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An unusual bud type in eucalypt flower morphology – another character to add to the *Eucalyptus* (Myrtaceae) suite

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Abstract: An unusual flower bud morphology is described here, for eight taxa in *Eucalyptus* (Myrtaceae), subgenus *Symphyomyrtus*, section *Adnataria*, series *Melliodorae*, in which mature capsules have a deciduous staminophore. In these taxa the stamens arise from a 'hinged' staminophore, infolded on the inner face of the hypanthium, which lifts the stamens up and out at anthesis. The 'hinged' staminophore of the bud becomes the deciduous staminophore on the capsule. This feature was not observed in any of the other 174 taxa examined in this study.

Keywords: *Adnataria*, capsule, deciduous staminophore, *Eucalyptus*, flower bud, hinged staminophore, hypanthium, *Melliodorae*, stamens, *Symphyomyrtus*

Introduction

The eucalypts (tribe Eucalypteae, Myrtaceae) are a large group of over 900 species – up to 934 taxa (including subspecies and varieties) according to the EUCLID website (Slee *et al.* 2020); 1008 taxa according to Nicolle (2019). Currently, the eucalypts comprise seven genera, distributed from Australia to New Guinea, Indonesia, Philippines and New Caledonia, with the centre of diversity being Australia (Bayly 2016; Thornhill *et al.* 2019; Nicolle 2019, 2022). The majority of species are endemic to Australia and are classified currently in three genera (*Angophora* Cav., *Corymbia* K.D.Hill & L.A.S.Johnson, *Eucalyptus* L'Hér.). The remaining four genera have only a tropical distribution (Thornhill *et al.* 2019; Slee *et al.* 2020).

At the moment, *Eucalyptus* is subdivided into eight subgenera (the two largest being subg. *Eucalyptus* and subg. *Symphyomyrtus*), which are subdivided further into various sections and series (Slee *et al.* 2020; Nicolle 2022). Thornhill *et al.* (2019) provided a brief summary of some key taxonomic changes, citing, among others, the work by K.D. Hill and L.A.S. Johnson during the 1990s and M.I.H. Brooker in 2000 as recent major contributors to eucalypt classification. While noting that the search for congruence between molecular and morphological classification is a work in progress, Thornhill *et al.* (2019) mapped their phylogeny on to a classification produced in 2015 by Dean Nicolle. Later, Nicolle (2019) produced version 4, incorporating and/or revising the previous classifications. Although Nicolle (2022) has since produced version 6, to date there is still no consensus. Thus, the classification followed here is that of Nicolle (2019, Version 4), but where early names of taxa have changed, the names used here follow EUCLID (Slee *et al.* 2020).

The name *Eucalyptus* refers to the cap that covers the eucalypt flower bud, comprised of one or two opercula derived from a modified calyx and/or corolla (Carr & Carr 1959; Pryor & Knox 1971), and that is typically shed at anthesis. Below the cap, the eucalypt flower (e.g., *E. nicholii*[1]; Fig.1) consists of a hypanthium (a cup-like modified receptacle) that contains the gynoecium, with an androecium of numerous stamens that arise from a zone called the staminophore on its rim. Staminophore morphology before and after anthesis is the focus of this article.

In the typical eucalypt flower the staminophore is located at the uppermost edge of the rim of the hypanthium. Depending on the shape and size of the hypanthium, stamens may be in several densely packed rows on a thick staminophore, or fewer on a thinner staminophore. Within the closed eucalypt bud, stamen arrangement varies between species, and is commonly described as either inflexed, or irregularly flexed (flexuose) (e.g., as in *E. nicholii*; Fig. 1), or erect, or varying combinations of all three arrangements (Brooker & Kleinig 1999, 2001; Boland *et al.* 1985; Slee *et al.* 2020).

Following pollination, the stamens fall and the hypanthium enlarges to become a woody or semi-woody capsule. Between the staminophore and the

1 Authorities of all species names are listed in Appendix 1.

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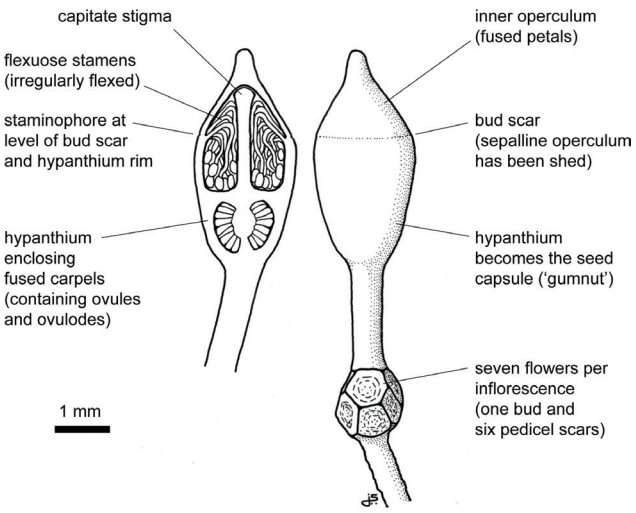


Fig. 1. *Eucalyptus nicholii*, subg. *Symphyomyrtus*, sect. *Maidenaria*, ser. *Viminales*, illustrating some typical eucalypt features: Umbellate inflorescence (7 flowers in this species). Bud dissected to show hypanthium enclosing fused carpels containing numerous ovules, stamens arising from rim of hypanthium, stamens flexuose (in this species), central style and stigma, two opercula (in this species; the outer one shed already, leaving a bud scar). The zone between the valves (the top of the ovary) and the hypanthium rim is the 'disc'. In the mature capsule, variation in disc and hypanthium development affects whether the valves will be sunk below the hypanthium, or level with it, or exserted above it (as in *E. nicholii*). — Scale bar = 1 mm. Line drawing by J. Salter.

ovary is the 'disc' that, in the flower, is concave to varying degrees and, together with the top of the ovary, serves to contain nectar (Slee *et al.* 2020). In the fully mature capsule the disc may become more exaggeratedly concave to vertical ('descending'), so that the valves of the ovary are sunken below the capsule rim (Figs 2–6), or become an expanded more or less flat or slightly raised band (Figs 7, 8), or form a pronounced raised convex band around the perimeter of the capsule (Figs 9, 10, 11), so that the ovary valves are either at the level of the capsule rim, or exserted above it. Where the disc forms a flat or convex part of the mature capsule, the staminophore is sometimes visible as a ring or band of scars left when the stamens fall, located between the scar of the operculum and the disc (Figs 7–11). In capsules that have a descending disc, the staminophore is usually located at the summit of the rim of the now woody capsule (Figs 2–6). However, in some species with a descending disc and sunken valves, there is a broad staminophore that, after stamens fall, fails to become woody, instead becoming a dry somewhat brittle flange on the rim of the mature capsule, usually falling off, either in pieces or as an intact ring – a 'deciduous staminophore' (Slee *et al.* 2020) (Figs 12, 13).

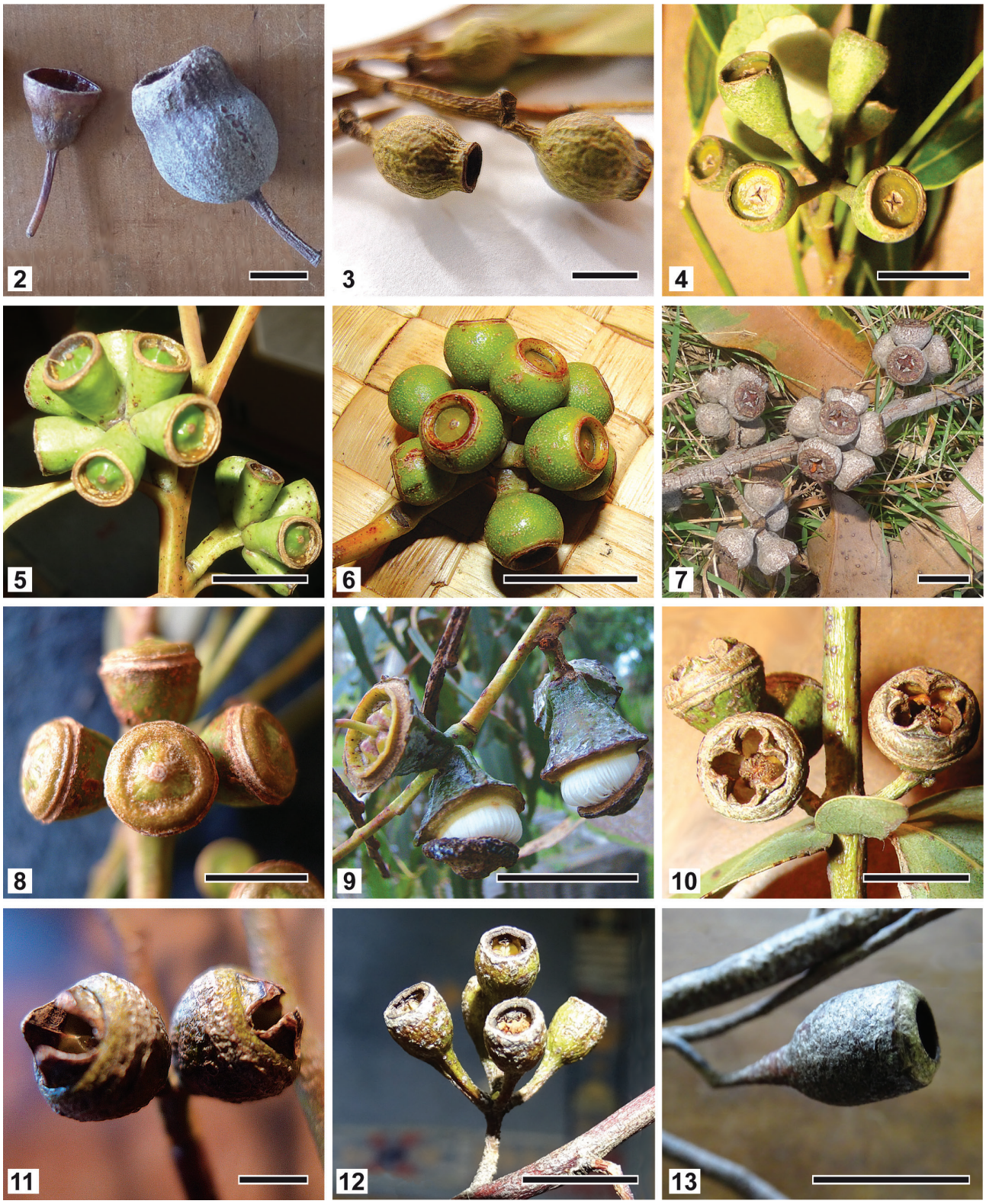
Eucalyptus leucoxylon F. Muell.

As described in EUCLID (Slee *et al.* 2020): "*Eucalyptus leucoxylon* belongs in *Eucalyptus* subgenus *Symphyomyrtus* section *Adnataria* because the buds have two opercula, ovules are in four rows, seeds are flattened-ovoid, cotyledons are reniform and anthers are rigid on the staminal filaments. Within section *Adnataria*, *E. leucoxylon* is part of a small subgroup, series *Melliodorae*, further characterised by having buds in axillary clusters, the outer operculum being retained until flowering when both opercula are shed together, the flowers having outer stamens that are sterile whilst inner stamens are fertile and a broad staminal ring that can often be seen on the fruit but ultimately is deciduous."

This species occurs mainly in southern Victoria and South Australia and several subspecies are recognised (four in Slee *et al.* 2020; five in Nicolle 2019; six in Nicolle 2022). Their showy flowers (white, pink, red) are borne in winter, making them popular as ornamental trees in gardens in Australia and New Zealand.

My own garden in Auckland, New Zealand, has two pink-flowered eucalypt trees, planted in c. 1955. In 2013, from the bark, leaves, inflorescence, bud and capsule characters, I identified the two trees as *E. leucoxylon*, but subspecies remained in doubt[2]. For this reason I designated them *E. leucoxylon* #1 and #2 (see Appendix 1). As described in the aforementioned books, the young capsules of both trees had a distinct 'staminal ring' that tended to break off on mature capsules (i.e., a deciduous staminophore). I also collected a few flowers and buds and dissected them to see the stamen arrangement. To my consternation, on dissecting closed buds and half-opened flowers, I found that, while the stamen arrangement in both entities was 'inflexed' (as described in the literature), the buds had what could best be described as a 'hinged' staminophore – a morphology that did not fit any of the three types of buds as illustrated in introductions to eucalypts (e.g., Boland *et al.* 1985: 200, fig. 23; Slee *et al.* 2020, https://apps.lucidcentral.org/euclid/text/intro/learn.htm).

2 I was always aware that my two *Eucalyptus* trees were clearly different and probably different subspecies: one, designated *E. leucoxylon* #1, has a sinuous leaning trunk, deep pink flowers and ovoid capsules (Fig. 13); the other, designated *E. leucoxylon* #2, has a straight trunk, flowers earlier than tree #1, with light pink flowers and hemi-spherical to cup-shaped capsules. When in 2021 a crop of shoots with apparently petiolate juvenile leaves appeared, low on the reclining trunk of tree #1, it initially seemed that this tree might be the entity once treated as *E. leucoxylon* subsp. *petiolaris*, now elevated to *E. petiolaris*. However, on viewing these shoots, Dr. Mike Wilcox pointed out that these leaves were in transition to adult leaves, not petiolate juvenile leaves, so my two trees remain *E. leucoxylon*. Unfortunately, their subspecific status is likely to remain uncertain, not only because of the difficulty of identifying cultivated (hybrid?) species that lack geographical context, but also because there is no consensus yet among experts (e.g., Slee *et al.* 2020; Nicolle 2022). Indeed, had I known that *E. leucoxylon* "is an exceedingly complex species which has been a constant source of torment to taxonomists and observers over many years" (Rule 1991: 396), I might not have even begun this 'small' project.



Figs 2–13. Capsule diversity in one *Corymbia* (**2**) and 11 *Eucalyptus* (**3–13**) species. **2** *C. calophylla* (AK385737), immature (L) and mature capsule, with deep-set valves. **3** *E. piperita* var. *urceolata*, mature capsules with deep-set valves (photo of herbarium specimen on AK 363934). **4** *E. microcorys* (AK385432), mature capsules, valves shallowly sunk. **5** *E. botryoides* (AK385423), immature capsules, valves just below hypanthium rim. **6** *E. pilularis* (AK385439), mature capsules with sunken valves. **7** *E. globoidea*, mature capsules, valves level with hypanthium rim. **8** *E. maidenii* (AK385430), mature capsules, disc and valves slightly raised above hypanthium rim. **9** *E. bicostata* (AK385396), two dehiscing buds and an immature capsule (L). Disc will become convex on mature capsule. **10** *E. cinerea*, mature capsules, raised disc elevating valves above hypanthium rim. **11** *E. viminalis* (AK385448), raised disc and prominent exserted valves. **12** *E. bosistoana* (AK385397), mature capsules with small deciduous staminophores partially obscuring the sunken valves. **13** *E. leucoxylon* #1 (AK385030), mature capsule, deciduous staminophore partially obscuring sunken valves. — Scale bars = 10 mm.

Aims

I decided to examine as many eucalypts around Auckland as I could locate and identify. Were there other species that shared this feature? And, since in these two eucalypts this feature clearly became the deciduous staminophore of the mature capsule, might other eucalypt species with a deciduous staminophore on the capsule also have a hinged staminophore in the bud?

