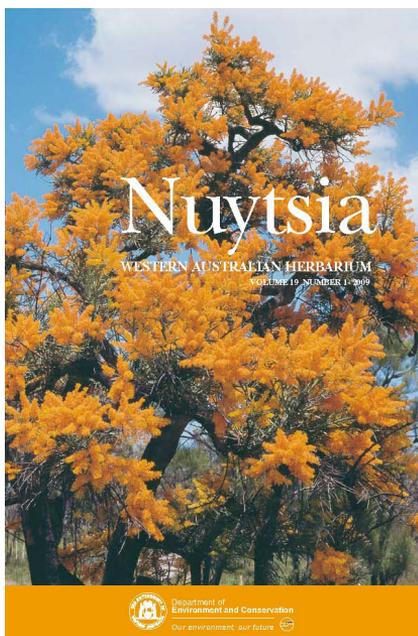


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B.L. Rye.

A reduced circumscription of *Balaustion* and description of the new genus *Cheyniana* (Myrtaceae: Chamelaucieae)

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All enquiries and manuscripts should be directed to:

The Managing Editor – *NUYTSIA*  
Western Australian Herbarium  
Dept of Environment and Conservation  
Locked Bag 104 Bentley Delivery Centre  
Western Australia 6983  
AUSTRALIA

Telephone: +61 8 9334 0500  
Facsimile: +61 8 9334 0515  
Email: [nuytsia@dec.wa.gov.au](mailto:nuytsia@dec.wa.gov.au)  
Web: [science.dec.wa.gov.au/nuytsia](http://science.dec.wa.gov.au/nuytsia)



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## A reduced circumscription of *Balaustion* and description of the new genus *Cheyniana* (Myrtaceae: Chamelaucieae)

Barbara L. Rye

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

### Abstract

B.L. Rye. A reduced circumscription of *Balaustion* and description of the new genus *Cheyniana* (Myrtaceae: Chamelaucieae). *Nuytsia* 19(1): 129–148 (2009). The myrtaceous genus *Balaustion* Hook. is reduced to its original monotypic circumscription. *Balaustion s. str.* is closely related to *Tilophloia* Trudgen & Rye ms, both genera having stamens in a single circular series, broad filaments, a very large placenta and seeds with a large concave hilum, but *Balaustion* is distinguished by its prostrate habit with adventitious roots, basifixed anthers and long tubular flowers adapted to pollination by birds. A second bird-pollinated species with elongated flowers, previously known as *B. microphyllum* C.A.Gardner, is transferred into the new genus *Cheyniana* Rye as *C. microphylla* (C.A.Gardner) Rye. Since the type material of this species is missing, it is lectotypified on the original illustration. Another large-flowered species, but with more spreading, apparently insect-pollinated flowers, is described as *C. rhodella* Rye & Trudgen. *Cheyniana* is related to also *Oxymyrrhine* Schauer, which it resembles in its very reduced anthers and narrow filaments, but differs in its large colourful petals and woody indehiscent fruit. Both of the small genera treated in this taxonomic revision belong to the tribe Chamelaucieae and are restricted to the south-west of Western Australia.

### Introduction

The tribe Chamelaucieae *s. lat.* of the Myrtaceae consists mainly of small-flowered insect-pollinated species and, especially among the many taxa that have traditionally been included within sections of *Baeckea* L., most species have white or pink flowers with a broad open disc surrounded by widely spreading petals. Against this backdrop, the small genus *Balaustion* Hook has been readily distinguished by the large size, tubular shape and orange to red colouring of its bird-pollinated flowers (see images in Corrick *et al.* (1996: 112), Keighery (2004) and Western Australian Herbarium 1998–). These striking floral adaptations have hindered attempts to determine the true affinities of the two species currently placed in *Balaustion*. Convergent similarities are commonly found among taxa with flowers adapted to pollination by birds and can easily mask their morphological similarities to insect-pollinated relatives, for example as recorded in the Fabaceae (Crisp 1996).

While some of the many morphological differences between the two bird-pollinated species of *Balaustion s. lat.* have been used to separate them from one another in publications such as Blackall and Grieve's (1980) key to south-western Australian Myrtaceae, no serious examination of these

differences has been made. However, differences in several molecular sequences of the two species led Wilson *et al.* (2004) to conclude that *Balaustion* was not monophyletic.

In the revision of *Balaustion* presented here, the genus is restored to its original monotypic state. A second bird-pollinated species that was added to the genus by Gardner (1927) appears to be much more closely related to an unnamed insect-pollinated species than to *Balaustion s. str.*, having significant differences from the latter in its stamens, fruits and seeds. The new genus *Cheyनिया* Rye is described here to accommodate Gardner's bird-pollinated species and its insect-pollinated relative.

## Taxonomic history

### Morphological evidence

*Balaustion pulcherrimum* Hook was one of many Western Australian species of the Chamelaucieae that were first collected by James Drummond. In a letter regarding specimens collected in about 1848, Drummond (1850: 31) noted 'I found several remarkable Myrtaceae plants; one appears to be a new genus, with flowers (though smaller) as handsome as those of a pomagranate which they resemble in shape and colour.' This very attractive species was described as a new genus three times, first as *Balaustion* by Hooker (1851), shortly afterwards as *Punicella* by Turczaninow (1852) and finally as *Cheyنيا* by Harvey (1855), all based on Drummond's material. While Drummond (1850) had been the first to publish a description of the genus and its type species, which he intended to call *Cheyنيا pulchella*, this name was not validly published until, at Drummond's request, Harvey published it in one of Hooker's journals. This was four years after Hooker himself had established the genus as *Balaustion*. Hooker had chosen a very similar epithet, *pulcherrimum*, for the species, suggesting that he also based it on Drummond's earlier manuscript name. Hooker (1851) believed the nearest affinity of the genus to be with *Hypocalymma* (Endl.) Endl., but considered the new genus to be 'superior' in the beauty of its flowers, which were of the 'most brilliant scarlet'.

Both Bentham (1867) and Niedenzu (1893) maintained *Balaustion* as a monotypic genus, although they treated a number of other genera as sections of *Baeckea s. lat.* Bentham distinguished *Balaustion* from other genera with opposite leaves by its large, red, urceolate flowers with numerous free stamens. He did not comment on the relationships of the genus but apparently agreed with Hooker as he placed it next to *Hypocalymma* in his treatment. However, he later noted (Bentham 1868: 135) that Mueller believed that *Balaustion* should be united with *Baeckea s. lat.* but justified maintaining the genus since 'the large coloured calyx gives to the single species so peculiar an aspect, that we are unwilling to suppress the genus, so long, at any rate, as the fruit and ripe seeds shall remain unknown'.

Niedenzu (1893) placed *Balaustion* adjacent to *Baeckea* rather than *Hypocalymma*. He recognised the taxonomic importance of a derived anther type, which he used to define his new group *Baeckea* subgenus *Hysterobaeckea* Nied., but kept *Balaustion* as a distinct genus, perhaps because its anthers were so modified that he did not realise that they were of the basic type that defines the *Hysterobaeckea* group.

Up to this point, only one bird-pollinated species had been described in the whole of the *Baeckea* group. When a second bird-pollinated species was discovered in the 1920s, Gardner (1927: 67) had no doubt that it belonged to the same genus, stating that the new taxon *Balaustion microphyllum* 'would appear to be developed from *B. pulcherrimum* in a northern area isolated from the range of that

species'. Although this new species actually bore only a superficial resemblance to *B. pulcherrimum*, for example showing marked differences in its anther type, filament shape, fruit dehiscence and seed morphology, it was maintained in the same genus in all subsequent publications.

Unaware of the morphological discrepancies between the two bird-pollinated species, Trudgen (1987, 2001: 546) included *Balaustion s. lat.* in his reniform-seeded lineage, placing it with genera such as *Euryomyrtus* Schauer, *Rinzia* Schauer and *Hypocalymma*. Keighery (2004: 273) considered that *Balaustion* was 'closely related to, and perhaps not distinct from, members of *Hypocalymma*, such as *H. puniceum*, the main difference being all members of *Hypocalymma* are insect pollinated'<sup>1</sup>.

