cylindrical depression at the centre of the ovary. At maturity the style is long and slender. In species with a 1-locular ovary, the style is eccentric, having its base attached towards the outside of the ovary but with the depression tilted inwards so that the exerted part of the style arises closer to the centre of the ovary summit.

Fruits. In those taxa with a 3-locular ovary, the fruit is 1/2–2/3-inferior, usually about half-inferior, and has a convex summit. It is surrounded by a rim formed by the free part of the hypanthium and the persistent calyx. The seeds are shed via three valves (Rye 1987: Figure 141E). *Babingtonia triandra* has a 1-locular, indehiscent, inferior fruit with a flat summit. Fruits of the other 1-locular species, *B. delicata*, are also indehiscent but have a convex summit with a single relictual valve extending from the margin to the centre of the fruit; these delicate fruits may split open by the valve when pressure is applied.

Seeds. Seeds range from 0.6 mm to 1.5 mm long in *Babingtonia*, and have a small hilum up to c. 0.3 mm long. Among the species with a multi-locular ovary, seeds are crustaceous and pieces of chaff are always distinctly faceted (Figure 3E) and crustaceous. Mostly these seeds are strongly faceted, sometimes with raised, somewhat frilly margins to the facets. In species with a 1-locular ovary, only one seed is produced per fruit. In *B. triandra*, the solitary seed is broadly and irregularly ovoid or obovoid, with a thinly crustaceous testa, while that of *B. delicata* has a large, rounded outer surface and a faceted inner surface.

Affinities and circumscription of *Babingtonia*

Babingtonia belongs to the *Hysterobaeckea* group of the large tribe Chamelaucieae (Wilson *et al.* 2005, 2007). As noted previously, all members of the *Hysterobaeckea* group have the connective gland fused to other parts of the stamen. The currently recognised genera are *Anticoryne*, *Balaustion* Hook., *Cheyniana* Rye, *Ericomyrtus* Turcz., *Harmogia*, *Hysterobaeckea* (Nied.) Rye, *Kardomia*, *Malleostemon*, *Oxymyrrhine*, *Sannantha*, *Scholtzia* and *Tetrapora*. *Babingtonia* is the oldest name

and hence has taxonomic priority. Its closest relative may well be *Anticoryne*, a genus comprising just two species from Fitzgerald River National Park. The two genera can be more readily distinguished by their different distributions than by their morphology in the extract below from a key to Western Australian genera (Rye 2009).

51. Peduncles 1-flowered. Flowers with petals 4–7 mm long, sepals 1.1–1.6 mm long and 12–45 stamens. Restricted to Fitzgerald River National Park..... **ANTICORYNE**
- 51: Peduncles 1–20-flowered. Flowers with petals 1.3–6.5 mm long (if petals more than 5 mm long then sepals 0.2–1.1 mm long) and 3–25 stamens. Occurring from north of Geraldton to the Mount Barker area..... **BABINGTONIA**

Leaf thickness is also helpful in distinguishing between *Anticoryne* and *Babingtonia*, with *Anticoryne* having flatter leaves up to 4 mm wide. As noted above in the section on molecular evidence, an *Anticoryne* species was invariably found in a sister relationship with *Babingtonia*.

The circumscription of *Babingtonia* given here may need to be expanded in the future to include some taxa currently misplaced in *Baeckea*, such as *B. staminosa* E.Pritz., which has a number of morphological similarities but only two ovules and somewhat narrower filaments, and *B. sp.* Three Springs (M.E. Trudgen 5368) [= *B. moschata* C.A.Gardner ms], which has the stamens united and a more prominent connective gland. These taxa should be given priority for sampling in future molecular studies to assist in determining generic boundaries.

Descriptions and key

Babingtonia Lindl., *Bot. Reg.* t. 10 (1842). *Baeckea* sect. *Babingtonia* (Lindl.) Benth. & Hook.f., *Gen. Pl.* 1: 701 (1865). *Type: Babingtonia camphorosmae* (Endl.) Lindl.

Shrubs low-growing to erect, 0.3–1.5(–3) m high, glabrous. *Young stems* smooth to tuberculate. *Leaves* opposite and decussate (rarely some of them ternate), sometimes densely clustered, small, entire, with a very short but well defined petiole. *Leaf blades* linear to elliptic in outline; abaxial surface shallowly to very deeply convex or more angled; adaxial surface concave, with oil glands often as conspicuous as those on abaxial surface. *Peduncles* 1–7(–16)-flowered, up to 9 mm long. *Bracteoles* persistent at anthesis and often in fruit. *Pedicels* up to 4 mm long but sometimes absent. *Flowers* 3–15 mm diam. *Hypanthium* broad, rugose-pitted to smooth, adnate to ovary for most of its length, green at first; adnate portion obconic or broadly obconic; free portion short. *Sepals* 5, erect, persistent in fruit, much shorter than the petals and sometimes greatly reduced, herbaceous at base and with a ± absent to broad, scarious to petaloid margin that is sometimes divided into two lateral parts; herbaceous base usually with a dorsal ridge (running longitudinally along its centre) or slightly horned dorsally. *Petals* 5, widely spreading, shed before fruit matures, very broadly obovate or ± circular, white or pink. *Antipetaline collectors* (when present) usually minute, slender and white or pale pink but sometimes shorter and triangular to subulate. *Staminodes* absent or rare. *Stamens* 3–26, free, either antisepalous or in a fairly continuous circle, those directly opposite or closest to the petals longest and those opposite the centre of the sepals shortest. *Filaments* curved inwards and down towards the stigma in bud, fairly erect at maturity, broad and flat (dorsiventrally compressed). *Anthers* highly modified, with the 2 cells closely fused with the connective gland into a helmet-like (longitudinally grooved) or 2-lobed structure, opening by two small pores somewhat lateral to the opening of the connective gland; connective gland not or only shortly protruding. *Ovary* 1–3-locular, inferior; placentas axile, peltate and shield-like; ovules 4–16 per loculus, radially arranged. *Style* terete, 0.5–3.5 mm long, well exerted at maturity from a

long, narrow depression in the summit of the ovary or a shorter, tilted depression, often reddish, the enclosed part pale; stigma small, capitate, circular from top view. *Fruits* dry, c. 1/2-inferior to fully inferior, with a narrow, deep central depression, with few to all of the ovules in a loculus developing into seeds, dehiscent by (2)3 valves or thin-walled and indehiscent; hypanthium broad and often somewhat 3-lobed. *Seeds* radially arranged on the placenta or solitary, 0.6–1.6 mm long, strongly faceted to unfaceted, usually with a large, rounded outer surface, 2 equal lateral surfaces and a small, narrow inner surface with a small or moderately large hilum; testa crustaceous, variously ornamented, often colliculate with a fine pattern of well raised (convex) cells, of varied shades of brown. *Chaff pieces* usually distinctly faceted and crustaceous, smaller than the seeds.

Size and distribution. Currently 11 species are recognised, extending from well north of Geraldton south to Dunsborough and south-east to the Mount Barker area. This distribution is entirely confined within the limits of the South-west Botanical Province, occurring in varied habitats including ones on laterite, more sandy habitats and winter-wet depressions.

Phenology. *Babingtonia* species flower mainly in spring and summer, especially from October to February, with the northern taxa tending to flower earlier in the year than the southern taxa. Fruits are produced soon after flowering but may not tend to dehisce for some time. Dehiscent fruits may persist for most of the year. In two species the fruits are indehiscent and are possibly shed soon after flowering.

Co-occurrence. Despite considerable overlap in the ranges of some pairs of species, *B. camphorosmae* and *B. pelloeae* are the only ones known to co-occur. These two species have been recorded together at two locations in the Shire of Kalamunda (e.g. *F. Hort* 399 & 399A). See also the notes under *B. grandiflora* regarding some co-occurrence of its variants.

Etymology. Dedicated to Charles Cardale Babington (1808–1895), a professor of botany at Cambridge.

Key to species of *Babingtonia*

1. Stamens 3–13, discontinuous, antisepalous (i.e. with gaps opposite the petals)
 2. Stamens 3–8; anther entire. Ovary 1-locular; ovules 4–9. Fruits indehiscent
 3. Peduncles always multi-flowered, up to 16-flowered. Flowers white, 3–3.5 mm diam. Stamens 3 (Calingiri area)..... **B. triandra**
 - 3: Peduncles 1–3-flowered. Flowers usually pink, c. 4 mm diam. Stamens 4–8 (W of Dandaragan)..... **B. delicata**
 - 2: Stamens 8–13; anther 2-lobed. Ovary (2)3-locular; ovules 7–13 per loculus. Fruits dehiscent
 4. Shrub low-growing, usually 0.1–0.4 m high, sometimes multi-stemmed from a lignotuber. Petals 3.5–5 mm long (Dandaragan area–Dunsborough–Mount Barker)..... **B. camphorosmae**
 - 4: Shrub erect, usually 0.7–3 m high, 1-stemmed or multi-branched at the base. Petals 2.3–3.2 mm long (Arrino area–Dandaragan)..... **B. erecta**
- 1: Stamens (10–)12–26 in a continuous circle or with small gaps, if 10–12 then with all or most stamens opposite both the sepals and petals
 5. Sepals 0.2–0.7 mm long, appearing fully herbaceous or with a narrow, white or pink margin
 6. Leaves 0.9–1.5 mm long (Bunjil area)..... **B. minutifolia**

- 6: Leaves 2.5–9 mm long
- 7: Petals 3–3.5 mm long. Anthers 0.4–0.5 mm long, somewhat 2-lobed. Ovules 6–9 per loculus (E of Mingenew) **B. fascifolia**
- 7: Petals 4–6.5 mm long. Anthers 0.7–1.3 mm long, entire. Ovules 10–16 per loculus (near Nolba–Boonanarring NR) **B. grandiflora**
- 5: Sepals 0.5–1.5 mm long, with a broad, white or pink margin
- 8: Peduncles 0.6–1.6 mm long in fruit, often shorter than the pedicels. Anthers with the connective gland protruding below base of anther (Watheroo NP–Cataby) **B. cherticola**
- 8: Peduncles 1.3–9 mm long in fruit, usually longer than the pedicels. Anthers with the connective gland not protruding
- 9: Petals 4–6.5 mm long, white or pale pink. Ovules 10–16 per loculus (near Nolba–Boonanarring NR)..... **B. grandiflora**
- 9: Petals 2.5–3.5 mm long in most taxa but up to 5 mm long in *B. pelloeae*, in which they are medium-pink. Ovules 6–11 per loculus
- 10: Associated with wetlands on the coastal plain. Petals 2.5–3 mm long. Seeds with raised, somewhat frilly margins to the facets (Badgingarra–Mandurah) **B. urbana**
- 10: Occurring in lateritic habitats, often on hillsides. Petals 3–5 mm long. Seeds with entire, smooth margins to facets
- 11: Leaves elliptic to narrowly obovate from top view, 1.7–4 mm long. Petals 3–3.5 mm long, white or pale pink (near Narrogin) **B. maleyae**
- 11: Leaves ± narrowly oblong to linear from top view, 3.5–8 mm long. Petals 3.3–5 mm long, medium-pink. (Darling Ra.) **B. pelloeae**

Babingtonia camphorosmae (Endl.) Lindl., *Bot. Reg.* t. 10 (1842). *Baeckea camphorosmae* Endl. in S.L. Endlicher, F. Fenzl, G. Bentham & H.W. Schott, *Enum. Pl.* 51 (1837). *Type citation*: ‘King George Sound. (Hügel)’. *Type*: Swan River area [probably from Fremantle to Darling Range], Western Australia, November–December 1833, *K.A.A. von Huegel s.n. (holo: W 0009018; iso: K 000843435)*.