Methods

Direct observations of dissected buds and flowers

Over several years, whenever opportunities arose, material was collected from street trees and from parks and gardens mostly around Auckland, in the North Island, New Zealand; two species were from Woodend and Dunedin, the South Island, New Zealand. Wherever possible, more than one tree was sampled and 4–5 buds and/or flowers examined from each, to ensure that the observed morphology of buds and/or capsules was consistent within taxa. A wide range of different species was sought, the species obtained being dependent on accessibility of flower buds and capsules. In cases where trees were too tall to collect fresh material, fallen material was sometimes useful, particularly when recently fallen after storms. A list of the eucalypt specimens held in the Auckland War Memorial Museum Herbarium (AK) was a helpful guide to the locations of species to be found in the Auckland region (in August 2013 comprising 167 specimens, representing approx. 65 species) and two herbarium specimens were sampled – *E. piperita* subsp. *urceolata* (AK363934) and *E. capitellata* (AK382764), the latter specimen from a tree felled in 2017. A visit to the UK in 2017 provided two *E. gunnii* specimens, one near Erlestoke, Wiltshire, and another at Kew Gardens, London, along with three more species, conveniently labelled – *E. nitida*, *E. parvula* and *E. pauciflora*. Identifications of specimens collected in Auckland were checked by Dr. Mike Wilcox and 50 voucher specimens of selected taxa were lodged in the Auckland War Memorial Museum Herbarium (AK). Five additional taxa already in AK were also examined (see AK numbers in Appendix 1).

Longitudinal dissections of unopened and partially opened buds and fully opened flowers, were examined with an Olympus binocular dissecting microscope, at ×15 magnification. Photographs were taken with handheld digital cameras (Panasonic Lumix DMC-LX3; Sony DSC-H50; Sony DSC-HX350), either directly or through the microscope. Mature and developing capsules were also photographed. Drawings were produced to show buds in longitudinal section (LS), from microscope observations or by tracing from digital photos, or a combination of both.

Indirect observations – online search for illustrations of dissected buds and flowers

A search was made for literature or other online sources of information that included any drawings or photographs of eucalypt flower buds in longitudinal section (LS). Of the taxa found online, only the informative ones (i.e., those for which illustrations showed staminophore morphology in buds or flowers) were recorded, as 'indirect' observations, using the current names in EUCLID (Slee *et al.* 2020) and the classification in Nicolle 2019 (see Appendix 1).

Online survey of mature capsules

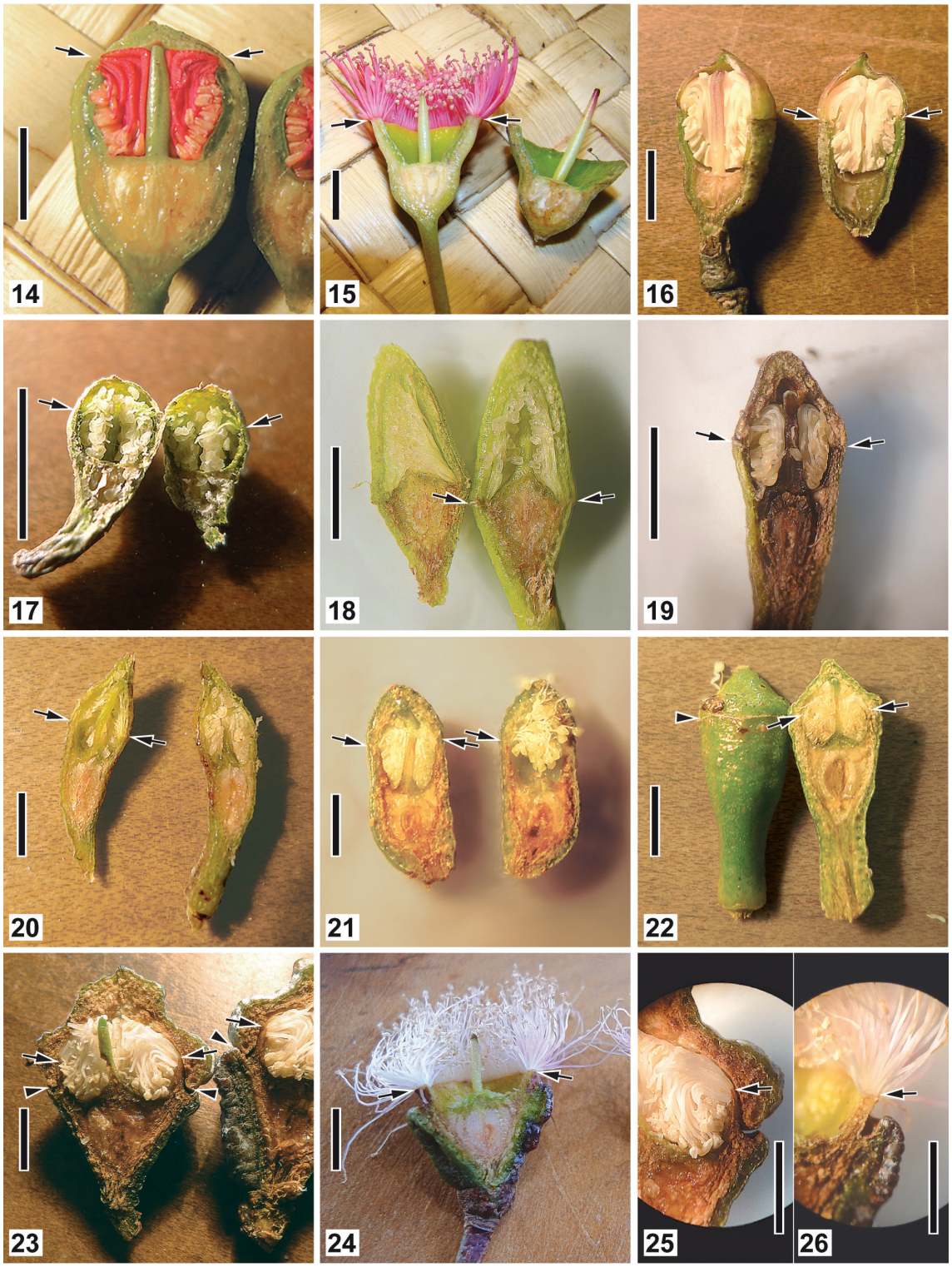
To determine whether a deciduous staminal ring on the mature capsule is correlated with a 'hinged' staminophore in the bud, as observed in the two trees *E. leucoxylon* #1 and #2, all descriptions of eucalypt species and subspecies in EUCLID (Slee *et al.* 2020) were surveyed and presence or absence of a deciduous staminophore was recorded, (a) for all taxa included in this survey (see Appendix 1) and (b) for almost all taxa listed in EUCLID (see summarised data in Table 1). Taxa not described as having a deciduous staminophore were deemed to have a 'fixed' staminophore. The capsule descriptions from EUCLID also served to confirm the 'indirect' observations of capsule morphology illustrated in the literature.

Results

Buds, flowers and capsules of 79 eucalypt individuals: two *Angophora* (one taxon), five *Corymbia* (three different taxa) and 72 *Eucalyptus* including my two trees (43 different taxa) were available for direct examination of staminophore morphology. Observations, illustrated in Figs 1–58, are detailed below. A further 171 images of eucalypt buds and flowers found online were examined, 108 of which were taxa unavailable for direct observation (two *Angophora*, 23 *Corymbia* and 83 *Eucalyptus* taxa). The results (recorded as 'hinged' or 'non-hinged' staminophores in buds and 'deciduous' or 'fixed' staminophores on capsules) are shown in Appendix 1, for all taxa observed, either directly or from searches of other sources (239 'individuals', comprising 182 different eucalypt taxa). These data are summarised at section level in Table 1.

First observations of a hinged staminophore morphology in **E. leucoxylon** *#1 and #2*

In dissected flower buds of *E. leucoxylon* #1 and #2, prior to anthesis, the neatly inflexed stamens appeared to arise in a dense band on the inner face of the rim of the hypanthium (Figs 36, 37, 39). However, dissections of half-opened flowers revealed that the broad staminophore was 'hinged'; that is, while the upper edge remained attached, the lower edge had separated from the hypanthium wall (Fig. 40). As the flower opened, the 'hinged' staminophore had changed position from folded inside to angled upwards, above the hypanthium rim, thereby lifting the stamens up and



Figs 14–26. Buds or flowers of nine eucalypts, two *Corymbia* (**14–16**) and seven *Eucalyptus* (**17–26**) species, dissected longitudinally (LS), showing 'non-hinged' staminophore morphology, in taxonomic sequence (Nicolle 2022). In Figs 14–22, arrows indicate location of staminophore at the rim of the hypanthium (operculum dehiscence line at same level). In Figs 23–26, arrows indicate staminophore location at rim of hypanthium; arrowheads indicate operculum dehiscence line. **14, 15** Pink-flowered *C. calophylla*: **14** closed bud, stamens inflexed; **15** Fully open flower (L) and hypanthium after stamens shed (R). **16** *C. maculata* (AK385394), closed bud, stamens inflexed. **17** *E. microcorys* (AK385433), closed bud, stamens flexuose. **18** *E. tereticornis* (AK385446), closed bud, stamens erect. **19** *E. botryoides* (AK385398), closed bud, stamens inflexed or flexuose. **20** *E. saligna* (AK385441), closed bud, stamens flexuose. **21** *E. goniocalyx*, closed bud, stamens flexuose. **22** *E. maidenii* (AK385430), closed bud, stamens inflexed. **23–26** *E. globulus*: **23** Closed bud, stamens inflexed; **24** fully open flower; **25** detail from Fig. 23; staminophore upright and stamens on inner face of hypanthium rim; **26** detail from Fig. 24; staminophore tilted outwards and stamens now on upper edge of hypanthium rim. — Scale bars: 14–22 = 5 mm; 23–26 = 10 mm.

out of the confines of the hypanthium (Fig. 38). Thus, the stamens, having apparently arisen on the inward-facing flank of the hypanthium, were now borne on the outward-facing flank of an extension to the rim of the hypanthium (Figs 38, 44). In spent flowers, after the stamens had fallen, the staminophore remained as a broad inwardly angled flange on the rim of the young capsule (Fig. 44). In the mature woody capsule, this flange did not become woody, but dried into a brittle ring that often broke away (Fig. 41) – the character known as a 'deciduous staminophore' (Fig. 13). Thus, the deciduous staminophore on the capsule was the last vestige of a hinged staminophore in the bud.

Another unexpected feature observed in partially opened *E. leucoxylon* flowers was the apparently premature dehiscence of the anthers before they straightened (Fig. 40). This was subsequently also seen in *E. sideroxylon* and *E. tricarpa* (Figs 53, 57, 58) and, in one case, a freshly opened flower was observed to have pollen deposited on the style (Fig. 43). It was later found that this was a phenomenon described by Ellis & Sedgley (1993) as a secondary pollen presentation syndrome unique to series *Melliodorae*.

***Direct observations of eucalypts in series* Melliodorae**

Nicolle (2019) places seven species (11 taxa if subspecies are included) in series *Melliodorae*, of which five species (8 different taxa, 15 individuals) were available for direct observation: *E. leucoxylon* (4 trees additional to trees #1 and #2 – see Appendix 1 for details); *E. melliodora* (2 trees); *E. sideroxylon* (4 trees); *E. tricarpa* (1 tree) and *E. bosistoana* (2 trees). Two of these, the large-flowered *E. sideroxylon* and *E. tricarpa*, were found to have a distinct 'hinged' staminophore, similar to that seen in the *E. leucoxylon* taxa, clearly visible in the dissected buds and flowers (Figs 52, 53, 56–58), that formed a prominent broad inturned flange on the hypanthium rim of spent flowers (Figs 50, 54). A narrower 'hinged' staminophore was found in the buds of *E. melliodora* (Fig. 48), that formed a smaller inturned flange on flowers (Fig. 49). On the rim of the mature capsule of all these taxa the staminophore became a brittle ring that was usually deciduous, but sometimes retained, obscuring the valves (Figs 51, 55). The small-flowered *E. bosistoana* was also found to have capsules with a narrow deciduous staminophore that appeared cracked and brittle (Fig. 12), albeit not described as such in EUCLID (Slee *et al.* 2020). Closer examination of somewhat dried fallen buds revealed the staminophore to be a very small inturned flange perpendicular to the hypanthium wall (Figs 45, 46); in opened and spent flowers the position of the flange was at an upwards angle of c. 45 degrees (Fig. 47), suggesting that it too lifted somewhat at anthesis.

Buds and flowers of eucalypts in other sections and series – direct observations

Figures 1 and 14–35 show the dissected buds of 19 different eucalypt species, two in genus *Corymbia* (Figs 14–16) and the rest in *Eucalyptus*. Despite the diversity of bud morphology, the staminophore was typically located just inside the operculum, more or less at the same level as the operculum dehiscence line (Figs 1, 14–22, 27–35). After stamen-fall the staminophore remained as a narrow ring of staminal scars just inside the usually thin operculum scar ('fixed' staminophores in Appendix 1 & Table 1). A notable exception was *E. globulus* (subg. *Symphyomyrtus*, sect. *Maidenaria*, series *Globulares*, subseries *Euglobulares*; Nicolle 2022), in which the operculum scar was unusually broad, because the staminophore at the rim of the hypanthium sits at a higher level than the external dehiscence line of the thick warty operculum (Figs 23–26). At anthesis the staminophore undergoes a shift from angled inwards (in the bud, constrained by the thick warty operculum) to angled outwards in the fully open flower (Figs 25–26). This change of angle is not the same as the 'hinged' structure described above in ser. *Melliodorae* and was scored as non-hinged in the bud and 'fixed' on the capsule (Appendix 1 & Table 1).