Since 2002, when a project funded by the *Australian Biological Resources Study* on the taxonomy of members of the *Baeckea* group of genera commenced, evidence has been accumulating that throws doubt on all of the relationships suggested in the taxonomic literature outlined above for *Balaustion s. lat.* Morphological data obtained in the current study indicate that both of the bird-pollinated species should be included in the *Hysterobaeckea* lineage but that they are not closely related to one another within this group

### Evidence from palynology and molecular sequences

The taxonomic decisions made in all of the publications outlined above have been based entirely on gross morphology. Two other lines of enquiry, palynology and molecular sequencing, have both suggested significant differences between the two bird-pollinated species of *Balaustion s. lat.*

Pollen studies of Myrtaceae have included both *Balaustion pulcherrimum* (Pike 1956: fig. 78) and *B. microphyllum* (Patel *et al.* 1984: fig. 44C). In the former study (pp. 44, 49), *Balaustion* was considered to be distinguished from other genera of Chamelaucieae sampled in having 'prolate-spheroidal' pollen grains. Its grains were 19–23 µm across. In the latter study (p. 939), pollen grains of *B. microphyllum* were measured as *c.* 17 µm across and were described as being 'brevicolpate with a psilate surface and a circular, thin-walled area on the pole'; these did not match the apparently unique pollen type found in *B. pulcherrimum*.

Molecular data from a study of the *matK* chloroplast gene and the *atpB-rbcL* intergeneric spacer (Lam *et al.* 2002) gave the first indication that *Balaustion pulcherrimum* was related to a new genus, *Tilophloia* Trudgen & Rye ms (Trudgen & Rye in prep.) represented by *Baeckea grandibracteata* E.Pritz., and an unnamed species [as *B. grandis* E.Pritz.]. A bootstrap support of 74% was recorded for those three species and Lam *et al.* noted (p. 542) that the 'three species possess the uniquely derived indel *r* and the two *Baeckea* species also possess indel *p*'.

Increased support was obtained in a later study (Wilson *et al.* 2004) using two additional chloroplast regions, the 5' *trnK* intron and part of the *ndhF* gene, this time achieving a Jackknife value of 86% and a decay index of 3. *Balaustion microphyllum*, which had not been sampled in the earlier study, grouped with a species that Bentham (1867) included in *Baeckea* section *Oxymyrrhine* (Schauer) Benth. & Hook.f. with over 90% bootstrap support and a decay index of 11. *Oxymyrrhine* Schauer is reinstated as a distinct genus in the accompanying paper (Rye 2009).

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<sup>1</sup> *Hypocalymma puniceum* C.A.Gardner is one of the largest-flowered members of the genus, having bright pink flowers up to 25 mm in diameter.

## Methods

Similar methods for obtaining measurements were used here to those of other recent papers on Western Australian Chamelaucieae such as Rye (2002), and the holotype of the new species *Cheyniana rhodella* has been lodged at PERTH. Precise localities are withheld for the specimens cited of that species as it has conservation priority. The distribution maps were compiled using DIVA-GIS freeware Version 5.2.0.2. The phytogeographic regions and Interim Biogeographic Regionalisation of Australia (IBRA) districts used here are those used in FloraBase (Western Australian Herbarium 1998–), where continually updated distribution maps are available.

## Morphology

This section compares the morphology of *Balaustion* and *Cheyniana* and also notes some of the characters that separate *Hypocalymma* from both genera.

*Habit.* Both genera are low shrubs. *Balaustion* has a maximum height of 0.2 m and produces long prostrate stems radiating from the centre of the plant, with a series of erect leafy branchlets arising along each prostrate stem (Figure 1A). The longer stems are commonly anchored about half way along their length by a single thick adventitious root below one of the erect branchlets. Occasionally, several adventitious roots are present on the same prostrate stem, with each root solitary at a node, as shown in Figure 1A. *Cheyniana* does not produce adventitious roots and has a more shrubby habit, with the bird-pollinated species up to 0.4 or possibly 0.5 m high and the insect-pollinated species up to 0.8 m high.

There appears to be a difference between the two genera in their fire-tolerance (Alex George pers. comm.), with *Cheyniana* probably being killed by fires whereas *Balaustion* regenerates from the base after fires. The regeneration is by multiple stems or shoots, although it is not clear whether this is from a lignotuber or just from a thickened main stem.

*Leaves.* The leaves of both genera have a short, but well-defined, petiole, with the blade up to 3 mm long in *Cheyniana* and up to 6 mm long in *Balaustion*. Oil glands are large in *Cheyniana* and may be very prominent (Figure 2A & F), whereas *Balaustion* has small oil glands that are not obviously protruding from the surface of the blade (Figure 1B–D). *Balaustion* also differs from *Cheyniana* in having a white apical point up to 0.3 mm long.

On young leaves of *Balaustion* the petiole is flanked by filiform erect stipules, which often persist on older leaves (visible on one side of each of the leaves in Figure 1B). There are usually additional filiform structures hidden behind the petiole in each axil. Stipules are absent or inconspicuous in *Cheyniana*.

*Inflorescence.* Both genera have solitary, axillary flowers. Few flowers are produced on each branchlet, usually only one pair, but occasionally two or three pairs, in which case the pairs may be in adjacent axils or they may be separated by at least one sterile pair of axils. Each flower has a peduncle terminated by two opposite bracteoles, which often persist in fruit. In *Cheyniana* there is often a short pedicel separating the bracteoles from the base of the flower, but in *Balaustion* the flowers are usually sessile within the subtending bracteoles.