Illustrations. J. Lindley, *Bot. Reg.* t. 10 (1842); W.E. Blackall & B.J. Grieve, *How Know W. Austral. Wildfl.* 3A: 75 (1980); N.G. Marchant, J.R. Wheeler, B.L. Rye, E.M. Bennett, N.S. Lander & T.D. Macfarlane, *Fl. Perth Region* 1: 381, Figure 141 (1987) [all as *Baeckea camphorosmae*].

Prostrate or low-growing *shrub* 0.1–0.4(–0.6) m high, sometimes multi-stemmed from a lignotuber, with densely clustered leaves; flowering branchlets usually with 4–22 flower-bearing nodes. *Young stems* often somewhat rugose with prominent glands. *Petioles* 0–0.3 mm long. *Leaf blades* linear in outline or filiform, 2.5–7 mm long, 0.3–0.4 mm wide, 0.3–0.4 mm thick, entire, often with an apical point *c.* 0.1 mm long; abaxial surface deep, with 1 or 2 main rows of very small, inconspicuous oil glands on each side of the midvein; adaxial surface fairly flat. *Peduncles* 1–2.5 mm long, tending to be shorter than pedicels, 1–5-flowered; secondary axes (when present) 0–0.6 mm long. *Bracteoles* deciduous, narrowly ovate, 1.3–2 mm long, *c.* 0.5 mm wide, with incurved, scarious margins; apex acute. *Pedicels* 1–3 mm long. *Flowers* 8–11 mm diam. *Hypanthium* 1.5–2.2 mm long, 2.5–3.5 mm wide, with glands somewhat protruding; free portion 0.5–0.7 mm long. *Sepals* depressed-ovate or of other depressed shapes, 0.5–1 mm long, 1.5–2.3 mm wide, ridged but not horned; margin fairly broad, continuous around apex or split into two parts, one on each side of the ridged keel. *Petals* 3.5–5 mm long, white to medium-pink. *Stamens* 10–13, antisepalous, in irregular groups of 1–3 or sometimes regularly 2 per sepal. *Longest filaments* 0.7–1 mm long. *Anthers* 0.4–0.6 mm long, 0.4–0.65 mm wide,

2-lobed; connective gland not or only shortly protruding. *Ovary* 2- or usually 3-locular; placentas long-stalked; ovules 7–10 per loculus. *Style* slender, 1.3–1.6 mm long, the base immersed in a central depression which fully engulfs the style in fruit. *Fruits* c. 2/3-inferior, 2–2.5 mm long, 3–3.5 mm diam. (3.5–5 mm diam. including the attached floral parts); summit convex. *Seeds* strongly faceted, 1–1.6 mm long, 0.8–1 mm wide, 0.8–1 mm thick, often with somewhat raised borders to the facets; testa moderately thick, usually light to medium brown, smooth on outer surface, prominently colliculate on lateral surfaces. *Chaff pieces* faceted, mostly 0.6–1.2 mm long, crustaceous, medium brown.

Diagnostic features. *Young stems* smooth or somewhat rugose. *Leaf blades* 2.5–7 mm long. *Peduncles* 1–2.5 mm long, 1–5-flowered. *Sepals* 0.5–1 mm long; margin fairly broad. *Stamens* 10–13, in antisepalous groups. *Anthers* 2-lobed; connective gland not or shortly protruding. *Ovary* 3-locular; placentas long-stalked, with 7–10 ovules.

Selected specimens examined. WESTERN AUSTRALIA: Boonanarring vacant Crown Land, off Wannamal West Rd, 21 Mar. 1986, *J.J. Alford* 495 (PERTH); 49.8 km along Muir Hwy from junction with South West Hwy, 10 Jan. 1996, *A.R. Annels* 5662 & *R.W. Hearn* (PERTH); near Regans Ford, 15 Nov. 1967, *A.M. Ashby* 2444 (AD); Great Southern Hwy, 5.5 km S of Pingelly, Station Street Reserve, 7 Jan. 1999, *D. Box* 259 (PERTH); Geographe Bay, *Miss Bunbury s.n.* (MEL 76186); 4 miles [6.4 km] E of Darkan, 30 Dec. 1955, *N.T. Burbidge* 4961 (CANB); Blythe Park, Gifford Rd, Dunsborough, 16 Dec. 2000, *H. Cole & D. Carter* 492 (PERTH); Biro Rd, 8.4 km E of Suez Rd [SE of Rocky Gully], 19 Jan. 1998, *R. Davis* 4832 (PERTH); c. 10 km E of Wannamal, 6 Dec. 1963, *A.S. George* 6043 (AD, BRI, MEL, NSW, PERTH); Kalamunda, Jan. 1928, *Miss Goodere s.n.* (ADW 16037); Serpentine, Oct. 1899, *R. Helms s.n.* (BRI, NSW); Gavins Rd, Gwindinup, 7 Jan. 2005, *G.J. Keighery & B.J. Keighery* 335 (CANB, PERTH); Wooroloo, Dec. 1906, *M. Koch* 1462 (AD, MEL); Melville Park, 28 Dec. 1897, *A. Morrison* 7177 (BRI, PERTH); Lake Muir, *Muir s.n.* (MEL); Vasse River, 1838–1842, *L. Preiss* 348 (MEL); Guildford, 1840, *L. Preiss* 367 (MEL, W); Murray District, Dec. 1900, *E.G. Pritzel* 130 (AD, NSW); near Cut Hill, York, 17 Jan. 1904, *O.H. Sargent* 90 (NSW); Narrakine Block, Highbury Forest 52, 7 Jan. 1999, *G. Warren* 74 (PERTH).

Distribution and habitat. Extends from the Dandaragan area south to Dunsborough and the Whicher Range and south-east to near Mount Barker (Figure 1A) and is found on the Swan Coastal Plain as well as on the Darling Range. Occurs in a wide variety of soil types, mostly in woodlands or forests dominated by eucalypts, sometimes in woodlands dominated by *Banksia* or other taxa.

Phenology. Flowers mainly from November to February. Fruits recorded from December to August.

Conservation status. This widespread taxon is not considered to be at risk.

Etymology. According to Lindley (1842), the scientific epithet refers to the resemblance of this species to the European Camphorwort genus, *Camphorosma* L., in the Chenopodiaceae. However, it is possible that the epithet simply refers to the plant having a camphor-like odour.

Common names. *Babingtonia camphorosmae* is commonly known as Camphor Myrtle, as in the original description of the genus *Babingtonia* (Lindley 1842). However, F. Mueller's specimens collected in the 1870s and now housed in MEL give its common name variously as Liquorice Teabush, Liquorice Teatree, Liquorice Tea and Native Tea, reflecting its use for making bush tea.

Affinities. See notes under *B. erecta*.

Notes. Although *B. camphorosmae* is widespread in the south-west, its range does not quite reach King George Sound on the south coast. Therefore it appears that the type locality is incorrectly given as King George Sound and that von Huegel collected the type material while he was in the Swan River area. Types of a number of other species, such as *Astartea affinis* (Endl.) Rye (see Rye 2006), were also given the incorrect locality of King George Sound when they had actually been collected near the Swan River settlement.

One specimen collected from the Darling Range (*R. Davis* 1002), described on the label as suckering, has a greatly thickened underground lignotuber or thickened rootstock from which three separate erect stems emerge and the underground thickened structure abruptly turns from vertical to horizontal (c. 90° angle) and then continues for c. 200 mm becoming much narrower distally. Whether this is true evidence of suckering or a result of the root being diverted by rocks or other physical reasons is not certain. Other specimens with a lignotuber attached include ones from Blackwood River (*J. Forrest s.n.*, MEL 76207 & 76312), Stirling Range (*F. Mueller s.n.*, MEL 76212 & 76328) and Murray District (*E.G. Pritzel* 130, AD). Groves *et al.* (2009) list *Babingtonia* [as *Baেকেa*] *camphorosmae* as being resistant to *Phytophthora cinnamomi*. Perhaps this resistance is related to its lignotuber.

There is great variability in this common taxon, including small-leaved specimens, such as *H. Seeds* 83. Some northern specimens that have thicker leaves and more numerous flowers than normal for *B. camphorosmae* have been excluded for now from the description given in this paper, as it is not clear whether further taxa need to be recognised.

***Babingtonia cherticola* Rye & Trudgen, sp. nov.**

Typus: north of Moora, Western Australia [precise locality withheld for conservation reasons], 17 December 1993, *R. Bone* 1993/1 (*holo:* PERTH 04367278; *iso:* CANB, K, MEL, NSW).

Baেকেa sp. Moora (*R. Bone* 1993/1), *G. Paczkowska & A.R. Chapman*, *West. Austral. Fl.: Descr. Cat.* 348 (2000); Western Australian Herbarium, in *FloraBase*, <http://florabase.dpaw.wa.gov.au/> [accessed 11 August 2015].

Shrub 0.5–2 m high, with erect slender stems and antrorse to widely spreading, densely clustered leaves; flowering branchlets usually with 4–16 flower-bearing nodes. *Young stems* tuberculate. *Petioles* 0.3–0.6 mm long. *Leaf blades* linear in outline, 6–12 mm long, 0.6–1.3 mm wide, 0.3–0.5 mm thick, obtuse, the margins often denticulate; abaxial surface deep, with centre flattened and with a narrow groove along the midvein, with 1 or 2 main rows of very small, inconspicuous oil glands on each side of the midvein; adaxial surface fairly flat, oil glands often as conspicuous as on abaxial surface. *Peduncles* 0.6–1.6 mm long, 1(–3)-flowered; secondary axes (when present) 0–0.5 mm long. *Bracteoles* deciduous or persistent, ovate to linear in outline, 1.5–3 mm long, 0.3–1.1 mm wide; margins somewhat to very incurved or folded inwards (blade v-shaped in TS), often somewhat scarious and tinged reddish; apex recurved. *Pedicels* 0.5–2 mm long. *Flowers* 8–10.5 mm diam. *Hypanthium* 1.7–2 mm long, 3–3.5 mm wide, rugose-pitted; free portion 0.4–0.5 mm long, often pink-tinged. *Sepals* depressed-ovate to ± triangular, 0.6–1.5 mm long, 1.7–2.5 mm wide, usually deep pink-tinged, acute, prominently ridged or shortly horned; margin broad, entire or denticulate. *Petals* 3–4.5 mm long, white or pale pink inside, pink outside in bud. *Stamens* 16–26, in a circle. *Longest filaments* 1–1.4 mm long, 0.4–0.5 mm wide at base. *Anthers* 0.4–0.7 mm long, 0.3–0.5 mm wide, entire; connective gland protruding below base of anther, sometimes reddish. *Ovary* 3-locular; placentas long-stalked; ovules 7–11 per loculus. *Style* 2–3 mm long, with the basal part immersed in a central depression. *Fruits* c. 1/2-inferior, 2.5–3 mm

long, 3–3.5 mm diam. (3.5–5 mm diam. including the attached floral parts); summit convex. *Seeds* strongly faceted, 1.1–1.4 mm long, 0.6–1.1 mm wide, 0.8–1.1 mm thick, with narrow raised paler rims along the borders of the facets; testa moderately thick, pale or yellowish brown at first, turning dark brown, smooth on outer surface, minutely rugose on lateral surfaces. *Chaff pieces* faceted, mostly 0.5–1.1 mm long, crustaceous, medium brown.