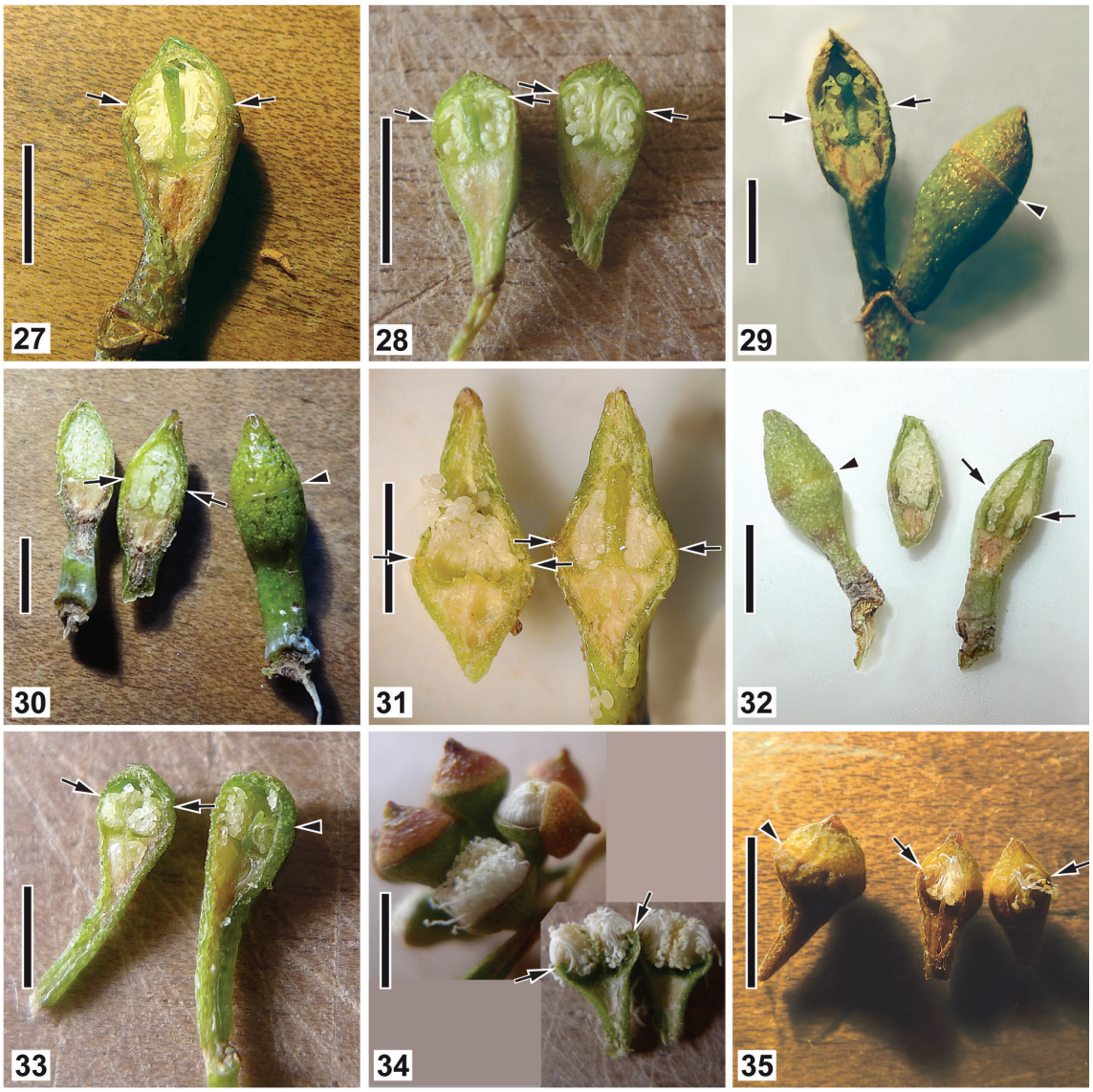
Indirect observations – illustrations of dissected buds, flowers or capsules, found online

A particularly good source was *Eucalyptographia* (Mueller 1879–1884) that provided illustrations of dissected buds for a wide range of eucalypts not otherwise accessible. All 100 eucalypts of *Eucalyptographia* were checked on the EUCLID website (Slee *et al.* 2020) and the 31 taxa that were found to have undergone name changes were recorded under the current names accepted in EUCLID (Appendix 1). Although many other recent papers and books on eucalypts provide illustrations of whole buds and/or capsules, only a handful of papers were found that included flower or bud dissections in LS, as a drawing or photograph:

***On taxa in series* Melliodorae.** A detailed histological study of bud, flower and embryo development in *E. melliodora* (Davis 1968) provided camera lucida drawings of the early stages of a 'hinged' staminophore, albeit not described as such; and the 'hinged' staminophore was clearly visible in three studies illustrated with photographs or drawings: in *E. melliodora* (Moncur & Boland 1989); in *E. leucoxylon* subsp. *leucoxylon* (Ellis & Sedgley 1993); and a drawing of a dissected bud in *E. petiolaris* (as *E. leucoxylon* subsp. *petiolaris*) (Boland 1979) – all scored as 'hinged' staminophores (Appendix 1).

Half-flower drawings, e.g., in a study of flowering ecology (Wilson 2002 – *E. melliodora*, *E. leucoxylon* and *E. tricarpa*) and in a taxonomic paper (Bean 2010 – *E. sideroxylon* subsp. *improcera*) were also included in the survey. Wherever staminophore morphology was unclear, or in conflict with direct observations, the uncertainty is indicated with a questionmark (Appendix 1).

***On taxa in sections or series other than series* Melliodorae.** Several studies were found that provided bud and/or flower illustrations, e.g., bud morphology of *E. stellulata* (Davis 1969); dissected bud of



Figs 27–35. Buds of nine *Eucalyptus* species in LS, showing 'non-hinged' staminophore morphology, in taxonomic sequence (Nicolle 2022). Arrows indicate location of staminophore at rim of hypanthium. Arrowheads indicate external operculum dehiscence line at same level as staminophore. **27** *E. cinerea*, closed bud, stamens inflexed. **28** *E. parvula*, closed bud, stamens inflexed or flexuose. **29** *E. viminialis* (AK385448), two closed buds, stamens flexuose. **30** *E. pilularis* (AK385439), two closed buds, stamens flexuose. **31** *E. macrorhyncha* (AK385429), closed bud, stamens flexuose. **32** *E. globoidea* (AK385421), two closed buds, stamens flexuose. **33** *E. nitida*, closed bud, stamens inflexed. **34** *E. pauciflora*, 6 buds ready to open, stamens inflexed. **35** *E. rossii* (AK385440), two closed buds, stamens inflexed. — Scale bars = 5 mm.

E. hallii (Brooker 1975); half flowers of *E. spathulata*, *E. cladocalyx* and *E. leptophylla* (Ellis & Sedgley 1992); bud and capsule morphology for new species in *Angophora*, *Corymbia* and *Eucalyptus* (Johnson & Hill 1990, 1991; Hill & Johnson 1992, 1994, 1995; Hill 1997; Hill *et al.* 2001); half-flowers of *E. polyanthemos*, *E. macrorhyncha* and *E. microcarpa* (Wilson 2002). Again, where staminophore morphology was unclear, or in conflict with direct observations, a questionmark indicates the uncertainty (Appendix 1).

An intriguing variation in staminophore morphology was found in Hill & Johnson (1992). Of the 46 taxa described (in section *Bisectae*), mostly from Western Australia, 35 were 'normal' in having the staminophore (or "stemonophore") as a broad or narrow zone at the hypanthium rim, recorded in Appendix 1 as 'non-hinged' in the bud and 'fixed' on the capsule. However, in a small group of nine with elongated calyptras, the staminophore was described as 'broad, flat, persistent' (Hill & Johnson 1992). Bud dissections were illustrated for three of these nine taxa and showed that in their narrow cylindrical buds the staminophore forms a distinctive wide flat structure perpendicular to the hypanthium rim, extending inwards almost to the central stigma and bearing numerous erect stamens. After stamen-fall the staminophore remains as a broad flat flange on the mature capsules, obscuring the disc, and, to judge from the nine capsules illustrated, appears to be dry and cracked. It also appears to be a static feature that does not change position at anthesis, nor is deciduous on the capsule (Hill & Johnson

1992; Brooker & Kleinig 2001). Therefore, despite their strikingly different morphology, these taxa were also scored as having 'non-hinged' staminophores in the buds, and 'fixed' staminophores on the capsules (Appendix 1).

Online survey of mature capsules

The capsule survey of eucalypt taxa included in EUCLID (Slee *et al.* 2020) was undertaken to see whether a deciduous staminophore occurs in sections other than *Adnataria*, or, within *Adnataria*, in series other than *Melliodorae*. Capsules where a deciduous staminophore was not mentioned in EUCLID were deemed to have a 'fixed' staminophore. The results of the capsule survey are set out in Table 1 (recording all taxa in EUCLID with 'deciduous' or 'fixed' staminophore on capsules, together with data from Appendix 1 showing numbers of taxa observed to have a 'hinged' or 'non-hinged' staminophore in buds, for each subgenus and section within the three eucalypt genera in EUCLID). Direct observations of 44 capsules are also recorded (Appendix 1 & Table 1). In a few cases (in sections *Glandulosae*, *Bisectae* and *Adnataria*) capsules described as having a 'persistent' staminophore, including the aforementioned 9 taxa in Hill & Johnson (1992), have been interpreted here as having 'fixed' staminophores on the capsules. It was found that most of the eucalypt capsules had a fixed staminophore (777 taxa, or 799 if the 22 taxa with 'persistent' staminophores are included) (Table 1).

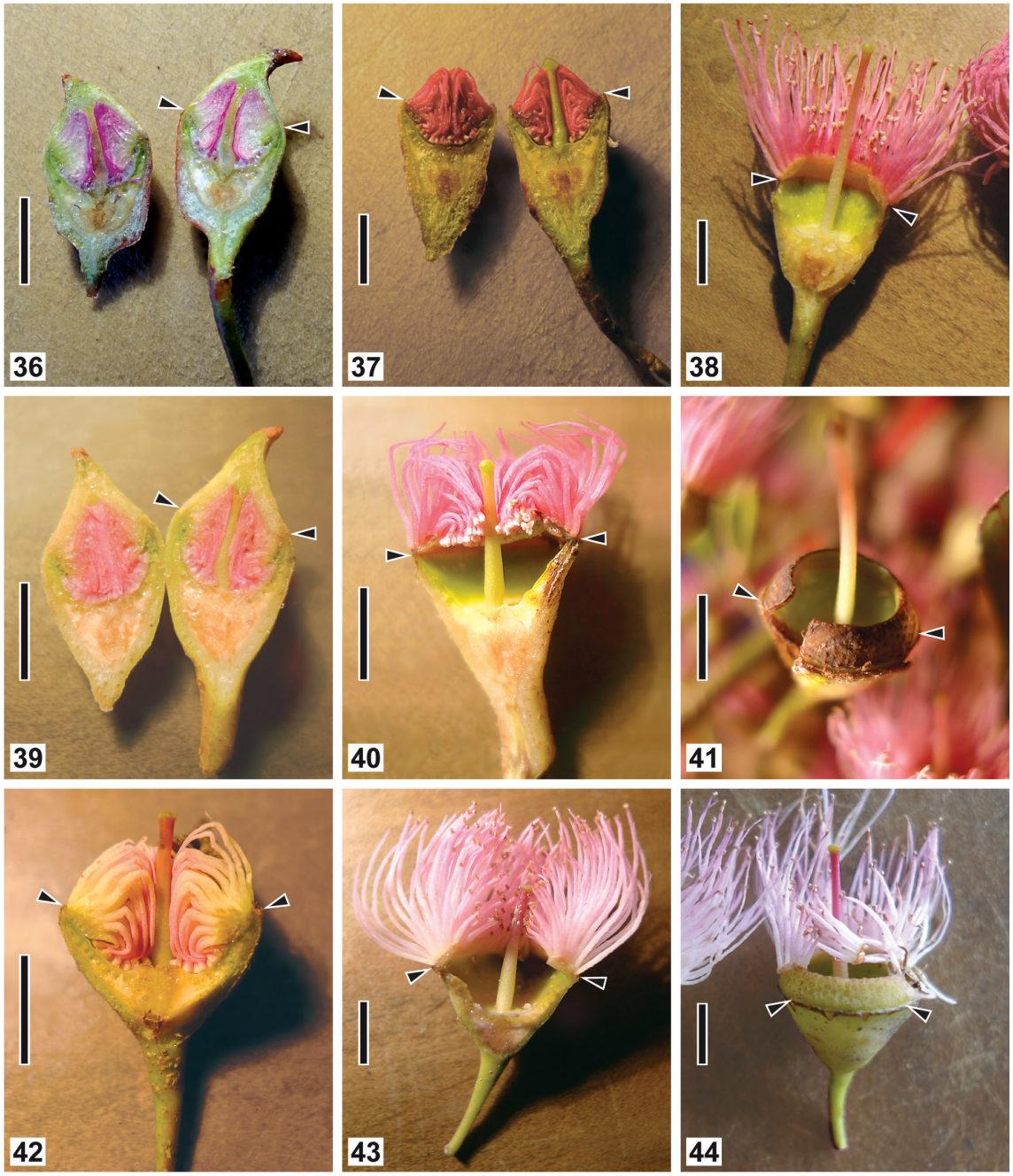
The afore-mentioned *E. polyanthemos*, in section *Adnataria* series *Heterophloiae*, is closely related to series *Melliodorae* (Nicolle 2019). In at least one of its subspecies (subsp. *vestita* in Nicolle 2019, subsp. *longior* in EUCLID 2020) the filaments are basally fused, a feature clearly illustrated in *Eucalyptographia* (Mueller 1879–1884, as *E. polyanthema*). The capsule status for this unusual taxon was unclear; according to the description in EUCLID, the stamens are basally fused so that the whole androecium is shed intact (Slee *et al.* 2020, taxon description), but elsewhere in EUCLID, the intact androecium is said to be shed with the staminophore attached (Slee *et al.* 2020, Glossary, 'staminophore'), either way, littering the ground under trees with 'fairy rings' (Ritter 2014; Slee *et al.* 2020). This taxon was therefore scored as having uncertain staminophore morphology on the capsule (Appendix 1 & Table 2).

Of the ten taxa recognised within series *Melliodorae* in EUCLID (Slee *et al.* 2020), nine were described as having a deciduous staminophore. Although not mentioned for the tenth species, *E. bosistoana*, the present study found that it too shares this character (Fig. 12). In EUCLID, with the possible exception of *E. polyanthemos*, there were no 'deciduous' staminophores on the capsules of any taxa in the other eucalypt genera, or in other *Eucalyptus* subgenera (Table 1). Within subg. *Symphyomyrtus*, the only section with taxa possessing a deciduous staminophore on capsules was sect. *Adnataria* (Table 1). When sect. *Adnataria* was viewed at series level, it was found that taxa observed to have both the 'hinged' staminophore (pers. obs.) and the deciduous staminophore (EUCLID) occurred almost entirely in series *Melliodorae* (Tables 1 & 2). Within sect. *Adnataria*, six taxa in series *Striolatae*, *Siderophloiae* and *Rhodoxyla* (Nicolle 2022) were described in EUCLID as having a 'persistent' staminophore on the capsule. However, except for *E. paniculata* (ser. *Rhodoxyla*), these taxa were not available for direct or indirect observation of buds and have therefore been omitted from Appendix 1. Based on an illustration of the bud (Mueller 1879–1884), *E. paniculata* was scored as 'staminophore possibly hinged', while the 'persistent' staminophore of the capsule (EUCLID: Slee *et al.* 2020) was scored as 'fixed/persistent' (Appendix 1). All uncertain or ambivalent data were excluded from the overall totals accompanying Appendix 1.

Discussion

In all, 182 taxa were included in this study (three *Angophora* species, 26 *Corymbia* taxa and 153 *Eucalyptus* taxa). The 43 different taxa available for direct observation were limited to those that can thrive in moist temperate climates (most of them in Auckland, two in the South Island, New Zealand, and three in southern England). Species adapted to more arid parts of Australia were inevitably excluded from direct examination, but illustrations of dissected buds in a wide range of taxa were found online. Although an attempt was made to use current names for all taxa observed directly or indirectly, it was realised that, given the lack of consensus in eucalypt taxonomy, some names may not be universally accepted. However, it was considered that, whatever the current taxonomic status of a given eucalypt, a change in its name or the splitting of a taxon into two or more entities was considered unlikely to make a significant difference to its staminophore morphology.

Aside from *Eucalyptographia* (Mueller 1879–1884), most compendiums of eucalypt species, however well illustrated, whether early (Maiden 1903–1909), or more recent (Kelly *et al.* 1969; Chippendale 1988; Brooker & Kleinig 1999, 2001; Boland *et al.* 1985; Slee *et al.* 2020), seldom provide a bud dissection for individual species, presumably because eucalypt species can be identified using other characters. There were exceptions; for instance, some studies of pollination biology in a handful of *Eucalyptus* species did provide somewhat simplified half-flower drawings (e.g., Ellis & Sedgeley 1992; Wilson 2002). A notable exception was the series of papers published during the 1990s and early 2000s (Johnson & Hill 1990, 1991; Hill & Johnson 1992, 1994, 1995; Hill 1997; Hill *et al.* 2001), in which the excellent drawings by David Mackay give one confidence that they are accurate representations of the bud and capsule morphology of all the taxa illustrated.