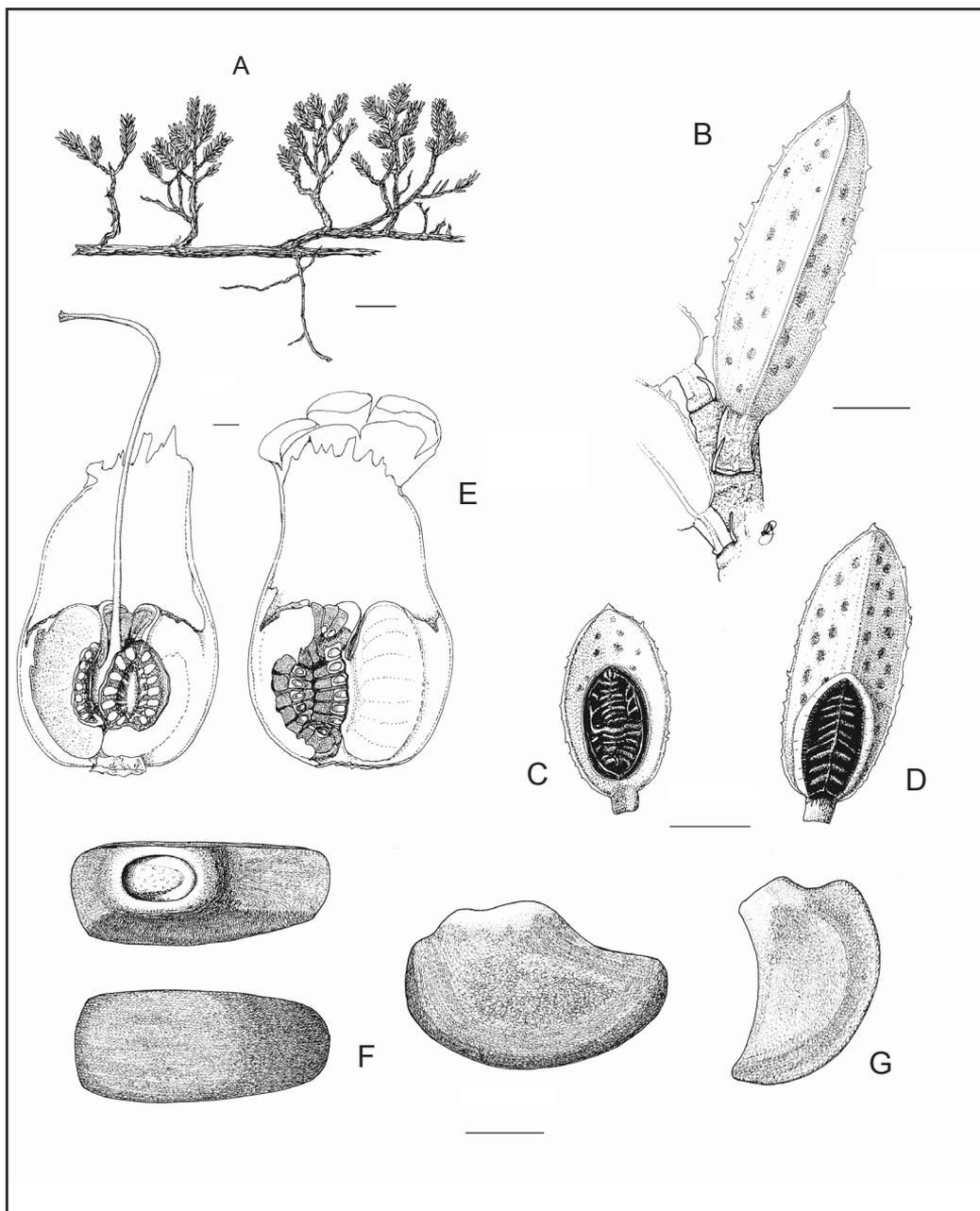


Figure 1. *Balaustion pulcherrimum*. A – prostrate stem with adventitious roots; B – leaf (outer surface) and stipules; C – inner leaf surface, with a black scale formed by a whitefly; D – outer leaf surface with a whitefly scale; E – fruit cut open to show a large placenta (front view, i.e. abaxial surface) and all the seeds that were attached to it in the other half of the split fruit; F – seed (3 views); G – chaff piece. Drawn by Lorraine Cobb from *B.L. Rye* 241155 & *M.E. Trudgen* (A, B), *F. & N. Mollemans* 2798 (C), *J. Coleby-Williams* 232 (D–G). Scale bars are 10 mm (A) or 1 mm (B–F).

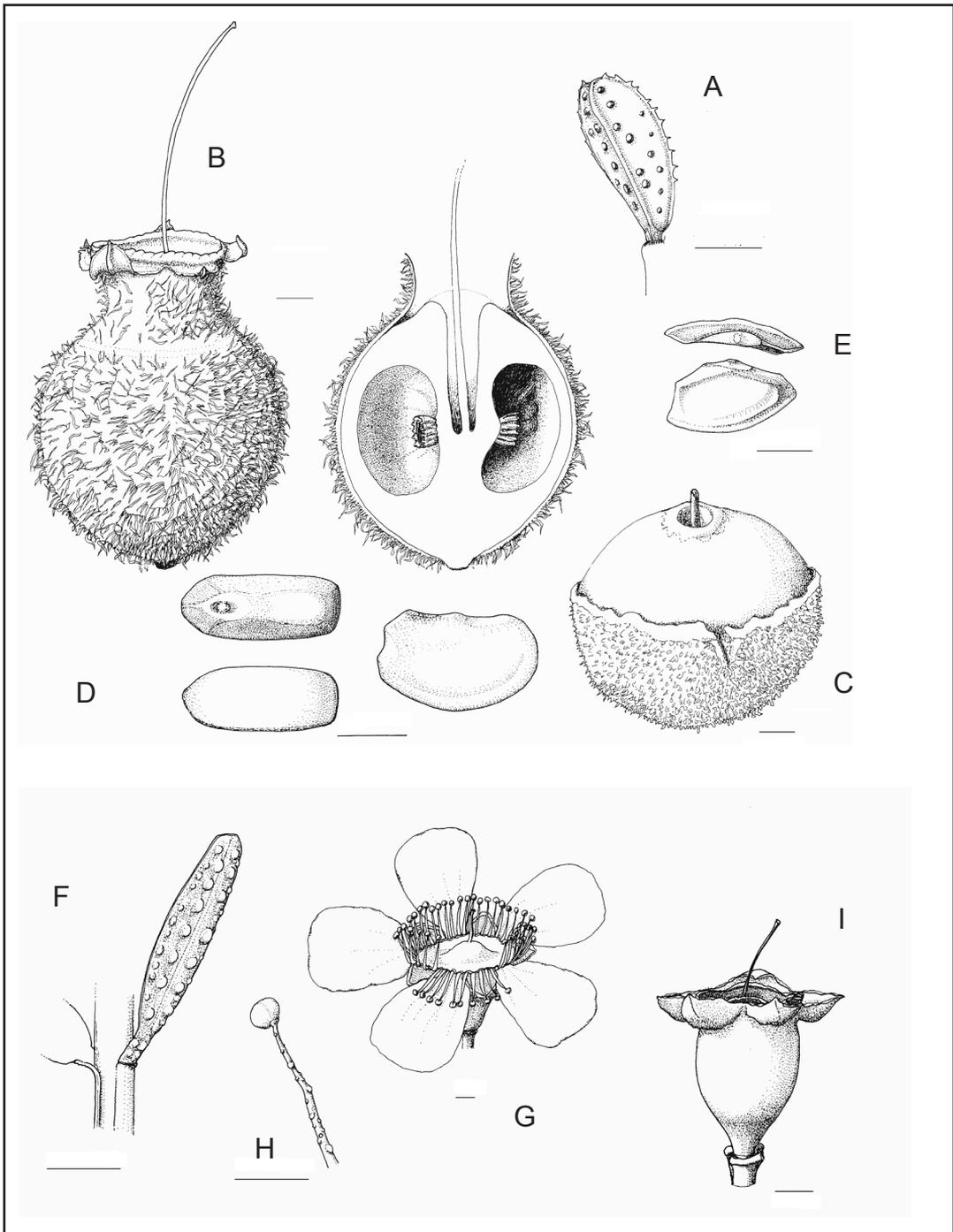


Figure 2. A–E. *Cheyniana microphylla*. A – leaf, B – fruit from outside and cut open, C – indehiscent fruit with other parts of flower removed, D – seed (3 views), E – chaff piece (2 views); F–I. *Cheyniana rhodella*. F – leaf, G – flower, H – stamen showing tubercles on filament, I – immature fruit. Drawn by Lorraine Cobb from G. Perry 366 (A,B), C.A. Gardner 12032 (C–E), A. Carr 114 (F–H) and M.E. Trudgen 5387 (I). All scale bars are 1 mm.

*Flowers.* Flowers are large and colourful in both genera. In *Balaustion* they have a diameter of about 15–25 mm and a smooth tubular hypanthium up to 20 mm long, while the other bird-pollinated species, *Cheyniana microphylla*, has flowers 10–14 mm in diameter and a hairy hypanthium up to 8 mm long. In *Balaustion*, the hypanthium and calyx have a similar texture and colour to the petals, whereas in *Cheyniana microphylla*, the hypanthium and calyx tend to be more greenish or yellowish than the petals. In both cases the petals may vary from yellowish or bright orange to deep red, with the colour deepening as the flowers mature. The insect-pollinated species *C. rhodella* differs from the other two species in having bright pink petals and a hypanthium only c. 2.5 mm long, although its flowers are up to 16 mm in diameter. It lacks hairs but has prominent oil glands towards the top of the hypanthium and on the sepals.

The sepals are herbaceous and tend to be prominently keeled or horned in *Cheyniana*, especially in *C. microphylla*, but are more uniformly thin and petal-like in *Balaustion*. The petals are 4.5–7 mm long in *Cheyniana* and 7–9 mm long in *Balaustion*.

Some genera in the Chamelaucieae have small outgrowths (processes) inserted between the petals and stamens. These are usually inconspicuous but are particularly well developed in most species of *Euryomyrtus* Schauer (see Trudgen 2001: fig. 2C, F & I). Antipetalous processes are minute or absent in *Cheyniana* and absent in *Balaustion*.

*Androecium.* The stamens are free and indefinite in both genera, and staminodes are rare or absent. In *Balaustion*, as in most members of the tribe Chamelaucieae, those stamens opposite or closest to the centre of a petal are the longest and those opposite the centre of a sepal the shortest. This is also the case in *Cheyniana* but in *C. microphylla* the stamens are also in two series with the outer stamens longer than the inner ones. *Hypocalymma* differs from both genera in having its stamens united at the base.

*Balaustion* has 15 to 35 stamens arranged with their bases contiguous or with occasional small gaps between them. The filaments are compressed, a characteristic that is usually most obvious near their base where they have a broad attachment to the staminophore. The stamens form a single continuous circle or, when most numerous, may have a few forming an inner circle.