Diagnostic features. *Young stems* tuberculate. *Leaf blades* 6–12 mm long. *Peduncles* 0.6–1.6 mm long, mostly 1-flowered. *Sepals* 0.6–1.5 mm long; margin broad. *Stamens* 16–26, in a circle. *Anthers* entire; connective gland protruding. *Ovary* 3-locular; placentas distinctly stalked, with 8–10 ovules.

Selected specimens examined of typical variant. WESTERN AUSTRALIA: [localities withheld for conservation reasons] 20 Dec. 2004, *A.D. Crawford* 829 (PERTH); 27 Nov. 1990, *E.A. Griffin* 6355 (PERTH); 26 Nov. 2000, *B. Morgan* BM 136 (PERTH); 30 Nov. 1999, *L. Polomka & S. Patrick* 3336 (PERTH); 26 Nov. 2003, *M.E. Trudgen* 22086 (AD, BRI, MEL, NSW, PERTH).

Selected specimens examined of western variant. WESTERN AUSTRALIA: [localities withheld for conservation reasons] 26 Nov. 1966, *J.S. Beard* 4594 (PERTH); 12 Feb. 2002, *F. Hort* 1696 (AD, BRI, PERTH); 12 Feb. 2002, *F. Hort* 1697 (CANB, K, MEL, NSW, PERTH); 21 Mar. 2007, *K.R. Thiele* 3204 (PERTH); 1 Nov. 1974, *D.J.E. Whibley* 4850 (AD, PERTH); 17 Nov. 2000, *Peter G. Wilson* 1514 (PERTH).

Distribution and habitat. Occurs in three main areas (Figure 4A), the largest one an eastern region of chert hills from Watheroo National Park south to Moora, in habitats with varied vegetation, often with *Allocasuarina* or eucalypts (such as *Eucalyptus wandoo*) dominant. In a north-western region near Badgingarra and a south-western area near Cataby, lower vegetation, primarily heath, occurs on sandplain or sand over laterite.

Phenology. Flowers recorded from November to February. Fruits recorded through most of the year.

Conservation status. Listed by Jones (2014) as Priority Three under Department of Parks and Wildlife Conservation Codes for Western Australian Flora as *Baeckeke* sp. Moora (R. Bone 1993/1). The known range of the species extends for c. 75 km.

Etymology. Its name reflects its main area of occurrence in chert hills, a relatively unusual kind of habitat in Western Australia.

Affinities. Differs from all other members of the genus in its more tuberculate young stems. It is similar to *B. fascifolia* in having its leaves clustered and the connective gland obviously protruding, but tends to be a taller shrub. The anthers on *R. Davis* 2694 are particularly short and broad, of a similar length to those of *B. fascifolia*, but other specimens can be distinguished from *B. fascifolia* by their larger anthers. *Babingtonia cherticola* may also be confused with *B. pelloeae* and *B. urbana* Rye, differing in its more clustered leaves and in having peduncles mostly shorter than the pedicels.

Notes. The known distribution of the species has three disjunct regions, possibly with significant habitat differences between the eastern area and the two western ones. Eastern specimens have a deeply pitted, rugose hypanthium. Western specimens, included among the specimens cited above but mapped separately as *B. aff. cherticola* in Figure 4A, tend to have the hypanthium less obviously

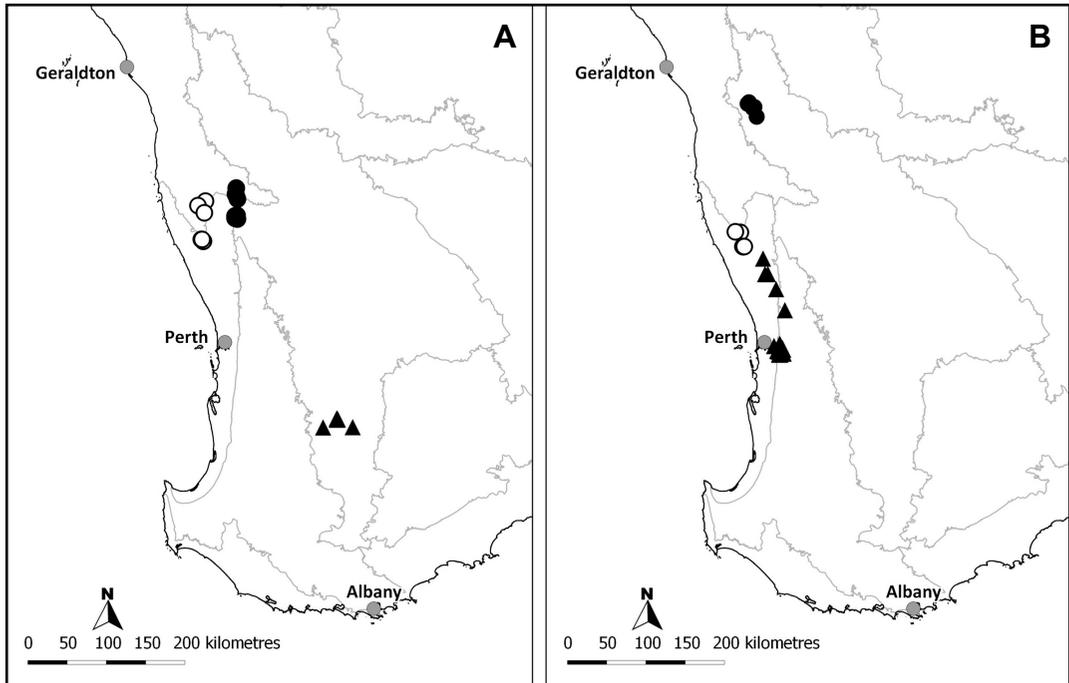


Figure 4. Distribution maps for five new species of *Babingtonia*. A – *B. cherticola* (●), *B. aff. cherticola* (○) and *B. maleyae* (▲); B – *B. delicata* (○), *B. fascifolia* (●) and *B. pelloeae* (▲).

pitted and also tend to have fewer stamens and ovules, although there is some overlap in all these characters. Further study is needed to determine whether the western populations warrant recognition as a distinct taxon.

Babingtonia delicata* Rye & Trudgen, *sp. nov.

Typus: Shire of Dandaragan [south of Cataby], Western Australia [precise locality withheld for conservation reasons], 13 November 2004, *F. Hort & J. Hort* 2423 (*holo*: PERTH 06983189; *iso*: K, MEL, NSW).

Malleostemon sp. Cooljarloo (B. Backhouse s.n. 16/11/88), G. Paczkowska & A.R. Chapman, *West. Austral. Fl.: Descr. Cat.* 390 (2000); Western Australian Herbarium, in *FloraBase*, <http://florabase.dpaw.wa.gov.au/> [accessed 11 August 2015].

Shrub 0.3–0.85 m high, with erect slender stems and antrorse to widely spreading leaves that are sometimes densely clustered; flowering branchlets usually with 8–13 or more flower-bearing nodes. *Young stems* smooth or with scattered, rounded, prominent oil glands. *Petioles* 0.4–0.7 mm long. *Leaf blades* linear or very narrowly oblong in outline, 5–11 mm long, 0.5–0.8 mm wide, 0.3–0.5 mm thick, thickest towards the apex, entire, not or scarcely mucronate; abaxial surface deep, the centre flattened and grooved, with *c.* 2 main rows of minute oil glands on each side of the midvein; adaxial surface fairly flat, oil glands similar to those on abaxial surface. *Peduncles* 1–2.2 mm long, 1–3-flowered; secondary axes (when present) up to 0.3 mm long. *Bracteoles* deciduous or persistent, narrowly ovate, 1.4–2 mm long, 0.3–0.4 mm wide, somewhat scarious and tinged reddish or brown; margins folded

inwards (blade v-shaped in TS), serrulate; apex sometimes recurved, acute. *Pedicels* up to c. 0.5 mm long on the main flower and apparently shorter on lateral flowers. *Flowers* 4–5 mm diam. *Hypanthium* c. 1.4 mm long, c. 1.6 mm wide, rather coarsely rugose-pitted; free portion c. 0.35 mm long, often reddish-tinged. *Sepals* depressed-ovate or depressed-hemispheric, c. 0.4 mm long, 0.7–1 mm wide, broadly obtuse, the herbaceous base keeled but not horned; margin broad, pink, usually with deep pink flecks towards the middle, entire or denticulate. *Petals* 1.4–1.8 mm long, usually bright pink inside, the outer ones deep pink outside in bud. *Stamens* 4–8, antisepalous or between the sepals and petals, 0–3 opposite each sepal. *Longest filaments* 0.25–0.4 mm long, c. 0.15 mm wide at base. *Anthers* 0.4–0.5 mm long, 0.2–0.35 mm wide, entire; connective gland not protruding. *Ovary* 1-locular, with a sloping summit; placenta almost sessile; ovules 5–9. *Style* somewhat displaced from the centre in flower and very eccentric in fruit, 0.5–0.7 mm long, the base in a rather short, tilted depression. *Fruits* indehiscent, largely inferior except for a lop-sided bulge, 1.4–1.5 mm long, 1.3–1.4 mm diam., very thin-walled, 1-seeded; summit convex. *Seed* with a broad, rounded outer surface and faceted inner surface, 1–1.2 mm long, c. 1 mm wide; testa thin, crustaceous, whitish to pale brown, ± smooth. *Chaff pieces* angled but compressed, c. 0.7 mm long, scarcely crustaceous, medium brown. (Figure 5)

Diagnostic features. *Young stems* smooth or with scattered prominent oil glands. *Leaf blades* 5–11 mm long. *Peduncles* 1–2.2 mm long, 1–3-flowered. *Sepals* c. 0.4 mm long; margin broad. *Petals* 1.4–1.8 mm long, bright pink. *Stamens* 4–8, in antisepalous groups. *Anthers* entire; connective gland not protruding. *Ovary* 1-locular; placenta ± sessile, with 5–9 ovules.

Other specimens examined. WESTERN AUSTRALIA: [localities withheld for conservation reasons] 16 Nov. 1988, B. & B. Backhouse s.n. (PERTH 02794349); 3 Feb. 2014, G. Cockerton & A. Quarmby WB 35204 (PERTH); 1 Dec. 1992, E.A. Griffin 7967 (NSW, PERTH); 13 Nov. 2004, F. Hort 2424 & J. Hort (AD, BRI, CANB, PERTH); 21 Oct. 1990, B.J. Keighery 1990/14 (PERTH).