Figs 36–44. Buds and flowers of three *Eucalyptus leucoxylon* samples (series *Melliodorae*), dissected longitudinally, showing 'hinged' staminophore morphology. Arrowheads indicate the location of the 'hinge' point of the staminophore, at the hypanthium rim, just inside the position of the operculum scar. **36–38** *E. leucoxylon* #1 (AK385030): **36** Immature closed bud, stamens inflexed, arising from inner face of 'hinged' staminophore that is tightly appressed to hypanthium wall; **37** opening bud, operculum gone, stamens still inflexed. but 'hinged' staminophore beginning to separate from hypanthium wall; **38** open flower in which the style has elongated and the fully extended 'hinged' staminophore (at c. 45–60 degree angle) has lifted stamens and staminodes out of the hypanthium. The dense array of stamens are now on the external face of the uplifted staminophore. **39–41** *E. leucoxylon* #2 (AK370732): **39** Closed bud, stamens inflexed, arising from tightly appressed 'hinged' staminophore; **40** half-opened flower, 'hinged' staminophore partially elevated and stamens beginning to leave the confines of the hypanthium; note fertile anthers dehiscing before straightening (see Ellis & Sedgley 1993); **41** spent flower or young capsule with elongated style and the now brown and dry deciduous staminophore already breaking away. **42–44** *E. leucoxylon* (AK385424): **42** Opening bud, operculum gone, stamens still inflexed but a few staminodes escaping on the periphery; **43** Nearly fully opened flower with the 'hinged' staminophore partially elevated; dense mass of stamens still not fully extended, the shorter central ones leaving patches of pollen sticking to the style (presumably having dehisced within the hypanthium, as in Fig. 40); **44** Spent flower with elongated style and half the stamens already detached; a dense pattern of stamen scars is visible on the still-green staminophore. — Scale bars = 5 mm.

When being non-hinged is the norm

The great majority of the eucalypts in this study (all the *Angophora* and *Corymbia* taxa and the majority of *Eucalyptus* taxa) have been found to have buds with a 'non-hinged' staminophore that becomes the 'fixed' (i.e., permanent) ring of staminal scars on the mature capsule, just inside the operculum scar. Also included in this category was the interesting variant, the 'flat' staminophore reported in 9 taxa by Hill & Johnson (1992). Given the relative uniformity of flower morphologies within *Angophora* and *Corymbia* taxa, it is likely that all the species in these two genera have 'non-hinged' and 'fixed' staminophores. Note that online (indirect) records of 'non-hinged' for 11 taxa in sect. *Adnataria* (Table 1) may be anomalies due to the illustrator/observer not recognising a 'hinged' condition. However, as Table 2 shows, none of these 'non-hinged' taxa occur in series *Melliodorae* and all except six (that have a 'persistent' staminophore) have a 'fixed' staminophore on the capsule (Table 2), suggesting that the 'non-hinged' condition for these 11 taxa may be correct. The occurrence of what EUCLID (Slee *et al.* 2020) refers to as a 'persistent' staminophore in six cases in sect. *Adnataria* is interesting (Table 2) and is discussed further below.

Significance of a 'persistent' staminophore on capsules

As mentioned above, a few taxa in different sections of subg. *Symphyomyrtus* have capsules described as having a 'persistent' staminophore (EUCLID: Slee *et al.* 2020). Since most eucalypts observed here or recorded from EUCLID have a 'fixed' staminophore that is a permanent feature of the mature capsule, the term 'persistent' implies a situation where the staminophore might otherwise be expected to be deciduous. Is the term 'persistent' being applied where a 'deciduous' staminophore fails to detach? For instance, *E. paniculata* (in section *Adnataria*, series *Siderophloiae*) has a 'persistent' staminophore (EUCLID: Slee *et al.* 2020). This species is recorded in Appendix 1 as possibly 'hinged', based on the illustration in *Eucalyptographia* (Mueller 1879–1884), which shows the bud as having an incurved rim on the hypanthium, suggestive of a 'hinged' staminophore that further suggests a deciduous staminophore on the capsule. If this is correct and if the staminophore often fails to detach, the term 'persistent' staminophore would seem appropriate.

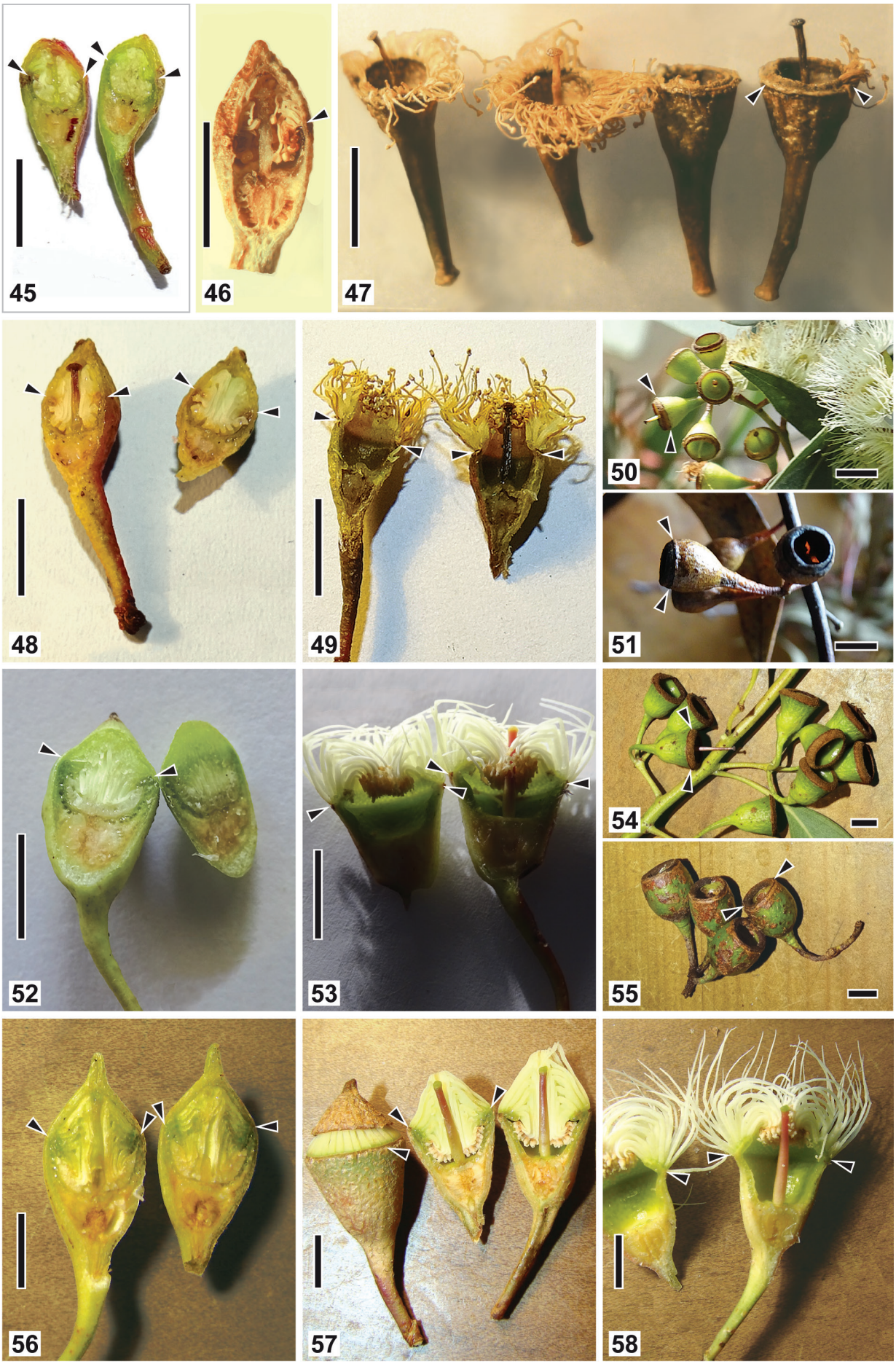
However, while the use of the term 'persistent' in EUCLID implies similarity in morphology, it cannot be assumed that structures "which look alike at maturity have necessarily developed in the same way" (Carr & Carr 1968: 515). For instance, 11 of 15 taxa in section *Glandulosae*, series *Erectae*, subseries *Abundae* (in Nicolle 2022), including the afore-mentioned 9 taxa of Hill & Johnson (1992), are described in EUCLID (Slee *et al.* 2020) as having 'persistent' staminophores, but this particular type of 'persistent' staminophore does not appear to originate from a 'hinged' staminophore in the bud, as made clear in David Mackay's excellent drawings of bud dissections and capsules (Hill & Johnson 1992) and detailed above in Results.

In other words, given the morphological diversity throughout the eucalypts, the occurrence of a scattering of taxa in different sections with a 'persistent' staminophore on the capsules needs further investigation, if only to clarify what is meant by the term 'persistent'.

Evidence for hinged staminophores in earlier studies

For the taxa reported here as having 'hinged' staminophores, this unusual morphology seems not to have been noticed by many authors, perhaps because it is most obvious only in half-opened buds. Even where half-flowers are illustrated with an inturned staminophore on the hypanthium rim, this unusual structure seems to have been ignored, or in some cases interpreted as simply an oddly shaped hypanthium. For instance, Wilson (2002) provided half-flower diagrams

Figs 45–58. Buds and flowers of four other *Eucalyptus* taxa in series *Melliodorae* with 'hinged' staminophores. Arrowheads indicate the location of the 'hinge' point of the staminophore, at the hypanthium rim, just inside the position of the operculum scar. **45–47** *E. bosistoana* (AK385397): **45** Closed bud, stamens flexuose, 'hinged' staminophore a small inward-projecting flange; **46** a dessicated bud, from fallen material shows more clearly the stamens arising from a blackened dried 'hinged' staminophore projecting inwards from the hypanthium wall; **47** two dried flowers and two spent flowers from same fallen material as in Fig. 46; in the two flowers the 'hinged' staminophore is now at an angle of c. 45 degrees, partially obscuring the ovary; on both spent flowers the former 'hinged' staminophore is now a clearly visible deciduous staminophore. **48–51** *E. melliodora*: **48** Closed bud, stamens inflexed, arising from a small downturned 'hinged' staminophore; **49** opened flower (fallen desiccated material), 'hinged' staminophore now at c. 45 degree angle upwards; **50** young green capsules, with deciduous staminophores clearly visible as brown bands above the hypanthium rim; **51** mature capsules, with blackened deciduous staminophores partially detached at rim. **52–55** *E. sideroxylon* (AK385445): **52** Closed bud in non-median LS, stamens inflexed, thin 'hinged' staminophore appressed to thicker hypanthium wall; **53** opening flower with 'hinged' staminophore partially elevated; dense mass of stamens still not fully extended, but fertile anthers dehiscing before straightening (see Ellis & Sedgley 1993); **54** young green capsules, one with elongated style still attached; deciduous staminophores clearly visible as brown bands above the hypanthium rim; **55** mature capsules, each with infolded dark brown remnants of the deciduous staminophore adhering to the hypanthium rim. **56–58** *E. tricarpa* (AK385447): **56** Closed bud, stamens inflexed, 'hinged' staminophore appressed to the inner hypanthium wall; **57** three buds beginning to open; anthers already dehiscing while stamens are still fully inflexed; 'hinged' staminophores are just beginning to lift away from the inner hypanthium wall; **58** opening flower with 'hinged' staminophore fully elevated; sterile staminodes nearly fully extended, but fertile stamens still infolded with dehiscing anthers clustered around style (see Ellis & Sedgley 1993). — Scale bars = 5 mm.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for several species (*E. polyanthemos*, *E. macrorhyncha*, *E. microcarpa*, *E. leucoxylon*, *E. melliodora* and *E. tricarpa*), referring to *E. leucoxylon* and *E. tricarpa* as having a "raised, in-curved ring of the hypanthium disc" or a "raised in-curved disc on the hypanthium rim" (Wilson 2002: 57 & 64, respectively). Furthermore, three of these species (*E. leucoxylon*, *E. melliodora* and *E. tricarpa*, as shown in the present study) have an inturned staminophore on the flower (Figs 40, 49, 58), yet Wilson's illustration shows only *E. tricarpa* with a pronounced inturned staminophore and *E. leucoxylon* with a somewhat incurved thickened hypanthium rim (Wilson 2002: 58). One possible explanation is that, due to natural variation, the particular specimens of *E. leucoxylon* and *E. melliodora* seen by Wilson (2002) lacked inturned staminophores. However, natural variation seems an unlikely explanation for the complete absence of a structure as distinctive as this type of staminophore. Perhaps instead, since Wilson's (2002) study was focussed on the floral ecology and the nectar-carrying capacity of fully mature flowers, the drawings, which seem somewhat simplified, do not accurately represent the morphology of the flowers. Furthermore, Wilson (2002: 57) erroneously describes *E. leucoxylon* and *E. tricarpa* as having a fused innermost whorl of stamens, perhaps a misinterpretation of the staminophore.

Another illustration of *E. melliodora* was found in *Eucalyptographia* (Mueller 1879–1884). Mueller's illustration showed a slight thickening at the hypanthium rim, although the significance of the infolded staminophore seems not to have been recognised. In contrast, Mueller's illustration of the closed bud of *E. leucoxylon* clearly showed an infolded flange at the rim of the hypanthium, but lack of comment again suggests that the significance of the infolded staminophore was not recognised (Mueller 1879–1884). A century later, Boland (1979), in a revision of *E. leucoxylon*, described two new subspecies, one of which was illustrated – *E. leucoxylon* subsp. *petiolaris*, since elevated to *E. petiolaris* (Slee *et al.* 2020). A dissected bud was shown with stamens arising from a small inturned flange (Boland 1979, fig. 2c), again with no comment in the text. Likewise, Bean (2010) illustrated a 'half-flower' of *E. sideroxylon* subsp. *improcera* (a subspecies not accepted by Nicolle 2019, 2022), clearly showing the staminophore as a somewhat inturned flange above the rim of the hypanthium (Bean 2010, fig. 1c). Here the only comment was mention of the deciduous staminophore at capsule stage (Bean 2010).

One study of the flower morphology of E. melliodora by Moncur & Boland (1989) showed in SEMs the various stages of development. The unopened bud was described as having "fully inflexed staminodes and stamens" without mention of the staminophore (Moncur & Boland 1989: 126–127, fig. 1F). However, anthesis was described thus: "The unfolding of filaments was accompanied by the upward and outward lifting of the upper surface of the staminophore ...." (Moncur & Boland 1989: 129, fig. 2G). Despite this observation and the fact that their bud dissection showed the infolded staminophore, they made no further comment on staminophore morphology, perhaps because their focus was pollination biology. An earlier study of *E. melliodora* bud development by Davis (1968) also made no mention of this phenomenon, despite bud and flower diagrams that showed the staminophore changing angle as the flower developed (Davis 1968: 22, figs 5 & 6).

Another interesting study of gynodioecy in *E. leucoxylon* subsp. *leucoxylon* (Ellis & Sedgley 1993) showed photos of stages in anthesis that involved the deposition of pollen on the style – described as a "pollen-presentation mechanism unique in this taxonomic group" (Ellis & Sedgley 1993: 323). Although the full width of the hypanthium does not show in their figs 1B and 1C, the bud (fig. 1B) has a 'hinged' staminophore that can be seen to have lifted in the opening flower (fig. 1C). There was, however, no discussion of this feature, the focus being on the anthers and the deposition of pollen on the style (Ellis & Sedgley 1993, figs 1B & 1C).