More numerous stamens, 30 to 60 per flower, occur in *Cheyniana*. Except at the extreme base, the filaments are more or less terete and filiform, and the longer ones have a scattering of prominent glands, as illustrated in Gardner (1927: pl. 25L) and Figure 2H. They may be contiguous at the staminophore or have small gaps between them, with the gaps perhaps appearing more significant than in *Balaustion* because of the narrower filaments.

*Anthers.* The stamens of *Cheyniana* have a very slender attachment of the filament to the small, more or less globular anther (Figure 2H). The thecae are closely fused to one another and the connective gland to form this globular structure, which is dehiscent by two basally divergent short slits or elliptic pores. The stamens appear to be dorsifixed as the filament is attached at the centre of the anther, which faces in towards the centre of the flower. This kind of attachment should perhaps be regarded as secondarily dorsifixed as it is not considered to be equivalent to the primitive dorsifixed anther of the Myrtaceae as a whole, one which has the filament attached dorsally near the centre of the connective below a free connective gland.

In *Balaustion* the stamens have a very long filament and an erect basifixed anther. The anthers are much longer than in *Cheyniana* and are longitudinally dehiscent by parallel slits. Their connective

gland is incorporated within a very broad connective and bulges dorsally in young anthers but does not form a free structure.

In *Hypocalymma* the anthers look more similar to those of *Balaustion* than those of *Cheyniana* as they are basifixed and dehisce by long slits. They vary from having an obvious free connective gland on the dorsal surface to having the gland visible as a lobe on the ventral surface of the anther, located at the centre between two curved thecae as in *H. robustum* (Endl.) Lindl. (see Rye 1987: fig. 155D). Although always quite different in structure from the anthers of *Balaustion*, they can sometimes appear quite similar in overall shape. The superficial similarity of the anthers of *Balaustion* and *Hypocalymma* is one of the factors that led to the two genera being considered closely related.

*Gynoecium.* The ovary is fully inferior with a flat disc in *Balaustion* but has a raised centre of the disc (see Figure 2G) in *Cheyniana*. Both genera have a slender style with its base enclosed in a cylindrical depression in the disc at the centre of the ovary, a small stigma and numerous ovules arranged right around the margin of each placenta. However there is a marked difference in the shape of the placentas in the two genera, those of *Balaustion* being very large and dorsiventrally compressed whereas those of *Cheyniana* are smaller and shortly cylindrical to conic. The placentas retain these distinct shapes in fruit, as shown in Figures 1E and 2B; the latter figure also shows the deep depression enclosing the base of the style.

*Fruit.* The fruit is large, multi-locular and more or less globular in both genera. In *Balaustion* it is moderately thick-walled, dehiscent by three valves and largely inferior (Figure 1E). In *Cheyniana* the fruit is very hard, very thick-walled, indehiscent and half to three-quarters inferior (Figure 2B & C). The lack of valves on the summit of the fruit is evident in Figure 2C.

*Seeds.* Seeds are shiny and somewhat faceted in both genera, with the hilum much larger and more concave in *Balaustion* (Figure 1F) than in *Cheyniana* (Figure 2D). In *Balaustion* the seeds are slightly to distinctly colliculate and 2.4–2.6 mm long. The chaff pieces usually vary greatly in size, but are paler and more obviously faceted than the seeds (Figure 1G). *Cheyniana* has smaller, smoother seeds. Those of *C. microphylla* are 1.4–1.7 mm long, but mature seeds have yet to be observed in the insect-pollinated species *C. rhodella*. Chaff pieces in *C. microphylla* are darker than the seeds, and are not very crustaceous, tending to be either very compressed or broader and irregularly shrunken (Figure 2E).

The seeds of *Hypocalymma* differ from those of *Balaustion* and *Cheyniana* in being more curved and in having a modified, usually distinctively coloured, region on the inner surface (see Rye & Trudgen 2008: fig. 3C).

### Adaptive biology

Many of the distinctive characteristics of *Balaustion* and *Cheyniana* are the result of their coevolution with pollinators, but coevolution has also occurred with harmful organisms such as sap-sucking or seed-eating insects. Other characters relate to adaptations for seed dispersal, competition with other plant species and many other factors, most of which have not been studied. This section examines a few of these adaptations in the two genera and in some of the genera that have been hypothesised to be their closest relatives.

## Pollination

*Balaustion pulcherrimum* and *Cheyniana microphylla* have many morphological specialisations related to bird-pollination, including their habit. Flowers are borne close to the ground, either concentrated around the edges of a ground-hugging shrub (*Cheyniana*) or along long prostrate stems (*Balaustion*), so that birds standing on the ground can easily reach them. Presumably, many kinds of honeyeaters would be responsible for pollination of these two plant species, but apparently the only published record has been of the White-fronted Honeyeater, *Phylidonyris albifrons*, visiting the flowers of *Cheyniana microphylla* [as *Balaustion*] in East Yuna Reserve (Dell & McGauran 1981). Keighery (1982, 2004) recorded both species of *Balaustion s. lat.* as bird-pollinated taxa but gave no details of his observations of the birds involved.

Both of the bird-pollinated species have a cylindrical hypanthium containing copious nectar. In *Balaustion*, the flower buds are distinctly tubular from an early stage, with the hypanthium short but uniformly broad, and undergo a rapid elongation before they open. In *Cheyniana microphylla*, the buds are more obconic at first, but become more tubular at maturity, showing very rapid elongation just before they open and having numerous tubercles that also elongate very rapidly to become long hairs by the time the flowers reach anthesis. The rapid late elongation of the hypanthium may reflect the relatively recent evolution in both groups of bird-pollinated flowers from previously short, insect-pollinated flowers. In *Cheyniana rhodella*, the hypanthium is more tubular than normal for an insect-pollinated flower, so possibly is pre-adapted to a change to bird-pollination.

Evolution of bird-pollination might be expected to occur in relatively large-flowered species that already present limited opportunities for bird visitation. *Hypocalymma* is one such genus that would seem pre-adapted, with its large, often colourful flowers densely arranged on moderately strong stems. There is one record of visitation by the Brown Honeyeater, *Lichmera indistincta*, on *H. xanthopetalum* F.Muell. and there are records of the Honey Possum, *Tarsipes rostratus*, feeding on two species of *Hypocalymma* (see Brown *et al.* 1997, Turner 1982), so the genus does not appear to be exclusively insect-pollinated. However, previous suggestions (see taxonomic history section) of a relationship between this genus and *Balaustion* are not supported by the morphological and molecular evidence. As noted earlier, *Hypocalymma* has basally connate stamens, a free connective gland on its anthers and more curved seeds with a proliferation on their inner surface.

A quite different species group appears to have been the progenitor of *Balaustion* and its close relative *Tilophloia* ms. The close relationship between *Balaustion* and *Tilophloia* that was indicated by the molecular evidence (see taxonomic history section) is supported by morphological similarities, with both genera having a low spreading habit, sepals without ridges or horns, stamens arranged in a single continuous circle, filaments broad and markedly flattened at the base, and very large placentas bearing seeds with a large concave hilum. Although most species of *Tilophloia* have white flowers, there is one undescribed species, currently known as *Baeckea* sp. Diemals (A.P. Brown 3636), that has large flowers with bright orange petals *c.* 10 mm long and a style *c.* 12 mm long. Because of its unusual flower size and colour, this species was originally thought to be a *Balaustion*.

The origin of bird-pollination in *Cheyniana* has evidently occurred within the genus as it also includes an insect-pollinated species with large colourful flowers. The closest relative of this genus, based on the molecular evidence, is *Oxymyrrhine*, which is fairly similar in its anther morphology, more or less terete filaments and small hilum, but differs in having small insect-pollinated flowers with white or pale pink petals and a dehiscent fruit.

## Phytophagous insects

Black scales formed by the larvae of whiteflies (family Aleyrodidae of the Hemiptera) occur on *Balaustion* and on the related genus *Tilophloia*. In *Balaustion* the scales of young larval stages (several instars) are very dorso-ventrally compressed whereas the final instar has a thicker profile (Woodward *et al.* 1970). At least one kind of whitefly scale has a convex dorsal surface and can be found anywhere on the inner or outer surface of the leaf (Figure 1C). Another kind of whitefly produces a strongly ridged dorsal surface on the scale of its final instar, which always occurs at the base of the outer surface of the leaf lamina, with its anterior end adjacent to the petiole (Figure 1D). Both kinds of scales tend to have a compressed white border of secreted waxy material. So far, no black scales have been observed on the leaves of *Cheyniana*, although white furry structures are present and these have not been observed on *Balaustion*.