Distribution and habitat. Occurs north-west and south of Cataby Roadhouse, which is on the Brand Highway west of Dandaragan (Figure 4B). The habitat is of sandy soils close to wetlands, described as seasonally wet and low-lying.

Phenology. Flowers recorded from November to December and mature fruits in February.

Conservation status. Listed by Jones (2014) as Priority One under Department of Parks and Wildlife Conservation Codes for Western Australian Flora as *Malleostemon* sp. Cooljarloo (B. Backhouse s.n. 16/11/88). This species is known from few, probably only two, populations over a range of less than 25 km.

Etymology. From the Latin *delicatus* (dainty), referring to the overall appearance of this slender-stemmed shrub with small but attractive pink flowers.

Affinities. This species is similar to *B. triandra* in having much reduced, 1-locular flowers and indehiscent fruits, and both occur in wetlands. However, the two species are probably more closely related to species with much larger flowers and 3-locular, multi-seeded fruits than they are to one another.

Notes. *Babingtonia delicata* has fewer stamens (4–8 per flower) than other species treated here except for the 3-staminate *B. triandra*. Although few, the stamens are still variable and their arrangement is still irregular, with a stamen sometimes directly opposite a sepal or petal but most stamens somewhat



Figure 5. *Babingtonia delicata*. A – habit; B – flowering stem. Images by Jean Hort (F. & J. Hort 2424).

intermediate between the sepals and petals. Gaps between the bases of the filament may be larger than the width of the filaments in this taxon.

The species is unusual in having a sloping ovary summit. For details of its fruits, see the *Morphology* section of this paper.

Babingtonia erecta Rye & Trudgen, *sp. nov.*

Typus: west of Three Springs, Western Australia [precise locality withheld for conservation reasons], 27 November 2003, *M.E. Trudgen* 22109 (*holo*: PERTH 06605672; *iso*: AD, BRI, CANB, K, MEL, NSW).

Baeckea sp. Bunney Rd (S. Patrick 4059), Western Australian Herbarium, in *FloraBase*, <http://florabase.dpaw.wa.gov.au/> [accessed 11 August 2015].

Erect *shrub* usually 0.7–3 m high, single-stemmed at the base but often branching close to the base, with leaves densely clustered; flowering branchlets usually with 4–32 flower-bearing nodes. *Young stems* often somewhat rugose with prominent glands. *Petioles* 0.1–0.3 mm long. *Leaf blades* ± linear in outline, 2.5–6 mm long, 0.5–0.8 mm wide, 0.4–0.5 mm thick, entire, not or scarcely mucronate; abaxial surface deep, with centre often flattened and with a narrow groove along the midvein, with 1 or 2 main rows of minute, inconspicuous oil glands on each side of the midvein; adaxial surface fairly flat. *Peduncles* 0.6–3 mm long, 2–7-flowered; bracts deciduous or persistent, narrowly or very narrowly ovate to narrowly oblong in outline, 1.7–3.2 mm long, 0.25–0.4 mm wide, the margins incurved; secondary axes ± absent or up to 0.8 mm long. *Bracteoles* deciduous or persistent, narrowly ovate to linear in outline, 1.1–1.8 mm long, 0.2–0.35 mm wide, with sides folded inwards (blade v-shaped in TS), entire to denticulate; apex acute. *Pedicels* 1.3–3 mm long. *Flowers* 5.5–7.5 mm diam. *Hypanthium* 1.5–1.8 mm long, 2.5–3 mm wide, rugose-pitted; free portion *c.* 0.5 mm long. *Sepals* usually depressed-ovate, 0.6–0.8 mm long, 1.3–2 mm wide, ridged; margin narrow or moderately broad, continuous around apex or split into two parts, one on each side of the ridged keel. *Petals* 2.3–3.2 mm long, white or pale pink, often denticulate. *Stamens* 8–14(–17), antisepalous in irregular groups of 1–4. *Longest filaments* 0.6–0.8 mm long. *Anthers* 0.4–0.6 mm long, 0.35–0.4 mm wide, 2-lobed; connective gland shortly protruding at base, pink or reddish. *Ovary* 3-locular; placentas distinctly stalked; ovules 7–13 per loculus. *Style* 1.3–2 mm long, the base inserted in a central depression. *Fruits* *c.* 1/2-inferior, 1.5–2.3 mm long, 2.5–3.5 mm diam.; summit convex. *Seeds* strongly faceted, 1–1.3 mm long; testa moderately thick, pale to dark brown, smooth on outer facet, deeply colliculate to shallowly tuberculate on lateral facets, often with a narrow rim protruding at the junction of the facets. *Chaff pieces* faceted, mostly 0.5–0.9 mm long, crustaceous.

Diagnostic features. *Young stems* often somewhat rugose. *Leaf blades* 2.5–6 mm long. *Peduncles* 0.6–3 mm long, 2–7-flowered. *Sepals* 0.6–0.8 mm long, ridged; margin narrow or moderately broad. *Petals* 2.3–3.2 mm long, white or pale pink. *Stamens* usually 8–14, in antisepalous groups. *Anthers* 2-lobed; connective gland shortly protruding. *Ovary* 3-locular; placentas distinctly stalked, with 7–13 ovules.

Selected specimens examined. WESTERN AUSTRALIA: [localities withheld for conservation reasons] 23 Nov. 2001, *A.D. Crawford* 832 (PERTH); *J. Drummond* s.n. (MEL 76377); 19 Nov. 2002, *S.J. Patrick* 4527 & *G. Paczkowska* (AD, BRI, PERTH); 18 Aug. 2003, *B.L. Rye* 238016, 128017 & *M.E. Trudgen* (PERTH); 27 Nov. 2003, *M.E. Trudgen* 22118 (CANB, MEL, NSW, PERTH).

Distribution and habitat. Extends from near Arrino south to south-west to the Gairdner Range, south-east to Gunyidi and possibly south to Dandaragan (Figure 6A), often on lateritic ridges or hillsides or in shallow sand over laterite, sometimes in deep sand, sometimes associated with watercourses.

Phenology. Flowers mainly from October to January. Fruits recorded from December to September.

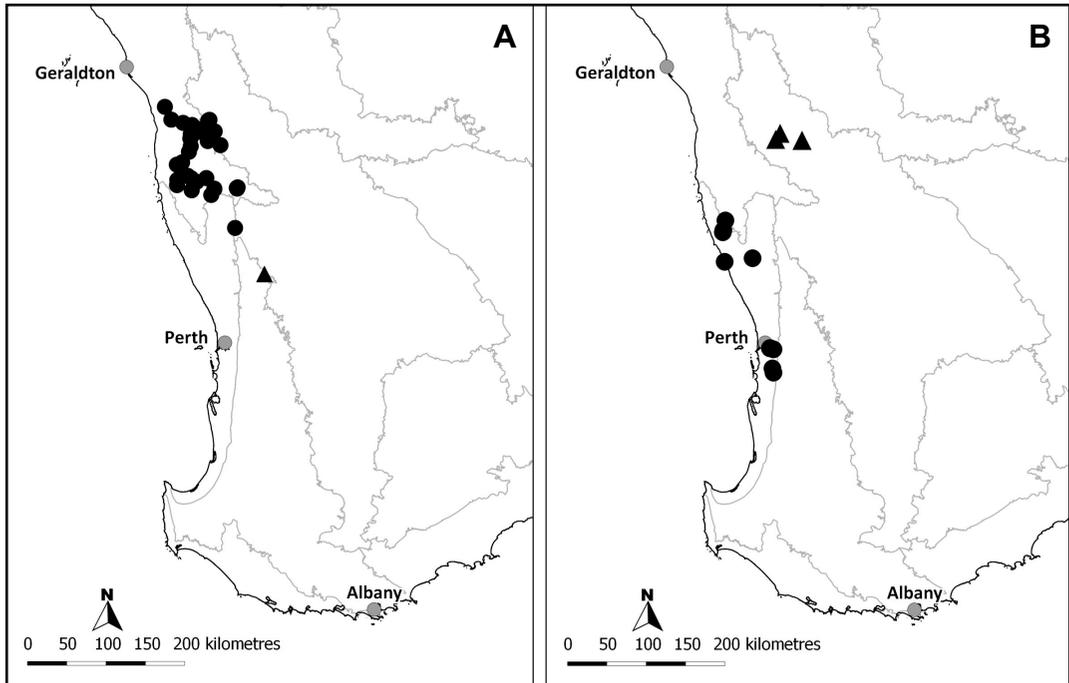


Figure 6. Distribution maps for four new species of *Babingtonia*. A – *B. erecta* (●) and *B. triandra* (▲); B – *B. minutifolia* (▲) and *B. urbana* (●).

Conservation status. This species is known from numerous localities over a moderately large range.

Etymology. From the Latin *erectus* (upright) referring to the plant's mature habit, a character that distinguishes this species from *B. camphorosmae*.

Affinities. Previously confused with *B. camphorosmae*, differing as indicated in the key and in having an obviously reticulate-pitted hypanthium. *Babingtonia erecta* is notable for having long inflorescences, sometimes occupying about 30 or more consecutive nodes along a branchlet, with usually dense clusters of flowers at each node, rather than few flowers per node as in most of the other taxa.

Notes. The variation within this taxon needs further study to determine whether any of the variants warrant recognition. South-eastern specimens tend to have scarios bracteoles that are shed prior to anthesis whereas north-eastern specimens are more variable and sometimes have relatively persistent bracteoles. One specimen (*J. Young* 463A) from the south-western part of the range has more numerous stamens than usual with 14–17 per flower.

Babingtonia fascifolia* Rye, *sp. nov.

Typus: Yandanooka–Morawa, Western Australia [precise locality withheld for conservation reasons], 2 December 1999, *S.J. Patrick* 3356 (*holo:* PERTH 05590833; *iso:* AD, NSW, MEL).

Baeckea sp. Yandanooka (R. Soullier 421), Western Australian Herbarium, in *FloraBase*, <http://florabase.dpaw.wa.gov.au/> [accessed 11 August 2015].