In short, despite a general lack of recognition of the 'hinged' staminophore, several studies of species in series *Melliodorae* were found to have diagrams or illustrations of flowers or buds that indirectly or directly provided supporting evidence for the structure here termed a 'hinged' staminophore.

The shared floral morphology in series Melliodorae

It is interesting to note that the species reported here to have a 'hinged' staminophore are grouped together in the current classification in series *Melliodorae* (Nicolle 2022). This small group of taxa are united by both morphological and molecular characters (Thornhill *et al.* 2019; Slee *et al.* 2020). The mallee *E. porosa* is described in EUCLID (Slee *et al.* 2020) as having deciduous staminophores on capsules, suggesting that it too may have a 'hinged' staminophore in the flower bud. Within series *Melliodorae*, six of the eight taxa observed here have pendulous flowers (four subspecies of *E. leucoxylon*, *E. sideroxylon* and *E. tricarpa*). The species *E. melliodora* and *E. bosistoana*, which have small flowers radiating in all directions in each inflorescence, are the exception.

Ecological significance of pendulous flowers

Wilson (2002) found that *E. leucoxylon* and *E. tricarpa* produce copious dilute nectar despite having pendulous flowers; the nectar is presumably retained in the flowers by surface tension and perhaps, as Wilson (2002) has suggested, the inturned staminophore and the masses of stamens help to retain nectar in sufficient volume to attract bird consumption. Another feature shared by most of the species in this group is that they are winter-flowering; perhaps pendulous flowers prevent dilution of the nectar by winter rainfall. Another suggestion is that the pendulous condition has a role in the unusual

pollen-presenting mechanism (Ellis & Sedgley 1993). The majority of eucalypts are white-flowered and generalist insect-pollinated, but it has been suggested that, with fewer insects around in the cooler winters of southern regions, birds become more important for pollination in these areas, hence the larger flowers and the bright reds and pinks of some south-eastern species (Ellis & Sedgley 1993; Catchpole 2005). More research is needed on the biology/ecology of the winter-flowering species within the series *Melliodorae* group.

Another taxon needing further study

The anomalous *E. polyanthemos* subsp. *longior* (in section *Adnataria* series *Heterophloiae*), warrants further investigation. It seems clear that *E. polyanthemos* has a fused androecium and it may or may not have a deciduous staminophore (EUCLID: Slee *et al.* 2020). Dissection of unopened buds and half-opened flowers would determine whether the 'fairy ring' is only fused filaments or also includes the staminophore. Do other taxa in the same genetic clade (as determined by Thornhill *et al.* 2019) share the same androecial feature?

Conclusion

Hinged staminophores in buds correlate with deciduous staminophores in capsules

Eight *Eucalyptus* taxa, in sect. *Adnataria*, ser. *Melliodorae* – *E. leucoxylon* (four subspecies), *E. melliodora*, *E. sideroxylon*, *E. tricarpa* and *E. bosistoana* – were found to have a 'hinged' staminophore in the bud, which becomes a deciduous staminophore on the mature capsule. In other words, in the group of taxa observed here, deciduous staminophores on the capsules are the remains of 'hinged' staminophores in the buds. These findings are summarised diagrammatically, modelled on *E. sideroxylon* and *E. tricarpa*, to represent typical stages in flower development in series *Melliodorae* (Fig. 59).

The unopened flower has a 'hinged' staminophore that is usually closely appressed to the inside of the hypanthium (Fig. 59A) – infolded but not appressed in *E. melliodora* and *E. bosistoana*. The 'hinged' staminophore lifts up as the flower opens (Fig. 59B), lifting the stamens up and out as they straighten (Fig. 59C), until they form the dense array of the fully opened flower, on the outward-facing flank of the 'extended rim' of the hypanthium (Fig. 59D). After the stamens fall, the staminophore remains as a prominent band of a different colour and/or texture at the rim of the young capsule (Fig. 59E). This later becomes the dry and brittle deciduous staminophore, which may crack and fall off in fragments, or detach as an intact ring (Fig. 59F).

None of the other taxa included in this survey, in any of the other sections or series within *Eucalyptus*, or the other eucalypt genera, possessed either a 'hinged' staminophore on buds or a deciduous staminophore on capsules.

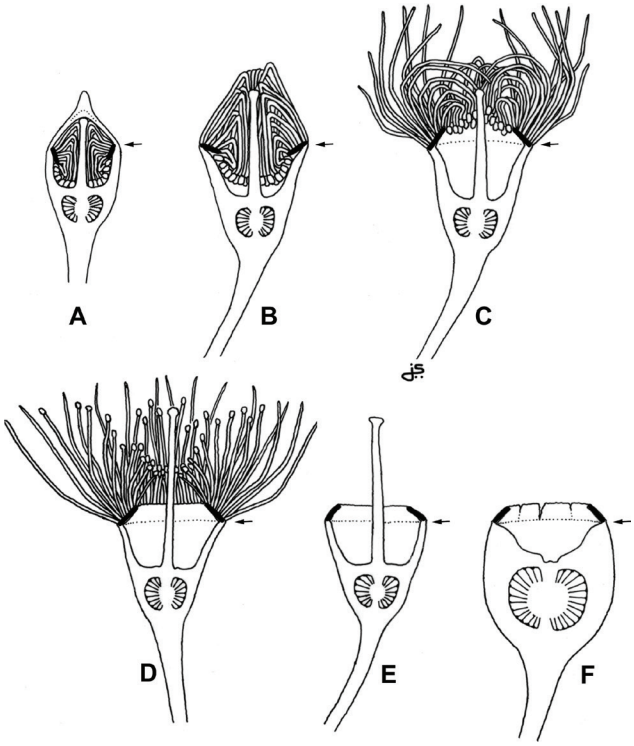

Fig. 59. Bud, flower and capsule development of a typical eucalypt in the series *Melliodorae*. Longitudinal dissections shown diagrammatically to summarise the stages from 'hinged' staminophore to deciduous staminophore. Cut staminophore tissues coloured black for clarity. Arrows indicate the location of the 'hinge' point of the staminophore, at the hypanthium rim, just inside the position of the operculum scar. **A** Closed bud with stamens inflexed and 'hinged' staminophore appressed to the inner wall of the hypanthium. **B** Bud beginning to open, 'hinged' staminophore beginning to lift away from hypanthium wall. **C** Partly opened flower, 'hinged' staminophore fully elevated to c. 45–60 degree angle above rim of hypanthium. Staminodes nearly fully extended, but stamens still infolded. **D** Fully open flower with broad staminophore bearing its dense array of staminodes and stamens overarching the hypanthium 'cup'. **E** Spent flower or young capsule, the prominent staminophore still adhering to the rim of the hypanthium. **F** Mature capsule with the now dry deciduous staminophore beginning to detach from the hypanthium rim. — Line drawing by J. Salter.

Taxonomic significance of a hinged staminophore

While fossil and molecular evidence indicates that the eucalypts are an old Gondwanan lineage (c. 59 million years old), the large subg. *Symphyomyrtus* appears to have diverged in the early Oligocene (c. 26–32 million years ago) and has since undergone extensive diversification (Thornhill *et al.* 2019). Within subg. *Symphyomyrtus*, the five largest sections, *Bisectae* (123 spp.), *Adnataria* (106 spp.), *Glandulosae* (94 spp.), *Maidenaria* (79 spp.) and *Dumaria* (76 spp.), are thought to have undergone accelerated diversification in the last 2–3 million years (Thornhill *et al.* 2019). Within sect. *Adnataria*, the series *Melliodorae* appears to be a genetically distinct group of relatively recent origin (Thornhill *et al.* 2019, Supplementary Material, fig. S3C) and this present study has found further morphological support for this group. In view of the

Table 1. Staminophore survey across Nicolle's (2019) *Classification of Eucalypts* (Version 4). Numbers of different taxa per section with 'hinged' (H) or 'non-hinged' (NH) staminophore on buds and deciduous (D) or 'fixed' (F) staminophore on capsules, observed either from images found on the internet ('online'), or from fresh or fallen material [pers. obs. in square brackets], or from capsule survey (EUCLID: Slee *et al.* (2020). Data from capsule survey represents most taxa listed in EUCLID (some subspecies omitted). 'Online' data represent only the taxa for which dissected buds and flowers were found in the internet search (references in Appendix 1). N.B. Some numbers in Column F differ from Nicolle (2019) due to differences in classification in EUCLID (Slee *et al.* 2020). Explanation: Dash '–' : no information found online. Dash in square brackets '[–]' : taxa not available for pers. obs.

Genus	No. of taxa per section (incl. subsp. & hybrids) in Nicolle (2019)		'hinged' staminophore on bud & flower	deciduous staminophore on capsule	'non-hinged' staminophore on bud & flower	'fixed' staminophore on capsule	'persistent' staminophore on capsule
			H	D	NH	F	
			'online' / [pers.obs.]	EUCLID / [pers.obs.]	'online' / [pers.obs.]	EUCLID / [pers.obs.]	EUCLID
Angophora		12			3 [1]	11 [1]	
Corymbia	subg. *Corymbia*						
	sect. *Calophyllae*	4			2 [2]	3 [2]	
	sect. *Corymbia*	56			11 [–]	56 [–]	
	subg. *Blakella*						
	sect. *Naviculares*	12			5 [–]	11 [–]	
	sect. *Torellianae*	1			1 [–]	1 [–]	
	sect. *Maculatae*	3			1 [1]	3 [1]	
	sect. *Abbreviatae*	25			6 [–]	23 [–]	
	TOTALS	101			26 [3]	97 [3]	
Eucalyptus	subg. *Eudesmia*						
	sect. *Complanatae*	12			4 [–]	10 [–]	
	sect. *Limbatae*	18			3 [–]	15 [–]	
	subg. *Acerosae*	2			– [–]	1 [–]	
	subg. *Cuboidea*	1			– [–]	1 [–]	
	subg. *Alveolata*	1			1 [1]	1 [1]	
	subg. *Cruciformes*	1			– [–]	1 [–]	
	subg. *Symphyomyrtus*						
	sect. *Bolites*	2			1 [–]	1 [–]	
	sect. '*Glandulosae*'	121			16 [1]	110 [1]	11
	sect. *Bisectae*	172			25 [–]	139 [–]	5
	sect. *Dumaria*	93			8 [–]	78 [–]	
	sect. *Inclusae*	1			1 [–]	1 [–]	
	sect. *Sejunctae*	3			1 [1]	3 [–]	
	sect. *Domesticae*	3			2 [–]	3 [–]	
	sect. *Equatoria*	2			– [–]	– [–]	
	sect. *Adnataria*	131	1 [8]	9 [7]	17 [0]	97 [0]	6
	sect. *Platysperma*	8			1 [–]	8 [–]	
	sect. *Pumilio*	5			1 [–]	5 [–]	
	sect. *Exsertaria*	67			7 [2]	56 [2]	
	sect. *Incognitae*	3			1 [–]	3 [–]	
	sect. *Latoangulatae*	20			4 [3]	13 [3]	
	sect. *Racemus*	1			– [–]	1 [–]	
	sect. *Maidenaria*	104			14 [12]	86 [10]	
	subg. *Idiogenes*	4			– [–]	1 [–]	
	subg. *Eucalyptus*						
	sect. '*Primitiva*'	1			– [–]	1 [–]	
	sect. *Eucalyptus*	129			32 [14]	105 [8]	
	sect. *Longitudinales*	5			2 [–]	4 [–]	
	sect. *Longistylus*	7			1 [–]	7 [–]	
	sect. '*Frutices*'	29			6 [–]	26 [–]	
	TOTALS	941	1 [8]	9 [7]	147 [34]	777 [31]	22

Table 2. Sect. *Adnataria*, showing numbers of taxa in each series with a 'hinged' (H) or 'non-hinged' (NH) staminophore on the buds, and a deciduous (D) or 'fixed' (F) staminophore on the capsules, observed either from internet searches for images ('online'; see references in Appendix 1), or from dissections of fresh or fallen material [pers. obs.]. EUCLID data (Slee *et al.* 2020) from capsule survey. Classification according to Nicolle (2019).

Eucalyptus **subg. *Symphyomyrtus*** **sect. *Adnataria***	**total taxa (incl. subsp. & hybrids) in Nicolle (2019)**	**'hinged' staminophore in bud** **H** 'online' / [pers.obs.]	**deciduous staminophore on capsule** **D** EUCLID / [pers.obs.]	**'non-hinged' staminophore in bud** **NH** 'online' / [pers.obs.]	**'fixed' / 'persistent' staminophore on capsule** **F** EUCLID / EUCLID
ser. *Striolatae*	18		0 [–]	5 [–]	17 / 1ps
ser. *Buxeales*	17		0 [–]	3 [–]	15
ser. *Lucasianae*	7		0 [–]	– [–]	7
ser. *Subbuxeales*	22		0 [–]	4 [–]	12
ser. *Submelliodorae*	1		0 [–]	– [–]	1
ser. *Siderophloiae*	32		0 [–]	3 [–]	26 / 3ps
ser. *Rhodoxyla*	12	[a] 1? [–]	0 [–]	1 [–]	9 / 2ps
ser. *Heterophloiae*	11		[c] 1? [–]	[d] 1 fs [–]	[c] 10–11?
ser. *Melliodorae*	11	[b] 2 [8]	[e] 9(10) [7]	[f] – [0]	0
TOTALS	131	2–3 [8]	9–11 [7]	17 [0]	97–98 / 6ps

Explanation:

[–]	taxa not available for direct observation.
–	no information found online.
[8]	value in square brackets is number of taxa in which character was directly observed.
ps	capsule described as having 'persistent' staminophore in EUCLID (Slee *et al.* 2020).
[a] 1?	*E. paniculata* with inturned rim on hypanthium, possibly hinged (Mueller 1879–1884).
[b] 2 [8]	Infolded flange in 'online' illustrations for *E. leucoxylon* and *E. melliodora* (see references in Appendix 1), but from pers. obs., 8 taxa in series *Melliodorae* have a 'hinged' staminophore.
[c] 1?, 10–11?	*E. polyanthemos* capsule staminophore details uncertain (both 'fixed' and 'deciduous' – see text).
[d] 1 fs	*E. polyanthemos* with stamens fused at base and bud staminophore 'non-hinged' (Mueller 1879–1884).
[e] 9(10)	EUCLID (Slee *et al.* 2020) shows no deciduous staminophore in *E. bosistoana*, but pers. obs. does.
[f] – [0]	Except for *E. leucoxylon* and *E. melliodora* (see references in Appendix 1), no data found online for other taxa in series *Melliodorae*, but from pers. obs. of 8 taxa, none possessed the typical 'non-hinged' staminophore.

unusual 'hinged' staminophore reported here, the morphology of dissected floral buds should perhaps be added to the suite of characters used to define eucalypt groups. Furthermore, the staminophore morphology and movement reported here appears to be correlated with the unique pollen-presenting mechanism described by Ellis & Sedgley (1993), raising more questions: Is the 'hinged' staminophore coincidental to or integral to the functioning of this pollination strategy? What role, if any, does the 'hinged' staminophore play in the trend towards gynodioecy reported by Ellis & Sedgley (1993) in *Eucalyptus leucoxylon*?

A more detailed investigation of phylogenetic relationships of the species in series *Melliodorae* and other subgroups in section *Adnataria* would be of interest. In addition, detailed histological studies of the taxa in series *Melliodorae* are needed, to augment the work done by Davis (1968), paying special attention to staminophore development, from earliest primordia to the mature flower bud, to elucidate the origin and development and perhaps also the 'mechanism' of the 'hinged' staminophore described here.