Whether this difference in insect associations backs up the morphological and molecular evidence separating the two genera, or whether it results more from the difference in geographic distribution of the two genera, is not known. Similar kinds of black scales of whitefly larvae have been observed on many other genera of the Chamelaucieae, including some members of the genus *Oxymyrrhine* (Rye 2009), so do not appear to be highly specific in their host plants. Still, the apparent absence of whiteflies on *Cheyniana* may be significant in view of the moderately high frequency of their occurrence on *Balaustion*.

## Seed biology

The multi-locular, indehiscent fruit of *Cheyniana* is very thick-walled and difficult to dissect, as it is very woody. One of the likely effects of this kind of fruit is a marked delay in seed germination, as has been recorded for indehiscent fruits in other Myrtaceous genera (Rye & James 1992). This delay could be particularly pronounced in such a woody fruit, but presumably the thick walls would give the seeds extra protection from predation, desiccation and other environmental hazards during the long period before germination.

Indehiscent fruits in the Myrtaceae usually have a reduced number of seeds and the testa of the seeds is usually thin and membranous. Seed number is reduced in *Cheyniana*, with few of the ovules developing into seeds, and the testa is very thin and easily broken although it is still crustaceous. In contrast, the capsules of *Balaustion* contain seeds with a thick crustaceous testa and it is common for the majority of ovules in each loculus to develop into seeds.

## Distribution and phenology

The two very small genera treated here are south-western Australian endemics. The monotypic *Balaustion* has a distribution centred in the northern to central wheatbelt, occurring in the South West Botanical Province, South-west Interzone and extending into the adjacent Eremaean Botanical Province in the Yalgoo and Murchison IBRA districts. *Cheyniana* has two species and occurs further north in the northern sandplains of the South West Botanical Province and adjacent Yalgoo district of the Eremaean Botanical Province (Figure 3).

Both genera are predominantly spring-flowering, with the main flowering time of *Balaustion* corresponding exactly with the three spring months of September to November. The flowering season

of the more northern genus *Cheyniana* tends to start and finish earlier, with the better known of its species, *C. microphylla*, flowering from August through to October.

### Descriptions and keys

The two bird-pollinated species key out successfully in Blackall and Grieve (1980) to *Balaustion s. lat.* on page 5 and to their respective species on page 88. The new insect-pollinated species keys out on page 5 to a choice between *Balaustion s. lat.* and *Hypocalymma*, where it is somewhat intermediate between the two options. The new genus *Cheyniana* could be readily keyed out prior to this couplet by the addition of a new couplet using its globular anthers, glandular-tuberculate filaments, and indehiscent fruit to distinguish it from both *Balaustion s. str.* and *Hypocalymma*. A suggested new couplet and a modified version of the existing couplet E are given below.

- D1.** Longest stamens with a glandular-tuberculate filament. Anthers dorsifixed, globular, dehiscent by short divergent slits or pores. Fruit very woody, indehiscent..... **Cheyniana**
- D1.** Longest stamens with a smooth filament. Anthers basifixed, not globular (longer and broader than thick), dehiscent by long parallel or curved slits. Fruit moderately woody, dehiscent by 2–4 valves.
- E.** Flowers tubular, orange to red (including tube and calyx). Ovules 16–21 per loculus .....**Balaustion**
- E.** Flowers much broader than deep, with white or coloured petals and a green calyx. Ovules 1–3 per loculus in most species but up to 12 per loculus ..... **Hypocalymma**

**Balaustion** Hook., *Icon. Pl.* 9, t. 852 (1851). *Type: Balaustion pulcherrimum* Hook.

*Punicella* Turcz., *Bull. Cl. Phys.-Math. Acad. Imp. Sci. St-Petersbourg* 10: 333 (1852). *Type: Punicella carinata* [= *Balaustion pulcherrimum* Hook.].

*Cheynia* J. Drumm. ex Harv., *J. Bot. Kew Gard. Misc.* 7: 56 (1855). *Type: Cheynia pulchella* J. Drumm. ex Harv. [= *Balaustion pulcherrimum* Hook.].

Prostrate *shrubs*, with long stems often anchored near the middle, usually by a single adventitious root, glabrous, with leaves crowded on short lateral branchlets and fairly widely spaced on rapidly growing shoots. *Stipules* filiform, pale, shorter than to slightly exceeding the petiole. *Leaves* usually opposite and decussate, small, with a very short but well defined petiole; blade fairly flat, herbaceous, lacinate, dotted with small oil glands, abaxial surface keeled, apical point small. *Inflorescence* of solitary axillary flowers, with 1 or several decussate pairs of flowers per branchlet. *Peduncles* moderately long. *Bracteoles* opposite, persistent, broad, convex-concave and often appressed to base of hypanthium. *Pedicels* absent or very short. *Buds* very obtuse. *Flowers* large, with the hypanthium and sepals similarly coloured to the petals. *Hypanthium* up to 20 mm long, urceolate or more cylindric, smooth; adnate portion broadly obconic (becoming cup-shaped in fruit); free portion erect, longer than the adnate part. *Sepals* 5, erect, persistent in fruit, moderately large, petaline, entire. *Petals* 5, erect or somewhat spreading, shed before fruit matures, very shortly clawed, very broadly obovate to more or less circular, orange to deep red. *Antipetalous processes* absent. *Stamens* indefinite, in a circular series, erect, exceeding sepals, those directly opposite the petals longest and those directly opposite the sepals shortest; staminodes rare or absent. *Filaments* free, contiguous or nearly so, slender, expanded and compressed near the base, tapering above to a narrow distal apex, smooth. *Anthers* basifixed, introrse, long; connective broad and swollen with the gland, which is not distinct from the remainder of the

connective; thecae introrse, erect, parallel, longitudinally dehiscent. *Ovary* inferior, 3-locular; placentas broadly ovate, very large,  $\pm$  sessile; ovules 16–21 per loculus. *Style* slender, terete, base inserted in a central depression on disc; stigma capitate or somewhat peltate. *Fruit* dry, largely inferior, 3-valvate, globular. *Seeds* c. 2.5 mm long, somewhat faceted, with a large curved outer surface, two large lateral surfaces, shiny, brown, slightly or distinctly colliculate, with a deeply concave inner cavity.

*Notes.* The distinguishing characteristics and distribution of this monotypic genus are described in previous sections of this paper.

**1. *Balaustion pulcherrimum*** Hook., *Icon. Pl.* 9: t. 852 (1851). *Type citation:* south-western Australia, between the Swan River and King George's Sound. *Type:* Mullean region, south-west of Western Australia, 1847–1849, *J. Drummond* coll. 5 suppl., no. 26 (*holo:* K 000355362; *iso:* BM 000793705, K 000355360 & 000355361, KW *n.v.*, photo PERTH 07536976).

*Punicella carinata* Turcz., *Bull. Cl. Phys.-Math. Acad. Imp. Sci. St-Petersbourg* 10: 333 (1852). *Type:* Mullean region, south-west of Western Australia, 1847–1849, *J. Drummond* coll. 5 suppl., no. 26 (*holo:* KW *n.v.*, photo PERTH 07536976; *iso:* BM 000793705, K 000355360–000355362).

*Cheyenia pulchella* J. Drumm. ex Harv., *J. Bot. Kew Gard. Misc.* 7: 56 (1855). *Type citation:* northern districts, south-west of Western Australia. *Type:* south-west of Western Australia 1847–1854 [possibly the same collection as for the earlier two but more likely a new collection from a more northern locality collected after 1849], *J. Drummond* (*holo:* TCD *n.v.*).

*Illustrations.* Blackall & Grieve (1980: 88), Hooker (1851: plate 852).