Shrub 0.3–0.5 m high, with erect slender stems and antrorse to widely spreading, densely clustered leaves; flowering branchlets usually with 6–18 flower-bearing nodes. *Young stems* smooth between the angles. *Petioles* 0.4–0.6 mm long. *Leaf blades* linear in outline, 3–5 mm long, 0.5–0.6 mm wide, 0.4–0.5 mm thick, obtuse, entire; abaxial surface deep, either convex along centre or with centre flattened and with a narrow groove along the midvein, with 1 or 2 main rows of small oil glands on each side of the midvein; adaxial surface fairly flat, oil glands often as conspicuous as on abaxial surface. *Peduncles* 0.7–1.4 mm long, 1–3-flowered; secondary axes (when present) up to at least 0.3 mm long. *Bracteoles* deciduous or persistent, ovate to linear in outline, 1.3–1.6 mm long, 0.3–0.5 mm wide, somewhat scarious and tinged yellowish or reddish, with margins somewhat to very incurved; apex incurved. *Pedicels* c. 2 mm long. *Flowers* commonly 7–8.5 mm diam. *Hypanthium* c. 2 mm long, 3–3.5 mm wide, smooth or somewhat rugose-pitted; free portion c. 0.6 mm long, often pink-tinged. *Sepals* ± depressed-ovate, 0.5–0.7 mm long, 1.5–2 mm wide, usually deep pink-tinged, acute, prominently ridged, the ridge reaching the apex of the outer ones and often horn-like but not a true horn; margin narrow, white, entire. *Petals* 3–3.5 mm long, white or pale pink. *Stamens* 19–23, in a circle. *Longest filaments* 1.3–1.4 mm long, c. 0.4 mm wide at base. *Anthers* 0.4–0.5 mm long, c. 0.3 mm wide, somewhat 2-lobed; connective gland protruding slightly, red. *Ovary* 3-locular; placentas shortly stalked; ovules usually 6–9 per loculus. *Style* 2.2–2.5 mm long, with the basal c. 0.7 mm immersed in a central depression. *Fruits* over 1/2- to c. 2/3-superior, c. 2.5 mm long, c. 3.5 mm diam. (c. 4.5 mm diam. including free hypanthium); summit deeply convex. *Seeds* not seen at maturity but strongly faceted, c. 1.1 mm long; testa pale (straw-coloured).

Diagnostic features. *Young stems* smooth. *Leaf blades* 3–5 mm long. *Peduncles* 0.7–1.4 mm long, 1–3-flowered. *Sepals* 0.5–0.7 mm long; margin narrow. *Stamens* 19–23, in a circle. *Anthers* somewhat 2-lobed; connective gland protruding slightly. *Ovary* 3-locular; placentas shortly stalked, with 6–9 ovules.

Other specimens examined. WESTERN AUSTRALIA: [localities withheld for conservation reasons] 8 Dec. 1992, R.J. Cranfield 8681 & P. Spencer (PERTH); Nov. 1997, R. Soullier 421 (PERTH); Nov. 1998, R. Soullier 648 (PERTH); Oct. 1999, R. Soullier 711 (PERTH).

Distribution and habitat. Occurs east of Mingenew (Figure 4B), with several records from yellow sand and one from red-brown lateritic soil, in woodlands or shrublands.

Phenology. Flowers from October to December. Fruits recorded from November to December.

Conservation status. Recently listed as Priority One under Department of Parks and Wildlife Conservation Codes for Western Australian Flora as *Baeckea* sp. Yandanooka (R. Soullier 421) (Western Australian Herbarium 1998–). This species is known from one locality on private land and several on road verges. Its late flowering time may partly explain the paucity of collections. One population sampled recently was apparently large.

Etymology. From the Latin *fascis* (bundle) and *-folius* (-leaved), referring to the densely clustered leaves.

Affinities. Its leaves are densely clustered on very short lateral branchlets like those of *B. cherticola*, a species which also has perhaps the most similar anthers. *Babingtonia fascifolia* differs from *B. cherticola* in its smoother young stems, smoother hypanthium, and narrower scarious to petaloid margins to the sepals. The anthers in *B. fascifolia* are shorter than in other taxa, with the connective gland obviously protruding at the base, and tend to be more divided into the two cells than other taxa apart from *B. camphorosmae* and *B. erecta*.

Notes. The young stems tend to have prominently ridged margins, almost slightly winged, but are quite smooth between the margins, i.e. with oil glands not prominent.

Babingtonia grandiflora (Benth.) Rye, *comb. nov.*

Baeckea grandiflora Benth., *Fl. Austral.* 3: 89 (1867). *Type:* between Moore and Murchison Rivers [probably from near Moore River], Western Australia, 1850–1851, *J. Drummond* coll. 6, n. 60 (*holo:* K 000821693; *iso:* MEL 72751, NSW 139907).

Illustration. W.E. Blackall & B.J. Grieve, *How Know W. Austral. Wildfl.* 3A: 81 (1980) [as *Baeckea grandiflora*].

Shrub 0.3–1.2 m high, with erect or arching slender stems and antrorse to widely spreading leaves that are dense on the young branchlets but not clustered; flowering branchlets with 1–10(–12) flower-bearing nodes. *Young stems* often with prominent oil glands and sometimes pustulate. *Petioles* 0.2–0.7 mm long. *Leaf blades* linear to narrowly obovate or rarely narrowly ovate in outline, 2.5–9 mm long, 0.5–1.6 mm wide, 0.3–0.6 mm thick, often with pale, tooth-like processes along the margins, thick and recurved towards the apex, with a somewhat to strongly recurved whitish apical point up to 0.3 mm long; abaxial surface deep, with centre flattened and with a furrow along the midvein, with 1 or 2 main rows of oil glands on each side of the midvein; adaxial surface indented into a 'v' shape or fairly flat. *Peduncles* 3–9 mm long, 1(–3)-flowered; secondary axes (when present) 1.5–2.3 mm long. *Bracteoles* persistent in flower and usually to the mature fruiting stage, with sides incurved, 1.5–4 mm long, 0.4–1.2 mm wide, usually largely or fully herbaceous but sometimes more scarious, occasionally toothed; apex sometimes with a minute recurved point. *Pedicels* 1–4 mm long. *Flowers* 11–15 mm diam. *Hypanthium* 1.7–3 mm long, 3–4.5 mm wide, sometimes with rather large oil glands but often rather smooth; free portion 0.6–1 mm long, often reddish-tinged. *Sepals* very depressed-ovate to depressed-ovate or depressed-hemispheric, 0.2–0.7 mm long, 1.5–3.3 mm wide, entire, often prominently ridged or slightly horned; margin scarcely developed to broad, often with deep pink markings. *Petals* (4–)4.5–6.5 mm long, white or pale pink. *Stamens* 11–25, in a circle or sometimes with distinct gaps. *Longest filaments* 1.5–2.3 mm long, 0.4–0.8 mm wide at base. *Anthers* 0.7–1.3 mm long, 0.4–0.7(–1) mm wide, entire; connective gland not protruding. *Ovary* 3-locular; placentas ± sessile; ovules 10–15 per loculus. *Style* 2.5–3.5 mm long, with the basal 0.7–1 mm immersed in a central depression. *Fruits* c. 1/2-inferior, 2.5–3 mm long, 3–4 mm diam. (4–5 mm diam. including attached floral parts); summit convex. *Seeds* 5-facetted or with dorsal facet reduced to the angle, 1–1.4 mm long, 0.3–0.5 mm wide, 0.6–0.9 mm thick; testa moderately thick, pale brown to golden brown or orange-brown, sometimes becoming dark brown, with obvious longitudinal rows of prominent colliculae. *Chaff pieces* facetted, commonly 0.8–1 mm long, crustaceous. (Figure 2)

Diagnostic features. *Young stems* smooth or with prominent oil glands. *Leaf blades* 2.5–9 mm long. *Peduncles* 3–9 mm long, mostly 1-flowered. *Sepals* 0.2–1.1 mm long; margin ± absent to broad. *Petals* (4–)4.5–6.5 mm long, white or pale pink. *Stamens* 11–25, in a circle. *Anthers* entire; connective gland not protruding. *Ovary* 3-locular; placentas ± sessile, with 10–15 ovules.

Selected specimens examined of typical variant. WESTERN AUSTRALIA: 1.2 miles [1.9 km] from Badgingarra towards Moora, 25 Sep. 1968, *E.M. Canning* WA/68 3507 (BRI, CBG); Mogumber, Nov. 1903, *W.V. Fitzgerald s.n.* (NSW); Boonanarring Reserve, S of Wannamal West Rd, 20 Oct. 1990, *B.J. Keighery* 1990/11 (MEL, PERTH); 100 miles [161 km] N of Perth, 22 Sep. 1962, *M.E. Phillips*

s.n. (BRI, CBG); 4.1 miles [6.6 km] N of New Norcia, 6 Oct. 1976, *M.E. & M.E. Trudgen* 1722 (PERTH); S foot of Mt Lesueur, 7 Oct. 1961, *J.H. Willis s.n.* (MEL, PERTH).

Selected specimens examined of other variants. WESTERN AUSTRALIA: 2 km N of Boonanarring Hill, Boonanarring Nature Reserve, 13 Sep. 1993, *P. Armstrong s.n.* (PERTH); Howatharra, near Northampton, c. 45 km N of Geraldton, 26 Sep. 1968, *A.M. Ashby* 2750 (AD, PERTH); N of Eneabba, 7 Sep. 1969, *A.M. Ashby* 3017 (AD); Oakabella hills, 22 miles [36 km] N of Geraldton, 2 Sep. 1947, *N.T. Burbidge* 2083 (CANB); G. Burrows block, White Peaks, 24 July 1999, *J.L. Checker* 11 (PERTH); Mogumber, between Perth and Moora on the railway, Mar. 1901, *F.L.E. Diels & E.G. Pritzel s.n.* (PERTH); south-western Australia, *J. Drummond s.n.* (MEL76384); 'Ajana' [probably from Howatharra], 15 Sep. 1960, *C.A. Gardner* 12757 (PERTH); between Champion Bay and Port Gregory, Oct. 1877, *F. Mueller s.n.* (MEL); Northern Gully Siding, W of railway crossing, 22 Sep. 1999, *S. Patrick* 3255 (PERTH); 24 miles [39 km] from Jurien Bay towards Eneabba, 24 Sep. 1968, *M.E. Phillips s.n.* (BRI, CBG, MEL); Moore River, Oct. 1901, *E.G. Pritzel* 731 (AD, PERTH); N of Nolba, 20 Sep. 2002, *M.E. Trudgen* 21633 (PERTH); between Badgingarra and Jurien Bay, 8 Oct. 1969, *D.J.E. Whibley* 3159 (AD).

Distribution and habitat. Extends from near Nolba (north-east of Northampton), south to Boonanarring Nature Reserve (Figure 1B), commonly on rocky hillsides or outcrops, mostly with laterite, or in sand over laterite. There is one specimen (*C.A. Gardner* 12757) reportedly from north of this range, in sand heath at Ajana. Since both the habitat and locality look suspicious, it seems likely that Gardner actually collected the species closer to Howatharra and Chapman River, which were the localities given for the previous numbers in his collecting sequence.

A significant disjunction occurs between east of Geraldton and the Arrowsmith River area, the northern area being c. 60 km long and the southern area much larger. In fact, the northern area of distribution occurs further north than, and is geographically separated from, all other members of the genus *Babingtonia*.

The geographical pattern of variation seen within *B. grandiflora* is similar to that in a number of other species groups, such as the *Petrophile pilostyla* group (Rye & Hislop 2005) in the family Proteaceae, where the geographically isolated, northern members of the group (from north of Geraldton) are relatively uniform whereas those occurring from the Arrowsmith River region southwards are very variable. This tendency for disjunct northern variants may be related to the comparative rarity of laterite in the region of disjunction.

Phenology. Flowering begins earlier in the north. Overall it occurs from late July to December, especially from August to October. With such a varied flowering period, the species can also be found in fruit over much of the year.