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Appendix 1. Staminophore morphology in flower buds and capsules of a selected range of eucalypt taxa (listed alphabetically). Flower buds categorised as having either hinged (H) or non-hinged (NH) buds; capsules categorised as having either deciduous (D) or 'fixed' (F) staminophore on capsules. Direct observations of buds from dissections of fresh or fallen material (♦); indirect observations from internet searches for images (+), including lithographs of dissected buds from '*Eucalyptographia*' (Mueller 1879–1884) and photos or drawings from other sources – see References. Data for capsules from direct observation (♦) or from capsule illustrations in literature cited (+), verified by capsule survey of the EUCLID website (Slee *et al.* 2020) or, where not illustrated in literature, from capsule survey only (#). Capsules not described in EUCLID as having a 'deciduous' staminophore are interpreted here as having a 'fixed' staminophore. Uncertain data indicated with a questionmark (?). Although classification follows Nicolle (2019), taxa generally follow EUCLID (Slee *et al.* 2020), including name changes (e.g. to taxa in *Eucalyptographia* and other references). All tree locations in Auckland, North Island, New Zealand, unless stated otherwise. Fiftyfive voucher numbers refer to specimens lodged in Auckland War Memorial Museum Herbarium (AK); 50 collected by the author between 2013 and 2023, and five collected by others in the years shown.

H — 'hinged' staminophore infolded in bud
D — staminophore 'deciduous' on mature capsule
NH — 'non-hinged' staminophore at rim of hypanthium
F — staminophore 'fixed' on mature capsules (not 'deciduous')
♦ — direct observations of dissected buds & flowers, or capsules
+ — indirect observations from illustrations in stated references
# — from EUCLID description. Staminophore on capsule either deciduous (D) or fixed (F)
? — uncertainty of interpretation of illustration
#PS — 'persistent' staminophore obscures valves on capsule (EUCLID); interpreted here as 'fixed' (usually derived from a 'flat' staminophore. See text)

Eucalypt taxon	Subgenus / section / series plus page no. in Nicolle (2019)		Location of tree (for direct observation) or source of information (reference with illustration of dissected bud)	Voucher numbers	Lat./Long. ± 10m	alt. m	H	D	NH	F
Angophora										
A. costata (Gartn.) Britten	ser. '*Costatitae*'	2	Mt. Eden, Ballantyne Square, Ewington Ave.	AK385392	-36.8786/174.7507	50			♦	♦#
			Hobsonville, 5 Williams Rd.		-36.8005/174.6466	30				♦#
A. hispida (Sm.) Blaxell	ser. *Angophora*	2	Hill & Johnson (1995)						+	#
A. inopina K.D.Hill	ser. *Angophora*	2	Hill (1997)						+	+ #
Corymbia										
C. abergiana (F.Muell.) K.D.Hill & L.A.S.Johnson	*Corymb./Corymb./'Dorsivent.'*	4	Mueller (1879–1884, Decade I) (as *E. abergiana*)						+	+ #
C. bella K.D.Hill & L.A.S.Johnson	*Blakella/Abbrev./'Tessellatae'*	8	Hill & Johnson (1995)						+	+ #
C. calophylla (Lindl.) K.D.Hill & L.A.S.Johnson	*Corymb./Calophyllae*	3	Mueller (1879–1884, Decade X) (as *E. calophylla*)						+	+ #
			Auckland Central, Albert Park, near Bowen Ave.		-36.8493/174.7684	60			♦	♦#
			Rothesay Bay, 88 Browns Bay Road	AK385737	-36.7239/174.7423	40			♦	♦#
			Auckland Domain, near Gum Tree Hill	AK385393	-36.8628/174.7762	60			♦	♦#
C. candida K.D.Hill & L.A.S.Johnson	*Blakella/Abbrev./'Scutiform.'*	8	Hill & Johnson (1995)						+	+ #
C. clarksoniana (D.J.Carr & S.G.M.Carr) K.D.Hill & L.A.S.Johnson	*Corymb./Corymb./'Dorsivent,'*	4	Hill & Johnson (1995) (as *C. maritima*)						+	+ #
C. clavigera (A.Cunn. ex Schauer) K.D.Hill & L.A.S.Johnson	*Blakella/Abbrev./'Scutiform.'*	8	Mueller (1879–1884, Decade IV) (as *E. clavigera*)						+	+ #
C. eximia (Schauer) K.D.Hill & L.A.S.Johnson	*Blakella/Naviculares*	7	Mueller (1879–1884, Decade IX) (as *E. eximia*)						+	+ #

Appendix 1. continued

Eucalypt taxon	Subgenus / section / series plus page no. in Nicolle (2019)		Location of tree (for direct observation) or source of information (reference with illustration of dissected bud)	Voucher numbers	Lat./Long. ± 10m	alt. m	H	D	NH	F
C. ficifolia (F.Muell.) K.D.Hill & L.A.S.Johnson	*Corymb./Calophyllae*	3	Mueller (1879–1884, Decade VII) (as *E. ficifolia*)						+	+ #
			Mt Albert, outside 12 Jesmond Terrace, street tree		-36.8779/174.7261	25			♦	♦#
C. foelscheana (F.Muell.) K.D.Hill & L.A.S.Johnson	*Corymb./Corymb./'Isobilat.,'*	5	Mueller (1879–1884, Decade IX) (as *E. foelscheana*)						+	+ #
C. gummifera (Gartn.) K.D.Hill & L.A.S.Johnson	*Corymb./Corymb.*	3	Mueller (1879–1884, Decade V) (as *E. corymbosa*)						+	+ #
C. hamersleyana (D.J.Carr & S.G.M.Carr) K.D.Hill & L.A.S.Johnson	*Corymb./Corymb./'Isobilat.'*	5	Hill & Johnson (1995) (as *C. semiclara*)						+	+ #
C. hendersonii K.D.Hill & L.A.S.Johnson	*Corymb./Corymb./'Dorsivent.'*	4	Hill & Johnson (1995)						+	+ #
C. intermedia (R.T.Baker) K.D.Hill & L.A.S.Johnson	*Corymb./Corymb./'Dorsivent.'*	4	Hill & Johnson (1995)						+	#
C. leichhardtia (Bailey) K.D.Hill & L.A.S.Johnson	*Blakella/Naviculares*	7	Hill & Johnson (1995)						+	#
C. maculata (Hook.) K.D.Hill & L.A.S.Johnson	*Blakella/Maculatae*	7	Mueller (1879–1884, Decade III) (as *E. maculata*)						+	+ #
			Ponsonby, outside 59 Kelmarna Ave	AK385394	-36.8498/174.7343	10			♦	♦#
			Hill & Johnson (1995)						+	#
C. papuana K.D.Hill & L.A.S.Johnson	*Blakella/Abbrev./'Tessellatae'*	8	Hill & Johnson (1995) (as *C. paracolpica*)						+	+ #
C. paractia K.D.Hill & L.A.S.Johnson	*Blakella/Abbrev./'Tessellatae'*	8	Hill & Johnson (1995) (in Nicolle 2019 as *C.* × *paractia*)						+	#
C. peltata (Benth.) K.D.Hill & L.A.S.Johnson	*Blakella/Naviculares*	7	Mueller (1879–1884, Decade VI) (as *E. peltata*)						+	+ #
C. ptychocarpa (F.Muell.) K.D.Hill & L.A.S.Johnson	*Corymb./Corymb./'Dorsivent.'*	4	Mueller (1879–1884, Decade V) (as *E. ptychocarpa*)						+	+ #
C. setosa (Schauer) K.D.Hill & L.A.S.Johnson	*Corymb./Corymb./'Terminali.'*	6	Mueller (1879–1884, Decade VI) (as *E. setosa*)							
C. tessellaris (F.Muell.) K.D.Hill & L.A.S.Johnson	*Blakella/Abbrev./'Tessellatae'*	8	Mueller (1879–1884, Decade IX) (as *E. tessellaris*)							
C. terminalis (F.Muell.) K.D.Hill & L.A.S.Johnson	*Corymb./Corymb./'Isobilat.'*	5	Hill & Johnson (1995) (as *C. tumescens*)							
C. torelliana (F.Muell.) K.D.Hill & L.A.S.Johnson	*Blakella/Torellianae*	7	Hill & Johnson (1995)							
C. trachyphloia (F.Muell.) K.D.Hill & L.A.S.Johnson	*Corymb./Corymb./'Trachyphl.'*	3	Mueller (1879–1884, Decade V) (as *E. trachyphloia*)							
C. watsoniana (F.Muell.) K.D.Hill & L.A.S.Johnson subsp. *watsoniana*	*Blakella/Naviculares*	7	Mueller (1879–1884, Decade VII) (as *E. watsoniana*)							
C. watsoniana subsp. *capillata* (Brooker & A.R.Bean) K.D.Hill & L.A.S.Johnson	*Blakella/Naviculares*	7	Hill & Johnson (1995) (as *C. catenaria*)							

Appendix 1. continued

Eucalypt taxon	Subgenus / section / series plus page no. in Nicolle (2019)		Location of tree (for direct observation) or source of information (reference with illustration of dissected bud)	Voucher numbers	Lat./Long. ± 10m	alt. m	H	D	NH	F
Eucalyptus										
E. acmenoides Schauer	*Euc./Euc./White-mahoganies*	48	Mueller (1879–1884, Decade X)						+	+ #
			Epsom, Cornwall Park, Eucalypt Arboretum near kiosk	AK385395	-36.8980/174.7859	100			♦	#
E. acroleuca L.A.S.Johnson & K.D.Hill	*Symphyo./Adnat./Striolatae*	31	Hill & Johnson (1994)						+	+ #
E. alba var. *australasica* Blakeley & Jacobs	*Symphyo./Exsert./Exsertae*	40	Mueller (1879–1884, Decade IV) (as *E. alba*)						+	+ #
E. amygdalina Labill.	*Euc./Euc./Radiatae*	52	Mueller (1879–1884, Decade V)						+	+ #
E. andrewsii subsp. *campanulata* (R.T.Baker & H.G.Sims) L.A.S.Johnson & Blaxell	*Euc./Euc./Psathyrox.*	53	Bean (1997) (as *E. montivaga*)						+	#
E. baileyana F.Muell.	*Eudesm./Complanat./Scutellif.*	9	Mueller (1879–1884, Decade III)						+	+ #
E. balladoniensis subsp. *sedens* L.A.S.Johnson & K.D.Hill	*Symphyo./Bisect./ Balladoni.*	22	Hill & Johnson (1992)						+	+ #
E. baxteri (Benth.) Maiden & Blakeley ex J.M.Black	*Euc./Euc./Pachyphloiae*	50	Mueller (1879–1884, Decade VIII) (as *E. santalifolia*)						+	#
E. behriana F.Muell.	*Symphyo./Adnat./Buxeales*	32	Mueller (1879–1884, Decade VII)						+	#
E. bensonii L.A.S.Johnson & K.D.Hill	*Euc./Euc./Pachyphloiae*	49	Johnson & Hill (1990)						+	+ #
E. bicostata Maiden, Blakeley & Simmonds	*Symphyo./Maiden./Globul.*	43	Birkenhead, Pompallier Cemetery opp. Pupuke Rd (as *E. globulus* subsp. *bicostata* in EUCLID and AK)	AK385396	-36.8038/174.7244	80			♦	♦#
E. blakelyi Maiden	*Symphyo./Exsert./Exsertae*	39	Epsom, Cornwall Park, Eucalypt Arboretum near kiosk		-36.8980/174.7859	100			♦	#
			Kohimarama, Madill's Farm Reserve	AK385739	-36.8581/174.8451	10				♦#
E. blaxelli L.A.S.Johnson & K.D.Hill	*Symphyo./'Gland.'/Loxophleb.*	12	Hill & Johnson (1992)						+	+ #
E. bosistoana F.Muell	*Symphyo./Adnat./Melliod.*	36	Epsom, Cornwall Park, farm boundary, tree beside gate	AK385397	-36.9014/174.7884	100	♦	♦		#?
			Epsom, Cornwall Park, farm boundary, tree east of gate		-36.9008/174.7887	100	♦	♦		#?
E. botryoides Sm.	*Symphyo./Latoang./Transvers.*	41	Mueller (1879–1884, Decade IV)						+	+ #
			Auckland, Awhitu Peninsula, Awhitu Regional Park	AK385398	-37.0930/174.6542	10			♦	♦#
			Northcote, Onepoto Domain, by lake near SE gate	AK385423	-36.8107/174.7507	5			♦	♦#
			Northcote, Onepoto Domain, on bank near Sylvan Ave	AK385399	-36.8107/174.7507	5			♦	♦#
			Birkenhead, Chelsea Estate Pk, Kendalls Bay Track		-36.8213/174.7204	30			♦	♦#
			Northcote, Akoramga Dr., west of College Road		-36.7963/174.7536	20			♦	♦#

Appendix 1. continued

Eucalypt taxon	Subgenus / section / series plus page no. in Nicolle (2019)		Location of tree (for direct observation) or source of information (reference with illustration of dissected bud)	Voucher numbers	Lat./Long. ± 10m	alt. m	H	D	NH	F
E. brachycalyx Blakeley	*Symphyo./Dumar./Torquat.*	27	Hill *et al.* (2001) (as *E. pleurocorys*)						+	+ #
E. buprestium F.Muell.	*Euc./'Frutices'/Diversiform.*	55	Mueller (1879–1884, Decade VI)						+	+ #
E. camaldulensis Dehnh.	*Symphyo./Exsert./Exsertae*	39	Mueller (1879–1884, Decade IV) (as *E. rostrata*)						+	+ #
E. campanulata R.T.Baker & H.G.Sm.	*Euc./Euc./Psathyrox.*	53	Bean (1997) (as *E. montivaga*)						+	#
E. capitellata Sm.	*Euc./Euc./Pachyphloiae*	49	Mueller (1879–1884, Decade III)						+	+ #
			Auckland, Western Springs, Auckland Zoo grounds, Felled 17 July 2019 (coll. 2019)	AK382764	-36.8610/174.7220	30			♦	♦#
			Sunnyvale, Waikumete Cemetery, SW bdy	AK385740	-36.9080/174.6471				♦	♦#
E. cinerea F.Muell. ex Benth.	*Symphyo./Maiden./Vimin.*	46	Northcote, College Rd, opp. Hato Petera College	AK385400	-36.7968/174.7530	20			♦	♦#
			Auckland Domain, E of The Valkyries pond		-36.8578/174.7756	60			♦	♦#
			Kohimarama, Madill's Farm Reserve	AK385738	-36.8581/174.8451	10			♦	♦#
E. cladocalyx F.Muell.	*Symphyo./Sejunctae*	30	Mueller (1879–1884, Decade II) (as *E. corynocalyx*)						+	+ #
			Ellis & Sedgeley (1992)						+	#
			Hillsborough, Hillsborough Cemetery	AK385736	-36.9259/174.7533	70			♦	#
E. conferruminata D.J.Carr & S.G.M.Carr	*Symphyo./'Gland.'/Lehmann.*	16	Hillsborough, Hillsborough Cemetery (coll. 2003)	AK284248	-36.9258/174.7533	80			♦	♦#
E. confluens W.Fitzg. ex Maiden	*Symphyo./Platysperma*	37	Maiden (1919) (only one bud LS in volume)						+	#
E. coolabah Blakeley & Jacobs	*Symphyo./Adnat./Striolatae*	31	Hill & Johnson (1994) (as *E. gymnoteles*)						+	+ #
E. cordata Labill.	*Symphyo./Maiden./Tasman.*	44	Mueller (1879–1884, Decade VIII)						+	+ #
E. cornuta Labill.	*Symphyo./'Gland.'/Lehmann.*	15	Mueller (1879–1884, Decade IX)						+	+ #
E. cosmophylla F.Muell.	*Symphyo./Incognit./Incognit.*	41	Mueller (1879–1884, Decade VII)						+	+ #
E. crebra F.Muell.	*Symphyo./Adnat./Siderophlo.*	34	Mueller (1879–1884, Decade V)						+	+ #
E. creta L.A.S.Johnson & K.D.Hill	*Symphyo./'Gland.'/Contortae*	12	Johnson & Hill (1991)						+	+ #
E. croajingolensis L.A.S.Johnson & K.D.Hill	*Euc./Euc./Radiatae*	52	Johnson & Hill (1990)						+	+ #
E. decipiens Endl.	*Symphyo./Bisect./Falcatae*	20	Mueller (1879–1884, Decade X)						+	+ #
E. depauperata L.A.S.Johnson & K.D.Hill	*Symphyo./'Gland.'/Erectae*	14	Hill & Johnson (1992) (as *E. tenera* in Nicolle 2019)						+	+ #PS
E. diminuta Brooker & Hopper	*Symphyo./'Gland.'/Erectae*	15	Hill & Johnson (1992) (as *E. sargentii* subsp. *fallens*)						+	+ #