*Shrub* usually 0.2–1.2 m across, up to 0.2 m high at the centre but always with prostrate flowering stems. *Petioles* 0.4–0.6 mm long, concave on adaxial surface. *Leaf blades* ovate to narrowly obovate, 2.7–6 mm long, 1.2–1.5 mm wide, acute, green and often glossy, sometimes with margins and keel distinctly whitish, margins lacinate or sometimes entire, with a white apical point 0.15–0.3 mm long; abaxial surface with keel incurved/rounded to the apex, the larger oil glands in 2–4 main rows on each side of midvein, the keel often somewhat wing-like; adaxial surface shallowly concave/infolded, often with a central longitudinal slight groove, with oil glands fewer and usually not as large as those on abaxial surface. *Inflorescence* with 1–3 pairs of flowers per branchlet. *Peduncles* 2–4 mm long, red. *Bracteoles* 2–3.5 mm long, 3–4 mm wide, reddish, somewhat keeled, often gland-dotted. *Pedicels* usually absent but up to c. 1 mm long. *Flowers* mostly 15–25 mm diam., orange to deep red. *Hypanthium* 9–20 mm long, narrowing to a minimum width of 4–6 mm diam., expanding at summit to 6–8 mm diam.; adnate part somewhat rugose or gland-dotted, 5–7 mm diam.; free part (6)10–16 mm long. *Sepals* very broadly ovate or depressed-ovate, 2.5–4 mm long, 3–4 mm wide, broadly obtuse, scarious but with oil glands often obvious in central part, entire to minutely lacinate. *Petals* fairly erect to widely spreading, 7–9 mm long. *Stamens* 15–35. *Longest filaments* 6.5–8(11) mm long, 0.4–0.5 mm wide above the base. *Anthers* 0.5–0.7 mm high, c. 0.35 mm wide. *Style* 20–24 mm long, 0.4–0.5 mm wide at base, with basal c. 2 mm inserted in a depression; stigma 0.4–0.8 mm diam. *Fruit* almost fully inferior, 7–8 mm long, 9–10 mm diam.; placentas 3–4 mm long, up to 3.5 mm wide. *Seeds* 2.4–2.6 mm long, 0.7–1 mm wide, 1.4–1.6 mm thick; inner surface with a portion raised 0.2–0.3 mm high around a cavity 0.5–0.7 mm long. *Chaff pieces* paler and smaller than the seeds. Native Pomegranate. (Figure 1)

*Selected specimens examined.* WESTERN AUSTRALIA: 5.4 km N of Latham on Mullewa Road, 15 Oct. 1982, *J. Coleby-Williams* 232 (PERTH); near Lake Monger [Mongers Lake], 2 Dec. 1958, *C.A. Gardner* 12028 (PERTH); 2 miles [3 km] ENE of Kulja, 13 Nov. 1971, *A.S. George* 11178 (AD, CANB, K, MEL, NSW, all *n.v.*, PERTH); 3 km N of N end of Helena and Aurora Ranges, 4 Dec. 1981, *G.J. Keighery* 4414 (PERTH); Kirkalocka Station *c.* 60 km S of Mount Magnet, 18 May 2006, *B. Moyle* 67 (PERTH); Wogarl East Rd, 1–2 km E of Wogarl, NE of Narembeen, 4 Nov. 2004, *B.L. Rye* 241155 & *M.E. Trudgen* (PERTH); 6.25 km NNE of Hyden–Norseman Road on Mt Holland Track, 5 Nov. 2004, *B.L. Rye* 241169 & *M.E. Trudgen* (PERTH).

*Distribution and habitat.* Extends from Kirkalocka Station west to near Latham and south to the Forrestania area (east of Hyden), usually occurring with varied sandplain species, with many records from yellow sand, often in very species-rich communities. (Figure 3A)

*Phenology.* Flowers mainly September–November.

*Typification.* None of the types cited above has been examined directly but photographs or scanned images are available for all of them except for the holotype of *Cheynia pulchella*, which is presumed to be in Dublin at TCD. The Kew specimen considered to be the holotype of *Balaustion pulcherrimum* is the only one that is stamped ‘Herbarium Hookerianum’. One of the isotypes from Kew was indicated as being from Bentham’s collection.

*Notes.* The leaves of *Balaustion pulcherrimum* sometimes have a distinct narrow white border formed by the margins and also a white keel; this is particularly well marked on *G.J. Keighery* 4414. Leaves in whorls of three are present on some stems of *W.E. Blackall s.n.* Sep. 1929 but have not been observed elsewhere.

Flower length sometimes appears to vary considerably on a single specimen, and a specimen from Bodallin has the shortest hypanthium measured, *c.* 9 mm long. Flower diameter varies according to whether or not the petals open to a fairly erect position or are widely spreading, but is generally in the range of 15 to 25 mm. The sepals in each flower are of distinctly different lengths, the longer ones *c.* 3 mm long and shorter ones *c.* 2 mm long, only the longer ones measured above. Stamens are particularly long, up to 11 mm, in a specimen from near Yellowdine.

### **Cheyniana** Rye, *gen. nov.*

Frutices humiles. Flores in axillis foliorum solitarii. Pedunculi modice longi. Bracteolae 2, oppositae, saepe persistentes. Pedicelli absentia vel pedunculis breviora. Hypanthium aliquantum tubulare. Petala 5, aurantiaca vel rosea vel rubra. Stamina 30–60 in seriebus 1 vel 2 circum singularem vel duplus formantes; filamenta longiora filiformia, glanduloso-tuberculata. Antherae parvae, ± globulae; glans connectivi non libera intra antheram conjunctae. Ovarium 2- vel 3-loculare; ovula 10–20 per placentam, radialiter disposita. Stylus longus, basis in depressione centrali inserta. Fructus pariete crassissimo, magnopere inferior, indehiscens, ± globularis.

*Typus:* *Cheyniana microphylla* (C.A.Gardner) Rye

*Shrubs* usually low and spreading, less than 1 m high, single-stemmed but often becoming multi-branched at base, glabrous, with leaves mostly densely arranged. *Stipules* absent or inconspicuous. *Leaves* opposite, decussate, very small, smooth or tuberculate, with a very short but well defined petiole;

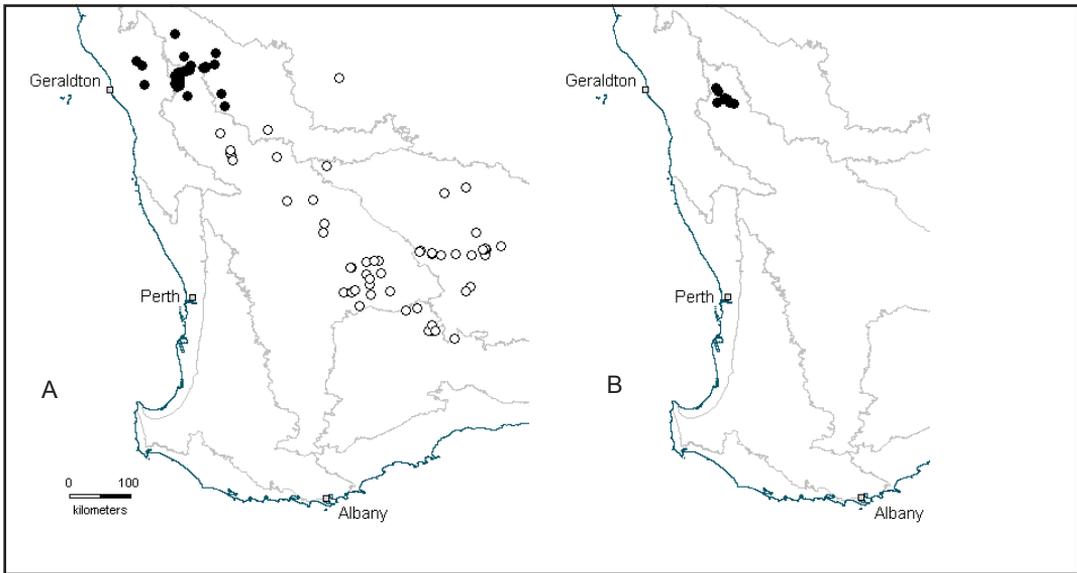


Figure 3. Distribution maps. A – *Balaustion pulcherrimum* (○) and *Cheyniana microphylla* (●). B – *Cheyniana rhodella* (●).