Conservation status. A relatively widespread taxon, not considered to be at risk. However, the variation within *B. grandiflora* needs further study to determine whether any variants are sufficiently distinct to be named and whether any of them should have conservation priority.

Etymology. Both the scientific epithet and the common names refer to the large size of the flowers, which are on average the largest of the species described here and also large in comparison with most other species of *Baeckea s. lat.*

Common name. Large-flowered Babingtonia. Previously known as Large-flowered Baeckea.

Affinities. The closest relatives are probably species with the most similar anthers, especially *B. maleyae* Rye & Trudgen and *B. pelloeae*; see notes under those species.

Notes. Bentham apparently based his description of this species solely on the type material from James Drummond's sixth collection, although additional material collected by Drummond may have been available to him. As there is no indication on the MEL and NSW sheets that Bentham saw either of them, it is presumed that K 000821693 can be treated as the holotype. Judging from its morphology, the type was collected in the southern part of the species' range, probably from near Moore River.

North of the disjunction in the species' range *B. grandiflora* is not nearly as variable as it is in the south; for example, the petioles are always short (0.2–0.4 mm long) in the north but up to 0.7 mm long in the south. All northern specimens have sepals 0.4–0.6 mm long, with a broad, scarious to petaloid margin above a much reduced, almost truncate, herbaceous part.

South of the disjunction, two main variants can be distinguished based on sepal morphology. The typical one, which extends from Cockleshell Gully south-east to Boonanarring Nature Reserve, has sepals 0.2–0.7 mm long and lacking, or with scarcely any, scarious to petaloid margin. The other variant, extending from near Arrowsmith River south-east to the Bindoon area, has sepals 0.6–1.1 mm long, with an obvious scarious to petaloid margin.

The typical variant is particularly variable in its stamen numbers, with the majority of flowers having 11–25 stamens. When the stamens are at their fewest they may tend to be arranged opposite the sepals and petals. The shortest filaments are sometimes fused to form a very broad filament up to 1.4 mm wide when the stamen number is reduced.

The two main southern variants greatly overlap in distribution and probably co-occur at some localities. One collection (*S. Patrick* 4455, 4455A) has material of both variants of *B. grandiflora*, the typical one with much narrower leaves than the other, but perhaps from a more shaded area, and also with the oil glands on the young stems more prominent. Both variants are very variable in leaf morphology, with specimens from well shaded positions under tree canopies tending to have long, spindly leaves while those from exposed positions at the same collecting localities have short, thick leaves.

In Boonanarring Nature Reserve, the typical variant (*B.J. Keighery* 1990/1) has been recorded from sand over laterite in heath and the other southern variant (*P. Armstrong s.n.* 13/09/1993) from sand in open Jarrah-Marri woodland.

Seed ornamentation may vary between the variants but additional collections of good fruiting material with mature seeds are needed to investigate this possibility. Mature fruits and seeds of the typical variant were measured from just one specimen (*P.G. Wilson* 3894) while no mature seeds were present on specimens from the disjunct northern area of occurrence of *B. grandiflora*. Only the atypical southern variant had several collections with mature seeds.

Babingtonia maleyae Rye & Trudgen, *sp. nov.*

Typus: east of Narrogin, Western Australia [precise locality withheld for conservation reasons], 15 February 2001, *K. Kershaw* 2136 (*holo*: PERTH 06029523; *iso*: CANB, MEL, PERTH 06021190).

Baeckea sp. Narrogin (R. Hnatiuk 780011), G. Paczkowska & A.R. Chapman, *West. Austral. Fl.: Descr. Cat.* 348 (2000); Western Australian Herbarium, in *FloraBase*, <http://florabase.dpaw.wa.gov.au/> [accessed 11 August 2015].

Shrub 0.8–1.3 m high, with erect slender stems and antrorse to widely spreading leaves that are dense on the young branchlets but not clustered, but densely leafy on small, widely spreading branchlets towards base of plant, these having longer leaves of a different shape from the more elliptic ones on flowering upper branchlets; flowering branchlets usually with 4–17 flower-bearing nodes. *Young stems* smooth or with somewhat prominent oil glands. *Petioles* 0.2–0.3 mm long. *Leaf blades* narrowly obovate to elliptic in outline, 1.7–4 mm long, 0.6–1.1 mm wide, 0.5–0.6 mm thick, herbaceous, with narrow, pale, tooth-like processes along the margins, thick and recurved towards the apex, often mucronulate; abaxial surface deep, the centre flattened widely towards the base but more narrowly towards the apex, with 1–3 main rows of small oil glands on each side of the midvein; adaxial surface fairly flat, oil glands often as conspicuous as on abaxial surface. *Peduncles* 1.5–5 mm long, 1(2)-flowered; secondary axes (when present) *c.* 1.5 mm long. *Bracteoles* persistent in flower and usually to the mature fruiting stage, narrowly ovate or ovate, 0.8–1.3 mm long, 0.25–0.5 mm wide, often somewhat scarious and tinged reddish, the margins folded inwards (blade v-shaped in T.S.); apex recurved, often with a point up to 0.2 mm long. *Pedicels* 1.3–2.4 mm long. *Flowers* 8–9.5 mm diam. *Hypanthium* 1.5–1.7 mm long, *c.* 2.5 mm wide, with rather large oil glands; free portion 0.6–0.8 mm long, often reddish-tinged. *Sepals* depressed-ovate or depressed-hemispheric, 0.5–0.8 mm long, 1.3–1.8 mm wide, usually deep pink-tinged, broadly obtuse, not horned; margin broad, entire or denticulate. *Petals* 3–3.5 mm long, white inside, pink outside in bud. *Stamens* 17–20, in a circle. *Longest filaments* 1.1–1.4 mm long, 0.3–0.4 mm wide at base. *Anthers* 0.6–0.7 mm long, 0.3–0.35 mm wide, entire; connective gland not protruding. *Ovary* 3-locular; placentas ± sessile; ovules 6–9 per loculus. *Style* 1.7–2.2 mm long, with the basal 0.6–0.8 mm immersed in a central depression. *Fruits* *c.* 1/2-inferior, 1.5–2 mm long, 2.5–3 mm diam.; summit convex. *Seeds* not seen at maturity but immature ones were *c.* 0.8 mm long. *Chaff pieces* faceted, up to 0.8 mm long, crustaceous.

Diagnostic features. *Young stems* fairly smooth. *Leaf blades* 1.7–4 mm long. *Peduncles* 1.5–5 mm long, mostly 1-flowered. *Sepals* 0.5–0.8 mm long; margin broad. *Petals* 3–3.5 mm long, white. *Stamens* 17–20, in a circle. *Anthers* entire; connective gland not protruding. *Ovary* 3-locular; placentas ± sessile, with 6–9 ovules.

Selected specimens examined. WESTERNAUSTRALIA: [localities withheld for conservation reasons] 5 Sep. 2000, *G.S. Durell* 248 (NSW, PERTH); 12 Jan. 1978, *R.J. Hnatiuk* 780011 (PERTH); Feb. 1959, *R.T. Lange* 40 (PERTH); 1965, *H.B. Shugg s.n.* (PERTH 04367146).

Distribution and habitat. Known only from a few locations near Narrogin (Figure 4A). The only information on herbarium sheets is that it grows on sandy loam with lateritic gravel.

Phenology. Flowers and fruits recorded in January and February, with fruits also recorded in September.

Conservation status. Listed by Jones (2014) as Priority Two under Department of Parks and Wildlife

Conservation Codes for Western Australian Flora as *Baেকেa* sp. Narrogin (R. Hnatiuk 780011). This species is known from only a very small area.

Etymology. Named after Sandra Maley, a science teacher and researcher who prepared draft descriptions of many new species of Chamelaucieae, including this one.

Common name. Narrogin Babingtonia.

Affinities. Its closest affinities are probably with *B. grandiflora*, which has larger flowers and more numerous ovules, and *B. pelloeae* (see notes under that species). Both of those species are well separated geographically from *B. maleyae*.

Notes. It is likely that this species, like most other members of the genus, sometimes produces three flowers per peduncle, but the maximum number of flowers seen in the little material available was two flowers.

The transition between the herbaceous base and the thinner margin of the sepals is less abrupt in *B. maleyae* than in related species, as the central section is less thickened than usual, although even in this species there is an abrupt change in colour between the two sections. Good fruiting material with mature seeds is still needed. Although mature fruits have been seen, their contents were either shed or all appeared to be sterile, i.e. chaff. Immature, somewhat shrunken seeds were seen in immature fruits on one specimen (*G.S. Durell* 248).

***Babingtonia minutifolia* Rye & Trudgen, sp. nov.**

Typus: south of Bunjil, Western Australia [precise locality withheld for conservation reasons], 16 December 1981, *B.R. Maslin* 5067 (*holo:* PERTH 03464792; *iso:* MEL).

Baেকেa sp. Bunjil (*B.R. Maslin* 5067), *G. Paczkowska & A.R. Chapman, West. Austral. Fl.: Descr. Cat.* 348 (2000); Western Australian Herbarium, in *FloraBase*, <http://florabase.dpaw.wa.gov.au> [accessed 11 August 2015].

Shrub 0.4–1.5 m high, erect and widely spreading, sometimes wider than high, intricately branched (i.e. compact habit), the branchlets very slender, with widely spreading leaves that are dense on the young branchlets and sometimes densely clustered; flowering branchlets usually with 1–4 flower-bearing nodes. *Young stems* with prominent oil glands forming tubercles. *Petioles* 0.1–0.2 mm long. *Leaf blades* narrowly obovate to elliptic in outline, 0.9–1.6 mm long, 0.4–0.7 mm wide, mostly 0.5–0.6 mm thick, many of them thicker than wide, increasing in thickness towards the apex, entire, often with a minute erect or recurved apical point; abaxial surface deeply convex, with 1 or sometimes 2 main rows of often large oil glands on each side of the midvein but oil glands often inconspicuous; adaxial surface fairly flat, oil glands often as conspicuous as on abaxial surface. *Peduncles* 1.5–5 mm long, 1-flowered. *Bracteoles* persistent in flower and usually to the mature fruiting stage, narrowly ovate or ovate, 0.6–1.2 mm long, 0.3–0.5 mm wide, often somewhat scarious and tinged reddish, with margins incurved; apex incurved, acute. *Pedicels* 0.6–2.5 mm long. *Flowers* 9–10.5 mm diam. *Hypanthium* *c.* 1.5 mm long, *c.* 3.5 mm wide, with rather large oil glands; free portion *c.* 0.6 mm long, often reddish-tinged. *Sepals* very reduced, very depressed-hemispheric, 0.2–0.5 mm long, pink-tinged, not horned or ridged; margin narrow or \pm absent, entire. *Petals* 3.5–4 mm long, very pale pink inside, deeper pink outside in bud. *Stamens* 16–19, in a circle. *Longest filaments* 2–2.5 mm long,

0.6–0.8 mm wide at base. *Anthers* 0.6–0.7 mm long, 0.4–0.5 mm wide, entire; connective gland not protruding but its presence evident by the deep pink to red colouring of the base of the anther. *Ovary* 3-locular; placentas ± sessile; ovules 9–12 per loculus. *Style* 2.5–3 mm long, with the basal *c.* 0.8 mm immersed in a central depression. *Fruits c.* 1/2-inferior, 2.5–3 mm long, 3–3.5 mm diam. (4.5–5 mm diam. including attached floral parts); summit deeply convex. *Seeds* faceted but not seen at maturity, *c.* 1.1 mm long, 0.45–0.6 mm wide, 0.5–0.6 mm thick; testa moderately thick, golden brown, deeply colliculate on outer and lateral surfaces. *Chaff pieces* faceted, 0.4–0.7 mm long, crustaceous.