Appendix 1. continued

Eucalypt taxon	Subgenus / section / series plus page no. in Nicolle (2019)		Location of tree (for direct observation) or source of information (reference with illustration of dissected bud)	Voucher numbers	Lat./Long. ± 10m	alt. m	H	D	NH	F
E. diversicolor F.Muell.	*Symphyo./Inclusae*	30	Mueller (1879–1884, Decade V)						+	+ #
E. diversifolia Bonpl.	*Euc./'Frutices'/Diversiform.*	55	Mueller (1879–1884) (as *E. santalifolia*)						+	+ #
E. dolichocera L.A.S.Johnson & K.D.Hill	*Symphyo./Bisect./Subulatae*	21	Johnson & Hill (1999)						+	+ #
E. doratoxylon F.Muell.	*Symphyo./Bisect./Decurv.*	18	Mueller (1879–1884, Decade IV)						+	+ #
E. drummondii Benth.	*Symphyo./Bisect./Curvipt.*	23	Mueller (1879–1884, Decade VII) (as *E. oldfieldii*)						+	+ #
E. erythrocorys F.Muell.	*Eudesm./Limbat./Heteropt.*	10	Mueller (1879–1884, Decade I)						+	+ #
E. erythronema Turcz.	*Symphyo./'Gland.'/Elongat.*	13	Mueller (1879–1884, Decade VIII)						+	+ #
E. eugenioides Sieber ex Spreng.	*Euc./Euc./Pachyphloiae*	49	Mueller (1879–1884, Decade X)						+	+ #
			Auckland Domain, Gum Tree Hill	AK385402	-36.8639/174.7748	60			♦	#
E. falcata Turcz.	*Symphyo./Bisect./Falcatae*	19	Hill & Johnson (1992) (as *E. argyphea*)						+	+ #
E. fastigata D.Deane & Maiden	*Euc./Euc./Regnantes*	48	Epsom, One Tree Hill Domain, SE of summit	AK385420	-36.9010/174.7850	120			♦	#
			Epsom, One Tree Hill Domain, NE of summit		-36.8984/174.7835	120			♦	#
E. foecunda Schauer	*Symphyo./Bisect./Poranth.*	25	Mueller (1879–1884, Decade X)						+	+ #
E. fraseri subsp. *melanobasis* L.A.S.Johnson & K.D.Hill	*Symphyo./Dumar./Rufisperm.*	28	Hill *et al.* (2001)						+	+ #
E. gamophylla F.Muell.	*Eudesm./Limbat./Heteropt.*	9	Mueller (1879–1884, Decade VIII)						+	+ #
E. georgei Brooker & Blaxell subsp. *georgei*	*Symphyo./Dumar./Rufisperm.*	29	Hill *et al.* (2001) (as *E. assimilans*)						+	+ #
E. globoidea Blakeley	*Euc./Euc./Pachyphloiae*	49	Auckland Domain, Gum Tree Hill		-36.8639/174.7748	60				♦#
			Auckland Domain, Gum Tree Hill, east lower slope	AK385421	-36.8639/174.7748	60			♦	#
E. globulus Labill.	*Symphyo./Maiden./Globul.*	43	Mueller (1879–1884, Decade VI)						+	+ #
			Forrest Hill, Becroft Park, N side	AK385422	-36.7708/174.7439	20			♦	♦#
			Dunedin, Caversham, 28 Embo St, rear boundary		-45.9016/170.4775	65			♦	♦#
E. gomphocephala A.Cunn. ex DC.	*Symphyo./Bolites*	11	Mueller (1879–1884, Decade VII)						+	+ #
E. goniocalyx F.Muell. ex Miq.	*Symphyo./Maiden./Globul.*	43	Mueller (1879–1884, Decade I)						+	+ #
			Auckland Domain, Gum Tree Hill, lower slope		-36.8639/174.7748	60			♦	♦#
E. gracilis F.Muell.	*Symphyo./Bisect./Heterostem.*	26	Mueller (1879–1884, Decade III)						+	+ #

Appendix 1. continued

Eucalypt taxon	Subgenus / section / series plus page no. in Nicolle (2019)		Location of tree (for direct observation) or source of information (reference with illustration of dissected bud)	Voucher numbers	Lat./Long. ± 10m	alt. m	H	D	NH	F
E. grasbyi Maiden & Blakeley	*Symphyo./Bisect./Subulatae*	20	Johnson & Hill (1999)						+	+ #
E. gunnii Hook.f.	*Symphyo./Maiden./Tasman.*	44	Mueller (1879–1884, Decade IV)						+	+ #
			UK, Wiltshire, Erlstoke, Lower Rd, Milk House		51.2886/-2.0525	70				♦#
			UK, London, Richmond, Kew Gardens, south of gate nearest Kew Station		51.4739/-0.2925	20			♦	#
E. haemastoma Sm.	*Euc./Euc./Psathyrox.*	53	Mueller (1879–1884, Decade II)						+	+ #
E. hallii Brooker	*Symphyo./Exsert./Connex.*	37	Brooker (1975)						+	#
E. howittiana F.Muell.	*Symphyo./Domesticae*	30	Mueller (1879–1884, Decade IX)						+	+ #
E. hypolaena L.A.S.Johnson & K.D.Hill	*Symphyo./Bisect./Subulatae*	22	Johnson & Hill (1999)						+	+ #
E. incrassata Labill.	*Symphyo./Dumar./Tetrapt.*	27	Mueller (1879–1884, Decade V)						+	+ #
			Bond & Brown (1979)						+	#
E. interstans L.A.S.Johnson & K.D.Hill	*Symphyo./Exsert./Liberivalv.*	38	Johnson & Hill (1990)						+	+ #
E. laevis L.A.S.Johnson & K.D.Hill	*Symphyo./Dumar./Tetrapt.*	27	Hill *et al.* (2001)						+	+ #
E. largiflorens F.Muell.	*Symphyo./Adnat./Buxeales*	32	Mueller (1879–1884, Decade V)						+	+ #
E. leptophylla F.Muell. ex Miq.	*Symphyo./Bisect./Poranth.*	25	Ellis & Sedgeley (1992)						+	#
E. leucoxylon F.Muell.	*Symphyo./Adnat./Melliod.*	36	Mueller (1879–1884, Decade I)				+	+ #		
			Northcote, 23 Onewa Road, beside house (tree #1) (planted in 1955 as *E. leucoxylon* 'Rosea')	AK385030	-36.8116/174.7473	20	♦	♦#		
			Northcote, 23 Onewa Road, NW corner (tree #2) (planted in 1955)	AK370732	-36.8116/174.7473	20	♦	♦#		
			South Island, Woodend, Owen Stalker Park entrance	AK385426	-43.3265/172.6656	10	♦	♦#		
			Birkdale, 48 Kiaora Road	AK385424	-36.8033/174.6967	60	♦	♦#		
E. leucoxylon subsp. *megalocarpa* Boland	*Symphyo./Adnat./Melliod.*	36	Epsom, Cornwall Park, near Grand Drive	AK385425	-36.9030/174.7860	100	♦	♦#		
E. leucoxylon subsp. *pruinosa* (Miq.) Boland	*Symphyo./Adnat./Melliod.*	36	Takapuna, Shea Tce, opp. Nth. Shore Hospital gate	AK385427	-36.7826/174.7584	20	♦	#		
E. leucoxylon	*Symphyo./Adnat./Melliod.*	36	Wilson (2002) (half-flower w. small inturned rim)				+?	#		
E. leucoxylon subsp. *leucoxylon*	*Symphyo./Adnat./Melliod.*	36	Ellis & Sedgeley (1993)				+	#		
E. longifolia Link	*Symphyo./Ingognit./Simila.*	40	Mueller (1879–1884, Decade II)						+	+ #
			Papakura, Sentinel Rd, near SW corner of Cemetery	AK385428	-37.0709/174.9435	20			♦	♦#

Appendix 1. continued

Eucalypt taxon	Subgenus / section / series plus page no. in Nicolle (2019)		Location of tree (for direct observation) or source of information (reference with illustration of dissected bud)	Voucher numbers	Lat./Long. ± 10m	alt. m	H	D	NH	F
E. loxophleba subsp. *lissophloia* L.A.S.Johnson & K.D.Hill	*Symphyo./'Gland.'/Loxophleb.*	12	Hill & Johnson (1992)						+	+ #
E. luculenta L.A.S.Johnson & K.D.Hill	*Symphyo./Bisect./Subulatae*	22	Johnson & Hill (1999)						+	+ #
E. macrocarpa Hook.	*Symphyo./Bisect./Curvipt.*	23	Mueller (1879–1884, Decade VIII)						+	+ #
E. macrorhyncha F.Muell. ex Benth.	*Euc./Euc./Pachyphloiae*	49	Mueller (1879–1884, Decade I)						+	+ #
			Wilson (2002)						+	#
			Greater Auckland, Awhitu Peninsula, Awhitu Regional Park below hill near homestead	AK385429	-37.0930/174.6542	10			♦	#
E. maidenii F.Muell.	*Symphyo./Maiden./Globul.*	43	Northland, Kaiwaka, Worsfold Farm east of Kaiwaka,300 Kaiwaka–Mangawhai Road	AK385430	-36.1573/174.4745	80			♦	♦#
E. mannensis subsp. *vespertina* L.A.S.Johnson & K.D.Hill	*Symphyo./Bisect./Micranth.*	18	Hill & Johnson (1992)						+	+ #
E. marginata Donn ex Sm.	*Euc./Longistyl./Occident.*	54	Mueller (1879–1884, Decade VII)						+	+ #
E. megacarpa F.Muell.	*Euc./'Frutices'/Preissian.*	56	Mueller (1879–1884, Decade VI)						+	+ #
E. melliodora A.Cunn. ex Schauer	*Symphyo./Adnat./Melliod.*	36	Mueller (1879–1884, Decade II)				+?	#		+?
			Davis (1968)				+	#		
			Moncur & Boland (1989)				+	#		
			Wilson (2002) half flower drg.						+?	
			Penrose, Station Rd, south of station entrance	AK385431	-36.9123/174.8145	20	♦	♦#		
			Panmure Basin, south side, near model railway		-36.9086/174.8490	5	♦	♦#		
E. microcarpa (Maiden) Maiden	*Symphyo./Adnat./Subbux.*	33	Wilson (2002) half flower drg.						+	#
E. microcorys F.Muell.	*Alveolata*	11	Mueller (1879–1884, Decade II)						+	+ #
			Auckland Central, Albert Park, below Bowen Ave	AK385432	-36.8484/174.7689	40			♦	♦#
			Epsom, Cornwall Park, Eucalypt Arboretum near kiosk		-36.8980/174.7859	100			♦	♦#
			Auckland Domain, Gum Tree Hill, west end	AK385433	-36.8639/174.7748	60			♦	♦#
E. microtheca F.Muell.	*Symphyo./Adnat./Striolat.*	31	Mueller (1879–1884, Decade X)						+	+ #
			Hill & Johnson (1994) (as *E. barklyensis* & *E. helenae*)						+	+ #
E. miniata A.Cunn. ex Schauer	*Eudesm./Complan./Miniatae*	9	Mueller (1879–1884, Decade VI)						+	+ #
E. misella L.A.S.Johnson & K.D.Hill	*Symphyo./Bisect./Micranth.*	18	Hill & Johnson (1992)						+	+ #

Appendix 1. continued

Eucalypt taxon	Subgenus / section / series plus page no. in Nicolle (2019)		Location of tree (for direct observation) or source of information (reference with illustration of dissected bud)	Voucher numbers	Lat./Long. ± 10m	alt. m	H	D	NH	F
E. moluccana Wall. Ex Roxb.	*Symphyo./Adnat./Subbux.*	33	Mueller (1879–1884, Decade V) (as *E. hemiphloia*)						+	+ #
E. moorei Maiden & Cambage subsp. *moorei*	*Euc./Euc./Longitudinales*	51	Johnson & Hill (1990) (as *E. latiuscula*); Hill (1997) (as *E. dissita*)						+	+ #
E. muelleriana A.W.Howitt	*Euc./Euc./Pachyphloiae*	49	Auckland Domain, Gum Tree Hill	AK385434	-36.8639/174.7748	60			♦	#
E. neutra D.Nicolle	*Symphyo./Bisect./Subulatae*	22	Johnson & Hill (1999)						+	+ #
E. nicholii Maiden & Blakeley	*Symphyo./Maiden./Vimin.*	47	Northcote Shopping Centre, east car park	AK385435	-36.8015/174.7468	30			♦	#
			Wairau Valley, 36 Poland Road, street tree	AK385436	-36.7756/174.7388	30			♦	♦#
			Northcote, 12 Kitewao St.	AK385735	-36.7940/174.7542	15			♦	#
E. nitida Hook.f.	*Euc./Euc./Radiatae*	52	UK, London, Richmond, Kew Gardens, south of gate nearest Kew Station		51.4739/-0.2925	20			♦	♦#
E. notactites (L.A.S.Johnson & K.D.Hill) D.Nicolle & M.E.French	*Symphyo./Bisect./Falcatae*	19	Hill & Johnson (1992) (as *E. gonianthus* subsp. *notactites*)						+	+ #
E. obliqua L'Hér.	*Euc./Euc./Eucalyptus*	48	Mueller (1879–1884, Decade III)						+	+ #
			Auckland Domain, Gum Tree Hill	AK385437	-36.8639/174.7748	60			♦	#
			Sunnyvale, Waikumete Cemetery, nr hilltop reservoir	AK385741	-36.8107/174.7507	100			♦	♦#
E. occidentalis Endl.	*Symphyo./'Gland.'/Erectae*	15	Mueller (1879–1884, Decade VI)						+	+ #
E. odorata Behr	*Symphyo./Adnat./Subbux.*	33	Mueller (1879–1884, Decade II)						+	+ #
E. oleosa F.Muell. ex Miq.	*Symphyo./Bisect./Subulat.*	20	Mueller (1879–1884, Decade VII)						+	+ #
E. olida L.A.S.Johnson & K.D.Hill	*Euc./Euc./Psathyrox.*	53	Johnson & Hill (1990)						+	+ #
E. ophitica L.A.S.Johnson & K.D.Hill	*Symphyo./Adnat./Siderophlo.*	34	Johnson & Hill (1990)						+	+ #
E. ovata Labill.	*Symphyo./Maiden./Foveol.*	44	Mueller (1879–1884, Decade IV) (as *E. stuartiana*)						+	+ #
			Auckland Central, Albert Park below Bowen Ave		-36.8487/174.7679	40			♦	♦#
			Auckland Domain, Gum Tree Hill	AK385438	-36.8639/174.7748	60			♦	♦#
E. pachyphylla F.Muell.	*Symphyo./Bisectae/Curvipt.*	23	Mueller (1879–1884, Decade I)						+	+ #
E. paniculata Sm.	*Symphyo./Adnat./Rhodox.*	35	Mueller (1879–1884, Decade V)				+?			+ #PS
E. parvula L.A.S.Johnson & K.D.Hill	*Symphyo./Maiden./Vimin.*	46	UK, London, Richmond, Kew Gardens, S of gate nearest Kew Station (labelled *E. parvifolia*)		51.4739/-0.2925	20			♦	♦#
E. patens Benth.	*Euc./Euc./Patentes*	54	Mueller (1879–1884, Decade IX)						+	+ #