blade narrowly oblong in outline to circular, up to 3 mm long, with glands obvious. *Flowers* solitary in leaf axils, with 1 or several decussate pairs per branchlet. *Peduncles* moderately long, terminated by two bracteoles. *Bracteoles* opposite, often persistent. *Pedicels* absent or shorter than peduncles, up to 2 mm long. *Flowers* usually 10–16 mm diam. *Hypanthium* narrowly obconic to urceolate, 2–8 mm long, bearded or with prominent glands. *Sepals* 5, persistent in fruit, somewhat herbaceous, with thickened keel often ridged or horned. *Petals* 5, shed before fruit matures, large, very shortly clawed, very broadly obovate to more or less circular, pink or orange to red. *Antipetalous processes* minute or absent. *Stamens* 30–60 in one or two circular series, those directly opposite the petals longest, with those of outer series (if present) also longer than adjacent ones of inner series; staminodes absent. *Filaments* filiform, more or less terete, tapering to apex, the longest ones distinctly glandular-tuberculate. *Anthers* dorsifixed, small, ± globular, dehiscent by 2 basally divergent to almost transverse, short slits or pores; connective gland fused between and not extended beyond the thecae. *Ovary* inferior but with a dome or lip raised at centre of disc, 2- or 3-locular; placentation axile, placentas shortly cylindrical to conic, with a short thick attachment; ovules 10–23 per placenta, arranged radially. *Style* slender, terete, base inserted in central depression on disc, largely exserted; stigma small, capitate or peltate. *Fruit* very thick-walled, woody, largely inferior, indehiscent, ± globular. *Seeds* (where known) somewhat faceted, c. 1.5 mm long; hilum small.

*Etymology.* This genus commemorates George McCartney Cheyne (1790–1869) and his wife, who were pioneers in the Albany area. It was Drummond's intention to name the genus *Balaustion* after the Cheynes, who had shown him warm hospitality, accommodating him on their property at Cape Riche and assisting him in obtaining supplies and in the transport of his specimens to Albany. They also assisted others, such as the visiting German botanist Ludwig Preiss in 1840 and the Irish botanist William Harvey in 1854 (Ducker 1988). However, Drummond's proposed generic name *Cheynia* was not validly published until several years after the genus had been named *Balaustion*.

*Notes.* The two species have obvious morphological differences, many of which are related to their different pollinators, but have an underlying similarity in morphology that indicates a close relationship between them. The floral differences between them are similar to those found between insect-pollinated and bird-pollinated members of genera such as *Darwinia* Rudge and *Verticordia* DC. Their shared characters include their colourful flowers of a similar size (the insect-pollinated ones broader and shallower though), similar stamen filaments (tuberculate-glandular and slender) and anther morphology, and an indehiscent fruit with very hard, thick walls. Leaves may become silvery with age in both taxa.

### Key to species of *Cheyniana*

1. Hypanthium 4–8 mm long, bearded. Petals yellowish to red, usually orange.  
Ovary 3-locular ..... **C. microphylla**
- 1: Hypanthium *c.* 2.5 mm long, glabrous. Petals pink. Ovary 2-locular ..... **C. rhodella**

### 1. *Cheyniana microphylla* (C.A.Gardner) Rye, *comb. nov.*

*Balaustion microphyllum* C.A.Gardner, *J. Roy. Soc. Western Australia* 13: 66–67, t. 25I–L (1927).  
*Type:* near Koolanooka, September, *H.V. Throssell s.n.* (*lecto:* illustration tab 25I–L, here selected).

*Illustrations.* Blackall & Grieve (1980: 88); Gardner (1927: 66, plate 25I–L) [both as *Balaustion microphyllum*].

*Shrub* 0.1–0.3(0.45) m high, commonly 0.5–1 m wide. *Petioles* 0.15–0.25 mm long. *Leaf blades* broadly obovate to circular, 1.3–2.3 mm long, 1.2–1.6 mm wide, not very thick except for the prominent keel, apex broadly obtuse with the keel incurved and often with a subterminal mucro, often broadly denticulate to laciniate on the narrow scarious margins, the longest projections 0.1–0.2 mm long; abaxial surface with black oil glands up to 0.15 mm diam. in 2–4 main rows, innermost rows commonly with 5–7 glands; adaxial surface shallowly v-shaped in transverse section, with oil glands less obvious. *Inflorescence* of 1 or 2 separated pairs of flowers per branchlet. *Peduncles* 2–4.5 mm long, 1-flowered, often dark red. *Bracteoles* persistent, broadly ovate to depressed-ovate, 1.2–2.2 mm long, 1.4–2.2 mm wide, scarious except for thickened centre or sometimes more leaf-like, strongly and narrowly keeled; scarious margins often red-tinged, with the laciniate white outer part up to 0.5 mm wide. *Pedicels* sometimes almost absent but usually 0.5–2 mm long. *Flowers* usually 10–14 mm diam. *Hypanthium* urceolate, 4–8 mm long, 4–6 mm diam., yellowish at first, turning orange-red and eventually deep red, bearded, the longest hairs near base or near middle of hypanthium and 0.8–2 mm long; free part 2–5 mm long. *Sepals* fairly erect, very broadly oblong to depressed-ovate, 1–1.7 mm long, 1.5–3 mm wide, with keel very strongly ridged or distinctly horned, largely herbaceous, green or sometimes reddish-tinged, with a scarious white laciniate margin 0.2–0.6 mm wide; horn 0.3–0.7 mm long. *Petals* somewhat or fairly widely spreading, often with inner surface concave (and outer surface convex), 4.5–6 mm long, yellowish orange to deep red, margin laciniate-toothed. *Stamens* numerous, commonly 50–60 in two series, those of outer series with a broader base and tending to be contiguous, those of inner series often having distinct gaps between them at the base. *Longest filaments* 3–6 mm long, glandular-tuberculate, often compressed at extreme base. *Anthers* globular to broadly reniform, *c.* 0.25 mm long, *c.* 0.35 mm wide; thecae facing inwards, basally divergent or almost transverse, dehiscent by a short slit or elliptic pore. *Ovary* 3-locular; ovules 16–23 per loculus, in a circle around a broad placenta. *Style* 8–13 mm long, with basal *c.* 3 mm inserted in a depression; stigma capitate or peltate, 0.25–0.35 mm diam. *Fruit* over half and up to *c.* 4/5-inferior, ± globular, 5–7 mm long

excluding and 7–13 mm long including hypanthium and calyx, 5.5–6.5 mm diam., with style often persistent; hypanthium bearded with hairs up to 3 mm long; placentas like a thick rod, 2–9-seeded. *Seeds* almost semi-circular from side view, very rounded on back and round top to the narrow flatter central face with a central hilum, with flat portions on the sides adjacent to the chaff but not particularly angular, 1.4–1.7 mm long, 0.6–0.8 mm wide, 0.8–1 mm thick, smooth, shiny, medium yellow-brown, the testa thinly crustaceous; hilum broadly elliptic, *c.* 0.25 mm long. *Chaff pieces* not very crustaceous, either very compressed or broader and irregularly shrunken, dark brown with hilum not obvious. Bush Pomegranate. (Figure 2A–E)

*Selected specimens examined.* WESTERN AUSTRALIA: W side of bitumen road between East Yuna and Yuna, 19 Aug. 1984, *A.C. Burns* 19 (PERTH); Bullardoo Station near the Mullewa road, 15 Aug. 1960, *S.J.J. Davies s.n.* (PERTH); Tardun, 26 Aug. 1948, *J.B. Cleland s.n.* (AD); 95–96 mile peg, Yalgoo–Mullewa, 12 Aug. 1971, *H. Demarz* D3308 (KPBG, PERTH); 17.9 km SE of Mullewa on Mullewa–Morawa road, 4 Oct. 1988, *J.M. Fox* 88/158 (PERTH), near Pindar, 8 Dec. 1958, *C.A. Gardner* 12032 (PERTH); 3 miles [5 km] W of Pindar on Geraldton–Mount Magnet road, 21 July 1953, *R. Melville & J. Calaby* 4260 (PERTH); Barnong Station, on track to CALM section, 5 Oct. 1999, *M. Officer* B2 (PERTH); Yuin–Pindar road, 3.8 km S of Tallering, 5 Aug. 1995, *S. Patrick* 2413 (PERTH); Mellenbye Station, 17 Aug. 1993, *A.L. Payne* 3786 (PERTH); 2.55 km E of Docherty Road on Geraldton–Mount Magnet road, 9 Sep. 2003, *B.L. Rye* 239054 & *M.E. Trudgen* (CANB, NSW, PERTH); 8.73 miles [14 km] S of Narloo Homestead, 27 Oct. 1984, *B.H. Smith* 512 (PERTH).