Diagnostic features. *Young stems* tuberculate. *Leaf blades* 0.9–1.6 mm long. *Peduncles* 1.5–5 mm long, 1-flowered. *Sepals* 0.2–0.5 mm long; margin narrow. *Petals* 3.5–4 mm long, white to pale pink. *Stamens* 16–19, in a circle. *Anthers* entire; connective gland not protruding. *Ovary* 3-locular; placentas ± sessile, with 9–12 ovules.

Other specimens examined. WESTERN AUSTRALIA: [localities withheld for conservation reasons] 5 Nov. 1974, *J.S. Beard* 7352 (PERTH); 23 Sep. 2013, *J. Borger* BR 02-1 (PERTH); 29 Nov. 1981, *B. Jack & V. Syme s.n.* (PERTH 03464806); 9 Oct. 2002, *S. Patrick* 4479 (PERTH).

Distribution and habitat. Restricted to a small area between Perenjori, Carnamah and Bunjil (Figure 6B), with most records from rock outcrops.

Phenology. Flowers from late September to December. Fruits recorded in November and December.

Conservation status. Listed by Jones (2014) as Priority One under Department of Parks and Wildlife Conservation Codes for Western Australian Flora as *Baeckea* sp. Bunjil (B.R. Maslin 5067). This species is known from an area *c.* 35 km long.

Etymology. From the Latin *minutus* (very small) and *-folius* (-leaved), this species having the smallest leaves in the genus, less than 2 mm long.

Affinities. This species is readily distinguished from all other species with similar anthers (such as *B. grandiflora*) by its minute leaves.

Notes. It appears from the available material that this species does not produce any multi-flowered peduncles. The young stems are tuberculate, but not as markedly so as in *B. cherticola*. Good fruiting material is needed for this species as only immature seeds have been examined.

Babingtonia pelloeae* Rye & Trudgen, *sp. nov.

Typus: Carmel, Western Australia [precise locality withheld for conservation reasons], 21 January 1999, *F. Hort* 393 (*holo:* PERTH 05367662; *iso:* CANB, K, MEL, NSW).

Baeckea sp. B, in N.G. Marchant, J.R. Wheeler, B.L. Rye, E.M. Bennett, N.S. Lander & T.D. Macfarlane, *Fl. Perth Region* 1: 384 (1987).

Baeckea sp. Darling Range (R.J. Cranfield 1673), G. Paczkowska & A.R. Chapman, *West. Austral. Fl.: Descr. Cat.* 348 (2000); Western Australian Herbarium, in *FloraBase*, <http://florabase.dpaw.wa.gov.au/> [accessed 11 August 2015].

Shrub 0.3–0.6 m high, usually open, with erect slender stems bearing numerous short lateral branchlets and with antrorse to widely spreading, sometimes densely clustered leaves; flowering branchlets usually with 3–15 flower-bearing nodes. *Young stems* fairly smooth or with prominent oil glands. *Petioles* 0.2–0.5 mm long. *Leaf blades* ± narrowly oblong to linear in outline, 3.5–8 mm long, 0.4–0.8 mm wide, 0.3–0.5 mm thick, with narrow, pale, tooth-like processes along the margins, with a terminal point up to 0.2 mm long; abaxial surface deep, with steep sides, the centre flattened widely towards the base but more narrowly towards the apex and often furrowed along the middle, with 1–3 (usually 1) main rows of small oil glands on each side of the midvein; adaxial surface fairly flat, oil glands as conspicuous as on abaxial surface. *Peduncles* 1.5–4 mm long, 1(2)-flowered; secondary axes (when present) usually 1–1.3 mm long. *Bracteoles* usually caducous or deciduous, ± linear or narrowly oblong in outline, 1.2–1.7 mm long, 0.2–0.4 mm wide, scarious, with prominent oil glands, with margins incurved or folded inwards (blade v-shaped in TS); apex recurved, often with a small point. *Pedicels* 0.7–2.5 mm long. *Flowers* 9–12 mm diam. *Hypanthium* 1.3–2 mm long, 3–3.5 mm wide, with rather large oil glands; free portion 0.5–0.7 mm long, often reddish-tinged. *Sepals* triangular to depressed-ovate, 0.7–1.3 mm long, 1.4–2.2 mm wide, usually deep pink-tinged, acute, the outer ones strongly ridged and rarely slightly horned; margin broad, denticulate or lacinate. *Petals* 3.3–5 mm long, medium-pink inside, deep pink outside in bud. *Stamens* usually 12–20, in a circle. *Longest filaments* 1.2–1.8 mm long, 0.3–0.4 mm wide at base. *Anthers* 0.6–0.8 mm long, 0.2–0.5 mm wide, entire; connective gland not protruding. *Ovary* 3-locular; placentas shortly stalked; ovules 6–10 per loculus. *Style* 1.7–3 mm long, with the basal *c.* 0.8 mm immersed in a central depression. *Fruits* *c.* 1/2-inferior, *c.* 2.5 mm long, 3–3.5 mm diam. (4–4.5 mm diam. including free hypanthium); summit convex. *Seeds* strongly faceted, 1.2–1.3 mm long, 0.8–1 mm wide, 0.7–0.9 mm thick; testa moderately thick, pale brown, colliculate on the lateral surfaces. *Chaff pieces* faceted, mostly 0.6–0.9 mm long, crustaceous. (Figure 3)

Diagnostic features. *Young stems* smooth or with prominent oil glands. *Leaf blades* 3.5–8 mm long. *Peduncles* 1.5–4 mm long, mostly 1-flowered. *Sepals* 0.7–1.3 mm long; margin broad. *Petals* 3.3–5 mm long, medium-pink. *Stamens* 12–20, in a circle. *Anthers* entire; connective gland not protruding. *Ovary* 3-locular; placentas shortly stalked, with 6–10 ovules.

Selected specimens examined. WESTERN AUSTRALIA: [localities withheld for conservation reasons] 22 Dec. 1996, *H. Bowler* 51 (PERTH); 3 Jan. 1981, *R.J. Cranfield* 1673 (PERTH); 4 Aug. 1982, *R.J. Cranfield* 2268 (PERTH); 11 Jan. 1985, *R. & M. Hamilton* 87 A (PERTH); 3 Jan. 1999, *M. Hislop* 1272 (PERTH); 26 Jan. 1999, *F. Hort* 399 (PERTH); 27 Dec. 2001, *F. Hort* 1672 (AD, BRI, HO, PERTH); 3 Jan. 2002, *F. Hort* 1689 (PERTH); 29 Jan. 2006, *F. Hort & J. Hort* 2778 (PERTH); 2 Apr. 2006, *G.J. Keighery & B.J. Keighery* 887 (PERTH); Jan. 1925, *E.T. Pelloe s.n.* (PERTH).

Distribution and habitat. Extends from Moore River south to Roleystone (Figure 4B), growing on the Darling Scarp and Range in lateritic habitats in Jarrah and Marri open woodlands.

Phenology. Flowers mainly from December to January, also recorded in July and August. Fruits recorded from December to June.

Conservation status. This species is geographically restricted but has been well surveyed and is not conservation-listed. Its known range is about 125 km long but very narrow.

Etymology. Named after Emily Harriet Pelloe (1877/8–1941), who helped bring the south-western Australian wildflowers to public attention in articles and books (see Council of Heads of Australasian Herbaria 2007b–), particularly with the publication of her wildflower paintings and botanical observations

in *Wildflowers of Western Australia* (Pellöe 1921). She collected *B. pelloeae* in Kalamunda in January 1925, and the species was apparently not re-collected until the 1980s.

Common name. Pellöe's Babingtonia.

Affinities. *Babingtonia pelloeae* appears to be related to *B. grandiflora* and *B. maleyae*, differing from both in its medium-pink flowers, which are usually smaller than those of *B. grandiflora* and usually larger than those of *B. maleyae*. It has fewer ovules than *B. grandiflora* and more elongated leaves than *B. maleyae*. See also the discussion of affinities under *B. urbana*.

Notes. This species was described as *Baeckea* sp. B in *Flora of the Perth Region* (Rye 1987) and has since been known as *Baeckea* sp. Darling Range (R.J. Cranfield 1673). In a few collections (e.g. *F. Hort* 397) some flowering stems have the branchlets, leaves and flowers in alternating whorls of three, and it is not uncommon for the leaves of a pair or triplet to be widely displaced such that some flowers appear to be singly arranged. One specimen (*M. Blackwell s.n.* Dec. 1978) has relatively few (maximum of 13, possibly down to 11 or 10) stamens per flower.

One odd specimen (*R.J. Cranfield* 2268) differs from the description given above in having larger, more herbaceous sepals, and leaves tending to have oil glands in three main rows rather than the usual one or two rows on each side of the midvein. It also has herbaceous, persistent bracteoles.

Babingtonia triandra Rye & Hislop, *sp. nov.*

Typus: Shire of Victoria Plains [Calingiri area], Western Australia [precise locality withheld for conservation reasons], 16 December 2003, *F. Hort* 2147 & *G. Harders* (*holo:* PERTH 06692583; *iso:* CANB, K, MEL, NSW).

Baeckea sp. Calingiri (*F. Hort* 1710), Western Australian Herbarium, in *FloraBase*, <http://florabase.dpaw.wa.gov.au/> [accessed 11 August 2015].