Appendix 1. continued

Eucalypt taxon	Subgenus / section / series plus page no. in Nicolle (2019)		Location of tree (for direct observation) or source of information (reference with illustration of dissected bud)	Voucher numbers	Lat./Long. ± 10m	alt. m	H	D	NH	F
E. pauciflora Sieber ex Spreng.	*Euc./Euc./Pauciflorae*	52	Mueller (1879–1884, Decade III)						+	+ #
E. pauciflora subsp. *pauciflora*	*Euc./Euc./Pauciflorae*	52	UK, London, Richmond, Kew Gardens, S of gate nearest Kew Station		51.4739/-0.2925	20			♦	♦#
E. petiolaris (Boland) Rule	*Symphyo./Adnat./Melliod.*	36	Boland 1979 (as *E. leucoxylon* subsp. *petiolaris*)				+?	#		
E. × *phylacis* L.A.S.Johnson & K.D.Hill	*Symphyo./Bisect./Falcatae*	20	Hill & Johnson (1992) (as *E. phylacis*)						+	+ #
E. phoenicea F.Muell.	*Eudesm./Complan./Phoenice.*	9	Mueller (1879–1884, Decade I)						+	+ #
E. pilularis Sm.	*Euc./Euc./Pseudostringybarks*	48	Mueller (1879–1884, Decade III)						+	+ #
			Auckland Domain, near nursery/glasshouses	AK385439	-36.8588/174.7739	50			♦	♦#
			Sunnyvale, Waikumete Cemetery, near chapel		-36.9079/174.6513	40			♦	♦#
E. piperita Sm. subsp. *piperita*	*Euc./Euc./Piperitales*	54	Mueller (1879–1884, Decade III) (as *E. piperita*)						+	+ #
E. piperita subsp. *urceolaris* (Maiden & Blakely) L.A.S.Johnson & K.D.Hill	*Euc./Euc./Piperitales*	54	Auckland Domain, Gum Tree Hill (coll. 2017)	AK363934	-36.8639/174.7748	60			♦	♦#
E. placita L.A.S.Johnson & K.D.Hill	*Symphyo./Adnat./Rhodox.*	35	Johnson & Hill (1990) (as *E. paniculata* in Nicolle 2019)						+	+ #
E. planchoniana F.Muell.	*Euc./Euc./Planchonian.*	53	Mueller (1879–1884, Decade IV)						+	+ #
E. platypus Hook.f.	*Symphyo./'Gland.'/Erectae*	14	Mueller (1879–1884, Decade VII) (as *E. obcordata*)						+	+ #
E. pleurocarpa Schauer	*Eudesm./Limbat./Heteropt.*	10	Mueller (1879–1884, Decade VI) (as *E. tetragona*)						+	+ #
E. polyanthemos Schauer	*Symphyo./Adnat./Heterophlo.*	36	Mueller (1879–1884, Decade III) (as *E. polyanthema*)				+?	+?		
			Wilson (2002)						+?	
E. polyanthemos subsp. *longior* Brooker & Slee	*Symphyo./Adnat./Heterophlo.*	36	EUCLID (Slee *et al.* 2020) (Glossary differs from description of taxon)					#?		#?
E. populnea F.Muell.	*Symphyo./Adnat./Buxeal.*	32	Mueller (1879–1884, Decade III) (as *E. populifolia*)						+	+ #
E. porosa F.Muell. ex Miq.	*Symphyo./Adnat./Melliod.*	36	EUCLID (Slee *et al.* 2022) in series *Buxeales*				+?	#	+?	
E. preissiana Schauer	*Euc./'Frutices'/Preissian.*	56	Mueller (1879–1884, Decade VIII)						+	+ #
E. protensa L.A.S.Johnson & K.D.Hill	*Symphyo./'Gland.'/Erectae*	15	Johnson & Hill (1991)						+	+ #
E. pruinosa Schauer	*Symphyo./Adnat./Striolat.*	31	Mueller (1879–1884, Decade VIII)						+	+ #
E. pulchella Desf.	*Euc./Euc./Radiatae*	52	Sunnyvale, Waikumete Cemetery, SW bdy	AK385742	-36.9075/174.6469				♦	♦#

Appendix 1. continued

Eucalypt taxon	Subgenus / section / series plus page no. in Nicolle (2019)		Location of tree (for direct observation) or source of information (reference with illustration of dissected bud)	Voucher numbers	Lat./Long. ± 10m	alt. m	H	D	NH	F
E. pulverulenta Link	*Symphyo./Maiden./Vimin.*	45	Mueller (1879–1884, Decade VIII)						+	+ #
			foliage in a bouquet – source unknown						♦	#
E. punctata A.Cunn. ex DC.	*Symphyo./Pumil./Lepidot.*	37	Mueller (1879–1884, Decade VI)						+	+ #
E. pyriformis Turcz.	*Symphyo./Bisect./Curvipt.*	23	Mueller (1879–1884, Decade VIII)						+	+ #
E. quadrangulata H.Deane & Maiden	*Symphyo./Maiden./Quadrang.*	42	Epsom, Cornwall Park, Eucalypt Arboretum (coll. 1998)	AK235271	-36.8980/174.7859	100			♦	♦#
E. raveretiana F.Muell.	*Symphyo./Domesticae*	30	Mueller (1879–1884, Decade I)						+	+ #
E. recta L.A.S.Johnson & K.D.Hill	*Symphyo./Bisect./Falcatae*	19	Hill & Johnson (1992)						+	+ #
E. redunca Schauer s.s.	*Symphyo./'Gland.'/Levisperm.*	17	Mueller (1879–1884, Decade X) (*E. wandoo* split from *E. redunca* s.l.)						+	+ #
E. resinifera J.White	*Symphyo./Latoang./Annular.*	41	Mueller (1879–1884, Decade I)						+	+ #
E. retinens L.A.S.Johnson & K.D.Hill	*Symphyo./Maiden./Globul.*	43	Johnson & Hill (1990) (as *E. volcanica* in Nicolle 2019)						+	+ #
E. robusta Sm.	*Symphyo./Latoang./Robustae*	41	Mueller (1879–1884, Decade VII)						+	+ #
			Parnell, Dove-Myer Robinson Park (coll. 1987)	AK178667	-36.8488/174.7870	20			♦	♦#
E. rosacea L.A.S.Johnson & K.D.Hill	*Symphyo./Bisectae/Curvipt.*	24	Hill & Johnson (1992)						+	+ #
E. rossii R.T.Baker & H.G.Sm.	*Euc./Euc./Psathyrox.*	53	Auckland Botanical Gardens (labelled as *E. racemosa* subsp. *rossii*)	AK385440	-37.0121/174.9079	60			♦	#
E. rudis Endl.	*Symphyo./Exsert./Exsertae*	39	Mueller (1879–1884, Decade X)						+	+ #
E. saligna Sm.	*Symphyo./Latoang./Transvers.*	41	Mueller (1879–1884, Decade II)						+	+ #
			Auckland Domain, Gum Tree Hill, near George St.		-36.8639/174.7748	60			♦	♦#
			Devonport, Ngataringa Park, Lake Road frontage	AK385441	-36.8187/174.7948	5			♦	#
			Devonport, Ngataringa Park. S corner nr. Victoria Rd	AK385442	-36.8214/174.7936	5			♦	#
E. salmonophloia F.Muell.	*Symphyo./Bisect./Salmonophl.*	19	Mueller (1879–1884, Decade IX)						+	+ #
E. salubris F.Muell.	*Symphyo./'Gland.'/Contortae*	12	Mueller (1879–1884, Decade IX)						+	+ #
E. sepulcralis F.Muell.	*Euc./'Frutices'/Muricatae*	55	Mueller (1879–1884, Decade VIII)						+	+ #
E. siderophloia Benth.	*Symphyo./Adnat./Siderophlo.*	34	Mueller (1879–1884, Decade IV)						+	+ #
			Hill (1997) (as *E. fracta*)						+	+ #

Appendix 1. continued

Eucalypt taxon	Subgenus / section / series plus page no. in Nicolle (2019)		Location of tree (for direct observation) or source of information (reference with illustration of dissected bud)	Voucher numbers	Lat./Long. ± 10m	alt. m	H	D	NH	F
E. sideroxylon A.Cunn. ex Woolls	*Symphyo./Adnat./Melliod.*	36	Bean (2010) (as *E. sideroxylon* subsp. *improcera*)				+?	+		
			Castor Bay, 191 East Coast Rd		-36.7600/174.7565	60	♦	#		
			Cornwallis, Huia Road, SE side, N of Cornwallis Rd	AK385443	-37.0021/174.5877	60	♦	♦#		
			Waiheke Island, 56 Korora Rd	AK385444	-36.7747/175.0069	15	♦	♦#		
			Northcote, Hillcrest Stream reserve	AK385445	-36.7947/174.7391	30	♦	♦#		
E. sieberi L.A.S.Johnson	*Euc./Euc./Psathyrox.*	53	Mueller (1879–1884, Decade II) (as *E. sieberiana*)						+	+ #
E. singularis L.A.S.Johnson & Blaxell	*Symphyo./Dumar./Tetrapt.*	27	Hill *et al.* (2001)						+	+ #
E. spathulata Hook.	*Symphyo./'Gland.'/Erectae*	14	Ellis & Sedgley (1992)						+	#
E. spreta L.A.S.Johnson & K.D.Hill	*Symphyo./Dumar./Rufisperm.*	28	Hill *et al.* (2001)						+	+ #
E. stellulata Sieber ex DC.	*Euc./Euc./Longitudinales*	51	Mueller (1879–1884, Decade VI)						+	+ #
E. stricta Sieber ex Spreng.	*Euc./Euc.//Strictae*	50	Mueller (1879–1884, Decade X)						+	+ #
E. tephroclada L.A.S.Johnson & K.D.Hill	*Symphyo./'Gland.'/Erectae*	14	Hill & Johnson (1992)						+	+ #PS
E. terebra L.A.S.Johnson & K.D.Hill	*Symphyo./'Gland.'/Contortae*	12	Johnson & Hill (1991)						+	+ #
E. tereticornis Sm.	*Symphyo./Exsert./Exsertae*	39	Mueller (1879–1884, Decade IX)						+	+ #
			Epsom, Cornwall Park, Eucalypt Arboretum near kiosk		-36.8980/174.7859	100			♦	♦#
			Northcote, Onepoto Domain, NW side on tuff ring	AK385446	-36.8067/174.7483	20			♦	♦#
E. tetraptera Turcz.	*Symphyo./Dumar./Tetrapt.*	26	Mueller (1879–1884, Decade II)						+	+ #
E. tetrodonta F.Muell.	*Eudesm./Complan./Tetradont.*	9	Mueller (1879–1884, Decade I)						+	+ #
E. todtiana F.Muell.	*Euc./'Frutices'/Diversiform.*	55	Mueller (1879–1884, Decade IX)						+	+ #
E. tricarpa (L.A.S.Johnson) L.A.S.Johnson & K.D.Hill	*Symphyo./Adnat./Melliod.*	36	Windsor Park, 415 East Coast Road	AK385447	-36.7378/174.7404	70	♦	♦#		
			Wilson (2002)				+?	#		
E. uncinata Turcz.	*Symphyo./Bisect./Poranth.*	25	Mueller (1879–1884, Decade IV)						+	+ #
E. verrucata Ladiges & Whiffin	*Euc./Euc./Pachyphloiae*	50	Mueller (1879–1884, Decade II) (as *E. alpina*)						+	+ #
E. victrix L.A.S.Johnson & K.D.Hill	*Symphyo./Adnat./Striolatae*	31	Hill & Johnson (1994)						+	+ #

Appendix 1. continued

Eucalypt taxon	Subgenus / section / series plus page no. in Nicolle (2019)		Location of tree (for direct observation) or source of information (reference with illustration of dissected bud)	Voucher numbers	Lat./Long. ± 10m	alt. m	H	D	NH	F
E. viminalis Labill.	*Symphyo./Maiden./Vimin.*	46	Mueller (1879–1884, Decade X)						+	+ #
			Mt Albert Domain	AK385448	-36.8909/174.7205	120			♦	♦#
E. viridis R.T.Baker	*Symphyo./Adnat./Subbux.*	33	Hill (1997) (as *E. aenea*)						+	+ #
E. williamsiana L.A.S.Johnson & K.D.Hill	*Euc./Euc./Pachyphloiae*	49	Johnson & Hill (1990)						+	+ #
E. youmanii Blakely & McKie	*Euc./Euc./Pachyphloiae*	49	Johnson & Hill (1990) (as *E. subtilior*)						+	+ #

TOTALS – excluding uncertain staminophore morphology indicated with a questionmark (?).

'Specimen' means either direct observations of material from individual trees, or different indirect observations from online sources.

Where the capsule survey (EUCLID: Slee *et al.* 2020) has confirmed observations it is not included in totals. Where it has provided data when direct or indirect observations were lacking, it has been counted as 1 'specimen' per taxon.

Angophora: 3 taxa (4 'specimens'; incl. 2 pers. obs.)
Staminophore 'non-hinged' in buds and 'fixed' on capsules.

Corymbia: 26 taxa (33 'specimens'); includes pers. obs. 3 taxa (5 'specimens').
Staminophore 'non-hinged' in buds and 'fixed' on capsules.

Eucalyptus: 160 taxa (223 'specimens'); includes pers. obs. 43 taxa (72 'specimens'). *Eucalyptus leucoxylon* was counted as four taxa – while all specimens were different, the subspecies names are given for only two entities identified by Dr. Mike Wilcox.
Staminophore characters:

Buds - non-hinged	150 taxa (190 'specimens'), includes pers.obs. 34 taxa (54 'specimens').
Capsules - fixed	150 taxa (188 'specimens'), includes capsule survey data (EUCLID: Slee *et al.* 2020) and pers. obs. 26 taxa (36 'specimens').
Buds - hinged	8 taxa (15 'specimens'), includes pers. obs. 8 taxa (15 'specimens').
Capsules - deciduous	10 taxa (19 'specimens'), includes pers. obs. 7 taxa (13 'specimens'). Only 9 taxa in capsule survey data (EUCLID: Slee *et al.* 2020), because according to EUCLID *E. bosistoana* lacks a deciduous staminophore. However, direct observation found otherwise.