*Distribution and habitat.* Extends from Bullardoo Station (north of the upper Greenough River) south-south-east to Mellenbye Station, north-east of Morawa. Occurs in rich sandplain vegetation, often in yellow or orange sand. (Figure 3A)

*Phenology.* Flowers mainly August to October, with fruits mainly from September to December.

*Conservation status.* Known from a large number of collections in an area *c.* 130 km long. It has been adequately surveyed.

*Lectotypification.* The type specimen of this species is missing. According to Gardner (1927) it was collected by Hugo V. Throssell and was lodged at the Department of Agriculture. It should, therefore, have become part of the collection of the Western Australian Herbarium, but the earliest collections of the species currently lodged at PERTH were made in 1928. Fortunately, Gardner included a good illustration of the species in the protologue and so that is selected here as the lectotype of the taxon.

*Affinities.* See notes under *Cheyniana rhodella*.

*Notes.* This species has the highest stamen number known for the *Hysterobaeckea*. This number is also higher than in most other lineages of tribe Chamelaucieae, although exceeded by some of the species of *Hypocalymma* and by many members of subtribe Calytricinae. The arrangement of the stamens in two series in *Cheyniana microphylla* is similar to that seen in other members of the Chamelaucieae with large numbers of stamens.

Some characters, such as petiole length, show very little variation between specimens of *Cheyniana microphylla*, while others, such as hypanthium length, are extremely variable.

Blackall and Grieve (1980: 88) and Corrick *et al.* (1996: 112) give the common name Bush Pomegranate for this species while Keighery (2004) gives the same common name, Native Pomegranate, as for *Balaustion pomaderroides*. Different common names are clearly needed now that the two species are in different genera. The name Bush Pomegranate, which is accepted here as the common name for *Cheyniana microphylla*, seems appropriate as this species has similar-looking flowers to those of *Balaustion* but differs in its more bushy habit.

## 2. *Cheyniana rhodella* Rye & Trudgen, *sp. nov.*

*Cheyniana microphyllae* affinis sed floribus brevioribus glabris, petalis roseis, staminibus et ovulis paucioribus, et ovario 2-loculari differt.

*Typus*: north of Morawa, Western Australia, 23 October 1986, *M.E. Trudgen* 5387 (*holo*: PERTH 06218857; *iso*: CANB, K, MEL, NSW).

*Baeckea* sp. Mullewa–Morawa (A.C. Burns 24), Western Australian Herbarium, in *FloraBase* <http://florabase.dec.wa.gov.au> [accessed July 2007].

*Shrub* moderately dense, 0.3–0.8 m tall, up to 1 m across, much branched, with leaves widely spreading to appressed, fairly dense on small branchlets, distant on flush growth. *Petioles* 0.2–0.3 mm long. *Leaf blades* narrowly oblong to more or less elliptic in outline, 1.5–3 mm long, 0.5–1.1 mm wide, 0.25–0.4 mm thick, apex obtuse; abaxial surface shallowly convex, with very prominent oil glands in 1–3 main rows of 4–8 glands up to 0.3 mm diam.; adaxial surface flat or slightly concave, with oil glands less prominent. *Inflorescence* of 1–3 pairs of flowers per branchlet. *Peduncles* 0.8–1.2 mm long, 1-flowered. *Bracteoles* caducous to persistent, ovate to very broadly ovate, 0.7–1.9 mm long, 0.9–1.6 mm wide, somewhat scarious, entire. *Pedicels* almost absent or up to 0.6 mm long. *Flowers* 11–16 mm diam. *Hypanthium* narrowly obconic, *c.* 2.5 mm long, 2.5–4 mm diam., red-tinged, adnate part fairly smooth but often with longitudinal lines; free part *c.* 1 mm long, often with somewhat prominent glands. *Sepals* spreading to fairly erect, depressed ovate to almost triangular, 0.8–1.5 mm long, 1.3–2 mm wide, with incurved keel thickened or ridged, largely herbaceous and reddish, with a narrow scarious margin 0.1–0.3 mm wide, entire, with prominent oil glands. *Petals* widely spreading, 5–7 mm long, pink or mauve-pink, rather broad-based, margin finely lacinate or entire. *Stamens* 30–46 in a single series, some of them often contiguous at the base but always with some distinct gaps in the circle. *Longest filaments* 1.5–2.2 mm long, with a few tuberculate glands, reddish. *Anthers* subglobular to reniform, 0.2–0.3 mm long, 0.25–0.35 mm wide, the pores elliptic or narrowly elliptic; connective gland not extended beyond the thecae. *Ovary* 2-locular, inferior but with a central dome equalling hypanthium rim; placentas cylindrical to conic with top truncate, more or less sessile by a circular central attachment; ovules 10–15 per loculus, arranged radially. *Style* slender, terete, 2.2–2.6 mm long, with basal 0.3–0.8 mm inserted in a depression; stigma capitate, up to 0.1 mm diam. *Immature fruit* 2/3–3/4-inferior, almost ellipsoid, *c.* 3 mm long, *c.* 2.7 mm wide excluding and *c.* 4.5 mm wide including the calyx, thick-walled; hypanthium shallowly but distinctly irregularly longitudinally patterned; disc convex, deep maroon. (Figure 3F–I)

*Other specimens examined*. WESTERN AUSTRALIA: Canna area, 6 Sep. 1963, *A.M. Ashby* 335 (AD); between Mullewa and Morawa, 6 Oct. 1984, *A.C. Burns* 24 (PERTH); NE of Mingenew, 12 Sep. 1992, *A. Carr* 114 (PERTH); between Mullewa and Morawa, 1 Oct. 1981, *L.A. Craven* 7013 (PERTH); between Mullewa and Morawa, 10 Sep. 1963, *A.R. Fairall* 1379 (KPBG *n.v.*, PERTH); W of Canna, Sep. 1981, *W. Kullman* S4779 (KPBG *n.v.*, PERTH); between Mullewa and Morawa,

2 Oct. 1962, *F. Lullfitz* L1193 (KPBG, PERTH); Gutha area, 10 Sep. 1985, *F.W. & T.E. Phillips s.n.* (PERTH); S of Tardun, 1 Oct. 1962, *M.E. Phillips* WA/62 1700 (CBG *n.v.*, PERTH).

*Distribution and habitat.* Occurs in an area north-east of Morawa, extending from near Tardun south-west to Gutha and south to half way between Mingenew and Canna. It is associated with gravel, recorded for example in red sandy soil over gravel, the type specimen from yellow-brown sandy loam in *Hakea* and *Acacia* scrub to closed scrub. No other specimens have vegetation details recorded. (Figure 3B)

*Phenology.* Flowers: September to October.

*Conservation status.* Recently listed as Priority Two under Department of Environment and Conservation (DEC) Conservation Codes for Western Australian Flora. This species is geographically restricted, known from an area *c.* 60 km long and almost as wide. It is not known from any conservation reserves and the small number of collections of the highly attractive species suggests that it may be at risk; it certainly needs to be surveyed. The most recent collection was made from private property in 1992.

*Etymology.* From the Greek *rhodellus* (rose-coloured, pale pure red), referring to the beautiful pink flowers of this species.

*Affinities.* Differs from its closest relative *Cheyniana microphylla* in many characters, including its narrower leaves with more prominent oil glands, its glabrous rather than bearded hypanthium and its 2-locular ovary with fewer ovules per loculus.

*Cheyniana rhodella* has a small geographic range that overlaps with the much larger range of *C. microphylla*. There are no records of the two species occurring in very close proximity and differences in their habitat preferences may keep them separated for the most part.

*Notes.* As *Cheyniana rhodella* was recognised as a distinct species and allocated the informal name *Baeckea* sp. Mullewa–Morawa (*A.C. Burns* 24) by Malcolm Trudgen, he is jointly an author of this species.

Minute antipetalous processes are often present in this species but appear to be absent in *Cheyniana microphylla*. Mature fruits and seeds are needed to complete the description given here for *C. rhodella*. Immature seeds or chaff pieces are flat and wedge-shaped with a rounded back.

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