Shrub erect at first, low and spreading to almost prostrate at maturity, 0.15–0.5 m high, up to 2.7 m wide, with leaves densely clustered on short lateral shoots; flowering branchlets usually with 8–15 or more flower-bearing nodes. *Young stems* often narrowly 4-winged or 4-ribbed, smooth between the wings or ribs; epidermis flaky or peeling in long strips on main branches. *Petioles* 0.3–0.4 mm long. *Leafblades* linear or very narrowly obovate in outline, 3.4–5.5 mm long, 0.4–0.5 mm wide, 0.3–0.4 mm thick, thickest towards the apex, entire, not mucronate; abaxial surface deep, sometimes flattened along the midvein, with 1 or 2 main rows of minute oil glands on each side of the inconspicuous midvein; adaxial surface fairly flat, oil glands similar to those on abaxial surface. *Peduncles* 1.5–4 mm long, several-flowered or with up to at least 16 flowers; bracts deciduous, ± narrowly oblong from side view, 0.7–1.5 mm long, 0.15–0.25 mm wide, somewhat scarious and tinged reddish or brown, entire, margins folded (blade v-shaped in TS), apex acute; secondary axes 0.4–1.5 mm long, often with many smaller, spreading branches above. *Bracteoles* similar to bracts but smaller. *Pedicels* absent or up to 0.5 mm long. *Flowers* 3–3.5 mm diam. *Hypanthium* cup-shaped to urceolate, 0.8–1.2 mm long, 0.7–1 mm wide, rather coarsely rugose-pitted, with no obvious free portion. *Sepals* depressed-ovate, 0.3–0.4 mm long, 0.5–0.7 mm wide, obtuse, largely green or red, the outer ones somewhat keeled; margin narrow, pale, entire. *Petals* 1.3–1.5 mm long, white. *Stamens* 3, widely spaced, antisepalous. *Filaments* 0.25–0.35 mm long, c. 0.2 mm wide at base, pale at first, becoming deep pink. *Anthers* 0.4–0.5 mm long, 0.25–0.3 mm wide, entire; connective gland not protruding. *Ovary* 1-locular, with a

concave summit; placenta distinctly stalked; ovules 4–6. *Style* somewhat displaced from the centre in flower and very eccentric in fruit, 0.5–0.75 mm long, the basal *c.* 0.1 mm inserted in a tilted depression. *Fruits* indehiscent, inferior, somewhat urceolate, 0.9–1.3 mm long, 0.8–1.3 mm diam., very thin-walled, 1-seeded; summit flat. *Seed* broadly and very irregularly ovoid or obovoid, 0.7–1.1 mm long, 0.5–0.8 mm wide; testa thin, medium brown, \pm smooth with reticulate patterning. *Chaff* pieces varying from flattened to thick and more obviously faceted, 0.3–0.7 mm long, crustaceous, medium brown.

Diagnostic features. *Young stems* smooth. *Leaf blades* 3.4–5.5 mm long. *Peduncles* 1.5–4 mm long, multi-flowered. *Sepals* 0.3–0.4 mm long; margin broad. *Stamens* 3, antisepalous. *Anthers* entire; connective gland not protruding. *Ovary* 1-locular; placenta long-stalked, with 4–6 ovules.

Other specimens examined. WESTERN AUSTRALIA [all from type locality]: 17 Mar. 2002, *F. Hort* 1710 (AD, BRI, CANB, MEL, PERTH); 14 Mar. 2002, *F. Hort* 1724–1726 (PERTH); 28 Mar. 2004, B.L. Rye 240304, 240305, 240307 & *F. & J. Hort* (PERTH).

Distribution and habitat. Occurs near Calingiri (Figure 6A) in a low-lying, sandy, winter-wet depression with a *Melaleuca* thicket over *Babingtonia* and sedges.

Phenology. Flowers from December to February, also recorded in March for a plant in a deep roadside ditch. Fruits mainly from February to April.

Conservation status. Listed by Jones (2014) as Priority Two under Department of Parks and Wildlife Conservation Codes for Western Australian Flora as *Baeckea* sp. Calingiri (*F. Hort* 1710). This species is known from a single population in a nature reserve, where it is common.

Etymology. From the Greek *tri-* (three-) and *-andrus* (-stamened).

Common name. Triplet Babingtonia.

Affinities. See notes under *B. delicata*.

Notes. *Babingtonia triandra* has the lowest regular stamen number in the whole of the tribe Chamelaucieae. No other taxa are known to have regularly three stamens per flower although a few, such as *Scholtzia parviflora* F.Muell., have variable numbers down to a minimum of two per flower.

The seeds are irregular in shape, fitting the shape of the available space other than that taken up by the pieces of chaff, and depending on their position they may have their broadest part towards the base or towards the apex of the fruit. They have a thin but still crustaceous testa, suggesting that this species has only relatively recently evolved an indehiscent fruit.

Babingtonia urbana Rye, *sp. nov.*

Typus: west of Mundijong, Western Australia [precise locality withheld for conservation reasons], 20 January 1992, *G.J. Keighery* 12705 (*holo:* PERTH 04099672; *iso:* AD, CANB, K, MEL, NSW).

Baeckea sp. Perth Region (R.J. Cranfield 444), Western Australian Herbarium, in *FloraBase*, <http://florabase.dpaw.wa.gov.au/> [accessed 11 August 2015].

Shrub 0.4–0.7 m high, with erect slender stems and antrorse to widely spreading leaves which are dense on the small branchlets but not clustered; flowering branchlets usually with 5–10 flower-bearing nodes. *Young stems* smooth or with scattered prominent oil glands only on the youngest, leafy stems. *Petioles* (0.3–)0.5–0.7 mm long. *Leaf blades* ± linear in outline, (4–)6–13 mm long, 0.7–1.2 mm wide, 0.3–0.5 mm thick, entire or sometimes denticulate, sometimes mucronulate, dotted with scattered minute oil glands scarcely forming rows; abaxial surface with centre flattened and a furrow along the midvein depressed; adaxial surface concave, oil glands at least as conspicuous as on abaxial surface. *Peduncles* 1.3–3(–5) mm long, 1(–3)-flowered; secondary axes (when present) 0.3–1.1 mm long. *Bracteoles* usually caducous and rarely seen, rarely present in the fruiting stage, narrowly ovate, up to 1.8 mm long, scarious and tinged reddish, with margins incurved or folded inwards (blade v-shaped in TS); apex incurved to recurved, acute. *Pedicels* 0.7–1.5 mm long or up to 3 mm long on the central flower of a triad. *Flowers* 7–8.5 mm diam. *Hypanthium* 1.5–1.8 mm long, c. 3 mm wide, rugose-pitted with rather large oil glands (each gland forming a pit); free portion 0.3–0.5 mm long, often reddish-tinged. *Sepals* depressed ovate or depressed hemispheric, 0.6–0.8 mm long, 1.8–2.2 mm wide, usually deep pink-tinged, broadly obtuse, strongly ridged and often very shortly horned; margin broad, entire to deeply denticulate. *Petals* 2.5–3 mm long, white or pale pink inside, pink outside in bud. *Stamens* 16–20, in a circle. *Longest filaments* 1.3–1.6 mm long, 0.3–0.6 mm wide at base. *Anthers* 0.5–0.8 mm long, 0.3–0.4 mm wide, entire; connective gland not protruding. *Ovary* 3-locular; placentas distinctly stalked; ovules 6–11 per loculus. *Style* 1.5–3 mm long, the basal 0.7–1 mm pale and immersed in a central depression. *Fruits* c. 1/2-inferior, 2.2–2.5 mm long, 2.5–3 mm diam. (3.5–4 mm diam. including the hypanthium); summit deeply convex. *Seeds* strongly faceted, 0.9–1.2 mm long, 0.5–0.7 mm wide, 0.6–0.7 mm thick, with irregular or somewhat frilly rims protruding at the margins of the facets; testa moderately thick, golden brown, smooth on outer facet, the lateral facets colliculate. *Chaff pieces* faceted, mostly 0.6–0.8 mm long, crustaceous.

Diagnostic features. *Young stems* smooth or rapidly becoming smooth. *Leaf blades* (4–)6–13 mm long. *Peduncles* 1.3–5 mm long, 1–3-flowered. *Sepals* 0.6–0.8 mm long; margin broad. *Petals* 2.5–3 mm long, white or pale pink. *Stamens* 16–20, in a circle. *Anthers* entire; connective gland not protruding. *Ovary* 3-locular; placentas distinctly stalked, with 6–11 ovules.

Selected specimens examined. WESTERN AUSTRALIA [localities withheld for conservation reasons]: 24 Feb. 1978, R.J. Cranfield 444 (PERTH); 23 Mar. 1981, R.J. Cranfield 1679 (BRI, CANB, PERTH); 14 Jan. 1970, H. Demarz 2121 (PERTH); Mar. 1901, F.L.E. Diels & E.G. Pritzel s.n. (PERTH 03378373); 15 Nov. 1988, E.A. Griffin 5502 (PERTH); 4 Jan. 2005, M. Hislop 3403 & F. Hort (AD, K, MEL, NSW, PERTH); 26 June 2004, G.J. & B.J. Keighery 433 (PERTH); 21 Feb. 1899, A. Morrison s.n. (PERTH 03378381); 13 Feb. 2014, A. Quarmby WB 35244 (MEL, PERTH); 2 Mar. 1948, N.H. Speck s.n. (PERTH 03377946).

Distribution and habitat. Extends from near Badgingarra National Park south to Mundijong (Figure 6B), but there is also a record of the species further south from the Mandurah area (Bronwen Keighery pers. comm.). *Babingtonia urbana* is associated with wetlands on the Swan Coastal Plain. In the Perth area the species occurs on the eastern side of the plain. The only spot on the map that is right on the coast is for the locality given as ‘Lancelin’ on H. Demarz 2121; it might actually have been collected somewhat further inland.

Phenology. Flowers January to March. Fruits recorded from January to July.

Conservation status. Listed by Jones (2014) as Priority Three under Department of Parks and Wildlife Conservation Codes for Western Australian Flora as *Baeckea* sp. Perth Region (R.J. Cranfield 444).

This species is threatened by urbanisation and the depletion of wetlands in Perth suburbs, although its full range is probably about 220 km long. Some cultivation of *B. urbana* has been undertaken in an attempt to conserve the species.

Etymology. From the Latin *urbanus* (of the city), referring to the occurrence of this species mainly in the areas of relatively high population density on the Swan Coastal Plain between Lancelin and Mandurah.

Common name. Coastal Plain Babingtonia

Affinities. This species differs from *B. cherticola* in its smoother stems and longer peduncles, and from *B. pelloeae* in flower colour, tending also to have a more coarsely reticulate-patterned hypanthium and usually longer leaves. It differs from both species in its habitat preference for wetlands.

Notes. The earliest collections of *B. urbana* were made at Cannington, a suburb of Perth, between 1899 and 1903 by Dr A. Morrison, who misapplied the name *Baeckea drummondii* Benth. to them. *Baeckea drummondii* is actually a synonym of *Cyathostemon tenuifolius* Turcz., but since *Cyathostemon* Turcz. was at that time being treated as a synonym of *Baeckea*, there followed a long period when the name *Baeckea tenuifolia* (Turcz.) Domin was used instead. Consequently, the species was described under the latter misapplied name in *Flora of the Perth Region* (Rye 1987); however, the description followed Blackall and Grieve (1980) in giving the ovule number as ‘probably 3 or 4’ per loculus as it is in true *C. tenuifolius*. *Babingtonia urbana* has 6–11 ovules per loculus.

In 2003, type material of *C. tenuifolius* was examined and the misapplication of its name realised. An informal name, *Baeckea* sp. Perth Region (R.J. Cranfield 444), was then used for *B. urbana*.

A specimen from north-west of Moora (*E.A. Griffin* 5502) is atypical, having shorter leaves (with a petiole *c.* 0.3 mm long and blade 4 mm long) than all other specimens cited and also the lowest stamen number (16) recorded for the species. It occurs further inland than the other known localities, separated from the closest of them by about 40 km, and might be sufficiently distinct to warrant formal recognition, but more material is needed to see whether these differences are significant.

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